

## ETHICAL IMPLICATIONS AND SOCIAL IMPACTS OF INTEGRATING ARTIFICIAL INTELLIGENCE INTO SUSTAINABILITY EFFORTS

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**Purpose:** The article undertakes a comprehensive investigation into the intricate network of ethical implications and societal impacts that ensue from the integration of artificial intelligence (AI) into initiatives geared towards promoting sustainability. The article seeks to elucidate the complex interplay between AI technologies and sustainability initiatives.

**Design/methodology/approach:** The methodology of this article involves a systematic and thorough literature review process as well as analysis and generalization.

**Findings:** The paper contributes to a nuanced understanding of the ethical and societal implications of integrating artificial intelligence into sustainability efforts, offering valuable insights.

**Originality/value:** The paper holds value for researchers, policymakers, practitioners, and educators involved in artificial intelligence development, sustainability efforts, and ethical considerations.

**Keywords:** Artificial intelligence, sustainability, ethical implications, social impacts.

**Category of the paper:** Literature review.

### 1. Introduction

In the realm of sustainability, the incorporation of artificial intelligence offers a substantial potential for addressing environmental concerns, managing resources, education, and fostering social development in unprecedented manners (Pedemonte, 2020; Wright, 2023, Bilan et al, 2022; Skrynnyk et al., 2022). Nonetheless, as researchers embark on this technological shift towards a more sustainable future, it is crucial to carefully analyse the moral considerations and societal consequences associated with the implementation of AI in sustainability initiatives

(European Parliament, Directorate-General for Parliamentary Research Services, Fox-Skelly et al., 2020; Genovesi, Mönig, 2022).

Sustainability has become a key worldwide goal, aiming to reconcile economic development, environmental preservation, and social fairness for the benefit of present and future generations (Talan et al., 2020, Kuzior, 2014, 2010, 2007; Ciążela, 2006). Innovations in the field of green economy, green energy and fair society started to play a huge role (Vasylieva et al., 2019; Kuzior, Lobanova, 2020; Kuzior et al., 2022; Tutak et al., 2020; Chen et al. 2023; Dzwigol et al., 2021; Kwilinski et al., 2023; Starchenko et al. 2021; Sakiewicz et al., 2020; Kochmańska, 2019; Kochmańska, Karwot, 2015). Over the past years, artificial intelligence has been utilised to bolster sustainable efforts, providing evidence-based insights, predictive models, and automation to facilitate impactful decision-making (Bracarense et al., 2022; Stanford University..., 2023; United Nations, 2022; Vinuesa et al., 2020).

This article aims to examine the complex connection between artificial intelligence, sustainability, ethics, and society. It is also vital to elucidate the profound impact that AI can have on sustainable practices, while still acknowledging the significant ethical and social considerations that come with its integration.

The integration of AI into sustainability initiatives holds significant potential to transform our approach to environmental issues and resource management (Francisco, 2023; Microsoft Corporation, n.d.; Yadav, Singh, 2023). Within the realm of AI-driven sustainability, it is crucial to acknowledge and confront the ethical predicaments that emerge during its execution (Bostrom, Yudkowsky, 2014; Hogenhout, 2021; Li, An, Zhang, 2021; McKinsey Company, 2019). The integration of AI into sustainability efforts has significant social consequences, in addition to ethical concerns (Bryson, 2019; Conklin et al., 2021; Oliver, 2022).

## 2. Methods

To fulfil the aim of the article, the research employs techniques such as literature review to gather, analyse, and synthesise relevant information from a wide range of sources; analysis to identify patterns, trends, relationships, and associations within data; generalisation to make broader statements or inferences based on the analysis of specific data or observations and tabular data presentation to organize and display data in a structured form.

The literature review is based on the Scopus database (TITLE-ABS-KEY ("cognitive technolog\*" OR "artificial intelligence" OR "machine learning" OR "deep learning" OR "natural language processing" OR "robotics") AND TITLE-ABS-KEY ("sustainable development" OR "sustainability") AND TITLE-ABS-KEY (ethic\*)) AND (LIMIT-TO (OA,

"all")) AND (LIMIT-TO (LANGUAGE, "English")) is the used searched query to gain 174 documents as a result.

Thus, the following questions emerge:

RQ1 – Is there any evidence of the connection between the area of application and the use of AI technologies?

