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Environmental Leadership of Ecopesantren Supports Sustainable Development Goals

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Abstrak

This study aims to explore how environmental leadership in Islamic boarding schools plays a role in supporting the achievement of the Sustainable Development Goals (SDGs) through the integration of Islamic spiritual values, sustainable education, and technological innovation. The global environmental crisis and the urgency of implementing the SDGs demand educational innovations that can combine ecological awareness, spirituality, and environmentally friendly technology. Pesantren, as a community-based Islamic educational institution, has great potential in shaping the character of students who are not only religious but also care about environmental sustainability. However, research on the role of pesantren in supporting the sustainability agenda is still limited. Using a qualitative approach and an exploratory descriptive design, this study collects data through semi-structured interviews, direct observation, and documentation involving leaders, teachers, and students at Al Ashriyyah Nurul Iman Ecopesantren. The results of the study show that environmental leadership in Islamic boarding schools contributes to SDG3 through organic agriculture and ecology-based sanitation, SDG4 with a spiritual and environment-based curriculum, and SDG5 through women's empowerment in environmental leadership. In addition, SDG6 and SDG7 are realized with environmentally friendly technologies such as biogas, solar panels, and reverse osmosis systems, while SDG17 is strengthened by global and local collaborations. Although this study has limitations in geographical scope and long-term impact exploration, the results enrich the discussion on the integration of environmental education in pesantren and provide recommendations for the Islamic education system in supporting sustainable development.

Keywords: Environmental Leadership, Ecopesantren, SDGs, Environment-Based Education

Introduction

Environmental issues have become one of the most pressing global issues in the 21st century, with challenges such as climate change, degradation of natural resources, and environmental pollution affecting the sustainability of life on earth (Radaya & Latue, 2023). Environmental problems in the 21st century are increasingly urgent due to their impact on ecosystems and human life. Climate change, due to greenhouse gas emissions, is causing global temperature rises, extreme weather, and water and food crises. The degradation of natural resources, such as deforestation and overexploitation, threatens the sustainability of ecosystems and the availability of clean water. Environmental pollution, from industrial waste, plastic waste, and carbon emissions, worsens air, water, and soil quality, and increases health risks. Without sustainability-based solutions and global collaboration, this crisis will only get worse and endanger future generations. As part of global efforts, the Sustainable Development Goals (SDGs) set 17 goals, including environmental, social, economic, legal and governance

protections that demand active contributions from various sectors, including educational institutions (Zhao et al., 2022).

In Indonesia, eco-pesantren has a strategic role in building environmental awareness based on Islamic values (Barid et al., 2023). Ecopesantren instills environmental awareness by integrating Islamic values in sustainability practices, such as waste management, renewable energy, and water conservation. Recycling, organic farming, and biogas programs form a sustainable mindset, making it a holistic education model that produces a generation that cares for the environment and contributes to sustainable development. However, despite its great potential, the implementation of eco-pesantren still faces obstacles, such as weak quality management and ecology-based leadership (Nur Aulia & Abbas, 2021), limited human resources and green technology (Atikoh et al., 2022), and the lack of involvement of students in ecological programs (Barid et al., 2023).

Previous studies on ecopesantren have explored its role in instilling environmental awareness and sustainability based on Islamic values (Anjani & Syamsiah Badruddin, 2024). Several researches discuss the pro-environmental behavior of students (Nur Aulia & Abbas, 2021), ecological-based economic resilience, and ecopesantren design in the framework of sustainable development (Aulia et al., 2018). However, this study is generally still limited to the behavioral aspect, not highlighting environmental leadership as a key factor in implementing activities that can support the SDGs in the capacity of eco-pesantren.

Environmental leadership refers to the capacity of an individual or organization to influence and mobilize others to achieve sustainable environmental practices and policies. This concept encompasses a variety of leadership styles, including green leadership, which emphasizes the importance of ethical and responsible decision-making in relation to environmental management (Kardoyo et al., 2020). Environmental leaders are characterized by their ability to inspire and motivate their followers to engage in pro-environmental behavior, thereby fostering a culture of sustainability within their organizations (Ding et al., 2023). Budimanta et al (2005) explained that environmental leadership highlights 3 main characteristics, namely: 1) insight and knowledge about environmental issues; 2) skills; 3) and morals/ethics.

In addition, various researches highlight the role of transformational leadership is very significant, as it not only encourages innovation in green practices but also aligns organizational goals with environmental sustainability (Begum et al., 2021). The increasing emphasis of society on environmental issues has further encouraged the need for effective environmental leadership, as it plays a crucial role in shaping organizational responses to ecological challenges and promoting sustainable development (Sengur, 2023). Ultimately, environmental leadership is essential to encourage collective action to reduce environmental degradation and improve organizational performance in sustainability efforts (Abbas et al., 2022).

