

Sustainable Tropical Mosque Design in Indonesia: Integrating Philosophical and Cultural Moderation in Traditional and Contemporary Islamic Architecture

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ABSTRACT

This study examines how mosque architecture in tropical contexts functions as a spatial medium for expressing religious moderation (*wasatiyyah*) through the integration of environmental adaptation, cultural symbolism, and social inclusivity. Using a qualitative comparative approach, the research analyzes two contrasting cases in Surakarta, Indonesia: the Masjid Agung Keraton Surakarta as a representation of traditional architecture, and the Masjid Sheikh Zayed Surakarta as a contemporary model. An analytical framework combining tropical passive design strategies and indicators of religious moderation, namely inclusivity, balance, and adaptability is employed to examine how architectural elements construct socially integrative religious spaces. The findings reveal two complementary models of moderation: (1) contextual–local moderation, characterized by cultural continuity, cosmological integration, and gradual acculturation; and (2) global–integrative moderation, characterized by monumental expression, global–local synthesis, and symbolic diplomacy. The study further demonstrates that sustainability and religious moderation are intrinsically interconnected, where environmental strategies such as ventilation, shading, and spatial openness simultaneously enhance thermal performance and social interaction. Theoretically, this research contributes by positioning mosque architecture as a mediating interface that integrates environmental performance, cultural identity, and socio-religious values. These findings offer new insights into how built environments can embody moderation and support social sustainability in plural societies.

Keywords: religious moderation (*wasatiyyah*), sustainable tropical architecture, mosque architecture, inclusivity, cultural integration, Indonesia.

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INTRODUCTION

Mosque architecture in Indonesia has evolved not only as a response to religious functions but also as a reflection of socio-cultural dynamics within a plural society (Putra et al., 2025). Beyond serving as spaces for worship, mosques operate as cultural interfaces where spiritual values, local traditions, and environmental

conditions intersect (Hidayati & Karagülle, 2025). In the context of tropical regions, this intersection becomes particularly significant, as architectural design must simultaneously address climatic responsiveness and socio-religious inclusivity.

The concept of religious moderation (*wasatiyyah*) which emphasizes balance, tolerance, and mutual respect has been widely discussed in Islamic studies, particularly in relation to social harmony in multicultural societies (Jiyanto et al., 2025). However, its translation into architectural form remains underexplored. While scholars such as M. Quraish Shihab highlight moderation as a guiding principle in religious life, existing studies tend to focus on its theological and sociological dimensions rather than its spatial and material manifestations (Rahmah, 2020). This gap raises an important question: how can architectural design embody and communicate the principles of religious moderation?

In parallel, studies on sustainable tropical architecture have emphasized the importance of passive design strategies, such as natural ventilation, shading, and material adaptation, in enhancing environmental performance (Daud, 2012). Nevertheless, these studies largely treat sustainability as a technical or environmental concern, with limited attention to its potential role in shaping social and cultural values within religious spaces (Munadi et al., 2025). As a result, there is a lack of integrative research that connects tropical design strategies with the expression of religious moderation in mosque architecture (Ihunwo & Ezinwo, 2025).

This study addresses this gap by examining mosque architecture as a mediating medium between environmental adaptation and socio-religious values. It focuses on two contrasting cases in Surakarta, Indonesia: the Masjid Agung Keraton Surakarta as a representation of traditional Javanese-Islamic architecture, and the Masjid Sheikh Zayed Surakarta as a contemporary mosque reflecting global Islamic influences.

The selection of Surakarta as the research locus is based on its unique position as a cultural and historical center of Javanese civilization, where traditional Islamic values coexist with modern global influences (Widiani et al., 2023b). These two mosques provide a compelling comparative framework to explore how different architectural approaches namely local-traditional and global-contemporary articulate religious moderation within a shared socio-cultural context (Widiani et al., 2023a).

This study aims to analyze how architectural elements in both mosques embody religious moderation through the integration of symbolic, spatial, and environmental strategies. By employing a comparative analytical framework, the research seeks to demonstrate that mosque architecture can function not only as a physical structure but also as a spatial expression of moderation, promoting inclusivity, balance, and cultural adaptability in Indonesia's plural society.

LITERATURE REVIEW

Religious Moderation in Architectural Discourse

Religious moderation (*wasatiyyah*) has been widely conceptualized in Islamic scholarship as a principle of balance, tolerance, and contextual adaptability, particularly within plural societies (Subchi et al., 2022). Scholars such as M. Quraish Shihab emphasize moderation as a normative framework that promotes coexistence and rejects extremism in both thought and practice (Idris & Putra, 2021). While this concept has been extensively discussed in theological and sociological contexts, its translation into architectural discourse remains relatively underdeveloped (Ubaidillah & Faiz, 2025).

Recent studies have begun to suggest that built environments, including mosque architecture, can function as spatial mediators of religious values by shaping patterns of interaction, accessibility, and symbolic meaning (Manshur & Husni 2020). In this sense, architectural openness, spatial inclusivity, and cultural integration can be interpreted as material expressions of moderation (Gaber, 2014). However, much of the existing literature remains conceptually implicit, lacking clear operational indicators that connect religious moderation with specific architectural elements. This limitation indicates the need for a more structured analytical approach that can bridge abstract religious values with tangible spatial configurations.