RQ2 – What is the link between AI and SDGS?

RQ3 – What is the promise of AI in sustainability?

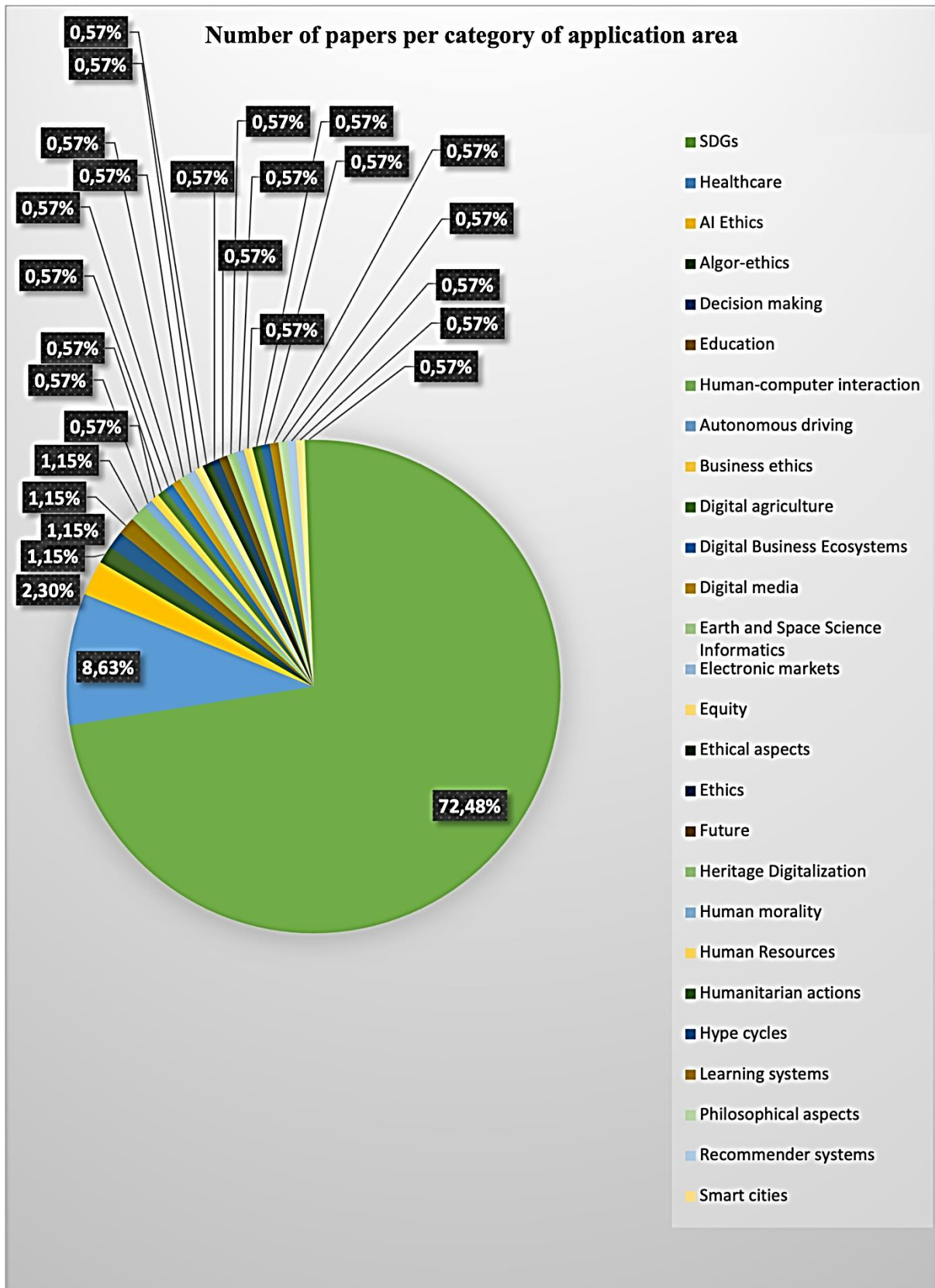
RQ4 – What are ethical considerations in AI-driven sustainability?

RQ5 – What are the social impacts of AI integration?