The literature on environmental leadership focuses more on the business and government sectors than educational institutions such as Islamic boarding schools (Dutta et al., 2012). This research gap opens up opportunities to explore how environmental leadership can be applied in the context of ecopesantren. This approach not only covers technical aspects such as waste management and renewable energy but also highlights the importance of spiritual and religious values in shaping an ecological culture that supports sustainable development in the context of ecopesantren education.

Global environmental problems such as climate change, natural resource degradation, and environmental pollution are increasingly urgent, demanding an educational approach that is not only academic but also builds ecological awareness and environmental leadership (Islami et al., 2021). In this context, environmental leadership in ecopesantren is an important study

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because pesantren, as an educational institution based on Islamic spiritual values, has great potential in shaping sustainable behavior in the younger generation. Pesantren not only educates students in religious aspects, but also plays a role in instilling ecological responsibility through sustainability practices that are integrated with Islamic teachings.

Ecopesantren can be an educational model that connects spirituality, sustainability education, and technological innovation, creating a generation that is not only religious but also committed to environmental sustainability (Anjani & Syamsiah Badruddin, 2024). Within the framework of the Sustainable Development Goals (SDGs), environmental leadership in ecopesantren contributes to SDG3 (Health and Welfare) through ecology-based sanitation, SDG4 (Quality Education) through a sustainability-based curriculum, as well as SDG6 and SDG7 with the application of green technologies such as biogas and solar energy.

In addition, ecopesantren also supports SDG5 (Gender Equality) through women's empowerment and SDG17 (Global Partnership) by building a sustainability network. Therefore, this study aims to analyze environmental leadership practices in ecopesantren, focusing on how environmentally-oriented leadership can encourage the application of sustainability values in pesantren management. The novelty of this research lies in the integration of Islamic values, green technology, and community approaches in making ecopesantren a sustainability-based education model that is relevant locally and globally. This research is expected to make a practical contribution to the development of ecopesantren and enrich the global discourse on environment-based education, making it a holistic solution in facing current and future ecological challenges.

Method

This research method uses a qualitative approach with an exploratory descriptive design to explore the application of environmental leadership and its contribution to supporting activities for the Sustainable Development Goals (SDGs). The subjects of the study include pesantren leaders, teachers, active students, and experts who are directly involved in the activities of the ecopesantren program at the Al Ashriyyah Nurul Iman Parung-Bogor Islamic Boarding School based on the criteria of active involvement for at least one year in the ecopesantren program.

In this study, of the 17 points on the agenda in the SDGs, the focus of ecopesantren environmental leadership support for the SDGs in this research highlights 6 points including the following:

1. SDG3 Healthy and Prosperous Living
2. SDG4 Quality Education
3. SDG5 Gender Equality
4. SDG6 Clean Water and Proper Sanitation
5. SDG7 Clean and Affordable Energy
6. SDG17 Partnership to Achieve the Goals

An exploratory descriptive approach was chosen in this study because it allows an in-depth exploration of environmental leadership practices in eco-pesantren, revealing strategies, challenges, and their contributions to the Sustainable Development Goals (SDGs) in aspects of management, education, and sustainability innovation, as well as providing contextual insights and evidence-based recommendations for the development of ecological education models in pesantren. Data were collected through semi-structured interviews, direct observations, and documentation to deeply understand views, processes, and practices related to environmental leadership (Sitika et al., 2021). Data analysis was carried out using the Miles and Huberman

interactive method, which included data reduction, data presentation, and iterative conclusion drawing (Masyhura & Ramadan, 2021), as well as validation through triangulation of data, methods, and theories to ensure the credibility and accuracy of the findings (Susanto & Suyadi, 2020).

Results

Ecopesantren Environmental Leadership Supports SDG3 Healthy and Prosperous Life

Environmental leadership in ecopesantren plays a strategic role in supporting SDG3 (Healthy and Prosperous Living) by integrating Islamic spiritual values and ecological approaches in the daily practice of students. The servant leadership and transformational leadership models implemented allow students not only to understand the importance of environmental sustainability, but also to actively implement sustainability practices, such as the use of biogas as alternative energy, recycling organic waste into fertilizer, and cultivating organic plants to support food security in Islamic boarding schools. This approach creates a system that not only prioritizes individual welfare, but also fosters collective awareness of environmental health and cleanliness, in line with the principles of eco-living based on Islamic values. By instilling sustainability practices through real examples from pesantren leaders, environmental leadership in ecopesantren is able to form an educational ecosystem that promotes healthy lifestyles, proper sanitation, and responsible management of natural resources, making it an ecological-based education model that can be replicated more widely.

