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About the programme

Heritage Horizon is a specialised 9-month training programme, designed and delivered by the School of Arts at SOAS in partnership with the Heritage Commission in Saudi Arabia, to equip researchers and professionals working in cultural heritage with the knowledge and skills to enhance the impact of their research. The programme brings together interdisciplinary research across the heritage sector in the Kingdom of Saudi Arabia, including researchers in archaeology, handicrafts, intangible cultural heritage, urban heritage, as well as heritage management, protection and science.

Cover image courtesy of the Saudi Heritage Commission.

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Beyond Material Conservation: Functional Integrity at Salwa Palace in At-Turaif World Heritage Site

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Abstract

Built heritage plays a critical role in shaping national historical narratives and cultural memory. However, contemporary conservation practices often privilege material fabric, reducing architecture to a self-contained object. This material-centric orientation risks separating physical remains from the social, political, and governance-related functions they historically sustained, producing conservation outcomes that preserve form while obscuring operational logic and lived practice.

This paper addresses this limitation through an examination of Salwa Palace in At-Turaif district, a UNESCO World Heritage Site that developed as the principal governance center of Diriyah from 1766, during the zenith of the First Saudi State (1727–1818). This paper introduces functional integrity as an analytical framework for understanding how spatial organization structured and sustained historical functions. In doing so, the study reframes intangible heritage practices, such as governance, consultation, and social interaction, not as a supplementary interpretive layer, but as spatially grounded and evidentiary.

Methodologically, the paper combines cultural mapping with systematic textual analysis through a process of text-to-fabric triangulation, correlating historical accounts with architectural and archaeological documentation. Where textual and spatial evidence do not align directly, priority is given to spatially verifiable architectural evidence, while textual accounts are treated as interpretive rather than definitive.

The analysis identifies key spatial–functional mechanisms within Salwa Palace and its surroundings. The findings demonstrate that architecture did not merely accommodate governance, but spatially structured and sustained it.

The primary contribution of this study lies in the application of functional integrity as a methodological framework for integrating tangible and intangible heritage within conservation studies. By treating intangible practices as spatially accountable evidence, it provides a transferable approach for analyzing complex heritage sites without reliance on speculative reconstruction.

Keywords: Salwa Palace; At-Turaif WHS; Diriyah; Wadi Hanifah; First Saudi State; Built Heritage; Functional Integrity; Intangible Heritage; Cultural Mapping; Conservation; Heritage Interpretation.

1. Introduction

Through its material presence, built heritage acts as an important medium for the formation and transmission of historical knowledge. Yet, within heritage conservation practices, the analytical relationship between built form and historical use remains unevenly addressed. While substantial effort has been directed toward documenting and preserving architectural fabric, the spatial conditions through which social, political, and administrative practices were organized remain less systematically examined.

This gap reflects a broader challenge within heritage studies and has been noted within critical heritage discourse, which has increasingly emphasized the role of lived experience and intangible practices.

However, translating such practices into spatially grounded analysis remains limited. As a result, complex heritage sites are often approached as static artefacts rather than as dynamic spatial systems shaped by patterns of access, movement, and interaction over time.

This paper aims to address this challenge through an examination of Salwa Palace, located within the At-Turaif World Heritage Site (WHS) in Diriyah, Kingdom of Saudi Arabia (Fig. 1). Situated along Wadi Hanifah in central Arabia, At-Turaif functioned as the principal political and governing district of Diriyah during the zenith of the First Saudi State (1727–1818). Diriyah itself was established in the mid-15th century (c. 1446 CE) following the migration of Prince Mani Al-Muraydi, with earlier settlement phases associated with districts such as Ghasibah preceding the development of At-Turaif. Over time, Diriyah evolved from a small oasis settlement into a prominent political and administrative center (Hashim, 2005). By the early 18th century, under Imam Mohammad bin Saud, it became the capital of the First Saudi State, marking a critical phase in the consolidation of political authority in the region (Yassin, n.d.; Al-Awwad, 2019).

Within this context, Salwa Palace constituted the principal governing complex of the state, comprising a system of interconnected architectural units that accommodated administrative, residential, religious, social, and logistical functions (Bin Khamis, 1982). Rather than a singular monumental structure, the palace operated as an integrated spatial system through which political authority, social interaction, and institutional practices were organized.

Beyond its historical role, Salwa Palace has also assumed significance as a symbol of national memory, with its silhouette widely reproduced in national iconography, including vehicle license plates and identity representations such as passports and commemorative media. This continued symbolic presence underscores the enduring capacity of architectural form to carry and communicate political and cultural meaning across time.



Figure 1: an aerial image of At-Turaif WHS (DGDA, 2020.)

2. Literature Review and Methodological Positioning

2.1. Intangible Heritage and Challenges of Spatial Integration

Early conservation frameworks such as the Venice Charter (1964) privileged material fabric, while later advances including the Nara Document on Authenticity (1994) and UNESCO's recognition of intangible heritage (2003) emphasized the need to understand built heritage as embedded within lived cultural

systems rather than isolated. Despite this conceptual shift, a persistent methodological challenge remains in the separation of intangible practices from their material contexts. Practices tend to be documented through ethnographic or narrative approaches, while buildings are analyzed and conserved architecturally, resulting in limited methodological integration between the two.

This limitation is especially evident in the context of Najdi architecture, where socio-cultural practices are closely embedded within spatial organization, but where many of these practices are no longer directly observable in their original architectural settings due to the absence of continuous occupation and the historical distance of such sites. This regional building tradition in central Arabia is characterized by earthen construction, compact inward-facing urban forms, and hierarchical spatial organization (Alnaim, 2021). As a defining example of this tradition, At-Turaif and the wider Diriyah landscape provide a critical context for examining the relationship between spatial form and social practice within heritage interpretation, due to their scale, defensiveness, significance, and association with the First Saudi State as a center of political and administrative authority.

Scholars have increasingly emphasized the spatial embeddedness of intangible heritage, arguing that practices such as governance assemblies, consultation formalities, administrative exchange, and everyday social interaction are shaped by spatial conditions including access, proximity, visibility, and architectural sequencing (Harrison, 2013). However, methodological frameworks capable of systematically tracing these relationships remain limited due to the difficulty of correlating non-spatial narratives with physical remains and the disciplinary separation between architectural analysis and historical interpretation.

2.2. Cultural Mapping as an Integrative Methodological Framework

In response to these challenges, cultural mapping has emerged as a methodological approach for analyzing relationships between space, practice, and meaning. It provides a framework for integrating textual, spatial, and historical data, enabling the correlation of social practices with architectural configurations (Duxbury et al., 2015; Cabeça, 2018; Caquard & Cartwright, 2014).

Cabeça (2018) emphasizes its capacity to synthesize diverse forms of evidence, including archival records, spatial documentation, and narrative accounts, while Caquard and Cartwright (2014) argue that mapping functions not only as representation but as a form of knowledge production. In this sense, mapping does not merely record spatial information but actively constructs relationships by bringing dispersed forms of evidence into a coherent spatial framework, making patterns of interaction, movement, and association visible. This process enables the identification of spatial connections that are not immediately apparent in textual or material sources alone, transforming mapping into an analytical tool through which relationships can be interpreted, rather than simply depicted.

As such, cultural mapping provides a methodological basis for translating social and cultural processes into spatially legible relationships, directly addressing the separation between architectural form and intangible practice identified in heritage studies.

3. Theoretical and Methodological Framework: Functional Integrity and Relational Space

Building on the identified limitations, this study applies the concept of functional integrity as an analytical framework for examining the relationship between spatial configuration and historically documented practice. This approach aligns with historical Najdi building practices, characterized by multifunctionality, adaptation, and periodic rebuilding, which were intrinsic to the architectural fabric, and where function was maintained through repeated use rather than fixed spatial designation.

Unlike conventional notions of integrity, which emphasize material completeness, or authenticity, which foregrounds the credibility of form and fabric, functional integrity focuses on the relational organization of space as a primary bearer of meaning. Rather than centering on the material completeness of

architectural elements, it shifts analysis toward how spatial relationships structure and sustain social, political, and cultural practices. As a conceptual framework, functional integrity defines the interpretive lens through which the relationship between space and practice is examined.

To operationalize this approach, this study uses cultural mapping which enables the integration of textual, spatial, and historical data. Within this methodological framework, the study develops a process of text-to-fabric triangulation, defined here as the systematic correlation of historical textual references with identified spatial features. This process functions as the primary analytical technique through which cultural mapping is applied.

This process draws on published and archival architectural and archaeological documentation, alongside recent archaeological and conservation studies and findings that provide access to previously undocumented spatial evidence. This includes regional historiographical works, which provide detailed accounts of spatial organization, governance structures, and social practices within Diriyah, in the absence of oral historical sources for this period.

The aim of this approach is not to reconstruct past conditions, but to trace spatial relationships through which historical practices can be analytically understood. Therefore, this process proceeds through three stages: extracting historical references, identifying corresponding spatial elements, and correlating both through spatial mapping and comparative analysis.

The study hence adopts a qualitative, interpretive methodology that integrates cultural mapping with systematic textual analysis to examine the functional integrity of Salwa Palace. The methodology deliberately avoids experiential simulation. Where historical evidence does not permit conclusive spatial attribution, ambiguity is retained rather than resolved through conjecture. This approach acknowledges both the interpretive limits of historical reconstruction and the iterative nature of earthen architecture and aligns with conservation principles that prioritize evidentiary accountability over narrative completeness (ICOMOS, 1994).

4. Analytical Directions: Interpreting Functional Relationships at Salwa Palace

4.1. Evidence and Interpretation: From Documentation to Spatial Analysis

Research on Salwa Palace and the At-Turaif WHS has produced substantial documentation of architectural form, construction techniques, and historical development (Yassin, n.d.). At the same time, historical chronicles provide detailed descriptions of political structures, governance practices, and social organization primarily during the First Saudi State. While these bodies of knowledge have been extensively studied, they have only rarely been brought into direct analytical correlation through spatial interpretation. As a result, the relationship between documented social practices and the spatial organization of the palace complex remains under-examined.

To address this gap, the following analysis draws on a combination of archaeological reports, building archaeology studies, historical surveys, and photographic archives. These are integrated with historical accounts and studies of Najdi architecture to examine the spatialization of governance and everyday practice within the palace complex where evidence permits. This layered evidentiary approach enables the correlation of textual and material data within a unified analytical framework. Moreover, diachronic photographic evidence (1930s–1980s) has been used to provide visual confirmation of lost architectural features and subsequent alterations over time (Fig. 2 and Fig. 3).

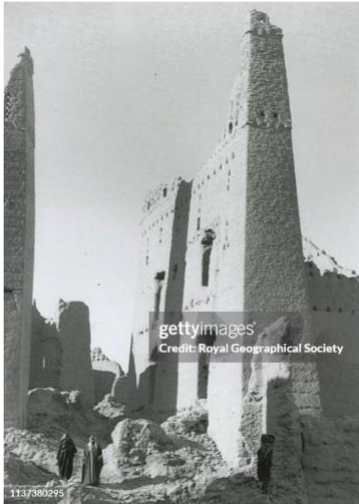


Figure 3: The Majlis of Salwa Palace in a photograph from Rendel (Getty Images, 1937).

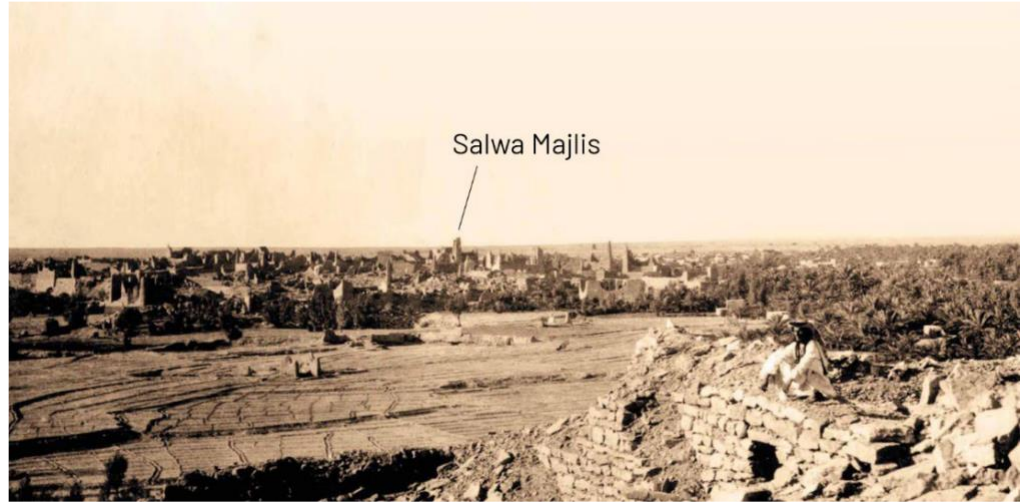


Figure 3: View of At-Turaif from the east across Wadi Hanifa in 1917, (Philby, 1955).

