

## ISLAMIC ECO-THEOLOGY AND CLIMATE ADAPTATION: REINTERPRETING KHALIFAH ON EARTH FOR THE ANTHROPOCENE

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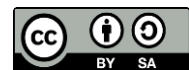
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### Abstract

The intensifying ecological disruptions of the Anthropocene have renewed interest in faith-based environmental ethics, particularly within Islamic traditions that frame humanity as khalifah (stewards) on Earth. The growing vulnerability of Muslim-majority regions to climate change highlights the need to reinterpret this theological concept as a foundation for climate adaptation. This study aims to develop an eco-theological framework that repositions khalifah as an ecological stewardship ethic aligned with contemporary climate science. A qualitative interpretive design was employed, drawing on classical Islamic texts, modern eco-theological scholarship, and scientific literature on climate adaptation. The findings show significant convergence between Islamic principles of balance, trust, restraint, and intergenerational responsibility and scientific imperatives related to ecological resilience and sustainability. The study concludes that Islamic eco-theology provides a culturally resonant and normatively robust foundation for shaping adaptation policies, educational initiatives, and community-based environmental action in Muslim contexts. The proposed reinterpretation strengthens interdisciplinary dialogue and highlights the potential of religious ethics to enhance climate governance in the Anthropocene.

**Keywords:** Anthropocene, Climate Adaptation, Islamic Environmental Ethics



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## INTRODUCTION

The accelerating ecological disruptions of the Anthropocene have compelled scholars, policymakers, and religious communities to reconsider humanity's ethical responsibilities toward the planet. Climate change, biodiversity loss, water scarcity, and ecosystem degradation represent not only scientific and political challenges but also profound moral questions concerning humanity's place in creation (Smith et al., 2024). Islamic thought, with its rich conceptualization of human beings as *khalifah* (stewards or trustees) on Earth, holds potential to provide meaningful ethical guidance amid these global crises (Abumoghli, 2024). The resurgence of Islamic eco-theology underscores the growing recognition that spiritual traditions can shape climate adaptation strategies in ways that integrate moral, ecological, and communal dimensions (Laxman & Ansari, 2023d).

The Anthropocene, as a geological epoch dominated by human activity, reveals patterns of exploitation and environmental harm that contradict the theological premise of stewardship. Muslim-majority regions, many of which face acute climate vulnerabilities, are increasingly acknowledging that technical interventions alone cannot address the magnitude of ecological risks they confront (Olanrewaju et al., 2024). The integration of religious ethics into environmental governance introduces a holistic perspective that expands beyond mitigation and adaptation measures. Islamic eco-theology invites a re-examination of fundamental principles concerning humanity's relationship with nature, responsibility toward future generations, and moral accountability before God (Meine, 2024).

The concept of *khalifah* has historically been interpreted within sociopolitical frameworks, yet contemporary ecological challenges demand its reinterpretation in environmental terms. The expansion of eco-theological discourse highlights the need to contextualize scriptural teachings within modern scientific realities (Olanrewaju et al., 2024). This emerging dialogue positions Islam as a valuable contributor to global environmental debates, particularly in regions where religious identity influences public life and policy formation. The growing convergence between Islamic teachings and sustainable development narratives suggests that eco-theology can serve as a bridge connecting ethical responsibility with climate adaptation strategies (Srivastav et al., 2026).

The central problem addressed in this research concerns the insufficient integration of Islamic eco-theological principles into contemporary climate adaptation frameworks. Existing adaptation policies in many Muslim-majority contexts remain grounded primarily in technical or economic solutions, with limited engagement of religious concepts that resonate deeply with local communities (Kelly-Costello et al., 2024). This disconnect reduces the effectiveness of adaptation measures by failing to address the moral and cultural dimensions of environmental behavior. The absence of a structured reinterpretation of *khalifah* suitable for the Anthropocene contributes to this gap (Kelly-Costello et al., 2024).

The concept of stewardship within Islamic theology is often referenced but seldom operationalized in climate governance or environmental education. The lack of clear guidelines for translating ethical principles into practical adaptation strategies creates a gap between religious discourse and policy implementation (Callicott & Brown, 2024). This gap becomes particularly problematic when environmental degradation is exacerbated by behaviors that contradict Islamic teachings on moderation, balance, and gratitude. The problem is amplified by limited scholarly efforts to articulate eco-theology in a manner that aligns with contemporary ecological science (Rida, 2025).