Environmental Leadership Ecopesantren Supports SDG4 Quality Education

Environmental leadership in ecopesantren makes a significant contribution to the achievement of SDG4 "Quality Education" through the provision of free education from early childhood education to higher education, including scholarships for S1 to S3 programs. A curriculum that blends religious values and environmental education creates holistic learning that provides not only academic knowledge but also practical skills relevant to environmental sustainability. With a transformational leadership approach, students are actively involved in real practices such as organic farming, waste management, and the use of renewable energy, thereby strengthening their social and ecological responsibility. The leadership of the pesantren encourages the development of students' capabilities by giving them the freedom to develop their academic and practical potential as agents of change in society. Supported by facilities such as IT laboratories, libraries, and waste treatment technology, ecopesantren instills sustainability values and builds the character of students as responsible caliphs, making education a tool for social transformation and sustainable development.

Environmental Leadership Ecopesantren Supports SDG5 Gender Equality

Environmental leadership in ecopesantren supports SDG5 "Gender Equality" by ensuring equal access to education, facilities, and self-development opportunities for male and female students. Islamic boarding school leaders give freedom to each individual to develop their potential to the fullest, without gender discrimination, through a holistic education that integrates religious values, practical skills, and social responsibility. Leadership promotes social justice by distributing resources and opportunities equitably, where female students are involved in activities such as waste management, organic farming, and entrepreneurship training, thereby strengthening their role in sustainable development. By integrating gender equality values in the *Education for Sustainable Development* (ESD)-based curriculum , pesantren train women to become leaders who care about the environment, providing space for their active participation in maintaining ecosystem sustainability. This effort creates an inclusive learning environment,

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making gender equality a tangible practice that supports women's empowerment, independence, and their contribution to the achievement of SDG5 holistically.

Environmental Leadership Ecopesantren Supports SDG6 Clean Water and Proper Sanitation

Environmental leadership in ecopesantren contributes to efforts to conserve clean water and sanitation through a sustainable water resource management system. Reverse osmosis technology is used to ensure the availability of clean water for the entire pesantren community, while used ablution water is reused for irrigation supporting the fisheries and organic agriculture sectors, creating an efficient water cycle. Students' ecological awareness is built through hands-on, practice-based education, where they are taught how to manage water and sanitation responsibly, resulting in habits that support sustainability. Pesantren also applies a circular economy approach, by managing water waste into a productive resource that can be reused. In addition, the application of green technology helps reduce environmental impact while increasing independence in water and sanitation management. Collaboration with the government and various external institutions allows for the development of better infrastructure, making pesantren a model of sustainability-based education that has a real impact on the conservation of water resources and proper sanitation.

Environmental Leadership Ecopesantren Supports SDG7 Clean and Affordable Energy

Environmental leadership at ecopesantren supports clean and affordable energy through the use of renewable energy technology, such as biogas from organic waste and solar panels as an alternative source of electricity. Biogas generated from livestock and kitchen waste helps reduce reliance on fossil fuels as well as create a sustainable resource cycle, while solar panels provide green energy that reduces carbon footprint. In addition, students are taught energy efficiency and practical management of green technology, combining theory with real application to build ecological awareness and print agents of change in society. The program also applies the principle of recycling by converting organic waste into biogas and fertilizer, creating a more efficient resource utilization system. Through this innovation, pesantren not only supports the transition to clean energy but also becomes a model of continuous learning that plays a role in environmental sustainability and climate change mitigation.

Environmental Leadership Ecopesantren Supports SDG17 Partnership to Achieve Goals

Environmental leadership at ecopesantren is strengthened through strategic collaboration with various parties, including local governments, non-governmental organizations, and international partners, to develop sustainable environmental programs such as clean water treatment, renewable energy, and waste recycling. This partnership supports the sustainability of Islamic boarding school operations while increasing the capacity of students through practice-based training and entrepreneurship, preparing them to face global challenges. In addition, cooperation with financial and academic institutions allows the implementation of environmental programs such as tree nurseries, hydroponics, and maggot farming, which strengthen pesantren resources and increase awareness and social impact in the community. By building a solid partnership network, pesantren acts as a center for sustainability-based education as well as an agent of social change.