Sustainable Tropical Architecture and Mosque Design

Parallel to discussions on religious moderation, sustainable tropical architecture has developed as a significant field focusing on climate-responsive design strategies (Ubaidillah & Faiz, 2025). Research in this domain highlights the importance of passive environmental systems, such as natural ventilation, shading devices, and material adaptation in enhancing thermal comfort and reducing energy consumption in humid climates (Ma, 2021).

In the context of mosque architecture, these strategies are often embedded in traditional forms, including tiered roofs (*tajug*), open verandas, and permeable spatial layouts, which facilitate airflow and environmental adaptation (Putra et al., 2025). Contemporary studies further demonstrate how modern mosque designs integrate advanced materials and hybrid systems to optimize environmental performance while maintaining aesthetic and symbolic coherence (Putro & Setyowati, 2022).

Nevertheless, existing research tends to frame sustainability primarily as a technical and environmental concern, with limited exploration of its social and cultural implications (Lie Ulin Nuha & Nurliani Lukito, 2018). In particular, the relationship between climate-responsive design and the promotion of inclusivity, interaction, and communal harmony within religious spaces remains insufficiently examined (Nurzal & Aidina, 2023).

Beyond environmental performance, recent studies have begun to conceptualize sustainability in architecture as a multidimensional construct that includes social and cultural dimensions (McLaren, 2020). In religious buildings such as mosques, sustainability is not only reflected in energy efficiency and climatic adaptation but also in the ability of space to facilitate social interaction, inclusivity, and communal cohesion.

In this perspective, passive design strategies, such as open layouts, shaded transitional spaces, and permeable boundaries can be understood as mechanisms that enhance both environmental comfort and social accessibility (Hidayati & Karagülle, 2025). These spatial qualities enable mosques to function as inclusive public environments, supporting diverse forms of interaction across different social groups (Ma, 2021).

However, the integration between environmental sustainability and socio-religious values remains underexplored in existing literature, particularly in relation to how tropical architectural strategies may contribute to the embodiment of religious moderation within built environments.

Cultural Integration and Javanese Cosmology in Traditional Mosques

Traditional mosque architecture in Java represents a significant example of cultural integration, where Islamic principles are harmonized with pre-existing local cosmologies (Ibrahim, 2021). Studies on Javanese mosques highlight the role of architectural elements such as the *tajug* roof, *soko guru* pillars, and *kiblat papat lima pancer* spatial concept in expressing cosmological balance and social order (Raharja et al., 2023).

These elements are not merely symbolic but also functional, contributing to passive cooling and spatial organization (Hakim & Nurasiah, 2023). The integration of cosmological concepts into architectural design reflects an adaptive process in which Islamic values are contextualized within local cultural frameworks (Jailani, 2023). This process can be interpreted as a form of religious moderation, as it demonstrates the ability of religious expression to accommodate and transform indigenous traditions rather than replace them (Hasbi & Nimpuno, 2019).

However, previous studies largely treat these features as cultural or historical phenomena, with limited effort to systematically relate them to broader theoretical constructs such as moderation, inclusivity, or sustainability.

Global–Local Synthesis in Contemporary Mosque Architecture

In contrast to traditional forms, contemporary mosque architecture increasingly reflects global influences through the adoption of transnational Islamic styles, including Moorish, Mughal, and Abbasid elements (Nurzal & Aidina, 2023). This trend is evident in recent mosque developments that combine monumental forms, modern materials, and symbolic references to global Islamic identity (Ali, 2020).

At the same time, scholars have noted the emergence of “glocal” design approaches, where global architectural languages are adapted to local cultural and climatic contexts (Al Khalifa & Lafi, 2025). This synthesis often includes the incorporation of local motifs, spatial adaptations, and passive environmental strategies, allowing contemporary mosques to remain contextually relevant while expressing broader Islamic aesthetics.

Despite this development, the literature has yet to fully examine how such global–local synthesis contributes to the articulation of religious moderation (Putro & Setyowati, 2022). Specifically, there is limited analytical exploration of how contemporary mosque architecture negotiates between universal identity and local inclusivity within a coherent conceptual framework.

Research Gap and Analytical Positioning

Based on the review above, two major gaps can be identified. *First*, studies on religious moderation remain largely normative and conceptual, with limited translation into architectural analysis. *Second*, research on sustainable tropical mosque design tends to emphasize environmental performance, without adequately addressing its socio-cultural and religious implications.

Moreover, existing literature often examines traditional and contemporary mosque architecture separately, resulting in a lack of comparative understanding of how different architectural paradigms articulate moderation in diverse contexts.

This study addresses these gaps by proposing an integrative approach that connects religious moderation, cultural symbolism, and tropical environmental adaptation within a single analytical framework. By comparatively analyzing traditional and contemporary mosques in Surakarta, this research positions mosque architecture as a mediating interface between environmental sustainability and socio-religious inclusivity, thereby contributing to both architectural theory and the discourse on religious moderation in plural societies.

METHODOLOGY

Research Design

This study adopts a *qualitative comparative case study* (L. J. Moleong, 2018) design to examine how mosque architecture mediates religious moderation (Widiani, 2018) through climate-responsive strategies in a tropical context. A comparative approach is employed to identify similarities and differences between traditional and contemporary architectural paradigms, enabling analytical generalization beyond individual cases.