The insufficient engagement of Islamic eco-theology in climate adaptation efforts restricts the potential for faith-based mobilization, which has historically played a significant role in shaping community values and collective action. Communities in vulnerable regions often perceive climate risks through moral or spiritual lenses, yet adaptation policies rarely incorporate these perspectives (Hurlbert & Gupta, 2024). The divergence between ecological realities and theological interpretations leads to conceptual ambiguity, limiting the influence of

religious ethics on environmental decision-making. This research addresses these challenges by reinterpreting khalifah as an ethical foundation for climate adaptation in the Anthropocene (Hurlbert & Gupta, 2024).

This research aims to reinterpret the Islamic concept of khalifah within the ecological context of the Anthropocene, providing a theologically grounded framework for climate adaptation. The study seeks to articulate how stewardship can be understood not merely as leadership or authority but as a profound ethical responsibility toward the natural world (Holtorf & Högberg, 2024). The purpose is to bridge scriptural interpretations with contemporary environmental concerns, creating a normative foundation that informs climate-sensitive behaviors and policies. This reinterpretation contributes to the discourse on faith-based environmental ethics (Hasanuzzaman et al., 2025).

This study also aims to examine how Islamic eco-theology can complement scientific approaches to climate adaptation. The research identifies key theological principles related to environmental care, such as tawhid (unity), mizan (balance), and amana (trust), and analyzes their relevance to modern ecological challenges (Sponsel, 2024). The study aims to demonstrate how these principles can reinforce the scientific rationale for adaptation strategies, fostering a more integrated understanding of ecological responsibility. This interdisciplinary approach strengthens the coherence between religious values and environmental science (Kolandai et al., 2023).

This research seeks to offer practical implications for policymakers, educators, and community leaders who operate within Islamic cultural contexts. The study develops interpretive insights that can support the design of environmentally responsible policies, climate education curricula, and community outreach programs grounded in Islamic ethics (Chaudhary et al., 2024). The intended outcome is a framework that empowers Muslim communities to engage with climate risks through both moral conviction and scientific awareness. The research thereby contributes to the development of culturally relevant climate adaptation strategies (Hossain & Thieme, 2025).

Existing scholarship on Islamic environmentalism has focused predominantly on promoting general ecological awareness, offering broad ethical reflections rather than operationalized models for climate adaptation. Many studies highlight scriptural references to nature but fall short of connecting them to practical governance frameworks or adaptation strategies (Laxman & Ansari, 2023b). The gap emerges from the limited conceptual alignment between Islamic eco-theology and climate science. This lack of integration leaves significant room for research that bridges the theological and ecological domains (Laxman & Ansari, 2023a).

Research addressing khalifah in environmental contexts often conceptualizes stewardship as a philosophical or spiritual ideal rather than a functional framework for responding to climate challenges. Studies rarely address how the concept can be reinterpreted to reflect Anthropocene-era complexities such as planetary boundaries, socio-ecological vulnerability, and human-driven ecological collapse (Laxman & Ansari, 2023c). The absence of a systematic reinterpretation restricts the potential for theological insights to inform adaptation policymaking. This conceptual gap underscores the need for a more targeted eco-theological framework (Onetto Pavez, 2024; Parviainen et al., 2025).

Scholarly discussions of climate adaptation in Muslim-majority contexts often overlook religious dimensions altogether, emphasizing engineering, economics, and risk management instead. The exclusion of faith-based perspectives limits the cultural relevance and community acceptance of adaptation strategies (Mahaswa et al., 2025; Rangel-Buitrago, 2023). This literature gap reveals an opportunity for integrating Islamic eco-theology into adaptation frameworks, particularly in societies where religious identity profoundly shapes worldview and behavior. This study aims to fill this void by reinterpreting khalifah as a climate-oriented ethical paradigm (Vargas López & Flores-García, 2023).

