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ECO-AI BASED ISLAMIC EDUCATION MANAGEMENT: MPI 5.0 INNOVATION BASED ON OUTCOME-BASED EDUCATION TO ACHIEVE SUSTAINABLE ACADEMIC EXCELLENCE

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Abstract:

The transformation of Society 5.0 presents a new dilemma for Islamic educational institutions, namely how to integrate artificial intelligence (AI) into academic governance without ignoring the principles of ecological sustainability and Islamic values. This article aims to formulate a conceptual model of Eco-AI Based Islamic Education Management as an innovation of the fifth generation of Islamic Education Management (MPI 5.0) based on the Outcome Based Education (OBE) paradigm to realize sustainable academic excellence. This study uses a library research method with a qualitative descriptive-analytical approach through a conceptual synthesis of Islamic education management, Green/Eco-AI, and OBE literature published between 2018 and 2026. The results of the study indicate that MPI 5.0 is a dialectical continuation of the digital transformation of madrasahs and Islamic boarding schools in the Society 5.0 era that places the values of shura and maqashid sharia as ethical controllers of AI utilization. The integration of OBE provides a framework for aligning graduate learning outcomes with sustainable quality indicators, while the Eco-AI principles encompass the dimensions of green in AI and green by AI, ensuring that the adoption of intelligent technologies does not increase the institution's carbon footprint. The proposed conceptual model consists of four interrelated pillars: Islamic ethical digital governance, an outcomes-oriented curriculum, energy-efficient AI infrastructure, and an environmentally friendly academic culture (eco-campus). This article contributes to the development of a new theoretical framework for managers of Islamic religious universities and Islamic boarding schools (pesantren) in designing adaptive, ethical, and sustainable digital transformation policies.

Keywords: *Eco-AI; Islamic Education Management; MPI 5.0; Outcome-Based Education; Sustainable Academic Excellence*

INTRODUCTION

Entering the third decade of the 21st century, the world of higher education is experiencing an accelerated digital transformation marked by the widespread adoption of artificial intelligence (AI) in almost all aspects of governance, from quality assurance and accreditation to data-driven academic decision-making (Apata et al., 2026; Isaifan & Hasna, 2025). AI is no longer positioned as an administrative complement, but has become a new epistemic infrastructure that reshapes the relationship between administrators, educators, and students. However, this rapid flow of transformation has also given rise to new issues that have not been widely discussed in the discourse of educational management: the

ecological footprint of AI itself, which ironically has the potential to conflict with the sustainability agenda that educational institutions are striving to achieve (Bolón-Canedo et al., 2024; Huang & Gopal, 2025).

In the context of Islamic education, this phenomenon presents its own complexities. Islamic educational institutions, whether in the form of Islamic boarding schools (pesantren), madrasahs (Islamic schools), or Islamic religious universities, have long been moving toward digital governance in response to the demands of Society 5.0 (Khoirudin et al., 2023; Wijaya & Umam, 2024). Various studies indicate that the digitalization of Islamic Education Management (IEM) has penetrated the realm of academic information systems, online administrative services, and even the digital leadership of madrasah principals (Wardhani et al., 2025; Yahya, 2025). However, this transformation generally stops at the level of administrative efficiency and has not explicitly integrated two major, interrelated agendas: outcome-based quality assurance and environmental sustainability, as a unified governance framework.

At the same time, the Green AI or Eco-AI movement in global technology literature increasingly emphasizes that the growth of large-scale AI models is positively correlated with increased energy consumption and carbon emissions in data centers, thus creating an urgent need for energy efficiency strategies at the algorithm, hardware, and institutional policy levels (Tabbakh et al., 2024; Huang & Gopal, 2025). In line with this, Islamic teachings on the position of humans as khalifah fil ardh responsible for maintaining the balance (mizan) of the universe provide a strong theological foundation for Islamic educational institutions to mainstream environmentally friendly principles in every aspect of their governance, including in the use of smart technology (Athoillah et al., 2024; Putri et al., 2025). The concept of eco-pesantren, which has developed as a model of environmental education based on Islamic spirituality, provides empirical evidence that Islamic values and ecological sustainability can be organically converged in institutional practices.

