Artificial Intelligence in Public Administration for Environmental Sustainability: An Integrative Review of Research and Practice

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Abstract: Artificial intelligence (AI) is increasingly utilized in public administration as a strategic enabler for achieving environmental sustainability and advancing progress toward the Sustainable Development Goals (SDGs). This study presents an integrative review of 3,107 peer-reviewed publications indexed in Scopus and 98 documented use cases from European public administrations. It explores how AI contributes to environmental goals by synthesizing academic insights and practical implementations. Key themes include environmental monitoring and forecasting, sustainable urban and resource governance, and ethical AI use. Use cases are organized across six environmental SDGs with notable applications in water management, climate action, and biodiversity protection. Findings inform future research and support evidence-based environmental policymaking, while addressing regulatory, technical, and institutional challenges.

Keywords: artificial intelligence, public administration, environmental sustainability, integrative review

1. Introduction

Artificial intelligence (AI) is increasingly adopted in public administration to enhance decision-making, improve service delivery, and advance sustainability goals (Aristovnik et al., 2024; Babšek et al., 2025). In the face of mounting environmental challenges, AI is viewed as a strategic enabler of greener and more adaptive governance (Konya and Nematzadeh, 2024). Despite growing interest, existing research is fragmented, often focusing narrowly on technical or ethical dimensions while overlooking practical applications within administrative contexts (Konya and Nematzadeh, 2024; Palomares et al., 2021). This study addresses this gap through an integrative review that combines insights from scientific literature and documented use cases across European public administrations. It explores how AI contributes to reaching the environmental Sustainable Development Goals (SDGs) by identifying dominant themes in academic discourse and real-world implementation patterns. The analysis is guided by two research questions: (1) What thematic areas of AI use for environmental SDGs are emphasized in the scientific literature? and (2) What types of AI applications are being implemented in public administration to accelerate the achievement of environmental SDGs? The study proceeds with methods, results, and conclusions.

2. Methods

This study employs an integrative review approach (Cronin & George, 2023) to synthesize insights into how AI is used in public administration to support the accomplishment of the SDGs. The literature sample was retrieved from the Scopus database (Mongeon and Paul-Hus, 2016) using a structured keyword query combining three dimensions: artificial intelligence (e.g., “AI,” “machine learning,” “deep learning”), public administration (e.g., “government,” “public sector,” “public organizations”), and the environmental dimension of the SDGs (SDGs 6, 7, 12, 13, 14, and 15) according to Palomares et al. (2021) (e.g., “drinking water,” “energy consumption,” “zero waste”). The search yielded a total of 3,107 peer-reviewed documents published in English up to May 2025. In parallel, 98 documented use cases were selected from the European Commission’s Public Sector Tech Watch database (European Commission, 2025), based on relevance to both AI implementation and environmental objectives. All sources were analyzed through thematic synthesis, with recurring topics organized by SDGs.

3. Results

Figure 1 presents a keyword co-occurrence network based on the 50 most frequent author keywords. The visualization reveals five distinct thematic clusters. The first cluster (red) centers on *digital governance and smart sustainability*, including terms such as AI, smart city, and circular economy. The second cluster (green) focuses on *sustainable systems and energy*, with keywords like machine learning, renewable energy, and optimization.

The third cluster (blue) emphasizes *remote sensing and environmental monitoring*, featuring remote sensing, classification, and convolutional neural networks. The fourth cluster (yellow) highlights *predictive modeling and neural architectures*, with terms such as deep learning, artificial neural network, and forecasting. The fifth cluster (purple) relates to *climate policy and data-driven governance*, connecting climate change, big data, and public policy. These clusters reflect the multidimensional integration of AI across environmental, technical, and governance domains in literature.

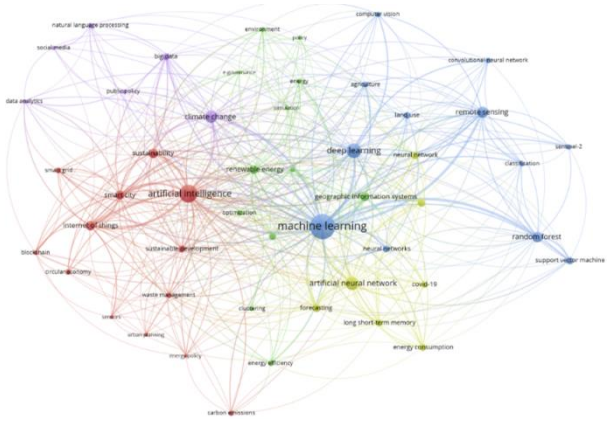

Figure 1. Keyword co-occurrence network of the 50 most frequent author keywords

An overview of how public administrations use AI to address six environmental SDGs, as defined by Palomares et al. (2021), is presented in Table 1. The highest number of applications, with each use case potentially addressing multiple SDGs, is linked to SDG 15 (Life on land), SDG 14 (Life below water), and SDG 6 (Clean water and sanitation), reflecting strong engagement with environmental monitoring and ecosystem management. Typical cases include water level forecasting (Estonia), forest and vegetation detection (Netherlands), marine pollution control (Portugal), waste sorting (Germany), energy-efficient buildings (Spain), and participatory climate platforms (Belgium).

Table 1. AI use cases in public administration for achieving environmental SDGs

SDG	No. of cases	Typical use case
SDG 6 (Clean water and sanitation)	23	Water level monitoring (Estonia); AI for Water in Garda Lake (Italy)
SDG 7 (Affordable and clean energy)	10	ZEBAI - Zero-Emission and cost-effective Buildings (Spain)
SDG 12 (Responsible consumption and production)	13	MATISSE - early warning system (Portugal); Municipal Waste Sorting (Germany)
SDG 13 (Climate action)	22	CitizenLab - Youth for Climate (Belgium)
SDG 14 (Life below water)	27	IPSTERS - Remote Sense Data (Portugal)
SDG 15 (Life on land)	28	Vegetation detection Friesland (Netherlands)

From the perspective of core public administration functions, most analyzed use cases (78) focus on optimizing internal processes, followed by those improving public services (20) and supporting policy decision-making (11), with some applications serving multiple functions (European Commission, 2025).

4. Conclusion

This study explores how the use of AI in public administration supports the environmental SDGs through a review of the literature and real-world applications. Findings highlight three key areas: environmental monitoring and forecasting, sustainable urban and resource governance, and ethical implementation frameworks. Applications are most common in domains such as water management, waste management, climate action, and biodiversity protection, primarily aimed at improving internal efficiency in public administration. Despite promising outcomes, challenges in data governance, regulation, and institutional readiness persist (Konya and Nematzadeh, 2024). Ongoing research and cross-sector collaboration are key to effectively applying AI to environmental SDGs.

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