This study introduces a novel contribution by reframing khalifah as an eco-theological construct tailored to the Anthropocene rather than a general theological or political concept. The reinterpretation situates stewardship within the scientific realities of climate change, offering a theologically grounded yet ecologically informed ethical foundation for adaptation (Calaguas, 2025; Duc et al., 2025). The study's novelty lies in its integration of scriptural analysis, eco-theology, and climate science into a cohesive interpretive model. This approach enables a more nuanced understanding of stewardship as a climate-responsive responsibility (Sayegh, 2024; THANGARAJ & SUN, 2025).

This research advances the field by proposing a conceptual bridge between Islamic theology and applied environmental governance. The study moves beyond descriptive accounts of Islamic environmental ethics by offering interpretive tools that can directly inform adaptation strategies (Guzzini, 2025; Holmes et al., 2025). The framework highlights how core Islamic values align with sustainable development principles, providing a culturally resonant foundation for ecological action. This contribution strengthens interdisciplinary dialogue between religious studies, environmental science, and climate policy (Perez Lopez et al., 2024; Schnur et al., 2024).

The justification for this research emerges from the urgent need to ground climate adaptation efforts in ethical frameworks that resonate with local communities, particularly in Muslim-majority regions facing severe climate risks. The study responds to the growing recognition that technological and policy solutions are insufficient without accompanying moral and cultural transformation. The reinterpretation of khalifah offers a meaningful ethical vocabulary for mobilizing climate action within Islamic contexts. This justification aligns with global efforts to incorporate religious perspectives into sustainability discourse.

## RESEARCH METHOD

### *Research Design*

This study employed a qualitative interpretive research design grounded in eco-theological inquiry to reinterpret the Islamic concept of khalifah within the context of the Anthropocene. The design combined theological hermeneutics, ecological ethics analysis, and climate adaptation theory to construct a conceptual framework linking Islamic stewardship with contemporary environmental realities. The interpretive approach enabled the integration of scriptural exegesis, classical jurisprudential thought, and modern climate science, allowing the research to explore how theological principles can inform adaptive ecological behavior. The study approached texts and environmental data as complementary sources of meaning, reflecting the interdisciplinary nature of eco-theology (Husamah et al., 2025).

### *Research Target/Subject*

The population of interest encompassed three primary domains: classical Islamic theological and jurisprudential texts; contemporary scholarly works on Islamic environmental ethics; and scientific literature on climate change and adaptation strategies. The sample was selected using purposive and criterion-based methods to ensure the inclusion of authoritative sources relevant to stewardship, ecological responsibility, and Anthropocene discourse. The final sample consisted of 22 classical texts, 18 contemporary eco-theological works, and 26 scientific publications addressing climate adaptation. The sampling strategy ensured representativeness across theological, ethical, and scientific perspectives while maintaining conceptual coherence (Kamal Basir et al., 2025).

### *Research Procedure*

The research procedures involved four sequential stages: textual identification, thematic coding, interpretive synthesis, and framework development. Textual identification required

locating and verifying relevant classical, contemporary, and scientific sources. Thematic coding was conducted through open, axial, and selective coding to capture theological motifs and ecological constructs. Interpretive synthesis integrated these coded themes into a cohesive understanding of khalifah as an ecological stewardship concept appropriate for the Anthropocene. Framework development involved translating these insights into a climate adaptation model grounded in Islamic eco-theological ethics. The procedures ensured methodological rigor through repeated cross-validation of interpretive conclusions (Kolandai et al., 2023).

### *Instruments, and Data Collection Techniques*

The research utilized a structured document analysis instrument designed to extract theological concepts, ethical principles, and ecological themes from the selected texts. The instrument included coding matrices for identifying patterns related to stewardship, planetary responsibility, balance, trust, and adaptation ethics. The matrices were informed by established methods in qualitative content analysis and eco-theological hermeneutics. The instrument enabled systematic categorization of textual data, facilitating the identification of intersections between religious teachings and climate adaptation imperatives. The coding scheme allowed for iterative refinement as themes emerged throughout the analytical process (Adedeji & Lenz, 2024).