4.2. Palace as System: A Macro-Spatial and Political Framework

Salwa Palace functioned as the residence of the ruling family and the primary center of governance, incorporating the *Majlis* (reception and consultation hall), residential quarters, and associated service structures such as a school, storage facilities and wells. (Bin Khamis, 1982; Darat al-Malik Abdulaziz, 2007). The palace operated as an evolving multi-unit system in which governance, domestic life, religious activity, and defense were spatially integrated.

This multi-unit system was closely aligned with the defensive topography of the valley, where restricted access routes and elevated positioning contributed to both administrative control and security. Rather than being passively determined by the landscape, the placement and organization of the palace demonstrate an active engagement with topographical constraints to structure movement, access, and governance (Fig. 4).



Figure 4: Salwa Palace in At-Turaif District in ad-Dir'iyah, Saudi Arabia (Hyland, 1995).

More broadly, Diriyah was organized as an extended spatial system along Wadi Hanifah, combining agricultural areas, dispersed residential districts, and fortified structures distributed across the terrain. Defensive architecture was integrated into elevated topography, forming a network of walls, towers, and strongholds overlooking the valley (Bin Khamis, 1982).

At the macro scale, this condition is expressed through the palace's incremental and phase-based development and multi-unit organization. Constructed across successive phases associated with different rulers (*Imams*), the complex expanded in response to demographic growth, political consolidation, and administrative demands (Ministry of Education, n.d.).

Archaeological investigations further show that this system developed through processes of accretion, adaptation, and reuse, with earlier structures incorporated into later phases rather than replaced (Fig. 5).



Figure 5: Overlay of the 1982–83 archaeological survey of Salwa palace units and its immediate surroundings (in black) with the current documented plan (in red) (DGDA, 2025), illustrating the partial preservation, reinterpretation, and restoration of architectural fabric across the different phases.

Its scale, approximately 10,000 m², and architectural complexity distinguishes it from typical Najdi domestic architecture, reinforcing its dual role as both a symbol of power and an operational infrastructure of governance (Ministry of Education, n.d.). The destruction of Diriyah in 1818 [reported as 1819 in Lacey, 1981, p. 63] and the subsequent relocation of power to Riyadh in 1824 further demonstrate the resilience of governance structures beyond their original architectural setting. This also reflects a broader model of governance in which authority was exercised through recurring practices of consultation, coordination, and decision-making, involving successive Imams figures across generations (Bin Khamis, 1982).

4.3. Spatial Organization and Circulation: Structuring Governance, Access, and Interaction

At the interpretive level, the spatial organization of the Palace demonstrates architecture as an active instrument in the production of authority, social order, and governance. The organization of space establishes a gradient of accessibility, moving from relatively open reception and administrative areas toward increasingly restricted residential zones associated with the ruling household.

The Majlis occupies a central position within this configuration, functioning as a key interface between the ruler and society. Historical accounts describe multiple Majalis' distributed vertically and functionally

within the palace, accommodating reception, consultation (*shura*), and governance while maintaining separation between levels of access and authority (Bin Bishr, 1871; al-Turki, 2005; Darat al-Malik Abdulaziz, 2007). Spatial arrangements within the Majlis also reflect clearly defined hierarchies of role and status, with the ruler positioned centrally and symbolically elevated, and religious scholars and tribal leaders arranged relationally around this focal point.

The palace also functioned as a focal point for organized social provision, where food, financial support, and clothing were distributed to visitors and local populations, particularly during religious occasions, within a space known as Qoa al-Sharea. Historical documentation describes this as an enclosed, yet open-use courtyard space attached to the palace, capable of accommodating large gatherings where aid and provisions were distributed (Bin Khamis, 1982; Darat al-Malik Abdulaziz, 2007, p.12). This spatial configuration demonstrates that governance extended beyond formal reception and administrative rooms into semi-public spaces specifically structured for large-scale social interaction, forming transitional zones that bridged the boundary between the palace and the wider community.

Circulation within the palace was not organized along a centralized or axial plan but distributed across interconnected and semi-autonomous units linked through corridors, stair systems, and controlled passageways, including elevated connections. These elements enabled direct yet regulated connections between different parts of the complex and adjacent structures. Historical documentation indicates that, during the rule of Imam Saud bin Abdulaziz, a bridge was constructed to connect the palace directly to the At-Turaif Grand Mosque (Darat al-Malik Abdulaziz, 2007; Ministry of Education, n.d.).

Historical chronicles record events such as the martyrdom of Imam Abdulaziz bin Mohammad during prayer within the mosque, followed by his transfer to the palace and the immediate succession of Imam Saud bin Abdulaziz. These events highlight the operational necessity for rapid and controlled movement between these spaces (al-Issa, 2019; Bin Bishr, 1871). In this context, the later construction of direct connective infrastructure can be understood as reflecting evolving spatial responses to such functional and political requirements.

This spatial relationship reflects a broader pattern of organization within At-Turaif. In addition to the Grand Mosque, evidence suggests the presence of a smaller mosque associated with the palace complex. This spatial interconnectedness corresponds to broader patterns of movement and access within At-Turaif, where proximity between major architectural units and religious structures supported functional coordination within the settlement (al-Issa, 2019; al-Turki, 2005).

This pattern is materially evidenced in the surviving remains of circulation infrastructure within Unit 2 of the palace complex (Figures 6–7), where stair systems once led to an elevated passageway connecting the palace directly to the At-Turaif Grand Mosque. Such connections facilitated controlled and efficient movement between discrete architectural domains.

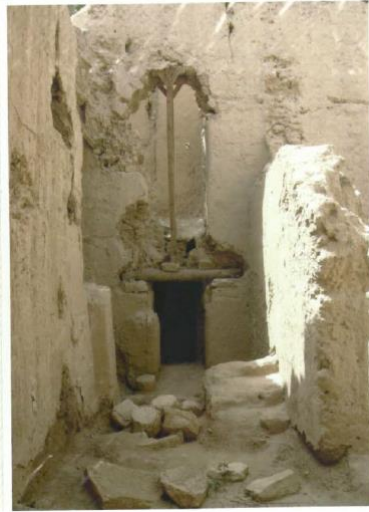


Figure 6: Remains of the stairs inside Unit 2 (High Commission for the Development of Riyadh, 2007).



Figure 7: Remains of the bridge leading from Unit 2 to Muhammad bin Sa'ud (Al-Mughnam, 2016).

More broadly, the palace can be interpreted as a form of cultural mapping, in which spatial organization translates social and political relationships into built form. The arrangement of residential areas reflects familial hierarchy and gendered organization, while the distribution of administrative, domestic, and religious spaces reveals an integrated socio-political system (Yassin, n.d.).

This relationship is further evidenced through building archaeology, which shows that the palace, while initially based on a coherent construction logic, was subsequently modified through subdivision, blocked openings, and the reconfiguration of circulation routes. These interventions indicate that movement patterns and access were actively managed and adapted in response to evolving functional and defensive requirements. Additional architectural features, including observation openings (*Tarma*) overlooking entries and circulation paths, further demonstrate deliberate control of visibility and movement within the palace.

Together, these spatial adjustments show that governance and everyday practices were not only accommodated within the architectural fabric but materially structured through it, where circulation, visibility, and spatial hierarchy functioned as active mechanisms of organization rather than passive conditions.

5. Limitations

This study has several limitations. First, it relies significantly on historical textual sources, which are often produced from particular social and political perspectives and may reflect selective or partial representations of social and political life. As such, these accounts must be approached critically, acknowledging potential biases, omissions, and narrative framing.

Second, the analytical correlations between textual descriptions and spatial configurations are interpretive rather than definitive. While grounded in architectural and archaeological evidence, these relationships cannot always be directly verified and should therefore be understood as analytically constructed rather than empirically fixed.

Third, the archaeological record of Salwa Palace remains incomplete, and ongoing excavation and documentation continue to reshape understanding of the site. Consequently, some spatial interpretations presented here are provisional and may evolve as new evidence becomes available.

Finally, the study is also limited by the absence of recorded oral histories that might, in other contexts, provide insight into how spaces associated with governance were used in practice. Such sources are not available for the historical depth of the At-Turaif site.

6. Conclusion: Towards a relational understanding of architecture and power

Despite these limitations, this study demonstrates that Salwa Palace cannot be adequately interpreted through conventional architectural or archaeological approaches that isolate form, function, or chronology. Instead, by applying functional integrity as an analytical lens, Salwa palace is understood as a dynamic spatial system in which architecture operates as a fundamental medium through which political authority and social organization were constructed and maintained.

These spatial relationships were adaptable, responding to shifting social, political and security conditions. This adaptability underscores the need to approach historic environments as dynamic and reconfigurable systems, rather than static compositions. Functional integrity, as applied here, enables the tracing of these transformations by revealing the relationship between spatial configuration and political contingency over time.

The primary contribution of this study lies in the application of functional integrity as a framework for reconstructing relationships between spatial form and historical practice. By applying cultural mapping through text-to-fabric triangulation, the analysis demonstrates that intangible heritage can be interrogated as spatially embedded and evidentiary, rather than supplementary. In doing so, it offers a methodological bridge between conservation practice and relational spatial analysis, addressing a persistent gap in the integration of tangible and intangible heritage.

Beyond the case of Salwa Palace, this approach has broader implications for the study and conservation of complex heritage sites, where meaning cannot be understood through material fabric alone. By foregrounding relationships between space, function, and social practice, it provides a transferable framework for integrating intangible heritage into conservation analysis without reliance on conjectural or purely interpretive reconstruction.

Ultimately, Salwa Palace emerges not simply as a monument, but as a spatial mechanism through which governance was enacted. Its architecture does not merely reflect authority it produces and regulates it by structuring access, structuring interaction, and materializing authority within everyday life. Recognizing these shifts the analytical focus from what the palace *is* to what it *does*, and critically, how it spatially organizes authority.

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Note on Sources

Few sources cited in this study lack complete publication details, including dates or clearly identified authorship. This reflects the limited availability of formally published material on Salwa Palace and the reliance on archival and unpublished documentation, including materials from DGDA, which are treated as primary research sources and cited according to available information.

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The Painted Wall and the Untold Story: Representing Al-Qatt Al-Asiri as Intangible Heritage

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Abstract

Intangible cultural heritage is unusual in that it does not reside in any object that can be placed on a shelf or behind glass. It lives instead in practices, skills, forms of knowledge, and the social relationships through which a community recognizes a part of itself. This raises a question that becomes pressing once such heritage moves online: when a cultural organization shares a tradition through a video or a post, does it actually recount that tradition, conveying the people, processes, and experiences that give it life, or does it simply present the finished result as an attractive image? This study examines that question through the case of Al-Qatt Al-Asiri, a form of decorative interior wall painting historically created by women in the Asir region of southern Saudi Arabia and inscribed on UNESCO's Representative List of the Intangible Cultural Heritage in 2017. The tradition is officially recognized as a women's practice rooted in domestic and communal life, passed across generations as relatives gather to decorate the home, and tied to hospitality and the reception of guests, which makes it a revealing case for asking whether digital representation captures these social dimensions or strips them away.

The research is guided by two complementary perspectives. The first offers a way of deciding when content qualifies as narrative rather than mere description, identifying several telling features: the presence of identifiable human actors in a context, the arrangement of events in a sequence with a sense of before and after, an indication of change or transformation rather than a frozen moment, and the communication of lived experience rather than purely factual statements. The second perspective treats heritage itself not as a fixed object but as a living cultural process embedded in relationships and shared practice, and it is critical of institutions that reduce dynamic traditions to static visual displays detached from their social settings. Together these lenses let the study examine both how content is told and what it conveys about the practice as a lived reality.

Using quantitative content analysis, the study examined twenty-eight digital items published by Saudi cultural entities across YouTube, Instagram, TikTok, and X, drawn from governmental bodies, private institutions, museums, television channels, tourism initiatives, and individual practitioners. Three questions framed the analysis: to what extent narrative elements appear in the content, to what extent the tradition is portrayed as a living cultural practice rather than a decontextualized product, and whose perspective is foregrounded.