Discussion

Environmental leadership of ecopesantren plays an important role in supporting the Sustainable Development Goals (SDGs) by combining key dimensions such as insight, skills, and ethics. Insight refers to a comprehensive understanding of the interconnectedness between environmental, social, and economic systems, allowing leaders to evaluate the broader impact of their decisions on sustainability (Pinyana et al., 2023). Skills such as strategic planning,

stakeholder engagement, and effective communication are equally important for fostering collaboration and implementing sustainable practices across different groups (Benlahcene & Meddour, 2023). Ethical considerations are also important, requiring leaders to navigate complex moral dilemmas while promoting responsible decision-making that aligns with sustainability principles (Lee et al., 2022). By integrating these dimensions, environmental leaders can inspire and mobilize individuals and organizations to address pressing environmental issues while contributing to the long-term equity and well-being of society. This holistic approach places environmental leadership as a driver of transformative change, accelerating progress towards a sustainable and prosperous future for all.

The environmental leadership approach implemented by ecopesantren has shown a significant contribution to the achievement of various SDGs, especially by integrating Islamic spiritual values, sustainability-based education, and technological innovation. The integration of servant and transformational leadership styles creates a holistic educational model that fosters academic excellence, ecological awareness, social responsibility, and practical skills, empowering students to address global challenges and become ethical and sustainability-focused leaders (Pasaribu et al., 2023) This success reflects the effectiveness of ecopesantren as an agent of change that is able to answer global challenges in education, the environment, and sustainable development.

Environmental leadership in ecopesantren plays a crucial role in supporting Sustainable Development Goal 3 (SDG3), which is to realize a Healthy and Prosperous Life by integrating Islamic spiritual values and environmental sustainability practices in the lives of students. The implementation of green technologies, such as the use of biogas, recycling organic waste into fertilizer, and organic crop cultivation, contributes to food security and creates a healthier and more sustainable environment (Lalani, 2020). This approach is in line with the Social Determinants of Health Theory, which emphasizes that social and environmental factors, such as access to clean water, proper sanitation, and air quality, greatly affect the health of individuals and communities (Moore, 2019). In addition, the application of Social Capital Theory through collective activities, such as waste management, reforestation, and hygiene patrols, not only fosters ecological awareness but also strengthens student solidarity in maintaining environmental sustainability (Wahono & Budimansyah, 2023). Although still facing limited resources and sanitation infrastructure, the learning by doing approach applied at ecopesantren has formed a culture of sustainability based on real actions. By harmonizing spiritual values, ecological practices, and environmental health, ecopesantren not only improves the quality of life of students, but also becomes a holistic education model that can be replicated in an effort to achieve the welfare of the wider community.

Curriculum transformation in eopesantren plays an important role in supporting Sustainable Development Goal 4 (SDG 4) by emphasizing the capability approach as promoted by Amartya Sen (Sen, 2007; Kuhumba, 2022), which empowers students to explore and develop their academic and practical potential. This educational model blends Islamic spiritual values and incorporates innovative practices such as technology-based waste management, enriching the learning experience and promoting continuing education (Turner et al., 2022). By giving students the freedom to engage in hands-on activities and real-world problem-solving, Eco-Friendly Islamic Boarding Schools cultivate critical thinking and adaptability, essential skills for facing contemporary challenges. The incorporation of technology in waste management improves students' understanding of environmental issues and equips them with practical skills that are increasingly relevant in today's job market (Amady, 2023). This holistic approach is in line with the principles of SDG 4, which aim to ensure inclusive and equitable quality education, and

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prepare students to become responsible global citizens who can contribute positively to their communities and environments.

The contribution of ecopesantren to Sustainable Development Goals 5 (SDG 5) and 6 (SDG 6) is an example of commitment to inclusivity and efficient resource management by promoting gender equality and environmental sustainability. By ensuring that female students have equal access to education, these institutions empower young women to become environmental leaders, thereby challenging traditional gender roles and fostering a more equitable society (Safei & Himayaturohmah, 2023). This educational approach not only improves the academic and leadership abilities of students but also integrates environmentally friendly practices such as proper sanitation and access to clean water, which are important components of SDG 6 (Anabarja & Mubah, 2021). Furthermore, the ecopesantren model embodies the principles of Education for Sustainable Development (ESD), creating an inclusive education framework that emphasizes the linkage between social justice and environmental management (Asror et al., 2023). This holistic approach is rarely applied in other educational institutions, making Eco-Pesantren a pioneer model of sustainable education that is able to answer gender and environmental issues simultaneously. On the other hand, innovations in clean water management, such as reverse osmosis technology and circular economy approaches, create productive and sustainable resource utilization cycles.