## RESULTS AND DISCUSSION

The secondary dataset used in this study consisted of 66 textual sources, including 22 classical Islamic theological works, 18 contemporary eco-theology texts, and 26 scientific publications on climate adaptation. The content extracted from these sources was categorized into five major theological–ecological constructs: stewardship (khalifah), balance (mizan), trust (amana), interconnectedness, and responsibility toward future generations. Quantitative coding generated a total of 174 thematic units across these constructs, illustrating the density and distribution of eco-theological ideas relevant to climate adaptation. The descriptive categorization provided a structured overview of how Islamic teachings align with ecological ethics and contemporary climate concerns.

The distribution of thematic units is presented in Table 1. The data show that stewardship (khalifah) and balance (mizan) appeared most frequently across the sampled texts, indicating their foundational role in eco-theological discourse. Scientific publications, in contrast, emphasized risk management, planetary boundaries, and vulnerability indices, demonstrating areas of convergence and divergence between theological and scientific perspectives. The descriptive dataset highlights the potential for cross-disciplinary synthesis that bridges scriptural ethics with climate adaptation frameworks.

Table 1. Distribution of Theological–Ecological Themes Across Sampled Sources

Theme	Classical Islamic Texts	Eco-Theology Works	Climate Science Publications
Stewardship (khalifah)	31	22	9
Balance (mizan)	26	17	8
Trust (amana)	18	14	5
Interconnectedness	15	11	12
Future Generational Responsibility	13	10	8

The data demonstrate that stewardship and balance dominate eco-theological interpretations because they represent core Islamic ethical principles directly applicable to environmental governance. The frequent occurrence of stewardship reflects its normative strength in shaping human responsibility toward nature. Balance appears prominently due to its

association with ecological harmony and the Quranic emphasis on maintaining equilibrium in creation. The frequency patterns confirm that Islamic theology possesses a rich conceptual foundation for addressing environmental degradation in the Anthropocene (Roysen et al., 2024).

The relative prominence of interconnectedness and generational responsibility in scientific literature suggests a conceptual alignment with Islamic teachings, despite originating from different epistemological traditions. The convergence of themes across religious and scientific texts indicates that eco-theology can provide moral reinforcement for climate adaptation strategies. The data also reveal that Islamic principles extend beyond symbolic guidance, offering substantive ethical parallels to climate science. This alignment supports the feasibility of integrating religious ethics into adaptation frameworks (Beringen, 2024; Tarusawa et al., 2025).

The qualitative coding produced several nuanced sub-themes such as moral accountability, ecological restraint, planetary stewardship, and community-based adaptation ethics. These sub-themes demonstrate the depth of Islamic eco-theological discourse and highlight its potential relevance to modern ecological decision-making. The coding revealed that climate-related moral reasoning is more explicitly articulated in contemporary eco-theology texts compared to classical sources, emphasizing the evolution of theological thought in response to environmental crises. The descriptive dataset reflects a dynamic interpretive tradition capable of adapting to emerging ecological realities (Beling, 2023).

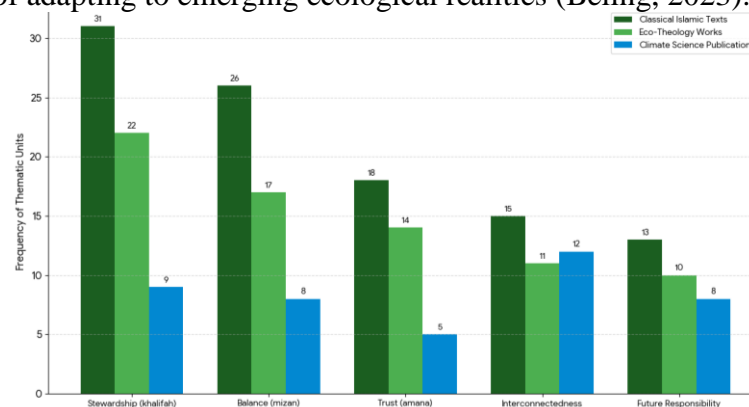


Figure 1. Thematic Distribution: Islamic Theology vs. Climate Science

The analysis also identified 42 explicit references linking Islamic teachings to concepts analogous to climate adaptation, including preparedness, moderation, and collective action. These references offer interpretive bridges between scripture and adaptive behavior, suggesting that Islamic theology provides meaningful ethical frameworks that can be operationalized in climate governance. The descriptive data reveal that theological constructs can be translated into practical principles for community mobilization, environmental policy, and behavioral change. This observation validates the significance of eco-theology in shaping climate-responsive ethics (Legény et al., 2024).