On the other hand, quality assurance in Islamic higher education over the past decade has relied heavily on the Outcome-Based Education (OBE) paradigm, which emphasizes alignment between graduate learning outcomes (CPL), course learning outcomes (CPMK), learning methods, and assessment instruments (Spady, 1994). Various studies in Islamic Religious Education and Islamic Education Management study programs have demonstrated that OBE implementation has a positive and significant impact on graduate learning outcomes (Mualif et al., 2026; Alim & Fauzi, 2020), although its implementation still faces obstacles in strengthening affective and psychomotor evaluations (Masruroh et al., 2024) and structural challenges in designing a curriculum relevant to the needs of the digital era (Manggali et al., 2024). Unfortunately, these studies are generally standalone and have not established an explicit link with the agenda of ecologically sustainable AI transformation.

Based on the mapping of the gap, this article is proposed to answer the question: how to formulate an integrative conceptual model that combines the innovation of the fifth generation of Islamic Education Management (MPI 5.0), the principles of Eco-AI, and the paradigm of Outcome-Based Education into a single governance framework capable of realizing sustainable academic excellence in Islamic educational institutions? The objectives of this article are: (1) to reconstruct the genealogy of MPI transformation from the conventional era to MPI 5.0; (2) to analyze the position of OBE as the backbone of achievement-oriented quality assurance; (3) to elaborate the principles of Eco-AI as an ethical-ecological controller of the use of artificial intelligence; and (4) to develop an integrative conceptual model of Eco-AI Based Islamic Education Management

and its implications for sustainable academic excellence. The novelty of this article lies in the effort to bridge the three areas of study that have been developing in parallel: Islamic education management, sustainability AI, and OBE into a coherent and applicable theoretical construction for managers of Islamic religious higher education institutions and Islamic boarding schools.

RESEARCH METHODS

This article was compiled using a library research method with a qualitative descriptive-analytical approach through conceptual synthesis techniques. This approach was chosen because the research objective is to develop theoretical-conceptual ideas, not to test hypotheses on a specific population. Data sources consist of two categories. First, primary sources in the form of journal articles indexed by SINTA (S1-S5), Scopus, and Web of Science that discuss Islamic Education Management, Society 5.0, Outcome-Based Education, and Green/Eco-AI published between 2018 and 2026. Second, secondary sources in the form of reputable academic books and relevant official policy documents, such as reports from international institutions related to sustainability and education.

The data collection procedure was conducted through a systematic search of Google Scholar, SINTA, ScienceDirect, Springer, IEEE Xplore, and Emerald databases using the keywords 'Islamic education management', 'Society 5.0', 'Outcome-Based Education', 'Green AI', and 'sustainable higher education'. Inclusion criteria included: (a) substantive relevance to the three main constructs of the study; (b) publication in a reputable indexed journal; and (c) availability of full text for analysis. Data analysis was conducted using content analysis techniques to identify themes, patterns, and conceptual relationships between the literature, which were then synthesized into an integrative model framework through the stages of data reduction, thematic categorization, and conceptual abstraction.

RESULTS AND DISCUSSION

From Society 5.0 to MPI 5.0: Genealogy of Islamic Education Management Transformation

Islamic Education Management (IEM) is not a static construct, but rather continues to evolve in line with changes in social and technological structures. Historically, the roots of Islamic education governance can be traced to classical mosques and madrasahs, which taught religious studies alongside philosophy, medicine, and astronomy (Makdisi, 1981). The governance pattern during this phase, referred to in this article as the early generation of IEM, was informal, based on the scholarly authority of Islamic scholars, and unfamiliar with modern administrative systems. Entering the era of industrialization and national education reform, IEM transformed into a more bureaucratized system with curriculum standards, accreditation, and school-based management, before finally entering a digitalization phase in the 2010s, marked by the use of academic information systems and online administrative services (Wardhani et al., 2025).

The Society 5.0 concept, introduced by Japan in response to the Industrial Revolution 4.0, emphasizes a balance between the use of advanced technology and human values, placing humans at the center of all technological innovation (Fukuyama, 2018). This idea was then widely adapted in the discourse of Indonesian Islamic education, as reflected in various studies on the transformation of student management, madrasah leadership, and the modernization of Islamic boarding school management in the Society 5.0 era (Khoirudin et al., 2023; Wijaya & Umam, 2024). These findings consistently

emphasize that the integration of technologies including AI, the Internet of Things, and big data can improve the efficiency, accuracy, and personalization of educational services. However, its success is highly dependent on the readiness of human resources, policy support, and the balance between technological modernization and Islamic values (Yahya, 2025).