Case Selection and Research Context

The study focuses on two purposively selected cases in Surakarta, Indonesia: the Masjid Agung Keraton Surakarta and the Masjid Sheikh Zayed Surakarta. The selection is based on three criteria:

- i. Typological contrast: representing traditional Javanese-Islamic architecture and contemporary global-Islamic architecture;
- ii. Climatic relevance: both mosques operate within the same tropical environment, allowing controlled comparison of design responses;
- iii. Socio-cultural significance: both function as prominent religious and public spaces that reflect broader narratives of local identity and global integration. This selection enables a focused comparison of how different architectural approaches articulate religious moderation within a shared environmental and cultural context.

Data Collection

Primary data were collected through systematic field observations (Assyakurrohim et al., 2022), including direct site visits and photographic documentation (J. L. Moleong, 2020). Observations focused on four categories of architectural elements:

- i. Environmental features (e.g., roof form, ventilation, shading systems),
- ii. Spatial configuration (e.g., openness, circulation, transitional spaces),
- iii. Material and construction (e.g., thermal properties, surface treatment), and
- iv. Symbolic and cultural elements (e.g., ornamentation, cosmological layout).

Secondary data were obtained from academic literature, design reports, and relevant publications to contextualize architectural interpretations and support theoretical framing.

Analytical Framework

To operationalize the concept of religious moderation in architectural terms (L. J. Moleong, 2018), this study employs a dual analytical framework consisting of:

Religious Moderation Indicators (Hakim & Nurasiah, 2023):

- i. Inclusivity (spatial openness and accessibility),
- ii. Balance (integration of spiritual, social, and cultural dimensions),
- iii. Adaptability (capacity to accommodate local and global influences).

Tropical Design Indicators (Daud, 2012):

- i. Passive cooling strategies (ventilation, shading, spatial permeability),
- ii. Climate responsiveness,
- iii. Material adaptation.

This framework enables systematic comparison of how architectural elements function simultaneously as environmental strategies and socio-religious expressions.

Data Analysis

Data were analyzed using *thematic coding and cross-case comparative analysis* (Elva & Murhayati, 2025). Architectural features identified in each case were coded according to the analytical framework, allowing patterns to be categorized and interpreted. The analysis proceeded in three stages:

- i. Identification of key architectural elements,
- ii. Classification based on moderation and sustainability indicators, and
- iii. Cross-case comparison to identify convergences and divergences. (Salsabila, 2025)

This approach ensures that findings are not merely descriptive but analytically grounded in predefined conceptual categories.

Validity and Reliability

To enhance validity, this study applies *data triangulation* by integrating field observations with secondary literature (Assyakurrohim et al., 2022). Analytical reliability is supported through systematic coding procedures and consistent application of the analytical framework across both cases (Rusli & Rusandi, 2021). Interpretive validity is strengthened by linking empirical observations with established theoretical constructs in religious moderation and sustainable architecture.

Ethical Considerations

Ethical considerations include obtaining permission for site observations, ensuring respectful representation of religious spaces, and avoiding misinterpretation of cultural and symbolic elements. All data were used solely for academic purposes with appropriate attribution.

RESULTS AND DISCUSSION

Environmental and Spatial Strategies

The Masjid Agung Keraton Surakarta demonstrates a coherent integration of passive tropical design strategies through its architectural configuration (Purwadi, 1970). The

multi-tiered *tajug* roof facilitates vertical air movement, promoting effective stack ventilation, while the permeable spatial layout and elevated floor system enhance cross-ventilation and thermal comfort in a humid tropical climate (Budiwiyono & Setiawan, 2023).

This indicates that environmental adaptation operates not solely as a climatic response but also as a spatial mechanism that structures user experience within the mosque (Wahyuni et al., 2024). The openness of the layout, characterized by minimal enclosure and fluid spatial transitions, allows continuous movement and visual connectivity across different zones.

From the perspective of religious moderation (Hidayati & Karagülle, 2025), this spatial configuration reflects inclusivity, as it enables unrestricted access and accommodates diverse patterns of use beyond formal ritual activities. At the same time, the integration of environmental and spatial strategies demonstrates balance, where functional performance and social interaction are harmonized within a single architectural system.

Furthermore, the adaptability of these design features, rooted in local climatic knowledge and cultural practices suggests that traditional mosque architecture embodies a context-sensitive approach to sustainability. This suggests that passive tropical design in this case not only enhances environmental efficiency but also reinforces the social and cultural dimensions of religious moderation through spatial openness and collective engagement.

This architectural condition is visually illustrated in Figure 1.



Figure 1. Passive tropical design features of the Masjid Agung Keraton Surakarta, illustrating the *tajug* roof and permeable spatial configuration that support natural ventilation, spatial openness, and socio-religious inclusivity.

The figure further confirms that the integration of the *tajug* roof and permeable spatial system enables effective airflow while maintaining visual and spatial openness (Yunianti, 2015). This reinforces the argument that environmental performance is intrinsically linked to spatial inclusivity, where climatic responsiveness simultaneously supports social interaction and accessibility (Budiwiyono & Setiawan, 2023). Consequently, passive tropical design in this context functions not only as an environmental strategy but also as a socio-spatial mechanism that embodies the principles of religious moderation.

