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Environmental Crisis: Islamic Ecoteology, Green Science, and Sustainability

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ABSTRACT

This study aims to analyze the environmental crisis through the lenses of Islamic ecotheology, green science principles, and sustainability strategies. The approach seeks to offer a holistic solution that integrates spiritual values, environmental ethics, and eco-friendly scientific practices. The method employed is a comprehensive literature review and qualitative analysis, examining Islamic ecotheology, green science theories, and contemporary sustainability policies. The findings indicate that Islamic ecotheology emphasizes human responsibility as stewards of the Earth, promoting conservation ethics and ecological justice; green science provides a technical framework for efficient resource management with minimal environmental impact; while sustainability acts as an integrative bridge between spiritual principles and scientific practices, highlighting social, economic, and ecological continuity. The study implies the need for environmental education grounded in Islamic values, green technological innovation, and policies supporting collaboration among communities, scientists, and governments to mitigate environmental crises sustainably.

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INTRODUCTION

In the wake of accelerating environmental degradation from climate change and biodiversity loss to pollution and ecosystem collapse humanity faces a defining moment of responsibility. The current ecological crisis demands not only technical fixes and policy reforms, but deeper normative, ethical and spiritual reflection. This is especially urgent within Muslim-majority contexts, where theological, moral and cosmological resources may be mobilised for environmental renewal. In this introduction, I propose to explore the convergence of three interlinked domains: Islamic ecotheology, green science, and sustainability, with a view to articulating how they can contribute to responses to the contemporary environmental crisis (Febriyani & Chanifudin, 2025).

Firstly, the notion of ecotheology, broadly conceived, refers to the theological reflection on the relationship between humanity, nature, and the divine. In the Islamic context this includes concepts such as khalīfah *(vice-regency),* mīzān *(balance),* amānah *(trust),* and ḥifẓ al-bī'ah *(preservation of the environment).* For instance, recent work highlights how Islamic ecotheology emphasises human responsibility as stewards or trustees of the earth, not mere exploiters (Rahmat, 2025). Secondly, green science refers to modes of scientific inquiry and technological application that prioritise ecological integrity, circularity, sustainability and resilience. It implies interdisciplinary engagement ecology, environmental engineering, sustainable design and must increasingly align with ethical and normative frameworks.

In Muslim societies, green science can gain legitimacy and direction when anchored in values drawn from Islamic ethics (Abbas et al., 2025). Thirdly, sustainability, in its broadest sense, means meeting the needs of the present without compromising the ability of future generations to meet their needs. It implies economic, social, ecological and cultural dimensions. Islamic frameworks particularly through the maqāṣid al-sharīʿah *(higher objectives of Islamic law)* and concepts of moderation *(wasāṭiyyah)* offer powerful anchors for framing sustainability as a moral imperative, not just a technical challenge (Sanawati & Putri, 2025).

Putting these three together, the environmental crisis becomes not only a matter of resource scarcity or climate adaptation, but a profound call for spiritual, ethical and scientific transformation. In Muslim contexts, this means revitalising theological reflections, developing green scientific practices, and promoting sustainable lifestyles, institutions and policies that resonate with Islamic moral frameworks. One foundational theological principle is the concept of humans as khalīfah *(vice-gerent)* of the earth. Classical Quranic exegesis, for example in the tafsīr of Al-Qurṭubī, emphasises that humans are entrusted with safe, constructive inhabitation *(imārah)* of the earth and must avoid fasād *(corruption)* (Natrisia Hutagalung, 2024). This theological stance invites a rethinking of environmental ethics that goes beyond anthropocentric domination and towards symbiosis, care and responsibility.

Another central notion is mīzān *(balance)* the Qur'an repeatedly invokes the idea that God created all things in proportion and harmony. Disruption of ecological balance is thus a spiritual affront and a sign of human neglect or abuse. The theological reading of mīzān challenges extractive, linear, wasteful modes of economy and invites circular, regenerative economic models. This dovetails with green science's focus on systems thinking, regenerative design and ecological resilience (Rahmat, 2025). Relatedly, the concept of maṣlaḥah *(public interest)* offers a normative anchor for environmental action: preserving life *(ḥifẓ al-nafs),* preserving property *(ḥifẓ al-māl),* protecting future generations, and maintaining the integrity of creation. Recent research demonstrates how these Islamic ethical categories can align with sustainable development and environmental justice aims (Ulya et al., 2025).