The findings point consistently in one direction. Only a minority of items qualified as genuinely narrative, while the majority were loosely narrative or not narrative at all, presenting the tradition more as an informational display than as a story. The feature signaling change or transformation over time was by far the rarest, indicating that the content seldom shows a process unfolding, such as a wall being decorated or a skill being passed on. The role of women as practitioners was widely acknowledged, yet the social fabric that sustains the practice was largely missing: the communal settings, and especially the occasions that traditionally prompt it, appeared in only a minority of items, and the relationships surrounding it were underrepresented. On the question of voice, a practitioner's perspective was foregrounded in a sizeable share of content, but in most of those cases it was filtered through an institutional framing rather than expressed directly. Content on YouTube showed noticeably richer narrative treatment than that on the other platforms, plausibly because its longer format invites more developed storytelling.

Taken together, the results suggest that institutional online content tends to exhibit Al-Qatt Al-Asiri rather than recount it. The makers and the artwork are shown, often attractively, but the stories of process, kinship, and lived experience that give the tradition its standing as intangible heritage are largely left untold. The study offers an empirical basis for understanding how cultural institutions communicate intangible heritage in digital spaces, and it points toward content that foregrounds process, social context, and the practitioner's own voice as a way of moving from display toward genuine narration.

Adaptive Reuse of Heritage Buildings in Makkah as a Catalyst for Sustainable Tourism

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Abstract

Makkah, the spiritual nucleus of Islam, contains an urban fabric in which sacred meaning, collective memory, and built heritage are closely intertwined. Yet the city's continuing transformation to serve growing numbers of Hajj and Umrah pilgrims has placed considerable pressure on its historic districts. This paper examines adaptive reuse as a strategy for conserving heritage buildings in Makkah's historic core while supporting sustainable tourism. Drawing on policy analysis, heritage literature, spatial interpretation, and comparative insights from Islamic heritage cities, the study explores how selected heritage assets can be retained, reactivated, and connected to contemporary pilgrimage needs. The analysis shows that adaptive reuse can help address three connected challenges: the fragmentation of Makkah's historic identity, the underuse of remaining heritage assets, and the weak integration of conservation within tourism and urban-development planning. The paper proposes a conceptual framework based on authenticity, functional compatibility, sustainability, and integrated governance. It argues that adaptive reuse should be treated not as an isolated architectural intervention, but as a heritage-management approach capable of enriching the pilgrimage experience, strengthening cultural continuity, and supporting more balanced development in a sacred city undergoing rapid change.

Keywords: Adaptive reuse; heritage conservation; sustainable tourism; urban regeneration; Makkah; cultural identity; sacred urbanism

1. Introduction

1.1 Background and context

Makkah occupies a singular place in the Muslim world. As the birthplace of Islam and the destination of the Hajj and Umrah pilgrimages, it is both a sacred center and a rapidly changing city. Its historic core once contained dense networks of traditional houses, mosques, markets, and service buildings that supported spiritual life and everyday urban activity. These buildings were not only physical structures; they carried memories of local craftsmanship, pilgrimage hospitality, social exchange, and spiritual attachment. In recent decades, however, the need to accommodate large flows of pilgrims has accelerated major infrastructure, transport, accommodation, and commercial projects. These improvements have expanded capacity and accessibility, but they have also contributed to the loss and fragmentation of historic neighborhoods and vernacular architecture (Alfelali, 2024; UN-Habitat, 2019).

This tension between growth and conservation is not unique to Makkah, but the city's sacred status makes it unusually sensitive. International heritage frameworks call for approaches that protect cultural significance while allowing historic places to remain meaningful within contemporary life (ICOMOS, 1999; UNESCO, 2011). Adaptive reuse responds directly to this challenge. Rather than preserving buildings as

static remnants, it allows heritage assets to serve new functions while retaining their material, cultural, and symbolic value (Bullen & Love, 2011; Plevoets & Van Cleempoel, 2019). In Makkah, such an approach could help reconnect surviving heritage assets with the city's tourism system, as summarized in the conceptual logic of Figure 1.

1.2 Problem statement

Despite its exceptional heritage value, Makkah continues to face a difficult balance between modernization and conservation. The expansion of accommodation, circulation routes, and service infrastructure has often favored large-scale redevelopment over the retention of smaller heritage buildings. As a result, vernacular houses, historic commercial spaces, and pilgrimage-related service buildings have frequently been neglected, removed, or detached from their urban setting. Al-Zahrani (2022) links this weakening of architectural identity to regulatory and design frameworks that have not sufficiently protected local character.

The problem is therefore not simply the loss of individual buildings. It is the gradual erosion of a wider cultural landscape: neighborhood patterns, pedestrian routes, memories of pilgrimage hospitality, and architectural vocabularies that once gave Makkah's historic core a distinct sense of place. Previous work has recognized the potential of reusing historical buildings in Makkah (Elbelkasy et al., 2015), but a clear framework connecting adaptive reuse with sustainable tourism and urban regeneration remains underdeveloped. This study addresses that gap.

1.3 Aim, objectives, and research questions

This research investigates how adaptive reuse of heritage buildings in Makkah can contribute to sustainable tourism and urban revitalization. It approaches reuse as a practical and conceptual bridge between conservation, pilgrimage experience, and contemporary urban needs.

The study has three objectives: first, to identify the main conservation challenges affecting heritage assets in Makkah's rapidly changing historic core; second, to assess how adaptive reuse can enhance cultural, social, environmental, and tourism value; and third, to develop a conceptual framework for integrating adaptive reuse into heritage management and tourism planning. The research asks: What challenges shape the conservation of Makkah's heritage buildings? How can adaptive reuse enrich tourism without compromising authenticity? What principles should guide reuse in a sacred city?

1.4 Contribution of the study

The paper contributes to adaptive reuse scholarship by extending the discussion to a sacred city shaped by mass pilgrimage. Much of the existing literature focuses on secular historic districts or post-industrial buildings. Makkah requires a more nuanced reading because heritage value is inseparable from sanctity, pilgrimage movement, visitor experience, and Islamic identity. By linking adaptive reuse with sustainable tourism, the study offers a context-specific framework that can inform conservation policy, urban planning, and future empirical research.

2.Literature Review

2.1 Adaptive reuse as a sustainable heritage strategy

Adaptive reuse has become a central strategy in contemporary heritage conservation because it treats historic buildings as living resources rather than frozen artifacts. It allows buildings to accommodate new functions while retaining cultural meaning, architectural character, and links to collective memory. Bullen and Love (2011) argue that heritage buildings form part of a city's social and cultural capital; their reuse can therefore generate environmental, economic, and social value when carefully managed. Plevoets and Van Cleempoel (2019) similarly frame adaptive reuse as an interdisciplinary field connecting architecture, conservation, planning, and heritage management.

Recent studies also connect adaptive reuse with sustainability and circular resource use. Reusing existing buildings can extend building life cycles, reduce demolition waste, and preserve embodied energy (Aigwi et al., 2023). At the same time, reuse is not only a technical or environmental decision. Van Laar et al. (2024) show that adaptive reuse involves different criteria at different project stages, while Arfa et al. (2024) demonstrate the importance of coordinated processes, stakeholder engagement, and design evaluation. These insights are important for Makkah, where reuse decisions must address physical condition, cultural meaning, spiritual sensitivity, and tourism demand simultaneously.

2.2 Adaptive reuse and heritage-led urban regeneration

Adaptive reuse is also closely linked to heritage-led urban regeneration. In historic city centers, reuse can reactivate underused buildings, support local economies, improve public spaces, and strengthen place identity. Shehata (2022) argues that conservation in medieval Arab city centers is most effective when it moves beyond monument protection and engages with wider urban vitality, pedestrian life, mixed uses, and community participation. This broader approach is directly relevant to Makkah, where heritage value is embedded in districts, routes, and everyday urban relationships, not only in landmark structures.

Implementation remains a major challenge. Conejos et al. (2011) emphasize that adaptive reuse requires systematic assessment of adaptability, performance, long-term viability, and conservation value. In Saudi Arabia, El-Bekasy (2022) shows through Historic Jeddah that reuse can support economic sustainability and cultural continuity when local context is respected. Moscatelli (2024) reaches a similar conclusion in the study of the Darb Zubaydah pilgrimage route, where heritage becomes a driver of sustainable tourism when conservation, interpretation, and local development are planned together. These studies suggest that adaptive reuse in Makkah should be evaluated as part of a wider heritage-tourism system rather than as a building-by-building exercise.

2.3 Heritage and sustainable tourism

Tourism research increasingly recognizes that pilgrimage destinations are shaped not only by ritual performance but also by the cultural environments through which visitors move. Zarkada et al. (2025) show that the destination image of Makkah and Medina is influenced by monuments, heritage

associations, and the wider experience of sacred place. This matters for adaptive reuse because heritage buildings can help visitors encounter the history of the city beyond the immediate ritual core.

International frameworks reinforce this relationship. The ICOMOS International Cultural Tourism Charter states that tourism at heritage places should communicate significance while protecting cultural values (ICOMOS, 1999). The UNWTO (2018) similarly emphasizes the synergies between tourism and culture when managed responsibly. For Makkah, this means that reused heritage buildings should not become merely commercial attractions. Their role should be to deepen understanding, support respectful visitation, and preserve the spiritual dignity of the city.

2.4 Saudi Arabia's policy transformation and heritage agenda

Saudi Arabia's Vision 2030 has placed heritage and tourism at the center of national transformation, linking cultural development with economic diversification and improved visitor experience (Kingdom of Saudi Arabia, 2016). The Pilgrim Experience Program further emphasizes service quality, accessibility, and the enrichment of pilgrimage journeys (Saudi Vision 2030, 2021). This policy environment creates an opportunity to connect Makkah's heritage assets with broader national goals.

However, policy ambition must be matched by conservation capacity. Alqahtany and Aravindakshan (2022) warn that rapid urbanization in Saudi cities creates sustainability challenges for heritage sites. In Makkah, these pressures are intensified by the scale of pilgrimage and the value of land surrounding the Grand Mosque. The Ministry of Culture's cultural vision (2019) provides an important foundation for strengthening heritage awareness, but adaptive reuse requires more specific mechanisms: clear guidelines, heritage impact assessment, inter-agency coordination, and monitoring. Table 1 later summarizes these policy gaps and corresponding recommendations.

2.5 Makkah-specific challenges: identity, transformation, and loss

Makkah presents a complex case because its heritage is shaped by spiritual centrality, urban pressure, and rapid development. Alfelali (2024) shows that heritage conservation in Mecca has developed within a long-standing tension between preserving historic identity and expanding pilgrimage capacity. UN-Habitat (2019) similarly notes that recent development has altered the city's traditional urban pattern. These transformations have improved the city's operational capacity, but they have also weakened the continuity between built heritage, local memory, and place identity.

Al-Zahrani (2022) further argues that Makkah's architectural identity has been affected by regulations and design approaches that have not adequately protected local character. Earlier research on reusing historical buildings in Makkah identified the need for site-selection guidelines and context-sensitive reuse (Elbelkasy et al., 2015). Together, these studies show that adaptive reuse is both relevant and urgent, but they also reveal the absence of an integrated framework that links reuse to tourism, sustainability, and sacred urban identity.

2.6 Research gap

The literature offers strong foundations in adaptive reuse, heritage-led regeneration, sustainable tourism, and Makkah's conservation challenges. Yet these strands are rarely brought together. Adaptive reuse research often focuses on secular cities, while tourism research tends to understate the practical role of built heritage reuse. Saudi-focused studies identify development pressure and identity loss, but they do not fully translate these concerns into a Makkah-specific reuse framework. This paper addresses that gap by proposing adaptive reuse as a mechanism for conserving heritage, enriching pilgrimage experience, and supporting balanced urban development.

3. Methodology

3.1 Research design

This study uses a qualitative, exploratory design to examine the role of adaptive reuse in Makkah's historic core. A qualitative approach is appropriate because the subject involves cultural meanings, spatial relationships, policy choices, and spiritual sensitivities that cannot be captured through quantitative measures alone. The study is interpretive in orientation: it seeks to understand how heritage value, urban change, and tourism interact in a specific sacred context.

The research combines three methods. First, document and policy analysis are used to examine national strategies, planning documents, conservation guidance, and relevant academic literature. Second, case-oriented spatial interpretation is used to understand the relationship between heritage assets, historic districts, and pilgrimage movement. Third, comparative synthesis draws lessons from Islamic heritage cities such as Istanbul, Cairo, and Medina. This design supports triangulation while remaining suitable for a conceptual, framework-building study. The staged logic of this approach is consistent with the adaptive reuse process model shown in Figure 2.