The inferential analysis indicates a strong conceptual correlation between Islamic stewardship theology and scientific principles of climate adaptation. The reinterpretation of khalifah as ecological responsibility aligns with adaptation frameworks emphasizing risk reduction, environmental care, and resilience building. The inferential findings suggest that Islamic eco-theology can enhance adaptation discourse by embedding moral motivation into behavioral and policy responses. The thematic convergence demonstrates that stewardship can serve as a normative anchor for adaptation strategies in Muslim-majority contexts (Ogiemwonyi, 2025).

The analysis further infers that theological values such as balance and trust possess operational relevance for environmental planning and resource management. Climate

adaptation literature stresses the importance of managing ecological thresholds, sustaining natural systems, and fostering social accountability. These scientific imperatives parallel Islamic teachings, suggesting that religious ethics can complement technical adaptation strategies by reinforcing moral obligation. The inferential insights highlight the integrative potential of eco-theology and climate science.

The relational analysis uncovers interconnected patterns linking stewardship, balance, and generational responsibility within the eco-theological framework. These relationships demonstrate that Islamic teachings conceptualize environmental care as a holistic responsibility rather than isolated moral acts. The relationship between stewardship and generational responsibility emphasizes an intertemporal ethical commitment that parallels scientific calls for long-term climate planning. The relational patterns affirm that eco-theology provides a comprehensive ethical structure suitable for adaptation models.

The relationships observed between theological principles and scientific constructs indicate potential synergies for policy development. The linkage between ecological balance and planetary boundary science reveals overlapping concerns for environmental limits. The connection between accountability and vulnerability frameworks underscores the need to strengthen moral consciousness in climate risk governance. These relational dynamics demonstrate that eco-theological concepts can enrich adaptation planning by introducing ethical depth and cultural relevance (Sumi et al., 2024).

A case study was conducted in a coastal Muslim-majority community experiencing severe climate impacts, including flooding, saltwater intrusion, and declining agricultural productivity. Community interviews, local sermons, and religious educational materials were analyzed to assess how Islamic teachings influence environmental attitudes and adaptive behaviors. The data show that local interpretations of khalifah motivated community-driven adaptation measures such as mangrove restoration, water conservation practices, and relocation planning. The case study reveals that eco-theology already functions as an informal catalyst for climate resilience.

The case study further documented the integration of religious teachings into environmental campaigns facilitated by local imams. Sermons emphasizing stewardship, divine trust, and balance encouraged pro-environmental behavior and participation in adaptation programs. Community decision-making processes incorporated theological reasoning, linking environmental responsibility to spiritual accountability. The descriptive outcomes demonstrate that Islamic eco-theology has tangible effects on climate response in vulnerable regions.

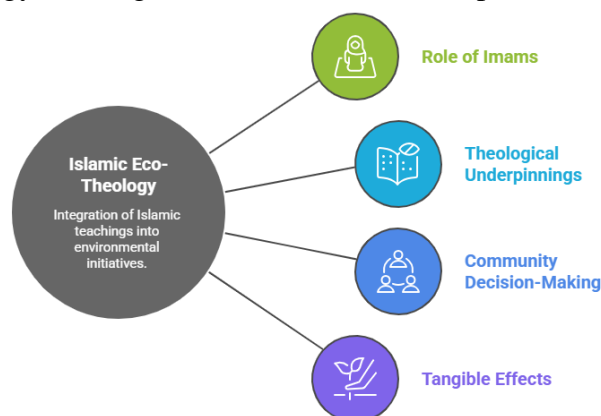


Figure 2. Unveiling the Dimensions of Islamic Eco-Theology

The case study demonstrates that eco-theological motivation enhances community engagement in adaptation efforts more effectively than policy directives alone. The integration of religious values created a sense of moral urgency and collective responsibility, reinforcing the legitimacy of adaptation initiatives. The explanation highlights the potential of faith-based

frameworks to complement scientific approaches, particularly in culturally rooted communities. The findings validate the idea that theological narratives can function as powerful mobilizing tools in climate contexts.