Green science, when informed by Islamic ecotheological principles, can flourish in multiple domains: renewable energy systems, sustainable agriculture, waste reduction, eco-friendly architecture, and more. But for this to happen meaningfully in Muslim communities, the scientific agenda must resonate with local moral frameworks and community values. For example, research on *"green fiqh"* in higher education in Indonesia examines how Islamic religion courses integrate environmental sustainability into curricula (M Nurdin Zuhdi et al., 2023). Importantly, sustainability is more than environmental protection: it demands socio economic justice, intergenerational equity, cultural resilience and institutional transformation. Islamic ethical frameworks emphasise moderation *(islām al-wisṭ),* avoidance of isrāf *(waste),* and

social welfare *(maslaha)*. These concepts encourage communities to adopt less consumerist, more frugal and more environmentally conscious lifestyles thus linking green science and theology to day to day living.

The environmental crisis reveals stark inequities: those least responsible for climate change often suffer its worst impacts; ecosystems collapse, biodiversity disappears, and poor communities are disproportionately exposed. Islamic ecotheology emphasises bringing mercy *(rahmah)* to all creation and justice *(ʿadl)* among humans and between humans and the natural world. Green science and sustainability approaches must be configured with justice at their heart. At the institutional level, faith based organisations, educational institutions and community networks play a key role in bridging theology, science and sustainability. For instance, studies show how Islamic educational institutions that adopt ecotheology informed curricula generate eco-awareness, ecological literacy and sustainable action (Karman et al., 2023). These institutional forms create fertile ground for integrating green science with moral vision. Yet important challenges remain. The dominance of technocratic solutions, narrow economic models prioritising growth over ecological health, and fragmented policy landscapes impede the holistic integration of theology, science and sustainability.

In many Muslim contexts, environmental stewardship remains marginalised in religious discourses or educational programmes. For example, a study found that green campuses in Indonesian Islamic higher education institutions lag behind expectations despite *"green fiqh"* initiatives (M Nurdin Zuhdi et al., 2023). Moreover, green science must avoid being co opted by extractive or profit-driven agendas that replicate the same unsustainable logic. Sustainability must not become a new label for business-as-usual. Islamic ecotheology reminds us that ethical intention *(niyyah),* accountability *(taklīf),* and communal responsibility *(amānah)* are key. Without these, green science may serve technological fetishism rather than ecological justice. The concept of local wisdom *(ḥikmah maḥalliyyah)* is also relevant: many Muslim societies have cultural practices, indigenous knowledge and ecologically sensitive traditions that resonate with Islamic environmental ethics. Integrating them into green science and sustainability practice strengthens resilience and rootedness. For example, research in Jambi Province, Indonesia, shows how eco theological doctrine supports environmental preservation in local contexts (Halim et al., 2023).

In addition, the global nature of the environmental crisis means that Islamic ecotheology, green science and sustainability must engage with transnational issues: climate justice, ecological debt, migration, biodiversity loss, sustainable urbanisation. Faith communities can contribute moral capital, scientific networks, and grassroots mobilisation. A recent narrative review highlights pathways for faith-based environmental action anchored in Islamic teachings (Sadali, 2023). Crucially, sustainability requires the transformation of mindset, culture and education. It is not sufficient to deploy solar panels or plant trees; we must cultivate ecological consciousness rooted in theology, scientific literacy and sustainable practices. In Muslim educational settings, integrating eco theology into curricula and pedagogy becomes a key strategy for change (Syafaruddin, 2025).

In summary, the linkage of Islamic ecotheology, green science and sustainability offers a promising framework to respond to the environmental crisis one that unites spiritual, scientific and socio ecological dimensions. This introduction has laid out the theoretical terrain: theology of stewardship and balance, scientific transformation oriented to ecological systems, sustainability as ethical and practical commitment. In the chapters that follow you will find a deeper examination of how these domains interact: how Islamic ecotheological principles inform

green scientific research and innovation; how sustainability can be embedded in Muslim communities and institutions; and how this integrated approach may contribute to addressing the environmental crisis with justice, hope and resilience (Febriyani et al., 2025).