### **3. Results and discussion**

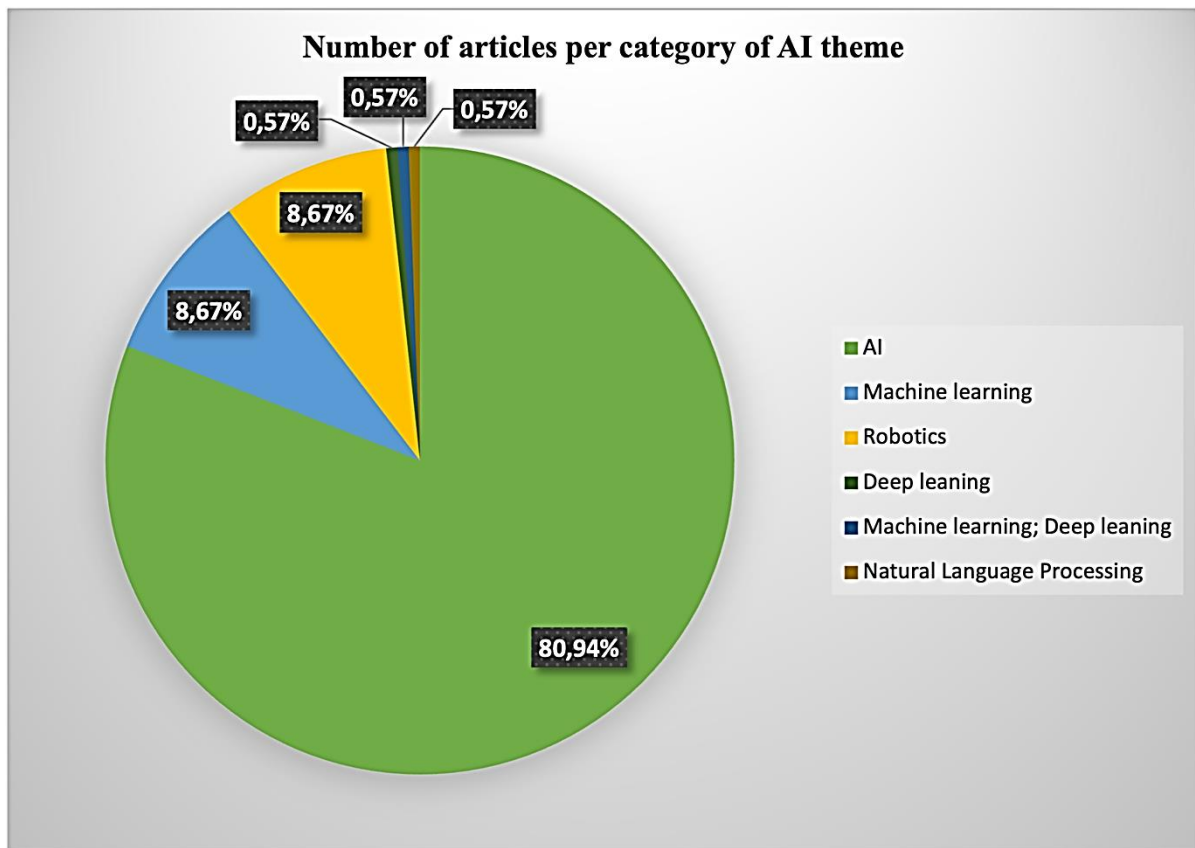
The incorporation of artificial intelligence into sustainability initiatives has garnered increasing attention and scholarly investigation across diverse fields of study.

RQ1 regards the existence of evidence about the connection between the area of technology adoption and the use of AI technologies. Analysing the sample of selected articles from the areas of AI application perspective, papers considering Sustainable Development Goals (SDGs) have been the most numerous, representing 72,48% (126). The use of AI in healthcare has been found in 8,63% (15) of the articles. AI ethics has been discussed in 2,30% (4) papers. Regarding other areas such as algor-ethics, decision-making, education, and human-computer interaction, they have been cited by 1,15% (2). The rest of the areas have been represented in only one article. Figure 1 shows these percentages. The literature review of the selected articles through the AI lens shows that techniques of general AI have been addressed by 80,94% (140) of the selected articles. Both machine learning and robotics have been the focus of 8,67% (15), while representation learning had the attention of 12,20% (5). Deep learning, the combination of machine and deep learning and natural language processing have been addressed by just 0,57% (1) These percentages can be observed in Figure 2. The sample of selected articles has been initially examined according to the themes of the studied fields separately.