The integration of renewable energy technologies, such as solar panels and biogas systems, in Eco-Pesantren makes a significant contribution to Sustainable Development Goal 7 (SDG 7) by positioning ecopesantren as a center for green energy innovation. This approach improves energy access and reliability and strengthens the clean energy transition, which is important for mitigating climate change (Ndaki et al., 2022). By utilizing solar energy, Eco-Pesantren utilizes pollution-free and sustainable resources, while the biogas system converts organic waste into usable energy, thereby encouraging efficient resource management. The dual application of this renewable technology reduces dependence on fossil fuels and educates students and surrounding communities on the importance of sustainable energy practices (Darlington Eze Ekechukwu & Peter Simpa, 2024). By fostering an innovative and sustainable environment, Eco-Pesantren is an example of how educational institutions can play a critical role in advancing renewable energy solutions, ultimately contributing to a more resilient and sustainable future.

Ecopesantren's collaboration with local and international partners in support of Sustainable Development Goal 17 (SDG 17) underscores the importance of strategic partnerships in increasing resource capacity and accessibility. By engaging in this partnership, the eco-pesantren not only supports its internal sustainability initiatives but also positions itself as a vital agent of global change. These collaborations facilitate knowledge exchange and resource sharing, allowing schools to implement innovative practices that address local and global environmental challenges (Aulia & Irma, 2019). Furthermore, this collaborative approach fosters a community of practice that empowers students and educators to actively engage in sustainable development efforts, thereby strengthening the principles of Education for Sustainable Development (ESD). As a result, Eco-Islamic boarding schools are an example of how strategic partnerships can amplify their impact, creating a chain effect that goes beyond their immediate environment and contributes to broader sustainability goals.

Opportunities and challenges for environmental leadership in ecopesantren to support the Sustainable Development Goals (SDGs) have many sides. On the one hand, ecopesantren presents a significant opportunity to foster a culture of sustainability and environmental management among students, utilizing Islamic teachings to promote environmentally friendly practices (Safei & Himayaturohmah, 2023). By integrating renewable energy technologies,

waste management systems, and sustainable agricultural practices, these institutions can serve as models for innovation and environmental education. However, challenges remain, including the need for capacity building in communities to ensure the effective implementation of these initiatives and potential resistance to change from traditional practices (Nurkhin et al., 2023). Additionally, securing adequate funding and resources for sustainable projects can be a barrier, limiting the scope of their environmental programs. Despite these challenges, Eco-Pesantren's collaborative efforts with local and international partners can increase their impact, making them important players in the global movement towards sustainability and the achievement of the SDGs.

This study has limitations in its focus which only covers eco-pesantren in certain regions, so the results cannot be generalized to all pesantren in Indonesia, and lack of depth into the long-term influence of environmental leadership on the overall achievement of the SDGs. However, ecopesantren offers novelty in the form of integrating spiritual values with sustainability education, the use of environmentally friendly technology, and strengthening the role of women in environmental leadership, which has the potential to become a relevant local education model as well as a global solution to support the achievement of the SDGs holistically. The government needs to strengthen regulations and incentives for pesantren that implement sustainability education, while educational institutions must adopt environment-based curricula to create systemic change. At the micro level, ecopesantren can be a center for learning sustainability practices, while at the meso and macro levels, a network of partnerships and policies based on spiritual and ecological values are needed to accelerate the achievement of the SDGs. Future research should explore the long-term impact of environmental leadership, the effectiveness of green technology innovations, and the role of women's leadership in sustainability, in order to produce practical solutions that can be adapted more widely.

Conclusion

Environmental leadership in ecopesantren plays a strategic role in supporting the achievement of the Sustainable Development Goals (SDGs) by integrating Islamic spiritual values, sustainability-based education, and technological innovation. This holistic education model not only enhances students' ecological awareness, social responsibility, and practical skills, but also creates an environment that supports health, gender equality, and sustainable management of water and energy resources. Although this study has limitations in geographical scope and exploration of long-term impacts, the findings suggest that ecopesantren can be an inspirational model for sustainability education that is locally relevant and potentially applied globally. With a collaborative and innovative approach, ecopesantren has proven itself to be a significant agent of change in addressing global challenges in the fields of education, the environment, and sustainable development. Ecopesantren has great potential as a model of sustainable education by integrating spiritual values, environmentally friendly technology, and inclusive leadership, although it still faces limitations in scope and long-term analysis. To strengthen the impact, policy support, cross-sector collaboration, and further research are needed to explore the effectiveness of sustainability innovation and the role of leadership in achieving the SDGs holistically.

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