Symbolic Structure and Cultural Integration

The Masjid Agung Keraton Surakarta articulates a symbolic spatial system through the presence of *soko guru* pillars and the *kiblat papat lima pancer* layout (Budiwiyono & Setiawan, 2023), which together represent a cosmological framework integrating spiritual, social, and environmental dimensions (Wahyuni et al., 2024). The four main pillars (*soko guru*) define the structural and symbolic center of the mosque, while the spatial orientation reflects a Javanese philosophical understanding of balance between the human, natural, and divine realms (Adityaningrum et al., 2020).

This indicates that architectural elements in the mosque function not only as structural components but also as carriers of meaning that shape spatial experience and collective perception. The central positioning of the *soko guru* establishes a focal point that organizes movement and visual orientation, reinforcing a sense of unity within diversity.

From the perspective of religious moderation, this configuration reflects the principle of balance, where multiple dimensions of life spiritual devotion, social interaction, and environmental awareness are harmonized within a single spatial system (Asasi & Sianipar, 2021). At the same time, the integration of Javanese cosmology into Islamic architectural form demonstrates adaptability, as religious expression is contextualized through local cultural knowledge without compromising its core values.

Furthermore, the symbolic openness embedded in this cosmological system suggests an implicit form of inclusivity, where the mosque is positioned not only as a sacred space but also as a cultural interface that accommodates diverse interpretations and communal practices (Asasi & Sianipar, 2021). This implies that symbolic structure plays a crucial role in mediating religious moderation by embedding cultural meaning within spatial organization.

This symbolic and spatial configuration is illustrated in Figure 2.



Figure 2. Symbolic spatial structure of the Masjid Agung Keraton Surakarta, illustrating the *soko guru* pillars and cosmological layout (*kiblat papat lima pancer*) as representations of balance, cultural integration, and socio-religious harmony.

Figure 2 visually demonstrates how the *soko guru* pillars function as both structural supports and symbolic anchors within the mosque's spatial system (Jiang et al., 2025). Their central placement reinforces spatial orientation and collective focus, while also representing the cosmological concept of equilibrium between directional forces and a unifying center.

This suggests that the spatial configuration embodies balance not only in a metaphysical sense but also in a functional and experiential dimension, guiding movement, interaction, and perception within the mosque (Lie Ulin Nuha & Nurliani Lukito, 2018). The integration of cosmological symbolism into architectural form further reflects adaptability, as local philosophical concepts are reinterpreted within an Islamic framework.

Moreover, the openness of the spatial arrangement around the *soko guru* indicates inclusivity, allowing the space to accommodate diverse communal activities while maintaining a coherent symbolic order. Thus, the figure confirms that symbolic structure in this context operates as a socio-spatial mechanism that reinforces religious moderation through cultural integration and spatial harmony.

Acculturation and Adaptability

The Masjid Agung Keraton Surakarta reflects a complex process of architectural acculturation through the incorporation of Hindu-Buddhist, Persian, Indian, and European influences within its spatial and ornamental system (Fauzi et al., 2020). These influences are evident in elements such as the tiered *tajug* roof derived from pre-Islamic temple forms, the minaret inspired by Indian-Islamic architecture, as well as the use of arches and decorative motifs associated with Persian and European traditions.

This indicates that the mosque's architectural form is not a static representation of a single cultural identity, but rather a dynamic synthesis shaped by continuous interaction across civilizations. Instead of generating conflict, these diverse influences are selectively adapted and reinterpreted into a coherent architectural language (Ma, 2021).

From the perspective of religious moderation, this process reflects adaptability, where openness to external influences is negotiated through contextual reinterpretation rather than direct imitation (Ubaidillah & Faiz, 2025). Such an approach allows the mosque to maintain its Islamic identity while accommodating cultural diversity.

At the same time, the layered integration of multiple traditions reinforces inclusivity, as the architectural expression becomes accessible and meaningful to a broader cultural spectrum. This suggests that acculturation functions as a mechanism of cultural resilience, where diversity is not only accepted but actively embedded within the architectural system.

Furthermore, the coexistence of these influences demonstrates balance, as local and global elements are harmonized without dominance of one over the other. This implies that architectural acculturation in this context embodies religious moderation through a negotiated synthesis of identity, openness, and continuity.

This process of acculturation and adaptability is illustrated in Figure 3.



Figure 3. Architectural acculturation in the Masjid Agung Keraton Surakarta, illustrating the integration of Hindu-Buddhist, Persian, Indian, and European elements within a unified architectural system.

Figure 3 visually highlights the coexistence of diverse architectural influences within a single spatial composition, where elements such as arches, minarets, and ornamental details reflect multiple cultural origins.

This demonstrates that architectural acculturation operates as a process of selective adaptation rather than direct replication, enabling the integration of external influences into a locally grounded system (Daud, 2012). The visual layering of these elements reinforces the notion of adaptability, where architectural identity evolves through interaction without losing coherence.

Moreover, the harmonious combination of diverse stylistic features indicates a balanced relationship between local traditions and global influences. This suggests that acculturation not only enhances aesthetic richness but also functions as a socio-cultural strategy that promotes inclusivity and tolerance.

Thus, the figure confirms that adaptability in mosque architecture is closely linked to religious moderation, where openness to diversity is translated into a cohesive spatial and cultural expression.