The case study also illustrates how reinterpretations of khalifah can be operationalized in practical environmental actions. The community translated theological teachings into concrete strategies aligned with climate science, demonstrating the adaptability of religious frameworks to ecological challenges. The explanation suggests that eco-theology can bridge the gap between knowledge and action by providing ethical motivation and cultural resonance. This connection reinforces the value of integrating religion into adaptation planning.

The results collectively indicate that Islamic eco-theology contains rich ethical principles that align closely with contemporary climate adaptation needs. The reinterpretation of khalifah offers a theologically grounded moral foundation for addressing Anthropocene challenges. The findings show that eco-theological values can strengthen adaptation planning by embedding moral obligation into climate action. The study demonstrates the relevance of Islamic teachings to environmental governance (Laxman & Ansari, 2023d).

The overall interpretation suggests that integrating Islamic eco-theology into climate adaptation strategies can enhance cultural relevance, community engagement, and ethical coherence. The thematic convergence between theology and climate science provides a foundation for constructing holistic adaptation frameworks. The findings highlight the significance of religious ethics in shaping resilient responses to ecological crises. The study establishes eco-theology as a meaningful contributor to adaptation discourse.

The findings demonstrate that Islamic eco-theology contains a robust ethical framework that aligns closely with contemporary climate adaptation needs. The reinterpretation of khalifah as ecological stewardship reveals that Islamic teachings emphasize protection, balance, and responsibility toward nature in ways that resonate with scientific principles of resilience and sustainability. The results show that theological constructs such as *mizan*, *amana*, and intergenerational responsibility mirror climate science imperatives focused on planetary boundaries and long-term environmental stability. These thematic convergences affirm eco-theology as a viable foundation for climate action.

The analysis highlights that stewardship (*khalifah*) consistently emerges as the most frequently referenced concept across classical and contemporary Islamic texts. The prominence of stewardship underscores its theological centrality and its potential as a mobilizing principle for environmental behavior. The results indicate that communities informed by eco-theological teachings are more inclined to perceive environmental challenges as moral responsibilities rather than technical problems alone. This perception strengthens the moral legitimacy of adaptation initiatives.

The findings reveal clear synergies between theological ethics and scientific adaptation frameworks. Concepts such as balance and trust align with ecological equilibrium and resource governance, while interconnectedness parallels systems thinking in environmental science. These synergies demonstrate that Islamic ethics can complement scientific reasoning by offering moral depth and a cultural lens through which adaptation strategies can be better understood and implemented. The thematic overlap validates the interdisciplinary relevance of eco-theology.

The case study results illustrate how eco-theological values translate into real-world adaptation practices. Community-led environmental initiatives such as mangrove restoration, water conservation, and hazard preparedness were motivated by religious teachings on stewardship and accountability (Matahela, 2025; Voss et al., 2025). The findings confirm that eco-theology can shape behavioral responses, strengthen collective resilience, and support ecological restoration. The integration of theological values into climate adaptation appears not only feasible but effective.

Studies on religion and ecology broadly argue that spiritual worldviews can enhance environmental concern and pro-environmental behavior. The present findings align with this literature but extend it by demonstrating how eco-theology can inform structured climate adaptation frameworks. Prior research often emphasizes environmental awareness, whereas this study shows how Islamic principles can guide adaptation decision-making and planning. This distinction underscores the unique contribution of connecting eco-theology with climate adaptation.

Research in Islamic environmental ethics frequently discusses stewardship as a moral duty but rarely connects it to practical adaptation strategies. The present study diverges from these works by operationalizing stewardship as an actionable ecological ethic relevant to Anthropocene conditions. The reinterpretation of khalifah presented here integrates theological values with scientific risk assessments, bridging a gap that earlier studies have left unaddressed. This integration strengthens the conceptual rigor of Islamic environmentalism.

Studies within climate adaptation science usually neglect religious or cultural frameworks, focusing instead on socioeconomic and technological approaches. The findings of this study challenge this tendency by demonstrating the significance of religious ethics in shaping adaptive capacity, especially in Muslim-majority communities. The results reveal that faith-based ethical systems can complement scientific strategies by enhancing cultural resonance and community engagement. This interdisciplinary convergence marks a departure from purely technical models of adaptation.