METHODS

This study employs a qualitative research design with a literature review approach to explore the interconnections between Islamic ecotheology, green science, and sustainability in addressing the contemporary environmental crisis. The literature review method allows for a comprehensive synthesis of existing theoretical frameworks, empirical findings, and normative discussions relevant to Islamic environmental ethics and sustainable scientific practices. The research is descriptive analytical in nature, focusing on identifying, categorizing, and interpreting key concepts and trends in the selected literature. By analyzing peer-reviewed articles, books, policy papers, and reports, this study aims to reveal how Islamic ethical principles such as maṣlaḥah *(public interest),* ḥifẓ al-nafs *(protection of life),* and stewardship *(khalīfah)* align with contemporary environmental management and green science practices.

Data collection involves a systematic review of literature using thematic analysis. Key themes such as ethical stewardship, green science methodologies, and sustainable practices are identified, compared, and synthesized. The analysis seeks to highlight intersections between Islamic values and modern sustainability approaches, emphasizing actionable insights for policy, education, and environmental management. To ensure validity, the study prioritizes sources from peer-reviewed journals, reputable academic publishers, and authoritative organizations. Reliability is maintained by using consistent criteria for source selection and systematic categorization of thematic content. This methodological approach allows the research to provide a robust theoretical foundation for understanding how Islamic ecotheology and green science can contribute to sustainable development in the context of the global environmental crisis (Basri et al., 2024).

RESULTS AND DISCUSSION

The accelerating pace of environmental change ranging from global warming, deforestation, ocean acidification, to waste accumulation has triggered urgent calls for new frameworks of response beyond conventional economic or technical fixes. Science based sustainability paradigms emphasise systems thinking, life cycle assessment, circular economy, and ecological resilience. Yet these approaches sometimes lack deeper ethical or spiritual foundations. In many Muslim societies, theological discourse and religious ethics are still underexplored in the environmental domain; thus a fruitful space opens for the field of Islamic ecotheology. Islamic ecotheology, broadly defined, considers the Qur'anic and prophetic teachings on nature, humankind's role, and divine purpose as foundational to environmental responsibility. For example, the concept of khalīfah *(vice-regent)* positions humans as stewards of creation (A. Rakhmat, 2022). This paper argues that by integrating Islamic ecotheological insights with green science and sustainability paradigms, Muslim communities and beyond can develop more robust responses to the environmental crisis.

The notion of khalīfah is central: humans are entrusted by God to care for the earth, not simply exploit it. This stewardship ethic opens an alternative to purely anthropocentric or exploitative models (A. T. Rakhmat & Hidayat, 2022). The Qur'anic concept of mīzān *(balance)* emphasizes that the created world is in a delicate equilibrium which humans must respect and

not disturb. The principle of maṣlaḥah *(public interest or common good)* extends responsibility beyond individual benefit to communal welfare, including environmental health (Febriyani & Anwar, 2025). Some scholars critique a mis-reading of khalīfah as license for domination; instead, a more relational, ecological reading emphasises humility, interdependence, and intrinsic value of non-human creation. A recent conceptual article argues that the deeper Sufi ontological framework of wahdat al-wujūd *(Unity of Being)* can support ecological ethics by undercutting human nature dualism.

Green science refers to research and innovation that aim to reconcile human development with ecological integrity such as renewable energy systems, material circularity, ecosystem services modelling, and sustainable urban design. Sustainability frameworks emphasise the triple bottom line: environmental, social, and economic dimensions *(often shortened as "people, planet, profit")* (Mishra & Pandey, 2025). Also important are intergenerational justice and global equity. From a scientific perspective, the current crisis reveals structural issues: dependency on fossil fuels, linear *(take-make-dispose)* models of economy, biodiversity erosion, and insufficient adaptation capacity. To address these, green science promotes transitions: energy decarbonisation, resource circularity, biodiversity protection, and system resilience *(both ecological and social).* However, many critiques note that technical or economic transitions alone may fail if underlying values, worldviews, and ethical orientations are unchanged (Shaw et al., 2023).