3.2 Study area

The study focuses on Makkah's historic core, particularly the areas around the Grand Mosque and adjacent districts such as Ajyad, Jarwal, Al-Shubaikah, and Al-Kakiyyah. These areas historically contained residential, commercial, cultural and service buildings connected to pilgrimage and local life. The spatial focus is defined conceptually rather than through an official GIS boundary, and future empirical work should verify the extent of heritage assets and development pressure using official spatial data and heritage inventories.

3.3 Data sources

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3.4 Case selection criteria

A purposive sampling logic is used to identify representative heritage assets and building typologies within Makkah's historic core. Rather than aiming for statistical representativeness, the study prioritizes analytical relevance. Selection criteria include cultural and historical significance, physical condition, location within high-pressure or moderate-pressure urban areas, potential adaptability, and symbolic relevance to pilgrimage or local identity. Figure 4 translates these criteria into possible reuse functions for different building types.

3.5 Analytical framework

The analytical framework is informed by adaptive reuse evaluation models that emphasize multi-dimensional assessment. Conejos et al. (2011) highlight adaptability, performance, and long-term reuse potential, while van Laar et al. (2024) show that decision criteria shift across project stages. Accordingly, this study evaluates adaptive reuse through three linked dimensions: heritage value, adaptive reuse potential, and sustainability-tourism impact. Figure 6 presents these dimensions in greater detail, including cultural value, functional compatibility, physical condition, community impact, environmental sustainability, and economic viability.

3.6 Data analysis methods

The analysis proceeds through four techniques. Content analysis identifies how policy and academic sources frame heritage conservation, tourism development, and adaptive reuse. Thematic analysis organizes recurring issues such as heritage loss, identity fragmentation, governance gaps, and reuse potential. Comparative analysis draws lessons from selected Islamic heritage cities, as shown in Figure 5. Spatial interpretation then relates these themes to Makkah's historic core and the pressures described in the literature.

3.7 Validity, reliability, and limitations

Methodological rigor is supported through triangulation, transparent selection criteria, theoretical grounding, and comparative validation. The study's main limitation is its reliance on secondary data; it does not include field surveys, stakeholder interviews, or structural assessments of individual buildings. This limitation is acknowledged directly because the proposed framework should be tested through future empirical research. Nevertheless, the approach is suitable for developing an initial conceptual model and identifying policy-relevant priorities for adaptive reuse in Makkah.

4. Findings and Discussion

4.1 Urban transformation and fragmentation of heritage identity

Rapid urban redevelopment has altered the spatial continuity of Makkah's traditional fabric. Large projects near the Grand Mosque have improved capacity, access, and services, but they have also displaced or weakened the fine-grained urban patterns that once characterized the historic core. Districts such as Ajyad, Jarwal, and Al-Shubaikah historically supported pedestrian movement, mixed uses, and pilgrimage-related services. Today, their heritage value is often fragmented: some buildings remain, but the social and spatial relationships that once gave them meaning have been disrupted. This finding is consistent with Alfelali's (2024) account of the trade-off between heritage conservation and pilgrimage-capacity expansion, and with Al-Zahrani's (2022) concern about the weakening of architectural identity.

Seen in this way, heritage loss is not only a matter of demolition. It is also a loss of continuity between buildings, routes, memories, and everyday practices. Adaptive reuse can respond to this fragmentation by giving surviving heritage assets a contemporary role while preserving their connection to place. The conceptual framework in Figure 1 positions this role as a bridge between conservation, urban revitalization, and sustainable tourism.

4.2 Underutilized heritage assets and reuse potential

The analysis identifies several heritage typologies with reuse potential: traditional residential buildings, historic commercial spaces, small mosques or community buildings, pilgrimage-related service buildings, and open historic spaces or courtyards. Figure 4 links each typology to compatible reuse functions, such as interpretation centers, cultural learning spaces, craft workshops, small-scale guesthouses, and pilgrimage orientation facilities.

Compatibility is the key issue. In Makkah, reuse should not be driven only by commercial return. Because the city's heritage is embedded in sacred meaning, new functions must respect spiritual values, cultural dignity, and the character of surrounding districts. This requirement echoes ICOMOS (1999), which emphasizes that tourism at heritage places must protect significance while supporting visitor understanding. Figure 7 summarizes this pathway: a heritage asset is identified, assessed, adapted through a compatible function, and then linked to improved pilgrim experience and wider sustainability benefits.

4.3 Adaptive reuse as a tool for sustainable tourism

Adaptive reuse can enrich tourism by adding cultural depth to the pilgrimage journey. Current pilgrimage infrastructure rightly prioritizes accommodation, circulation, safety, and services. Yet these systems often leave limited room for visitors to engage with Makkah's historical narratives, traditional architecture, and social memory. Reused heritage sites could fill this gap through interpretation, education, and carefully managed cultural programming.

This argument is supported by Zarkada et al. (2025), who show that the image of Makkah and Medina is shaped by monuments, heritage associations, and the wider destination environment, not by ritual performance alone. Figure 3 illustrates this relationship by placing sustainable tourism at the intersection of heritage conservation, adaptive reuse, and tourism sustainability. The sustainability benefits are also practical. Reuse can reduce demolition waste, preserve embodied energy, and make better use of existing resources (Aigwi et al., 2023). It can also generate local employment, support cultural industries, and encourage community participation. Table 2 summarizes these expected outcomes across heritage, tourism, social, economic, environmental, and spiritual dimensions.

4.4 Institutional and policy challenges

Several institutional barriers could limit the implementation of adaptive reuse in Makkah. Heritage management, tourism planning, pilgrim services, infrastructure, and urban development are often handled through separate administrative systems. This separation can make it difficult to integrate conservation priorities into redevelopment decisions. In addition, the absence of clear adaptive reuse guidelines leaves planners without consistent criteria for assessing compatible functions, acceptable interventions, or long-term management responsibilities.

Table 1 organizes these challenges into policy gaps and recommendations. The table highlights the need for stronger protection of vernacular heritage, earlier heritage impact assessment, clearer adaptive reuse standards, better inter-agency coordination, community participation, and a shift from capacity-only tourism planning toward experience-sensitive heritage strategies. Without these mechanisms, adaptive reuse risks remaining a design aspiration rather than becoming an implementable policy tool.

4.5 Comparative insights from Islamic heritage cities

Comparative cases from Islamic heritage cities offer useful but not directly transferable lessons. Istanbul demonstrates the value of combining heritage regulation with mixed-use historic districts; Cairo highlights the importance of community-based initiatives and cultural reuse; Medina shows the need to respect spiritual sensitivity while using heritage for education and interpretation. These insights are summarized in Figure 5.

Makkah, however, operates at a different scale. Its pilgrimage pressure, land values, symbolic centrality, and pace of redevelopment make simple replication inappropriate. The comparative lesson is therefore not that Makkah should copy other cities, but that reuse strategies must be embedded in governance, community engagement, and long-term management. A Makkah-specific approach is needed, especially for functions that may affect sanctity, movement, and visitor behavior.

4.6 Proposed conceptual framework

The proposed framework, shown in Figure 1, positions adaptive reuse as an integrative mechanism linking heritage conservation, urban revitalization, and sustainable tourism. Its logic is developed further in Figure 2, which breaks adaptive reuse into five stages: identification and assessment, feasibility

analysis, design and planning, implementation and adaptation, and operation and evaluation. This sequence makes clear that reuse is not a one-time design act but a continuous management process.

The framework is grounded in four cross-cutting principles: authenticity, functional compatibility, sustainability, and integrated governance. These principles draw on ICOMOS (1999), UNESCO's Historic Urban Landscape approach (2011), and recent adaptive reuse evaluation literature (van Laar et al., 2024). Together, they provide a practical structure for assessing whether a proposed reuse project protects cultural significance, respects sacred meaning, remains viable, and contributes to the wider city.

4.7 Discussion

The findings suggest that conservation and modernization in Makkah should not be framed as opposing agendas. The more productive question is how development can retain cultural continuity while meeting contemporary pilgrimage needs. Adaptive reuse offers one answer because it preserves existing heritage assets, gives them relevant functions, and connects them to tourism, education, and community value.

The paper therefore supports a shift from monument-centered conservation toward an understanding of heritage as a living urban system. For Makkah, this means protecting not only prominent landmarks but also the smaller buildings, routes, and spatial relationships through which sacred urban memory is experienced. Figures 1 and 7 together summarize this contribution: adaptive reuse becomes both a conservation strategy and a pathway toward more meaningful, sustainable tourism.

5. Conclusion and Recommendations

5.1 Conclusion

This study examined adaptive reuse as a strategy for revitalizing Makkah's historic core and supporting sustainable tourism. The analysis shows that adaptive reuse can help reconcile heritage conservation with the pressures of pilgrimage growth and urban modernization. In a city where sacred meaning, cultural identity, and development needs are closely connected, heritage buildings should be viewed as active urban assets rather than as obstacles to progress.

The study also shows that Makkah's historic districts have experienced significant fragmentation as redevelopment has prioritized infrastructure, commercial investment, and accommodation capacity. These changes have expanded the city's ability to serve pilgrims, but they have also weakened traditional urban character and architectural identity. The reuse pathway in Figure 7 demonstrates why remaining heritage assets need to be identified, assessed, and reactivated before further loss occurs.

Adaptive reuse can contribute to sustainable tourism by reconnecting visitors with Makkah's historical narratives, architectural traditions, and local memory. The framework proposed in Figure 1 and the integration model in Figure 3 show that reuse can connect heritage conservation, tourism sustainability, and urban revitalization. Table 2 further summarizes the expected benefits across heritage, tourism, social, economic, environmental, and spiritual dimensions. At the same time, fragmented governance, limited heritage-sensitive planning, insufficient adaptive reuse guidelines, and development-oriented

priorities constrain implementation. Table 1 translates these barriers into policy recommendations. Overall, the study's main contribution is a context-specific framework that positions adaptive reuse as a practical tool for preserving Makkah's identity while supporting a richer and more sustainable pilgrimage experience.

5.2 Recommendations

First, governmental and planning authorities should develop adaptive reuse guidelines tailored to Makkah's sacred and cultural context. These guidelines should define acceptable intervention levels, compatible functions, conservation standards, and monitoring requirements. The process model in Figure 2 can be used as an initial structure for these guidelines.

Second, heritage conservation should be embedded in urban development planning from the earliest stages. Heritage impact assessments should be required before major redevelopment decisions are finalized, especially in zones surrounding the Grand Mosque and historic districts.

Third, adaptive reuse projects should prioritize culturally compatible functions, including interpretation centers, museums, educational facilities, traditional craft workshops, spiritual reflection spaces, and small-scale pilgrimage support services. The typology-function matrix in Figure 4 provides a starting point for matching heritage assets with appropriate uses.

Fourth, institutional coordination should be strengthened among agencies responsible for heritage conservation, tourism development, urban planning, pilgrimage affairs, and infrastructure. As Table 1 indicates, a dedicated coordination mechanism would help align conservation decisions with tourism and development strategies.

Fifth, comprehensive documentation and digital preservation programs should record historic buildings, traditional urban patterns, architectural details, and intangible cultural associations. GIS mapping, 3D scanning, and digital archives would support future reuse planning and provide a stronger evidence base for conservation decisions.

Finally, future research should test the proposed framework through fieldwork, stakeholder interviews, economic feasibility studies, and visitor perception analysis. Such research could validate the expected outcomes summarized in Table 2 and refine the evaluation dimensions presented in Figure 6.

5.3 Final reflection

Makkah's heritage should not be treated as a constraint on development. It is part of what gives the city its spiritual depth and cultural distinctiveness. Adaptive reuse offers a way to keep that heritage visible, functional, and meaningful within a changing urban landscape. If guided by authenticity, compatibility, sustainability, and coordinated governance, reuse can help Makkah meet future pilgrimage needs while preserving the memory and identity that make the city unique.

The two tables below are referenced throughout the manuscript. Table 1 synthesizes the policy gaps identified through the analysis and links them to practical recommendations, while Table 2 summarizes the expected outcomes of adaptive reuse across the main sustainability dimensions.

Table 1. Key Policy Gaps and Recommendations

Policy Area	Key Gaps Identified	Recommendations
Heritage legislation	Limited protection for vernacular buildings; focus on monuments	Update legislation to include historic urban fabric and adaptive reuse provisions
Urban planning	Heritage not integrated in master planning; priority to mega projects	Embed heritage impact assessment; allocate heritage conservation zones
Adaptive reuse guidelines	Lack of clear standards for compatible uses and interventions	Develop context-specific adaptive reuse guidelines for Makkah
Institutional coordination	Fragmented responsibilities among multiple authorities	Establish inter-agency heritage and tourism coordination body
Community involvement	Limited public awareness and participation	Strengthen education, awareness and community participation programs
Sustainable tourism	Tourism planning focused on capacity, not experience quality	Promote heritage-based experiences and responsible tourism strategies

Note. The table synthesizes policy gaps emerging from the literature review and the proposed adaptive reuse framework.