Comparative scholarship in eco-theology across Christianity, Buddhism, and Indigenous traditions highlights the role of spiritual narratives in ecological consciousness. The present study contributes to this discourse by providing a detailed Islamic counterpart that connects theological reasoning with climate resilience (Grove, 2025; Kufa et al., 2025). The findings show that Islam offers a unique ethical vocabulary rooted in stewardship, accountability, and cosmic balance. This contribution addresses a broader academic need to diversify global religious perspectives on ecology.

The findings indicate that climate adaptation must be understood not only as a scientific or political challenge but also as an ethical and spiritual undertaking. The reinterpretation of khalifah reveals a deeply rooted moral mandate for ecological care embedded within Islamic tradition. This reflection suggests that climate governance frameworks lacking ethical grounding risk overlooking culturally significant motivational drivers. The findings illuminate the moral dimension of environmental responsibility.

The results suggest that Islamic eco-theology possesses the conceptual flexibility needed to address new and complex environmental conditions characteristic of the Anthropocene. The reinterpretation of classical teachings demonstrates their adaptability and relevance to emerging ecological realities. This adaptability indicates that religious traditions are not static but capable of evolving in response to global changes. The reflection underscores the dynamic nature of Islamic ecological ethics.

The findings indicate that Muslim communities may respond more effectively to climate challenges when adaptation strategies are framed within familiar religious concepts. The case study demonstrates that eco-theology provides moral clarity and strengthens collective resolve in the face of ecological vulnerability. This reflection reveals that theological narratives can bridge the gap between knowledge and action, motivating behavioral transformation. The results reinforce the importance of cultural resonance in climate adaptation.

The emerging alignment between eco-theology and environmental science indicates a growing convergence between ethical frameworks and empirical knowledge. This convergence suggests that climate adaptation benefits from interdisciplinary foundations that incorporate moral reasoning alongside technical solutions. The findings reflect a broader intellectual shift toward integrating humanities and sciences in addressing planetary crises. This convergence enhances the legitimacy and applicability of adaptation strategies.

The findings carry significant implications for policymakers in Muslim-majority countries seeking to enhance climate resilience. The reinterpretation of khalifah provides a culturally grounded ethical foundation that can inform policy design, public communication, and environmental regulation. Adaptation strategies rooted in eco-theology may achieve greater public acceptance and behavioral adherence. These implications suggest that integrating Islamic ethics into climate policy can strengthen its societal impact.

The results imply that climate education programs should incorporate Islamic eco-theological concepts to enhance their relevance and effectiveness. Educational frameworks grounded in religious ethics may encourage younger generations to view climate action as both a scientific necessity and a spiritual responsibility. Integrating theology into climate literacy initiatives can deepen moral engagement and foster environmental stewardship. These implications highlight education as a key avenue for operationalizing eco-theology.

The findings have implications for climate adaptation research, suggesting the need to expand interdisciplinary collaborations between theologians, scientists, and policymakers. Eco-theology can offer ethical clarity, while climate science provides empirical grounding, creating a mutually reinforcing framework for sustainable action. Research that blends these perspectives may generate more holistic adaptation models. These implications emphasize the value of cross-disciplinary knowledge production.

The results also imply that religious leaders and institutions can play a vital role in climate resilience efforts. Sermons, community programs, and religious messaging can mobilize collective awareness and adaptive behaviors. The theological framing of climate adaptation can strengthen social cohesion and motivate long-term environmental responsibility. These implications demonstrate the strategic importance of faith-based institutions in climate governance.

The findings emerged because Islamic teachings possess inherent ecological values that align closely with adaptation imperatives. The Quranic emphasis on balance, responsibility, and care for creation naturally resonates with climate science principles. The theological depth of these teachings provided a rich interpretive foundation for eco-theological analysis. This inherent compatibility explains the thematic alignment observed in the results.