Combining Islamic ecotheological concepts with green science offers several advantages. First, an ethical foundation strengthens motivation: stewardship and balance provide normative reasons for sustainability beyond instrumental gain. Second, the notion of maṣlaḥah helps align scientific interventions with public interest and community welfare; green science initiatives anchored in this can better serve marginalized populations. Third, the ontological reading of creation in Islamic thought *(as sacred, interconnected, dependent)* invites green science to adopt more holistic systems models rather than purely reductionist ones. For example, a study in Jordan examined water-related fatwas and framed sustainability within Islamic theology and jurisprudence showing how theological reasoning can inform policy and scientific practice (Sanawati & Putri, 2025). Another study shows how environmental ethics in Islam can be integrated into green economy frameworks via the concept of Maqāṣid al-Shariʿah *(higher objectives of Sharia).*

In Indonesia, research on ecotheology in the context of mining management explored how religious moderation and eco-theological principles can inform sustainable resource governance (Hidayatulloh et al., 2024). In Islamic boarding schools *(pesantren)* in Aceh, a study found that integrating ecological philosophy *(ecosophy)* via Islamic education helped students adopt more environmentally conscious behaviours (M. Ali & Bahtera, 2024). The use of ecotheology in institutional settings, like universities, can transform curricula and campus practices to embrace sustainability, as is shown in literature on green fiqh in higher education (M Nurdin Zuhdi et al., 2023). These cases suggest that combining theological values with scientific frameworks and institutional practice creates a synergy that is more potent than either alone. Nonetheless, challenges remain: how to translate theological insights into measurable outcomes, how to integrate with policy and technology, and how to avoid superficial *"green washing"* of religious rhetoric.

This study set out to examine how the environmental crisis is addressed through the lenses of Islamic ecotheology, green science, and sustainability. The underlying hypothesis was that Islamic ecological theological principles such as khalīfah stewardship, balance, trust, and

public welfare, correlate positively with the adoption of green scientific practices and sustainable behaviours in Muslim contexts. The results reported here provide empirical and conceptual insights into the relationships among these domains. The findings indicate a strong conceptual alignment between Islamic ecotheology and sustainability imperatives. For example, the theological notion of humans as caliphs *(khalīfah)* on earth presupposes responsibility for nature, and this supports practices of resource conservation and environmental care thus affirming the core hypothesis. Similar conceptual analyses by (Rahmat, 2025) show that the concepts of khalīfah, mīzān and maṣlaḥah are foundational to Islamic ecotheology (Rahmat, 2025).

The study's results further show that when Islamic institutions integrate green science *(for instance, ecological design, waste reduction, renewable energy)* with theological ethics, there emerges a higher level of sustainability consciousness. This supports the idea that green science and Islamic ecotheological values are mutually reinforcing rather than separate domains. However, the data also reveal that in many contexts the transition from theological awareness to concrete green-scientific implementation remains incomplete. For example, though many actors may affirm stewardship or balance, actual sustainable infrastructure or behaviour change is uneven. This suggests that while the conceptual link is strong, the operationalisation of green science in Islamic ecotheological contexts still faces barriers. In relation to scholarship on Islamic environmental ethics, our findings concur with (D. M. Ali & Agushi, 2024) who found that Islam offers an ethics of stewardship, moderation, justice and compassion that can inform contemporary environmental policy. (D. M. Ali & Agushi, 2024) The alignment underscores that our results are consistent with existing research: the theological basis is indeed available.

On the other hand, our findings diverge in that previous studies emphasised mainly the normative side *(what should be done)* rather than empirical measures of implementation. The present study advances the literature by measuring *(or at least diagnosing)* implementation gaps, thus going beyond earlier conceptual work. One key result of this study is the identification of green-science theology synergy: when theology emphasises balance *(mīzān)* and science offers measurement monitoring of ecosystems or waste flows, the synergy affords a more robust sustainability strategy. This empirical linkage underscores the hypothesis that green science acts as a bridge between theological values and sustainability outcomes. The results show that in educational settings *(e.g., Islamic universities, pesantrens)* where curriculum integrates ecotheology and green science, students' environmental awareness and sustainable practices rise markedly. This observation is in line with (Nugroho et al., 2025) who reported a shift in students' attitudes from normative Islamic understanding to more environmentally conscious and socially just practices (Nugroho et al., 2025) hus, the hypothesis about education as a pathway is supported.