Table 2. Expected Outcomes of Adaptive Reuse in Makkah

Dimension	Expected Outcomes
Heritage	Preserved architectural identity; strengthened cultural memory; conservation of historic urban fabric
Tourism	Enriched pilgrimage experience; diversified attractions; longer visitor engagement
Social	Community pride; cultural continuity; increased participation in heritage conservation
Economic	Job creation; support for local businesses; cost-effective development
Environmental	Reduced demolition waste; lower carbon footprint; efficient use of existing resources
Spiritual	Maintained sanctity and authenticity; deeper connection with the sacred city

Note. The expected outcomes are derived from the proposed framework and should be validated through future empirical research.

Figures

Figures 1-7 are referenced throughout the manuscript to clarify the conceptual framework, adaptive reuse process, tourism-sustainability integration, reuse typologies, comparative insights, evaluation dimensions, and implementation pathway.

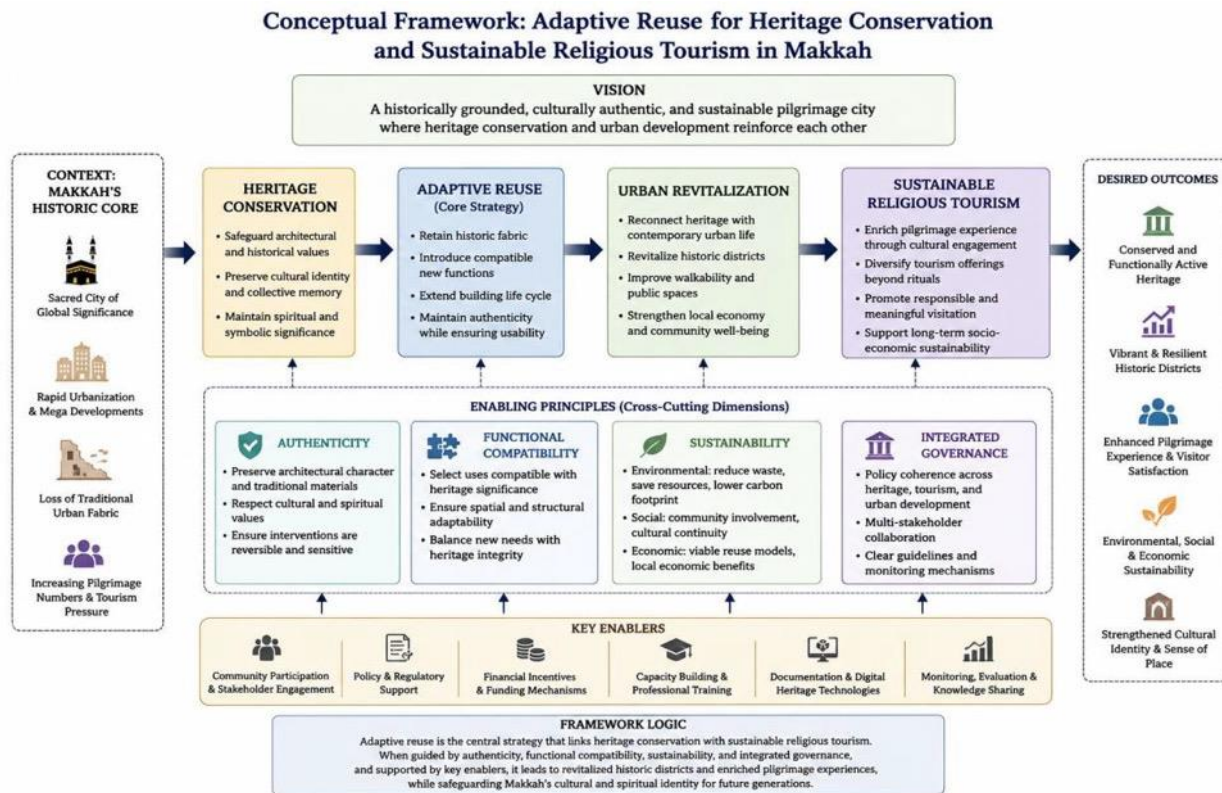


Figure 1. Conceptual framework for adaptive reuse in Makkah's historic core.

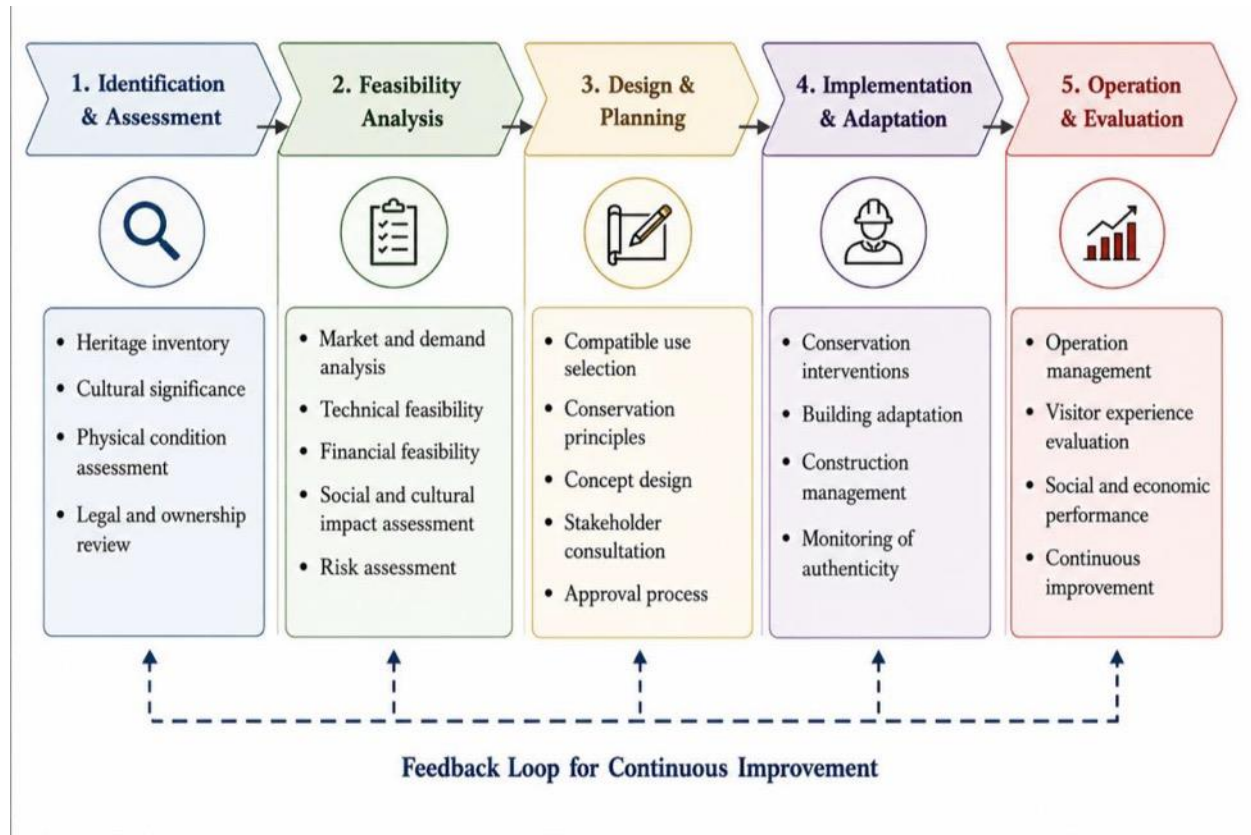


Figure 2. Adaptive reuse process model for Makkah's heritage buildings.

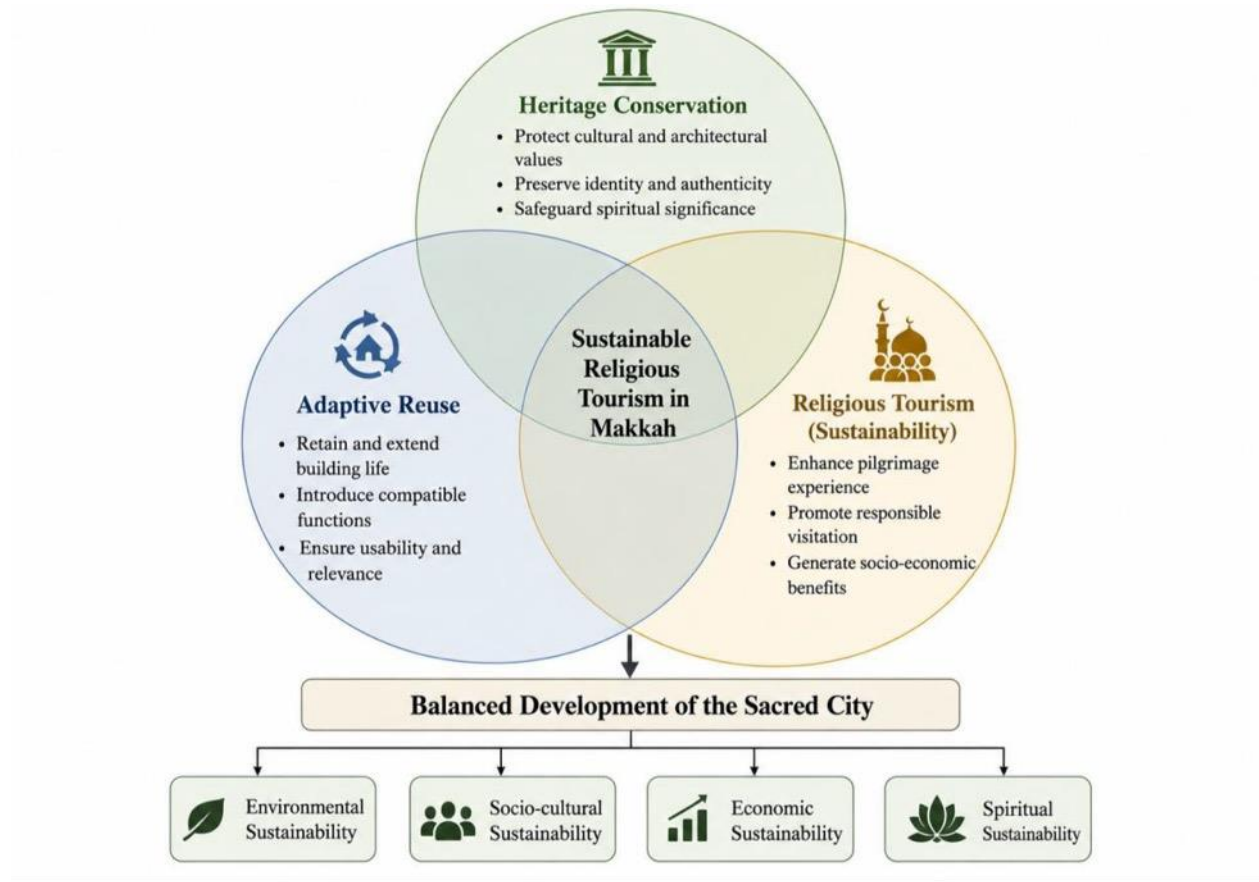


Figure 3. Integration of heritage, tourism, and sustainability.

Building Typology		Potential Compatible Reuse Functions
	Traditional Residential Buildings	• Pilgrim guesthouses (small scale) • Cultural homestays • Community learning centers
	Traditional Commercial Buildings (Souq)	• Traditional craft and artisan workshops • Heritage retail (local products) • Cultural cafés and restaurants
	Religious / Community Buildings (Small Mosques, Zawiyas)	• Prayer spaces (after conservation) • Islamic education centers • Spiritual reflection areas
	Pilgrimage-Related Service Buildings (Old Facilities)	• Orientation and interpretation facilities • Health and well-being services • Community support uses
	Open Historic Spaces & Courtyards	• Cultural events and exhibitions • Traditional markets (temporary) • Public gathering and rest areas

Figure 4. Potential adaptive reuse functions for heritage buildings in Makkah.