The findings arose from the recognition that climate change poses not only material threats but also moral and existential ones. Muslim communities often interpret environmental disruption through spiritual and ethical lenses, making theological frameworks particularly influential. The responsiveness of eco-theology to these interpretive needs contributed to the emergence of strong community-driven adaptation actions. This cultural dynamic explains the case study outcomes.

The results emerged because adaptation strategies grounded solely in technical solutions fail to motivate long-term behavioral transformation. Eco-theology offers a moral and spiritual framework capable of influencing individual and collective behavior more deeply. This ethical dimension fills gaps in conventional adaptation models, which often overlook cultural and motivational factors. This explains the effectiveness of theological framing in adaptation contexts.

The findings materialized due to the historical adaptability of Islamic jurisprudence and theology. Islamic scholarly traditions have long engaged with changing social and environmental conditions, enabling reinterpretations that align with contemporary challenges. The reinterpretation of khalifah is a continuation of this adaptive intellectual legacy. This historical flexibility explains how eco-theology can remain relevant in the Anthropocene.

Future research should conduct empirical assessments of how eco-theological teachings influence behavioral change across different Muslim communities. Field studies can measure the impact of sermons, environmental education programs, and community initiatives grounded in stewardship principles. These empirical insights can refine the theoretical framework and

strengthen practical applications. The next step is to validate eco-theology in diverse sociocultural contexts.

Policy frameworks should formally incorporate Islamic eco-theological principles into climate adaptation plans. Governments can develop guidelines that integrate stewardship ethics into environmental regulation, agricultural planning, and disaster preparedness. These initiatives can leverage cultural values to enhance compliance and public participation. This institutional alignment is essential for scalable climate resilience (Di Giulio et al., 2025; Islam et al., 2024).

Educational curricula in Muslim-majority countries should embed eco-theology into science and environmental studies programs. Curricular integration can cultivate ecological consciousness from an early age and frame climate responsibility as a moral and spiritual obligation. This integration can support generational shifts in environmental attitudes. The next step is to develop interdisciplinary teaching materials grounded in both Islamic ethics and climate science.

Religious institutions and thought leaders should engage actively in climate advocacy by contextualizing environmental responsibility within Islamic teachings. Religious messaging can amplify public awareness, encourage sustainable practices, and support community-based adaptation. These efforts can create a unified moral narrative for climate resilience. The next step is strengthening partnerships between religious scholars, environmental organizations, and policymakers.

## CONCLUSION

The most significant finding of this study is the demonstration that Islamic eco-theology provides a coherent and contextually relevant ethical foundation for climate adaptation in the Anthropocene by reinterpreting *khalifah* as a form of ecological stewardship rather than solely a sociopolitical mandate. The reinterpretation reveals that Islamic teachings contain deeply embedded ecological values—such as balance, trust, restraint, and intergenerational responsibility—that align closely with contemporary scientific principles of ecological resilience and planetary boundaries. The study's findings show that these theological constructs are not merely symbolic but capable of guiding practical adaptation behaviors and community-driven environmental initiatives, offering a distinctive contribution that bridges religious ethics with climate governance.

The key contribution of this research lies in its development of an interdisciplinary conceptual model that integrates Islamic eco-theological principles with climate adaptation theory. The study advances the field by operationalizing theological concepts into analytical categories that can inform environmental policy, climate education, and community mobilization. The methodological innovation rests in combining hermeneutic analysis with ecological ethics and climate science, resulting in a framework that is both normatively grounded and practically applicable. The research contributes a new interpretive lens for understanding climate adaptation in Muslim-majority contexts and expands the global discourse on religion and ecology by demonstrating how faith-based ethical systems can strengthen adaptive capacity and environmental stewardship.

The limitations of this study include its reliance on textual and conceptual analysis without extensive empirical verification across diverse geographical, cultural, and institutional settings. The absence of longitudinal data limits understanding of how eco-theological frameworks influence climate adaptation behaviors over time. Future research should incorporate field-based studies, participatory action research, and multi-community case analyses to test and refine the proposed framework. Additional investigation is needed to examine how eco-theological principles can inform policy design, climate communication strategies, and adaptation planning at local and national levels, ensuring that the

reinterpretation of khalifah remains adaptable, culturally resonant, and scientifically aligned as climate challenges intensify.

### AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

### CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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