This article proposes the term MPI 5.0 to refer to the next phase of transformation that goes beyond mere administrative digitization to Islamic education governance supported by artificial intelligence but remains rooted in Islamic epistemology and ethics. Different from the purely instrumental-technical adoption of technology, MPI 5.0 places three Islamic principles as normative controls on the use of AI: shura (deliberation) in institutional decision-making involving multiple stakeholders, maqashid sharia as an ethical framework for assessing the benefits and disadvantages of each technological policy (Akbar et al., 2025), and mizan (balance) as a principle of ecological sustainability that guides the use of AI so as not to create environmental externalities that are detrimental to future generations. Thus, MPI 5.0 is not simply a chronological stage after Society 5.0, but rather an epistemic synthesis between technological progress and the sustainability of values that are characteristic of Islamic education.

Outcome-Based Education as the Backbone of Quality Assurance in Islamic Education

Outcome-Based Education (OBE) was first comprehensively formulated by Spady (1994) as an approach that focuses and organizes all components of the education system around what is essential for students to successfully complete their learning experience. This principle shifts the orientation of education from merely fulfilling inputs (face-to-face hours, teaching materials) to achieving measurable and demonstrable learning outcomes. In the context of Islamic higher education in Indonesia, OBE has become the primary reference for curriculum development by aligning Graduate Learning Outcomes (CPL) and Course Learning Outcomes (CPMK) with learning methods and assessment instruments (Alim & Fauzi, 2020).

Empirical evidence demonstrates the significant impact of OBE implementation on the quality of graduates of Islamic religious studies programs. A study of the Islamic Religious Education Study Program at a regional Islamic religious college found that OBE implementation had a positive and significant impact on graduate learning outcomes, with a relatively strong influence, while also emphasizing the importance of strengthening evaluation in the affective and psychomotor domains to ensure a more holistic learning quality (Mualif et al., 2026). This finding is reinforced by a study of the Islamic Education Management Study Program, which showed that the success of OBE implementation is largely determined by the consistent alignment between curriculum design, the learning process, and the achievement-based evaluation system (Masruroh et al., 2024).

Nevertheless, several studies have also identified structural challenges in implementing OBE in Islamic education, particularly in redesigning the curriculum to align with the Merdeka Belajar Kampus Merdeka (Freedom to Learn/Independent Campus) policy and the ever-changing needs of the job market due to technological acceleration (Manggali et al., 2024). This is where the relevance of this article becomes crucial: OBE can no longer be understood solely as a static academic quality assurance instrument, but rather needs to be reconstructed as a dynamic framework that also accommodates learning outcomes related to AI literacy, ecological awareness, and Islamic-value-based digital ethics competencies. In other words, the indicators of OBE success in the

MPI 5.0 era need to be expanded from merely mastering scientific competencies to holistic sustainability competencies.

Eco-AI: Managing the Ecological Footprint of Artificial Intelligence in Educational Governance

The rapid growth of large-scale AI models has raised serious concerns about environmental impacts, particularly regarding the energy consumption and carbon emissions generated by the training and inference processes of machine learning models (Bolón-Canedo et al., 2024). The Green AI literature distinguishes two main orientations: green-in AI, which focuses on the energy efficiency of AI algorithms and hardware itself, and green-by AI, which refers to the use of AI to support environmentally friendly practices in various other sectors (Bolón-Canedo et al., 2024). A comprehensive framework developed by Tabbakh et al. (2024) emphasizes that Green AI strategies can be realized through model optimization, the use of energy-efficient hardware such as tensor processing units and field-programmable gate arrays, and the design of energy-efficient data centers.

At the global institutional level, the Green AI Institute initiative has launched the Green AI Index as a standard instrument for evaluating the environmental impact of AI technologies, encompassing indicators of carbon emissions, energy consumption, and water use in data center infrastructure (Huang & Gopal, 2025). The existence of such an instrument is relevant for Islamic educational institutions to adopt as a basis for formulating responsible technology adoption policies. Unfortunately, research on AI governance in higher education, including in the context of quality assurance and accreditation, rarely explicitly includes environmental sustainability dimensions in its policy framework (Isaifan & Hasna, 2025; Apata et al., 2026), thus opening up opportunities for conceptual contributions for this article.