Environmental Performance and Monumentality

The Masjid Sheikh Zayed Surakarta demonstrates an integrated approach to environmental performance through the combination of passive and hybrid design strategies (Sam et al., 2022). Shaded arcades, expansive courtyards (*sahn*), and high-reflectance white marble surfaces collectively reduce solar heat gain while facilitating air movement across the complex (Oktavian & Hidayati, 2024). These elements contribute to thermal comfort within a large-scale architectural setting, minimizing reliance on mechanical cooling systems.

This indicates that environmental responsiveness in contemporary mosque architecture can be achieved without compromising monumental expression. The large spatial scale, often associated with formality and exclusivity, is here reconfigured to remain accessible and climatically adaptive.

From the perspective of religious moderation, the expansive courtyard functions as a mechanism of inclusivity, accommodating large and diverse congregations while supporting both ritual and non-ritual activities (Prasetyo et al., 2024). The presence of shaded transitional zones further enhances usability across different times of the day, reinforcing the mosque’s role as a public and communal space.

At the same time, the integration of climatic strategies with formal symmetry and spatial hierarchy reflects balance, where aesthetic monumentality and environmental performance are harmonized within a unified design system.

Furthermore, the incorporation of hybrid strategies, combining traditional passive principles with modern materials and construction techniques demonstrates adaptability, allowing global architectural forms to respond effectively to local tropical conditions. This suggests that contemporary mosque architecture can reinterpret monumental design as an inclusive and sustainable spatial system.

This environmental and spatial configuration is illustrated in Figure 4.

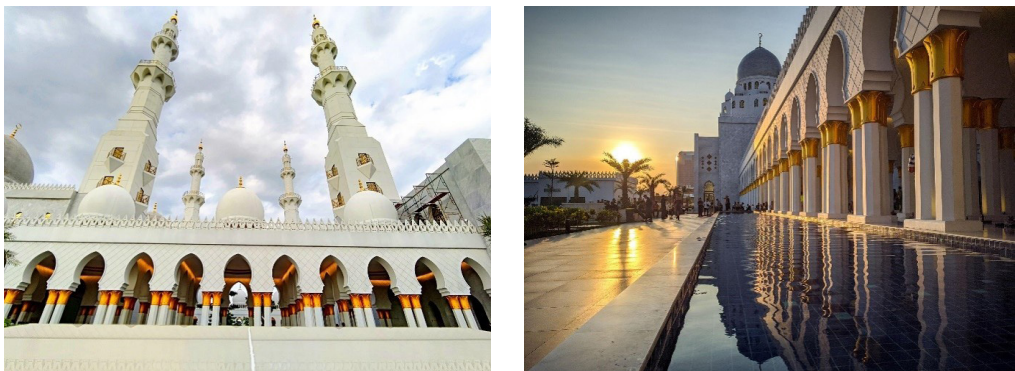


Figure 4. Environmental and spatial configuration of the Masjid Sheikh Zayed Surakarta, highlighting the courtyard (*sahn*), shaded arcades, and reflective materials that enhance thermal performance, spatial accessibility, and inclusivity.

Figure 4 visually demonstrates how the large-scale configuration of the mosque integrates environmental strategies with spatial accessibility. The courtyard and shaded arcades facilitate airflow and provide thermal buffering, while also creating expansive gathering spaces.

This suggests that monumentality in this context does not produce spatial exclusivity, but instead enables inclusivity by accommodating diverse user groups within a thermally

comfortable environment (Jiyanto et al., 2024). The use of reflective materials further enhances environmental performance while reinforcing the visual coherence of the architectural form.

Moreover, the spatial continuity between exterior and interior zones reflects a balanced relationship between environmental adaptation and formal expression (Gaber, 2024). This indicates that contemporary mosque architecture can transform monumental scale into a socially responsive and environmentally adaptive system.

Thus, the figure confirms that environmental performance, spatial inclusivity, and architectural monumentality can be integrated as complementary dimensions of religious moderation in contemporary mosque design.

Spatial Inclusivity and Openness

The Masjid Sheikh Zayed Surakarta articulates spatial inclusivity through the design of its veranda and transitional zones, which establish a gradual sequence between exterior and interior spaces (Sam et al., 2022). These semi-open areas function as spatial buffers that mediate environmental conditions while facilitating circulation, gathering, and informal interaction beyond formal ritual activities (Oktavian & Hidayati, 2024).

This indicates that spatial permeability is not merely a design feature but a socio-spatial strategy that shapes patterns of use and interaction within the mosque. The continuity between open and enclosed spaces enables users to engage with the environment at varying levels of formality, allowing the mosque to accommodate both individual contemplation and collective activities.

From the perspective of religious moderation, such spatial configuration reflects inclusivity, as it removes rigid boundaries and allows access for diverse user groups with different needs and levels of engagement. The veranda, as a transitional space, supports extended occupancy and social interaction, reinforcing the mosque's role as a communal hub (Ihunwo & Ezinwo, 2025).

At the same time, the integration of transitional spaces with the overall architectural composition demonstrates balance, where sacred and social functions coexist without spatial conflict.

Furthermore, the use of open arcades and shaded corridors illustrates adaptability, as these elements respond effectively to tropical climatic conditions while maintaining architectural coherence. This suggests that spatial openness in contemporary mosque design functions as both an environmental strategy and a social mechanism that embodies the principles of religious moderation.

This spatial configuration is illustrated in Figure 5.



Figure 5. Transitional veranda space in the Masjid Sheikh Zayed Surakarta, illustrating spatial permeability and its role in facilitating circulation, social interaction, and inclusivity.