City	Key Characteristics	Successful Reuse Examples	Key Lessons for Makkah
 Istanbul (Turkey)	• Strong heritage regulations • Mixed-use historic districts • Tourism integrated with conservation • Legal and ownership frameworks	• Khan (Caravanserais) as hotels/shops • Historic mosques as cultural centers • Historic baths as wellness/spa facilities	• Integrate conservation into urban life • Promote mixed uses and pedestrian areas • Public-private partnerships • Community involvement is essential
 Cairo (Egypt)	• Rich Islamic heritage • Dense historic fabric • Community-based initiatives • Sacred city with strong religious values	• Wekalet as cultural centers • Historic houses as museums/guesthouses • Historic mosques as cultural centers	• Protect historic character and pedestrian areas • Public-private partnerships • Community involvement strengthens local ownership
 Medina (Saudi Arabia)	• Traditional architecture conserved in pockets • Community participation • Faith-based experiences and sensitivity	• Historic houses as museums • Heritage routes & interpretation • Small-scale reuse aligned with religious context	• Respect sanctity and spiritual values • Use heritage for education and interpretation • Need specific adaptive reuse guidelines
 Makkah (Saudi Arabia)	• Extreme pilgrimage pressure • Rapid urban transformation • Limited heritage protection frameworks • Sacred and globally significant context	• Historic houses (traditional courtyards) • Historic souqs • Old service buildings (potential reuse)	• Balance development with identity preservation • Focus on spiritual and cultural authenticity • Need a Makkah-specific adaptive reuse policy and institutional capacity

Figure 5. Comparative insights: adaptive reuse practices in Islamic heritage cities.

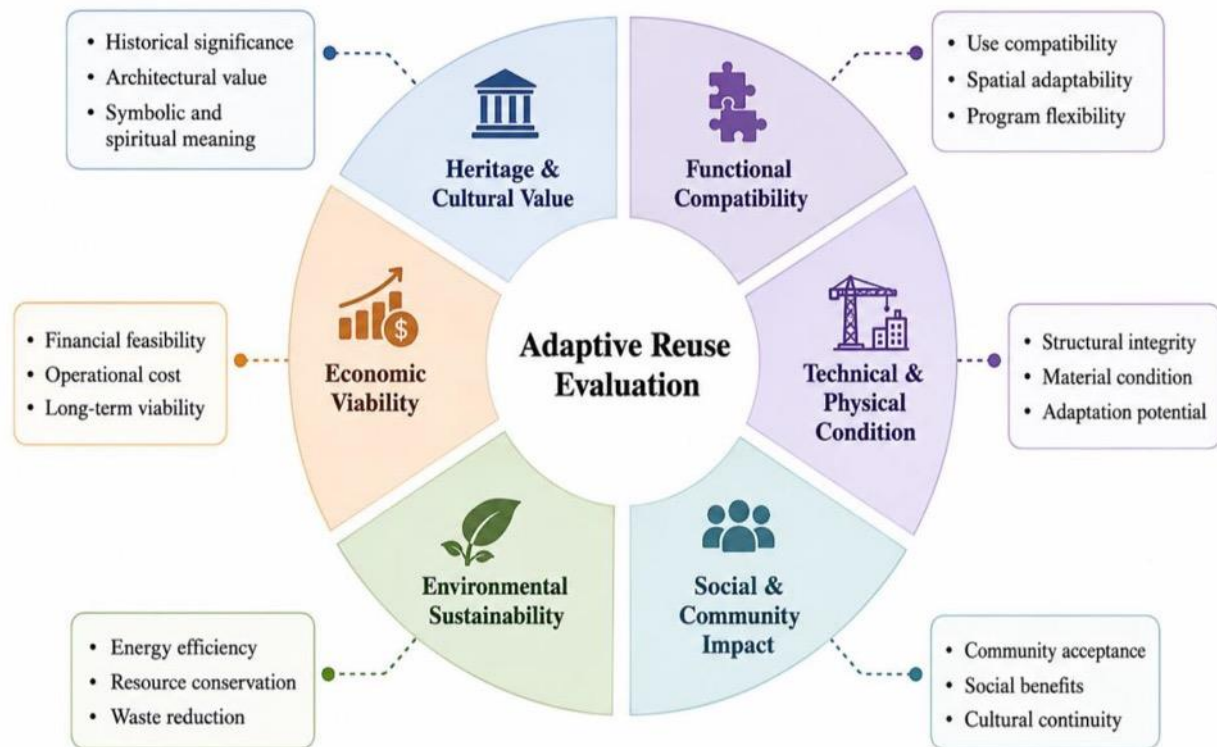


Figure 6. Multi-dimensional evaluation framework for adaptive reuse projects.

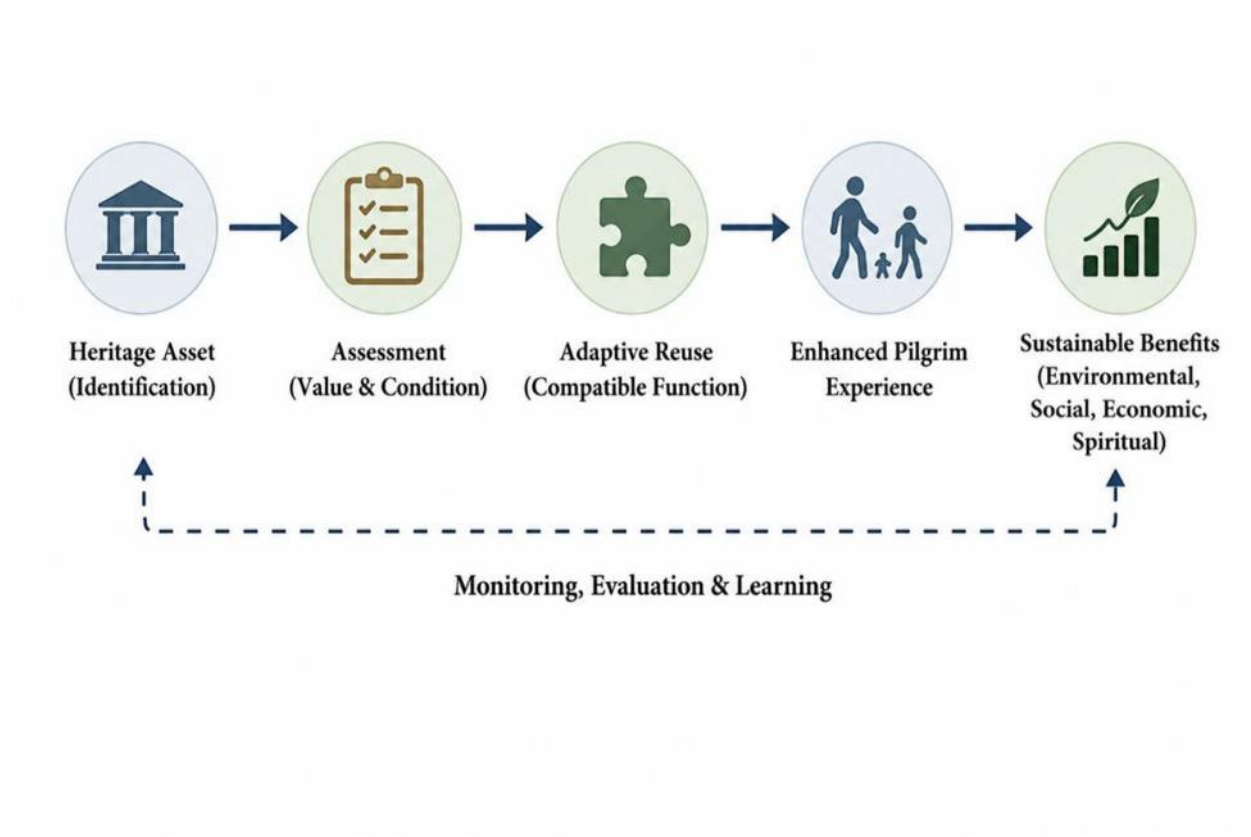


Figure 7. Pathway from heritage asset to sustainable tourism.

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The Impact of Climate Change Risks on Heritage Buildings: Alqishlah Palace in Hail as a Case Study

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Abstract

Climate change has emerged as one of the most significant challenges affecting the conservation and sustainability of heritage buildings worldwide. Heritage structures, particularly those constructed from traditional earthen materials, are increasingly exposed to climate-related hazards such as temperature extremes, rainfall events, humidity fluctuations, flooding, and windstorms. These factors can accelerate material deterioration, reduce structural integrity, and increase maintenance and management requirements.

This research investigates the impacts of climate change risks on Qishlah Palace in Hail, Saudi Arabia, as a representative example of earthen heritage architecture. The study adopts an integrated approach combining literature review, climate risk assessment, and expert consultation to identify and evaluate the most significant climate-related risks affecting the building. The findings contribute to a better understanding of the vulnerabilities of heritage buildings in arid environments and provide a structured basis for prioritising climate change risks and supporting informed conservation and management decisions.

The study ultimately highlights the importance of integrating climate considerations into heritage management practices to enhance the long-term protection and sustainability of cultural heritage assets.

Keywords: Climate Change; Heritage Buildings; Qishlah Palace; Earthen Architecture; Climate Risk Assessment; Heritage Conservation; Saudi Arabia

Chapter 1: Research plan

Introduction

Cultural heritage buildings embody values beyond their physical form, representing identity, memory, and continuity. However, their material authenticity makes them vulnerable to environmental and climatic stressors.

In Hail, Saudi Arabia, earthen heritage structures face increasing pressures from temperature fluctuations, episodic rainfall, and dust storms. These conditions intensify processes such as wetting drying cycles, moisture movement, salt crystallization and accelerating material deterioration.

This study addresses the gap between climatic data and site-specific deterioration by integrating climate analysis with conservation science. It utilizes meteorological records and field-based assessments to examine relationships between environmental conditions and observed decay.

Adopting the IPCC risk framework, the study conceptualizes risk through exposure and vulnerability. Using a mixed-methods approach, key building components of Qishlah Palace are assessed to identify patterns of deterioration.

The study aims to systematically identify and assess climate-related risks affecting earthen heritage buildings in arid environments.

Structure of the Research

This research is organized into eleven chapters addressing climate change risks on heritage buildings, using Qishlah Palace as a case study. Chapter 1 introduces the research background, objectives, and scope. Chapter 2 presents the case study, including its history and architectural context. Chapter 3 outlines the research methodology and data analysis approach. Chapter 4 provides an overview of climate change. Chapter 5 presents climate change factors relevant to heritage building. Chapter 6 presents data collection and statistical analysis, followed by climate-related risks. Chapter 7 discusses findings in relation to existing studies followed by conclusions.

Research Problem and Objectives

Research Problem

Despite growing global awareness of climate change, limited research addresses its direct impacts on Saudi Arabia's heritage buildings. Qishlah Palace in Hail, constructed from earthen materials, is highly vulnerable to temperature extremes, rainfall variability, and erosion. However, a standardized, climate-informed risk assessment framework tailored to Saudi contexts remains lacking.

This gap limits the ability to systematically assess climate risks and understand deterioration processes. Consequently, heritage professionals face challenges in evaluating risk factors and their impacts. Addressing this issue requires an evidence-based approach that integrates climatic data with conservation science to support a clearer understanding of risks affecting Saudi Arabia's earthen heritage.

Research Aim and Objectives

This study aims to identify and assess climate change risks affecting Saudi heritage buildings using a structured approach tailored to local conditions, with Qishlah Palace as a case study. The objectives are to identify key climatic stressors, assess exposure and vulnerability across building components (foundations, walls, roofs, openings), and rank climate risk factors based on their impact on material performance. The study integrates climate analysis with conservation science to support a systematic understanding of risks and bridges the gap between climatic data and site-specific deterioration. It also establishes research questions to examine climate-related risks in earthen heritage buildings.

Research Questions

What are the most significant climate change risks affecting Qishlah Palace?

This study examines which climatic variables most influence material deterioration at Qishlah Palace, how current conditions affect earthen materials, and the levels of exposure and vulnerability across key building components. These questions support the systematic assessment of climate risks by linking climatic data with observed deterioration patterns.

Chapter overview of the Case Study (Qishlah Palace)

Introduction

This chapter examines Qishlah Palace in Hail as a representative case of Saudi earthen heritage. Traditional buildings, constructed from local materials such as mud, stone, and timber, reflect adaptation to environmental conditions and form a key part of cultural identity. Preserving such structures supports both heritage continuity and sustainability.

Hail Region, located in north-central Saudi Arabia (Figure 1), historically connected trade and pilgrimage routes. Covering approximately 120,000 km², it includes eight governorates and features diverse landscapes such as Al-Nafud dunes, Aja and Salma mountains, and Wadi Al-Adira. Its arid climate and clay soils have shaped a simple, functional architectural character adapted to local conditions (Hail Municipality, 2026).



Figure 1: Location of Hail Region in the Kingdom of Saudi Municipality.

of Hail Region in the Arabia. Source: Hail

Historical Background of Qishlah Palace in Hail

Qishlah Palace is located in the center of Hail city (as shown in Figures 2 and 3) and represents a prominent example of traditional Najdi architecture. It was commissioned by King Abdulaziz bin Abdulrahman Al Saud in 1360 AH / 1941 AD and constructed over approximately one and a half years. The palace originally served as a military barracks and training facility, reflecting its strategic and historical significance.