**Figure 1.** The number of papers of the sample studied per areas of adoption.

Source: developed by the authors.



**Figure 2.** Number of articles by category of AI discipline found in the sample studied.

Source: developed by the authors.

Paying attention to the fact that research showed the link between SDGs and AI is a crucial and promising one, as AI has the potential to significantly contribute to achieving these global goals. RQ2 concerns the potential of AI in promoting sustainability. SDGs 17 (75 articles), 9 (38 articles), 4 (33 articles), 8 (28 articles), and 12 (22 articles) have been referenced the most. The data is represented in Table 1.

The role of AI in the mentioned SDGs is as follows. Goal 17: AI can facilitate collaborations between governments, businesses, academia, and civil society in addressing global challenges, fostering innovative solutions, and sharing knowledge to achieve the SDGs.

Goal 9: AI innovations drive advancements in various industries, facilitating technological progress and infrastructure development, which can contribute to economic growth and sustainable development.

Goal 4: AI technologies offer personalized learning experiences and educational content recommendations, supporting inclusive and equitable education, and enhancing learning outcomes for individuals with diverse needs.

Goal 8: AI's potential in automating repetitive tasks can free up human resources to focus on higher-value work, thus fostering economic growth and job creation in new and innovative industries.

Goal 12: AI is used to optimize resource use, minimize waste generation, promote circular economy practices, enhance supply chain management, and facilitate sustainable production

processes across industries, thus fostering more responsible and sustainable patterns of consumption and production.

**Table 1.**

*Number of times SDGs have been mapped in the articles*

SDG	Title of the SDG	Number of times
Goal 1	No poverty	9
Goal 2	Zero hunger	5
Goal 3	Good health and well-being	7
Goal 4	Quality education	33
Goal 5	Gender equality	4
Goal 6	Clean water and sanitation	1
Goal 7	Affordable and clean energy	3
Goal 8	Decent work and economic growth	28
Goal 9	Industry, innovation and infrastructure	38
Goal 10	Reduced inequalities	13
Goal 11	Sustainable cities and communities	15
Goal 12	Responsible consumption and production	22
Goal 13	Climate action	15
Goal 14	Life below water	3
Goal 15	Life on land	1
Goal 16	Peace, justice and strong institutions	17
Goal 17	Partnership for the goals	75

Source: developed by the authors.

As people embrace the transformative power of AI, it is essential to acknowledge and address the ethical concerns and societal consequences that arise from its integration into sustainability initiatives. The article also explores the ethical considerations and social impacts associated with incorporating AI into our pursuit of sustainability (RQ4 and RQ5).

As the use of AI becomes increasingly important in promoting sustainable practices, it is essential to thoroughly analyse the ethical issues related to its integration. The utilization of AI technologies is growing to optimize the management of resources, support environmental preservation, and enhance decision-making in sustainability projects (Jarosz, 2023; Kar et al., 2022; Mrówczyńska et al., 2019).

Data privacy and security are major concerns when it comes to AI systems, as they heavily rely on large amounts of data for learning and prediction purposes (Elliott and Soifer, 2022; The Economic Times, 2023). Within the realm of sustainability, these datasets may contain sensitive information about individuals, communities, and ecosystems. Therefore, it is crucial to prioritize the maintenance of data privacy and security and to establish the theoretical and methodological bases for employing parametric artificial intelligence technologies to safeguard the security of sustainable societal progress (Kwilinski et al., 2019). To prevent unauthorized access, data breaches, and potential misuse of personal information, responsible and ethical practices must be implemented in the collection, storage, and utilization of data (United Nations Development Group, n.d.). The implementation of robust data protection measures, consent mechanisms, and anonymization protocols is vital in safeguarding individual privacy and cultivating public trust in AI-driven sustainability endeavours (European Commission, 2019).

Algorithmic bias and fairness are significant issues in the field of artificial intelligence (Myers, Nejkov, 2020). AI algorithms can be influenced by biases that are present in the data they are trained on. This can have negative implications in the context of sustainability, as biased AI models may unintentionally contribute to environmental injustices and worsen existing inequalities in vulnerable communities (European Union Agency for Fundamental Rights, 2022). To tackle this challenge, developers must actively work to identify and address bias in AI systems. This can be achieved through the utilization of diverse and representative datasets, conducting regular assessments to identify bias, and employing algorithms that prioritize fairness and equity (Schwartz et al., 2022).