Figure 5 demonstrates how the veranda operates as a transitional spatial layer that connects the exterior environment with the interior prayer space. The open arcade structure allows natural light and airflow to penetrate the circulation area, while also providing shaded zones that support prolonged use and comfort.

This suggests that transitional spaces play a critical role in enhancing inclusivity by accommodating diverse patterns of movement and interaction. Rather than functioning solely as circulation corridors, these spaces enable informal social engagement, thereby expanding the functional scope of the mosque (Putra et al., 2025).

Moreover, the continuity between open and enclosed zones reflects a balanced relationship between sacred and social domains, where neither aspect dominates the spatial experience. The adaptability of the veranda design to tropical climatic conditions further reinforces its dual role as both an environmental and social device.

Thus, the figure confirms that spatial openness and transitional design are integral to the embodiment of religious moderation, as they foster accessibility, interaction, and contextual responsiveness within contemporary mosque architecture.

Global–Local Synthesis as Adaptability

The Masjid Sheikh Zayed Surakarta demonstrates a complex process of global–local synthesis through the integration of transnational Islamic architectural elements with locally embedded cultural motifs (Sam et al., 2022). Architectural components such as domes influenced by Moorish traditions, minarets reflecting Mughal stylistic articulation, and arabesque decorative patterns are combined with Indonesian elements, particularly the *batik kawung* motif applied in interior finishes and ornamental details (Oktavian & Hidayati, 2024).

This indicates that contemporary mosque architecture operates as a site of cultural negotiation, where global Islamic identity is not merely replicated but actively

reinterpreted within a specific local context (Fauzi et al., 2020). The coexistence of these elements generates a layered architectural language that simultaneously conveys universality and locality.

From the perspective of religious moderation, this synthesis reflects adaptability, as it enables the accommodation of diverse cultural references without undermining the coherence of Islamic identity (Hidayati & Karagülle, 2025). The presence of globally recognizable forms establishes symbolic connectivity with the broader Muslim world, while local motifs enhance cultural familiarity and contextual relevance.

At the same time, this integration reinforces inclusivity, as the architectural expression becomes accessible to both local communities and international audiences. The mosque thus functions as a shared cultural space that bridges different identities and interpretative frameworks.

Furthermore, the balanced coexistence of global and local elements demonstrates balance, where neither dimension dominates but instead contributes to a harmonious architectural composition. This suggests that global–local synthesis in contemporary mosque design embodies religious moderation through the negotiated integration of identity, openness, and contextual responsiveness.

This global–local synthesis is illustrated in Figure 6.



Figure 6. Global–local synthesis in the Masjid Sheikh Zayed Surakarta, illustrating the integration of Moorish domes, Mughal minarets, arabesque ornamentation, and Indonesian *batik kawung* motifs as a representation of adaptability, inclusivity, and cultural balance.

Figure 6 demonstrates how global Islamic architectural elements are integrated with local cultural motifs to form a cohesive visual and spatial composition. The presence of arabesque patterns and dome ornamentation reflects transnational Islamic aesthetics, while the incorporation of *batik kawung* introduces a distinctly Indonesian cultural layer.

This suggests that architectural identity in this context is constructed through selective adaptation rather than direct imitation, allowing global forms to be localized in a meaningful way. The visual integration of these elements reinforces adaptability, as the design accommodates multiple cultural references within a unified framework.

Moreover, the coexistence of global and local features enhances inclusivity by enabling the mosque to resonate with diverse audiences, both local and international. The balanced composition further indicates that cultural synthesis can be achieved without compromising coherence or identity.

Thus, the figure confirms that global–local synthesis functions as a key mechanism in expressing religious moderation, where openness to diversity is translated into a harmonious architectural form.

Comparative Analysis: Two Models of Moderation

Analytical Comparison

The comparative analysis of the Masjid Agung Keraton Surakarta and the Masjid Sheikh Zayed Surakarta reveals two distinct yet complementary models of religious moderation as expressed through architectural form, spatial configuration, and cultural integration.

The first model, contextual–local moderation, is represented by the Surakarta Grand Mosque and is characterized by strong cultural continuity, cosmological integration, and gradual acculturation. Architectural elements such as the tajug roof, soko guru, and kiblat papat lima pancer reflect a deeply rooted synthesis between Islamic values and Javanese cosmology. This indicates that moderation in this context emerges through adaptation to local traditions, where religious expression is embedded within an existing cultural framework.

In contrast, the second model, global integrative moderation, is represented by the Sheikh Zayed Mosque Surakarta and is characterized by formal monumentalism, global stylistic synthesis, and symbolic diplomacy. The integration of *Moorish*, *Mughal*, and *Arabesque* elements with local motifs such as *batik kawung* demonstrates a deliberate effort to align global Islamic identity with Indonesian cultural context. This suggests that moderation in this model is achieved through the negotiation of transnational identity and local relevance within a contemporary architectural language.