The building was constructed using traditional materials such as mudbrick, stone, and clay, incorporating decorative plasterwork with geometric and vegetal motifs typical of Hail's architectural heritage. The palace features eight cylindrical **defensive towers**, approximately 13 meters in height, including four internal support towers known as "Al-Sanadah." It has two main entrances on the eastern and southern sides.

Covering an area of approximately 20,000 m², the palace has a rectangular layout and consists of two floors organized around a central courtyard. Surrounding the courtyard are covered arcades supported by stone columns and roofed with palm fronts and tamarisk wood. The ground floor includes 83 rooms, while the upper floor contains 53 rooms, primarily used for accommodation, bringing a total of 143 rooms. The palace also includes a mosque, a basement space used during winter, and service areas.

Over time, Qishlah Palace has served multiple functions, including as a regional administrative headquarters and a police station. Today, it stands as a major heritage site attracting visitors and tourists. Continuous restoration efforts have been undertaken, with a comprehensive rehabilitation completed in 2022 under the Ministry of Culture, represented by the Heritage Commission. King

Abdulaziz Foundation has also played an important role in documenting and preserving the site (Heritage Commission, 2026).

Tourism Significance of Qishlah Palace

Qishlah Palace in Hail is a significant heritage destination attracting visitors from across Saudi Arabia and internationally. Since its reopening in April 2022, the site has hosted a range of cultural and tourism events, including national celebrations and international initiatives, enhancing its cultural value and role within the tourism sector. Visitor data indicate that between 5,000 and 15,000 people visited the site in 2022 (Heritage Commission, 2022). The palace is open throughout the week with scheduled visiting hours and is featured on national tourism platforms such as "Spirit of Saudi Arabia," highlighting its importance within the Kingdom's heritage tourism network (Heritage Commission 2026). From a research perspective, this activity underscores the importance of preserving heritage buildings for their cultural, economic, and social value, particularly in the context of climate change risks.

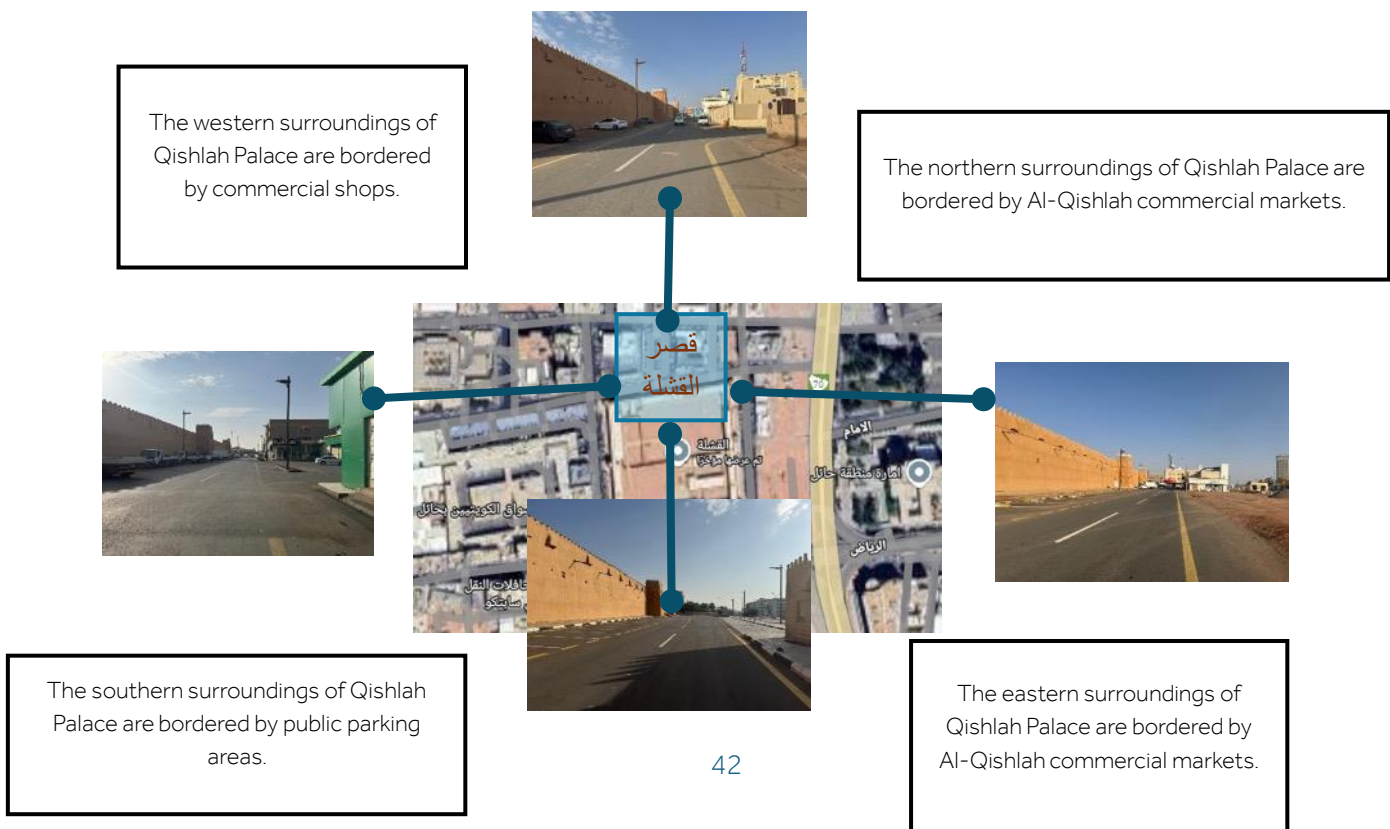


Figure 3: The surrounding area of Qishlah Palace, including commercial shops and public parking spaces along the adjacent commercial streets.

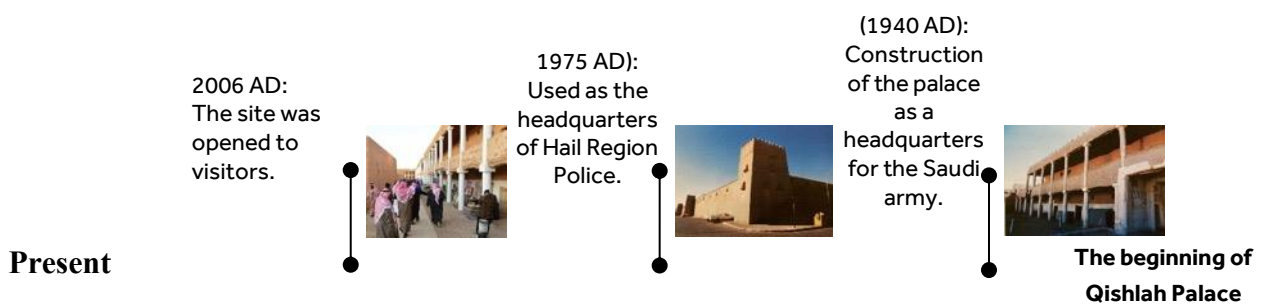
Qishlah Palace is centrally located within Hail's urban fabric, surrounded by mixed land uses including commercial markets, government services, mosques, and residential areas, reinforcing its role as a key urban landmark and highlighting its exposure to environmental risks (Figure 3).

Figure (5) illustrates traditional Najdi urban form, characterized by compact layouts and spatial transitions, and the use of *katoula*, which enhances privacy and ventilation as a climatic adaptation in hot arid environments (Al-Eidrous, 2016, pp. 132–134).



Figure (5): Katoula form or small opening ventilation system in Najd. Source: Al-Eidrous, 2016.

Qishlah Palace in Hail has undergone multiple functional transformations since its establishment. Initially constructed as a military barracks and training facility for the Saudi army, its role has evolved over time to meet changing social and cultural needs. Following restoration efforts beginning in 1427 AH / 2006 AD, the site began hosting public events, including Eid Al-Fitr celebrations for the first time. Subsequently, the management of the palace was transferred among several responsible authorities. Figure (6) illustrates the chronological development of the palace's functions and uses since its construction (Heritage Commission).



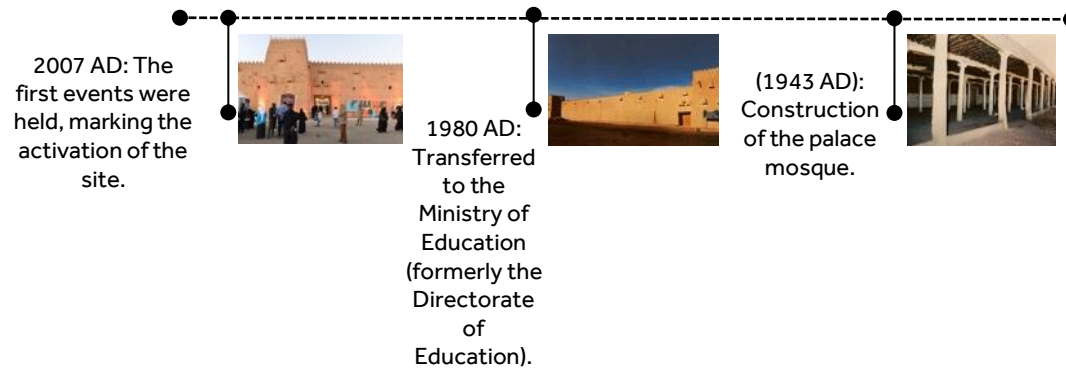


Figure (6): Uses and functions of Qishlah Palace since its establishment (Heritage Commission).

The internal façades of Qishlah Palace exhibit architectural regularity based on the repetition of openings and arcades, with simple wall treatments that reflect the traditional Najdi style (Figure 8). The façades demonstrate a clear rhythm in the arrangement of architectural elements and circulation spaces, contributing to the building's functionality and visual coherence.

The internal courtyards and surrounding rooms illustrate the traditional spatial organisation of the palace, where spaces are arranged around open courtyards to enhance environmental performance and social interaction (Figure 7). Traditional structural elements, including load bearing supports and wooden roof systems, remain evident throughout the building (Figure 8), reflecting construction techniques commonly employed in Najdi architecture.

Together, these architectural features enhance both the defensive and organisational functions of the palace while demonstrating adaptation to the environmental conditions of the region.

Figure 7: Architectural Plan Illustrating the Spatial Organization and Internal Courtyard of Qishlah Palace