The lack of transparency and accountability in certain AI models gives rise to concerns regarding their ability to be understood and held responsible (Larsson, Heintz, 2020; Loi, Spielkamp, 2021). In sustainability initiatives, it is crucial to ensure that AI-driven decisions can be explained and comprehended by stakeholders. Transparent AI systems enable individuals and communities to grasp the rationale behind decisions that impact their lives, fostering trust and acceptance (Rubin, 2020). Additionally, it is imperative to establish mechanisms for holding AI accountable, as it should not be deployed without oversight and accountability (Busuioc, 2020).

AI systems, despite their advanced capabilities, have the potential to generate unforeseen outcomes. Within the realm of sustainability, these unintended consequences may encompass unanticipated environmental ramifications, unforeseen disruptions in ecological systems, or inadvertent social repercussions (Galaz et al., 2021). Consequently, it is imperative to undertake thorough risk assessments before incorporating AI into sustainability endeavours and to maintain continuous vigilance in monitoring for unexpected effects.

The incorporation of AI in sustainability endeavours carries various societal ramifications that necessitate thorough examination. Although AI offers considerable potential in promoting environmental preservation and efficient resource utilization, it also presents certain societal obstacles that require careful attention.

Job displacement and economic inequality are significant societal issues that arise from the integration of AI (Sholler, Macinnes, 2022). The increasing prevalence of AI-driven automation across industries has the potential to render certain job positions obsolete or require fewer human workers. Consequently, this may result in disruption within the workforce and contribute to disparities in economic conditions, especially for individuals employed in sectors heavily affected by automation.

To alleviate these consequences, it is imperative to adopt proactive strategies that focus on reskilling and upskilling the labour force for new positions that are compatible with AI technologies (Kuzior et al., 2021; The White House, 2022). Allocating resources towards educational and training initiatives aimed at equipping individuals with the requisite proficiencies for employment in the AI era can contribute to the promotion of economic fortitude and the mitigation of inequality.

The incorporation of AI often necessitates access to powerful computational resources, high-speed internet connectivity, and proficiency in managing intricate algorithms (National Artificial Intelligence..., 2023). In areas or communities with limited access to these resources, there exists a potential for exclusion from the advantages offered by AI-driven sustainability endeavours.

To tackle the issue of unequal access to technology, it is imperative to prioritize the development of digital literacy and equal availability of AI technologies and data (Imran, 2022). By fostering partnerships between governmental entities, businesses, and civil society, the gap can be narrowed, thereby guaranteeing that the transformative abilities of AI are accessible to individuals across various geographical locations and socioeconomic backgrounds.

The attainment of successful incorporation of AI in sustainability initiatives is contingent upon social acceptance and cultural considerations. Diverse societal perspectives and attitudes towards AI may lead to certain communities expressing hesitancy or concerns regarding the adoption of AI technologies in their everyday lives or environmental practices (Bao et al., 2022).

The implementation of AI technologies has the potential to cause changes in power dynamics both on a societal and organizational level (Kuzior et al., 2019). The utilization of AI enables decision-makers to efficiently access and analyse large quantities of data, granting them previously unattainable insights and influence (Mikalef, Gupta, 2021). However, this centralization of power may raise apprehensions regarding the transparency and accountability of decision-making processes.

Promoting democratic and participatory decision-making processes in the implementation of AI for sustainability can assist in addressing potential power disparities. Involving various stakeholders through extensive consultations and integrating a wide range of perspectives can bolster the credibility and efficacy of AI-driven approaches.

## 4. Conclusions

The promise of AI in sustainability is vast and transformative. AI technologies offer innovative solutions to address complex environmental challenges, optimize resource management, and drive social progress. However, to fully realize this promise, it is essential to address ethical considerations, mitigate potential social impacts, and ensure responsible AI deployment.

As we embrace the potential of AI in advancing sustainable development, it is crucial to address ethical implications, ensure equitable access to AI technologies, and promote responsible AI governance. By harnessing the power of AI while upholding ethical principles



and inclusivity, people can collectively work towards building a more sustainable and prosperous future for all. Ethical considerations play a central role in the pursuit of sustainability through AI. The incorporation of artificial intelligence in sustainability initiatives has notable societal consequences that necessitate attention to facilitate a just and equitable shift towards a sustainable tomorrow.

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