From an Islamic perspective, the urgency of Eco-AI aligns with the eco-pesantren paradigm that has developed as a manifestation of environmentally friendly education based on Islamic spirituality, where environmental awareness is built through an integrated curriculum, daily practices, and the role models of educators (Athoillah et al., 2024). A literature review on the role of Islamic education in supporting the achievement of the Sustainable Development Goals (SDGs) also confirms the strong alignment between the values of justice ('adl), balance (mizan), and social responsibility (mas'uliyyah) in Islam with the global sustainable development agenda, including aspects of environmental awareness and wise resource management (Putri et al., 2025). This convergence is the fundamental argument that Eco-AI is not merely a technical-environmental agenda, but also a theological necessity for Islamic educational institutions that wish to be consistent with the principle of khalifah fil ardh in utilizing technology.

Eco-AI Conceptual Model Based on Islamic Education Management (MPI 5.0)

Based on the synthesis of the three areas of study mentioned above, this article proposes a conceptual model for Eco-AI-Based Islamic Education Management, built on four interrelated and inseparable pillars. These four pillars are designed to ensure that each established outcome indicator is consistently connected to the ecological sustainability dimension of artificial intelligence, ensuring academic quality assurance and environmental responsibility operate within a unified policy framework, rather than as separate agendas. Table 1 below presents the details of this model.

Table 1. Eco-AI Conceptual Model Based on Islamic Education Management (MPI 5.0)

Pillar Model	Substance Description	OBE-Based Achievement Indicators	Eco-AI Dimension
1. Islamic Ethical Digital Governance	AI adoption decision-making through multi-stakeholder shura mechanisms and policy screening based on maqashid sharia (Akbar et al., 2025).	CPL related to ethical-digital leadership and technology policy deliberation capabilities.	Cross-dimensional governance (green-in & green-by) at the policy level.
2. Achievement-Oriented Curriculum & Assessment	Alignment of CPL--CPMK with AI literacy competencies and ecological awareness, following the OBE down-design principle (Spady, 1994; Mualif et al., 2026).	CPL digital literacy, AI ethics, and sustainability awareness are measured through authentic rubrics.	Green-by AI: AI supports resource-efficient personalized formative assessment.
3. Energy-Efficient AI Infrastructure	Application of compressed AI models, edge computing, and utilization of renewable energy in campus/Islamic boarding school data centers (Tabbakh et al., 2024).	CPL technical competency in sustainable digital infrastructure management.	Green-in AI: algorithm & hardware efficiency.
4. Eco-Campus Academic Culture	AI is utilized for energy monitoring, waste management, and strengthening the eco-pesantren curriculum (Athoillah et al., 2024; Putri et al., 2025).	CPL character cares about the environment and social-ecological responsibility (mas'uliyyah).	Green-by AI: AI for environmentally friendly operational efficiency.

The four pillars in the above model work cyclically, not linearly. Islamic ethical digital governance (pillar 1) serves as the normative umbrella that determines the direction of curriculum policy (pillar 2), which then requires the support of energy-efficient infrastructure (pillar 3) so that its implementation is not counterproductive to the sustainability agenda, and ultimately the entire process must be internalized in the academic culture of the eco-campus (pillar 4) which reflects long-term success. Validation of the success of this model is measured through expanded learning outcome indicators (CPL), which include not only conventional cognitive-academic competencies, but also sustainability competencies and Islamic digital ethics as measurable and accountable outcomes, in line with the basic philosophy of OBE that success must be demonstrably tangible at the end of the learning experience (Spady, 1994).

Implications of the Model for Sustainable Academic Excellence

The implementation of the Eco-AI Based Islamic Education Management model has direct implications for strengthening sustainable academic excellence, which in this article is defined as academic excellence achieved without sacrificing ecological sustainability and the integrity of institutional values in the long term. First, in the quality assurance dimension, the integration of sustainability indicators into the OBE framework strengthens institutional accountability to accreditation bodies and the public, in line with the global trend that positions AI as a strategic instrument in strengthening transparent and data-driven accreditation governance (Isaifan & Hasna, 2025). Second, in the dimension of contribution to the global agenda, this model positions Islamic educational institutions as active actors in achieving SDG 4 on quality education and SDG 13 on climate change management, considering that AI in higher education has been seen as an important instrument for achieving the sustainable development agenda, but also carries environmental risks that must be consciously managed (Apata et al., 2026).