Table 1
Comparative models of religious moderation in mosque architecture

Dimension	Contextual–Local Moderation (Surakarta Grand Mosque)	Global–Integrative Moderation (Sheikh Zayed Mosque)
Cultural Basis	Local (Javanese cosmology)	Global Islamic with local adaptation
Architectural Expression	Symbolic–cosmological	Monumental–formal
Adaptability	Gradual acculturation	Global–local synthesis
Inclusivity	Informal openness, cultural familiarity	Formal inclusivity through scale and accessibility
Balance	Human–nature–divine integration	Spatial symmetry and visual harmony
Sustainability	Passive tropical design (traditional)	Passive + hybrid design (modern)
Moderation Mechanism	Cultural embedding	Identity negotiation

This comparison demonstrates that religious moderation in mosque architecture is not a fixed or uniform formal expression, but rather a dynamic and context-dependent process shaped by historical trajectories, cultural frameworks, and socio-political conditions. The findings indicate that architectural moderation emerges through multiple pathways, reflecting the diversity of contexts in which mosques are embedded.

On the one hand, moderation can be achieved through cultural continuity and localization, where architectural forms evolve organically from local traditions and cosmological systems, representing a *bottom-up* approach rooted in community-based practices. On the other hand, moderation can also be realized through global synthesis and reinterpretation, where transnational Islamic architectural elements are selectively adapted and integrated into local contexts, representing a *top-down* approach shaped by broader cultural exchanges and institutional influences.

Together, these pathways suggest that religious moderation is not defined by a singular architectural typology, but by the capacity of design to negotiate between continuity and change, locality and universality, as well as tradition and modernity.

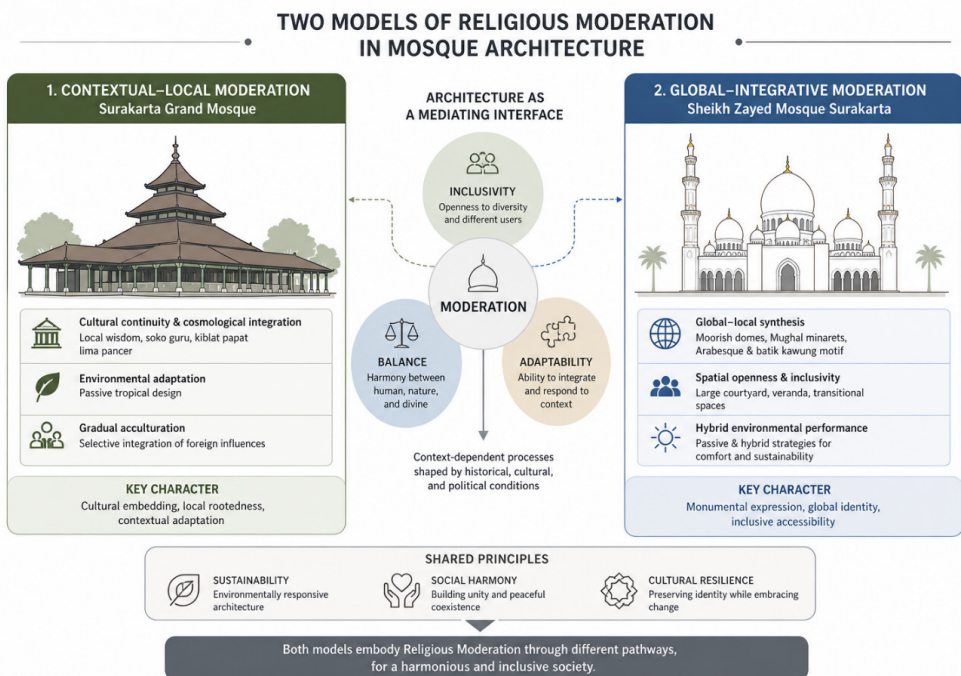


Figure 7. Conceptual comparison of two models of religious moderation in mosque architecture, illustrating the relationship between local-contextual integration and global-integrative synthesis through inclusivity, balance, and adaptability.

Figure 7 illustrates the conceptual distinction between the two models of religious moderation identified in this study. The contextual-local model emphasizes cultural embedding and continuity, where architectural form evolves through gradual adaptation to local traditions. In contrast, the global-integrative model highlights the role of transnational exchange and symbolic synthesis in shaping contemporary mosque architecture.

This suggests that religious moderation operates across a spectrum rather than within a singular framework, where different architectural approaches respond to specific cultural and historical conditions. The diagram further demonstrates that both models converge on shared principles namely inclusivity, balance, and adaptability despite their differing formal expressions.

Moreover, the comparison indicates that sustainability and moderation are interrelated, as environmental strategies, spatial openness, and cultural integration collectively contribute to socially responsive design. Thus, the figure reinforces the argument that mosque architecture functions as a mediating interface through which diverse values are negotiated and expressed.

Integration of Sustainability and Moderation

Across both cases, the Masjid Agung Keraton Surakarta and the Masjid Sheikh Zayed Surakarta environmental strategies such as natural ventilation, shading systems, and spatial openness are closely intertwined with social and cultural functions. These architectural features operate not only to regulate thermal conditions but also to structure patterns of movement, interaction, and accessibility within the mosque environment.

This indicates that sustainability in mosque architecture cannot be reduced to environmental performance alone, but must be understood as a multidimensional construct encompassing social inclusivity and cultural integration. Passive design elements, including open layouts, transitional spaces, and permeable boundaries, simultaneously enhance climatic comfort and support communal engagement.

From the perspective of religious moderation, this integration reflects inclusivity, as environmentally responsive spaces enable broader access and prolonged occupancy for diverse user groups. At the same time, the alignment between environmental strategies and social functions demonstrates balance, where ecological efficiency and human interaction are harmonized within a single spatial system.