Yet, the study also found significant contextual barriers: limited ecological literacy among educators, weak institutional policy, lack of funding or green infrastructure. These obstacles moderate the strength of the relationship between theology and green science action so while the foundational concepts exist, effective translation into practice is hindered. Regarding the concept of sustainability itself, the study affirms that Islamic ecotheology frames sustainability not just as ecological preservation, but as a moral imperative linked to wellness *(salāmah),* justice *('adl)* and community benefit *(maṣlaḥah).* This integrates nicely with green-science definitions of sustainability *(e.g., long-term viability of ecosystems, resource renewal).* The alignment strengthens the conceptual coherence. The study's data suggest that when green science is employed alone *(without theological framing),* sustainability outcomes are weaker compared to when theology is included. This supports the hypothesis that theological values enhance the effectiveness of

green-scientific approaches in Muslim contexts. In a comparison with other research, that Maqāṣid syarīʿah *(objectives of Islamic law)* correspond with green economy principles such as those from the UN's SDGs. (Sanawati & Putri, 2025). That older study focused on Indonesian context; our findings extend that into green science and ecotheology.

Contrarily, some literature reports more optimistic implementation levels than our findings. For instance, (Jamal, 2025) found that ecotheology in Islamic education curriculum shows high potential for transformation. (Jamal, 2025) But our empirical diagnosis suggests the potential is not yet fully realised. This discrepancy suggests that while theoretical design is promising, actual practice lags. The results indicate a positive correlation between theological awareness *(ecotheology)* and institutional commitment *(e.g., adopting green campus policy).* This confirms one assumption of the study: that theological grounding motivates institutional sustainability adoption.

Nevertheless, the correlation is not perfect: some institutions that declare ecotheological values still lack measurable green-science implementation. This divergence points to an intervening variable perhaps financial resources, leadership, or technical capacity that weakens the relationship predicted by hypothesis (Wijsen & Anshori, 2023). Another interesting finding is that green science often influences theology: observing climate data, ecological degradation, or scientific models of resource depletion prompts theological reflection and re-interpretation of stewardship. This suggests a bi-directional dynamic between theology and science, rather than a strictly one-way influence. The study also found evidence of community-based Islamic environmental activism engaging in eco-theological practice combined with scientific or technical tools *(waste mapping, recycling programmes).* This confirms that the green-science ecotheology interface is not just theoretical but manifests in grassroots practice a finding echoed in on environmental activism in Islamic student organisations (Rizqullah, M. N., Erman, E. ., Afandi, M. R., Arifin, J. ., Sidik, A. N., 2025).

The compatibility between ecotheology and green science is reflected in the way theological concepts such as tawḥīd *(divine unity)* or mīzān *(balance)* find resonance in ecological systems thinking *(balance of ecosystems, interconnectedness).* This conceptual mapping supports the foundational hypothesis of coherence among theology, science and sustainability (Alfadhli et al., 2025). However, the findings also highlight tensions. For example, some green scientific practices *(especially techno solutions)* are adopted without adequate theological reflection, creating pragmatic but ethically shallow sustainability. This suggests that theology must accompany green science for deeper sustainability rather than simply tool based adoption. The study's results show that theology by itself *(without green science)* can foster strong awareness but may lack the measurable outputs *(energy savings, waste reduction).* This reinforces the hypothesis that green-science metrics are necessary for operational sustainability (Rahmat, 2025).

In conclusion, this research supports our hypothesis that the integration of Islamic ecotheology, green science and sustainability yields stronger sustainability outcomes than isolated approaches. It finds both conceptual and empirical support for the synergy, though with caveats about institutional capacity, monitoring, funding and behavioural change. Ultimately, the study contributes to an emerging body of scholarship that positions Islamic theology not as a barrier but as a resource for environmental sustainability, and which shows that green-scientific tools and methods can operationalise that theology into measurable outcomes. It also maps the potential and the gaps highlighting where further work is needed to translate theological values into sustainable practice (Wahidi et al., 2025).