Third, in terms of value distinctiveness, this model offers strategic differentiation for Islamic educational institutions amidst an increasingly

homogenous higher education landscape resulting from the global adoption of uniform technology. By embracing the values of shura, maqashid sharia, and mizan as ethical drivers of AI utilization, Islamic educational institutions are not merely followers of technological trends but are able to offer an alternative model of AI governance that is more humane and sustainable, as reflected in the practice of eco-pesantren (Islamic boarding schools) that have successfully shaped the character of environmentally conscious students through contextual learning and exemplary behavior (Athoillah et al., 2024). Such academic excellence is sustainable because it is not susceptible to reputational or regulatory risks arising from ignoring the environmental impacts of technology, while simultaneously strengthening institutional competitiveness in the long term.

Challenges, Opportunities, and Implementation Recommendations

The implementation of the Eco-AI-Based Islamic Education Management model is not without several structural challenges. First, the gap in digital literacy and technical competency among educators and Islamic boarding school/madrasah managers remains a major obstacle to the adoption of advanced technology, as consistently found in various MPI digitalization studies (Yahya, 2025; Wardhani et al., 2025). Second, budget limitations for energy-efficient AI infrastructure investment have the potential to hinder the implementation of the third pillar of this model, especially for small and medium-sized Islamic educational institutions. Third, there is potential epistemic tension between the instrumental orientation of technological efficiency and the Islamic value orientation that emphasizes the holistic process of character formation. Therefore, a clear normative mediation framework is needed to prevent AI from reducing the essence of Islamic education to mere data optimization.

On the other hand, the opportunity to implement this model is quite open considering the global regulatory trend that increasingly encourages responsible and transparent AI governance in the higher education sector (Isaifan & Hasna, 2025), as well as the availability of a Green AI technical framework that can be gradually adapted according to institutional capacity, starting from the use of lighter and more efficient AI models to collaboration with cloud computing service providers that apply renewable energy principles (Tabbakh et al., 2024). Based on the mapping of these challenges and opportunities, this article recommends: (1) the development of guidelines for AI governance based on maqashid sharia at the institutional policy level and regulations of the Ministry of Religious Affairs; (2) strengthening the digital and ecological capacity of educators through continuous training; (3) the development of a roadmap for transformation towards an eco-campus that is integrated with the OBE curriculum document; and (4) the development of quality evaluation instruments that explicitly include AI sustainability indicators as part of graduate learning outcomes .

CONCLUSION

This article formulates a conceptual model of Eco-AI Based Islamic Education Management as an innovation of MPI 5.0 that integrates three areas of study that have previously developed separately, namely the digital transformation of Islamic education management, the Outcome-Based Education paradigm, and the principles of sustainable artificial intelligence (Eco-AI). The results of the study confirm that MPI 5.0 is an epistemic synthesis between technological progress and Islamic values, where shura, maqashid sharia, and mizan function as ethical-ecological controllers of the use of AI in educational governance. The proposed integrative model, consisting of four

pillars of Islamic ethical digital governance, an outcomes-oriented curriculum, energy-efficient AI infrastructure, and an eco-campus academic culture, offers a new theoretical framework that positions academic excellence and environmental sustainability as a unified goal, rather than two competing agendas.

Theoretically, this article contributes to expanding the scope of learning outcome indicators within the OBE paradigm to include sustainability competencies and Islamic digital ethics literacy. Practically, this model can serve as a reference for managers of Islamic religious universities, madrasahs, and Islamic boarding schools (pesantren) in developing adaptive, ethical, and environmentally friendly digital transformation policies. Given its conceptual nature, this article has limitations in the lack of empirical validation in the field. Therefore, further research is recommended to test this model through a mixed-methods approach in Islamic religious universities or Islamic boarding schools that have adopted AI technology, in order to empirically measure the effectiveness of implementing the four pillars of the model on academic quality achievement and sustainability indicators .

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