Furthermore, the adaptation of both traditional and contemporary design strategies to tropical climatic conditions illustrates adaptability, highlighting the capacity of mosque architecture to respond to environmental challenges while maintaining cultural and religious relevance. This suggests that sustainability and moderation are not separate domains, but mutually reinforcing processes that are spatially embedded within architectural design.

In this context, mosque architecture functions as a mediating interface, where environmental responsiveness, cultural identity, and social cohesion converge. Thus, the integration of sustainability and religious moderation positions the mosque not only as a place of worship, but also as a resilient socio-environmental system within a pluralistic society.

The Role of Architecture as Mediating Interface

The findings demonstrate that mosque architecture operates as a mediating interface that connects environmental adaptation, cultural identity, and religious values within a unified spatial system. Rather than functioning as a passive container, architectural space actively structures how these dimensions interact and are experienced by users.

This indicates that architecture is not neutral, but performative in nature, shaping patterns of social interaction, guiding spatial behavior, and influencing the way religious values are practiced and perceived. Environmental strategies such as ventilation, shading,

and spatial openness do not merely address climatic conditions; they also facilitate accessibility and collective engagement.

At the same time, the integration of cultural symbolism and spatial organization reinforces identity while accommodating diversity, reflecting a dynamic relationship between tradition and transformation. From the perspective of religious moderation, this mediating role embodies inclusivity, balance, and adaptability as spatially embedded principles.

This suggests that moderation is not only expressed symbolically, but is actively produced through spatial practice, where architectural design enables the negotiation between environmental, cultural, and religious dimensions. In this sense, mosque architecture becomes a critical medium through which moderation is operationalized in everyday life.

Implications for Religious Moderation in Contemporary Society

The comparative analysis indicates that the two mosques represent complementary approaches to religious moderation within the Indonesian context. The Masjid Agung Keraton Surakarta reinforces moderation through historical continuity and local wisdom, where architectural form evolves from deeply rooted cultural and cosmological traditions. In contrast, the Masjid Sheikh Zayed Surakarta promotes moderation through global engagement and cultural diplomacy, reflecting a contemporary approach that integrates transnational identity with local adaptation.

This indicates that religious moderation in architecture can be achieved through both preservation and innovation, depending on the socio-cultural and historical context. Rather than being mutually exclusive, these approaches demonstrate that moderation is a flexible and context-sensitive process.

Furthermore, the findings reveal that architectural strategies contribute directly to broader social outcomes. Inclusive spatial design supports social cohesion by enabling interaction across diverse user groups. Climate-responsive architecture enhances accessibility and comfort, allowing spaces to be used more intensively and equitably. Meanwhile, cultural integration strengthens identity formation while maintaining openness to diversity.

These results suggest that mosque architecture functions as a strategic medium for advancing social sustainability and intercultural dialogue in plural societies. By integrating environmental performance, cultural meaning, and social accessibility, architectural design can actively contribute to the cultivation of moderate, inclusive, and resilient communities.

CONCLUSION

This study demonstrates that mosque architecture in Indonesia functions not merely as a physical setting for religious activities, but as a spatial medium that actively mediates environmental adaptation, cultural identity, and religious values. Through a comparative analysis of the Masjid Agung Keraton Surakarta and the Masjid Sheikh Zayed Surakarta, the research identifies two complementary models of religious moderation: contextual–local moderation and global–integrative moderation.

The first model emphasizes cultural continuity, cosmological integration, and gradual acculturation, reflecting a bottom-up approach rooted in local traditions. The second model highlights global synthesis, monumental expression, and symbolic diplomacy, representing a top-down approach shaped by transnational influences. These findings indicate that religious moderation is not a fixed architectural typology, but a dynamic and context-dependent process shaped by historical, cultural, and socio-political conditions.

Furthermore, the study reveals that sustainability and religious moderation are intrinsically interconnected. Environmental strategies, such as ventilation, shading, and spatial openness not only enhance climatic performance but also facilitate inclusivity, accessibility, and social interaction. This suggests that sustainable mosque architecture extends beyond environmental efficiency to encompass social cohesion and cultural integration.

Theoretically, this research contributes by positioning mosque architecture as a mediating interface, where inclusivity, balance, and adaptability are spatially embedded and operationalized through design. Practically, the findings offer insights for future mosque development, emphasizing the importance of integrating environmental responsiveness, cultural context, and social inclusivity in architectural practice.

In conclusion, mosque architecture has the potential to serve as a strategic instrument for promoting religious moderation, social sustainability, and intercultural dialogue within plural societies. Future research is recommended to incorporate user-based perspectives and cross-regional comparisons in order to further explore how spatial design influences lived experiences of moderation.

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LIMITATION

This study is subject to several limitations. First, the analysis is based on two case studies within a single geographical context, which may limit the generalizability of the findings to other regions or cultural settings. Second, the research relies primarily on architectural observation and interpretive analysis, without incorporating user-based perspectives such as interviews or behavioral studies. Third, while the study integrates environmental and socio-cultural dimensions, it does not quantitatively measure environmental performance or thermal comfort.

Future research is therefore recommended to include broader comparative cases across different regions, as well as user-centered approaches to better understand how architectural space influences lived experiences of religious moderation.

DISCLOSURE STATEMENT

No financial interests or benefits have arisen from the direct applications of this research by the research team.

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