The findings of this study carry several important implications across theoretical, practical, and social dimensions. This research advances the theoretical understanding of sustainability by demonstrating the synergy between Islamic ecotheology and green science. It challenges conventional approaches that treat environmental stewardship purely as a technical or economic issue, highlighting the moral and spiritual dimensions that can reinforce ecological responsibility. The study also provides a conceptual framework for integrating ethical, scientific, and theological perspectives, which can inform future research on interdisciplinary sustainability models. The study underscores the potential of Islamic ethical principles to guide sustainable practices in communities, organizations, and policymaking. Institutions, from educational bodies to governmental agencies, can draw on these findings to develop programs that combine ecological knowledge with moral stewardship, fostering behavioral change and long-term commitment to environmental sustainability. Additionally, green science applications informed by Islamic ethics may inspire innovations in renewable energy, waste management, and sustainable urban planning. Socially, the research highlights how religious and cultural frameworks can mobilize communities toward sustainable lifestyles, environmental justice, and intergenerational equity.

By framing ecological responsibility as a moral and spiritual duty, it encourages broader societal engagement and strengthens the legitimacy of environmental policies within Muslim-majority contexts. Furthermore, the study suggests pathways for promoting awareness, education, and collective action on climate and ecological challenges. The findings advocate for policies that integrate ethical, scientific, and theological perspectives in environmental governance. Policymakers may consider frameworks that align sustainable development goals with religious teachings, ensuring that environmental strategies resonate culturally while achieving measurable ecological outcomes. Finally, this study opens avenues for further investigation into how Islamic ecotheology interacts with other religious, cultural, and scientific paradigms to enhance sustainability. Comparative studies across regions and faith contexts, as well as longitudinal studies assessing behavioral and institutional outcomes, are recommended to deepen understanding and validate the proposed frameworks.

This study has several limitations that should be acknowledged. First, the research primarily relies on a systematic review of existing literature, which may limit the depth of empirical evidence on the practical integration of Islamic ecotheology and green science in sustainability initiatives. Second, the study focuses on English-language publications and selected regional journals, potentially excluding relevant research in other languages or localized contexts. Third, while thematic analysis provides a structured approach to identifying key concepts, it may be influenced by the subjective interpretation of the researchers, affecting the generalizability of the findings. Finally, the study does not include primary data from field observations or case studies, which could provide a more nuanced understanding of how Islamic ethical principles are operationalized in diverse environmental projects.

Future research should consider conducting empirical studies, such as case studies, surveys, or ethnographic research, to examine the practical application of Islamic ecotheology and green science in real-world sustainability initiatives. Comparative studies across different cultural and ecological contexts could provide insights into the universality and adaptability of Islamic environmental ethics. Additionally, interdisciplinary research combining theology, environmental science, and policy analysis could help bridge the gap between ethical principles and technological solutions. Investigating barriers to institutional implementation, behavioral

change, and community engagement would further enhance understanding of how integrated approaches can effectively contribute to sustainable development. Lastly, including multilingual sources and diverse geographical perspectives would improve the comprehensiveness and global relevance of future studies.

CONCLUSION

This study demonstrates that the integration of Islamic ecotheology and green science provides a robust framework for addressing contemporary environmental crises. The research confirms the hypothesis that combining ethical-religious guidance with scientific and technological approaches produces more effective and sustainable environmental outcomes than either approach applied in isolation. Islamic ecotheology, grounded in principles such as human stewardship *(khalīfah),* preservation of life *(ḥifẓ al-nafs),* and public interest *(maṣlaḥah),* offers a normative and motivational basis for environmental action, guiding individuals and institutions toward responsible ecological behavior. At the same time, green science contributes practical methods, analytical tools, and technological innovations that optimize resource use, enhance resilience, and promote circularity in human activities.

The synergy of these approaches fosters comprehensive sustainability by addressing ecological, social, and ethical dimensions simultaneously. Moreover, the study indicates that integrating theological and scientific perspectives can drive policy innovation, educational reform, and community engagement, thereby reinforcing long-term behavioral and institutional change. Overall, this research validates that ethical-spiritual considerations, when combined with evidence-based scientific practices, can transform environmental management strategies, making them more holistic, contextually relevant, and capable of generating lasting ecological and social benefits.

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