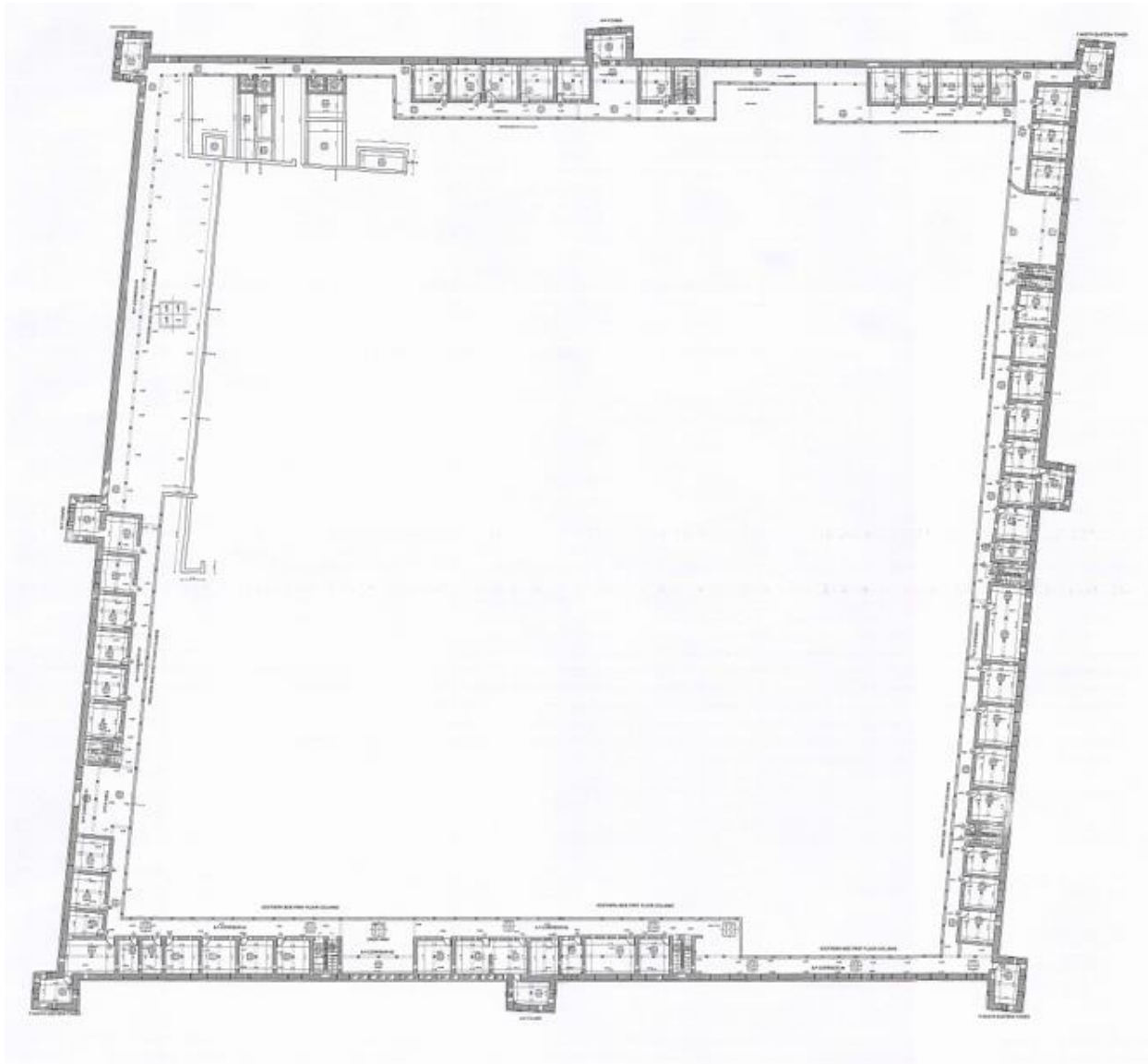
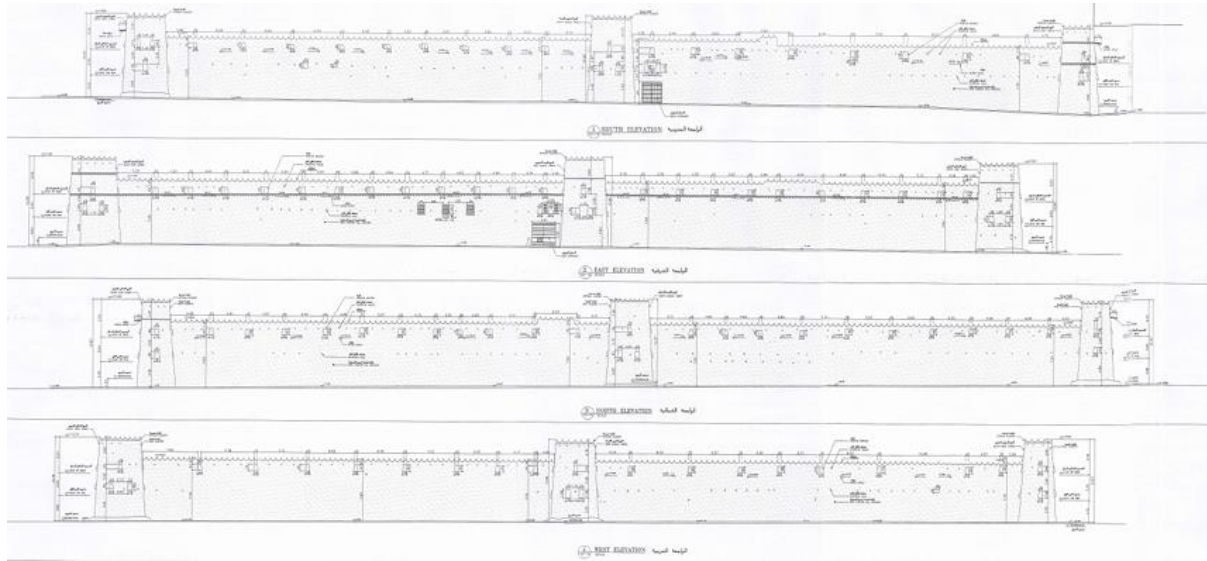


Figure 8 : Facades of Qishlah Palace



This element represents a prominent defensive loophole in the wall of Qishlah Palace, allowing for surveillance and firing while providing protection. The top of the wall features crenellated formations, reflecting the traditional Najdi style and serving both aesthetic and functional roles in enhancing privacy and defense (Figure 9).

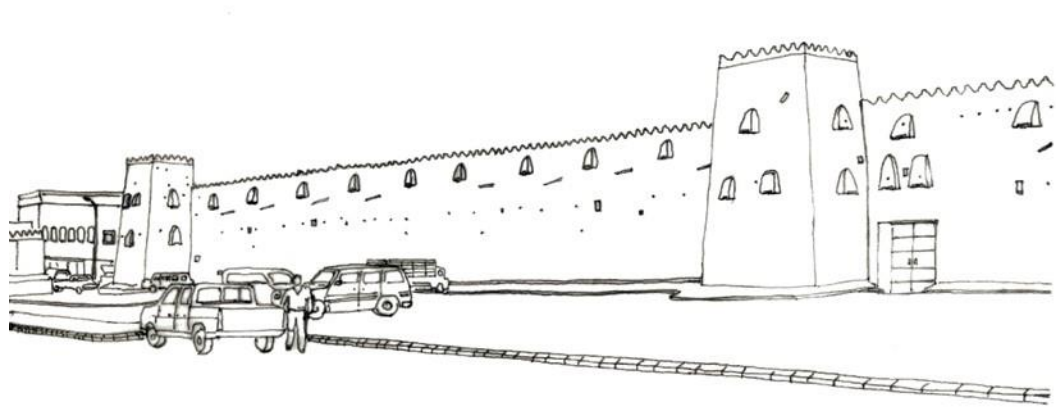


Figure 9: Defensive Loophole and Crenellated Parapet of Qishlah Palace

Table (1): Phases of Restoration of Qishlah Palace. Source: Saad Al-Ruwaisan, based on a personal interview conducted on 8 October 2025. Mr. Al-Ruwaisan has over 30 years of professional experience and previously served as Director of the Cultural Heritage Department at the Saudi Commission for Tourism and National Heritage.

Source	Reason for Restoration	Key Scope of Work	Partial / Full Restoration	Date	#
Saad Al-Ruwaisan: Former staff member of the Heritage Commission branch and Head of the Archaeology Department, currently retired. Data obtained through a personal interview conducted on 8 October 2025.	Preservation of earthen plaster against erosion resulting from climatic fluctuations.	Mud plastering, platform and lime layer works, replacement of some wooden roofs, restoration of doors and windows, and other related works.	Full Restoration	1400هـ/1980م	1
	Foundation strengthening within the structural reinforcement works of Qishlah Palace.	Earthen plastering and repointing works, structural reinforcement and addition of columns, and electrical system works.	Full Restoration	1425هـ/2004م	2
	Structural strengthening of the western section.	Conservation and structural strengthening of the western section of Qishlah Palace.	Full Restoration	1433هـ/2011م	3
	Strengthening the structural integrity of the building.	Electrical works, earthen plastering, and structural strengthening and reinforcement of roofing elements.	Full Restoration	1440هـ/2019م	4
	Site development and preparation for investment opportunities.	A comprehensive restoration program encompassing architectural, electrical, mechanical, and selected structural interventions.	Full Restoration	1443هـ/2022م	5

Chapter 2: Research Methodology

Introduction

Research methodologies are commonly classified as quantitative, qualitative, or mixed approaches. Quantitative methods focus on measurable variables and hypothesis testing (Creswell and Creswell, 2023), while qualitative approaches emphasize interpretive understanding within real-world contexts (Merriam and Tisdell, 2024). Given the complexity of climate risks affecting heritage buildings, this study adopts a mixed-methods approach to enhance analytical robustness (Creswell and Plano Clark, 2018).

The research begins with a qualitative literature review to identify key risk factors and deterioration mechanisms. This is followed by a quantitative phase using a structured questionnaire distributed to selected professionals based on relevant experience and expertise. Data are analyzed to identify and prioritize climate-related risks. This methodology ensures a systematic and reliable assessment, integrating climate analysis with conservation science to support practical and research applications.

Qualitative Approach: Critical Literature Review

The literature review establishes a theoretical foundation by examining key concepts, prior studies, and existing frameworks (Creswell and Creswell, 2023). It identifies gaps, debates, and limitations in current knowledge, helping refine research focus and objectives. In this study, it explores climate risks, deterioration mechanisms, and risk assessment approaches for heritage buildings, informing subsequent research stages and data collection design.

Quantitative Approach: Questionnaire Design

This study employs a structured questionnaire to collect quantitative data and assess climate-related risks affecting heritage buildings, building on insights from the literature review. Questionnaires enhance consistency, reduce interviewer bias, and enable efficient data collection and analysis (Taherdoost, 2022). However, limitations include potential response bias and lack of direct interaction. The survey targets 30–50 professionals selected based on relevant expertise. Data are analysed using SPSS and Excel to identify key risk patterns and priorities, supporting a structured assessment of climate risks in heritage buildings.

Rationale for Designing the Survey

The choice of research strategy depends on the research questions, level of control, and focus on contemporary issues (Creswell and Creswell, 2023). This study addresses questions on key climate risks and their effects on heritage buildings, making survey methods appropriate. A survey approach was adopted in two stages: first, designing and validating the questionnaire to reflect research objectives and relevant risk factors; second, distributing it online to selected professionals. This enabled efficient data collection and supported the analysis and prioritisation of climate-related risks affecting heritage buildings.

Strategy	Form of research question	Requires control over behavioural events?	Focuses on contemporary events?
Experiments	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Archival analysis	Who, what, where, how many, how much	No	Yes / No
History	How, why	No	No
Case study	How, why	No	Yes

Selection of research strategies in varying relevant situations (Yin, 2003)

Research Method Process

The methodology follows six stages: defining aims and hypotheses; conducting a literature review; designing a validated questionnaire with clear selection criteria; collecting and analysing data using statistical methods; establishing a structured climate risk assessment approach; and interpreting findings to present conclusions.

Task 1: Initial Research

This stage defined the research problem, objectives, and scope while ensuring originality through a review of existing studies. It established foundational knowledge of key variables related to climate change risks affecting heritage buildings, providing a basis for structuring subsequent research stages.

Task 2: Literature Review

This stage involved a critical review of literature to understand climate change risks and their impacts on heritage buildings. It examined key climatic factors (temperature, humidity, rainfall, wind) and their relationship with material deterioration such as erosion and cracking. Climate risks were mapped to building impacts to clarify vulnerability patterns.

The assessment framework was structured around six aspects: site context, spatial configuration, structural system, building envelope, building systems, and operation and maintenance. These dimensions provide a basis for analysing how environmental stressors affect heritage buildings and support a structured climate risk assessment approach.

Task 3: Questionnaire Design and Development

A structured questionnaire was used to collect data on climate-related risks affecting heritage buildings. Risk factors were derived from the literature review and refined based on research objectives. The questionnaire included seven sections covering key aspects such as site context, materials, structure, envelope, environmental exposure, and management. Participants evaluated each factor using a five-point Likert scale (1–5). This enabled quantification, comparison, and prioritisation of risks, supporting the identification of the most significant climate-related factors affecting heritage buildings.

The figure below provides an illustration of the initial section of the questionnaire.

Very ineffective	Ineffective	Neutral	Effective	Very effective

To what extent do the following climate Change risk factors affect heritage buildings?

Personal information

1- Respondent's name (optional)	
2- Contact details if you wish to receive a results (optional)	Email:
3- Company name (optional)	
What is your professional role? ☐ Architect practicing ☐ Academic and architect practicing ☐ Academic	
How many years of experience do you have? ☐ 0-5 years ☐ 5-10 years ☐ More than 10 years	

Figure: The second section of the questionnaire was designed to gather participants' personal information.

Questionnaire Validation, Development, and Data Collection Procedures

The questionnaire was reviewed by the researcher's supervisor and colleagues to ensure clarity, structure, and alignment with the study objectives. Based on feedback, revisions were made, followed by pilot testing with specialists, which led to further refinement. This iterative process enhanced the validity and reliability of the instrument. Google Forms was selected as a user-friendly platform to facilitate efficient data collection and management. Ethical approval was obtained to ensure compliance with research standards, including informed consent and confidentiality. The questionnaire was distributed electronically to 30–50 professionals selected based on relevant expertise in heritage and earthen construction. Response rates of 20–30% are considered acceptable for survey research (Taherdoost, 2022; Hair et al., 2022).

Task 4: Data Collection and Analysis

Data analysis was conducted in three stages: descriptive analysis, prioritisation, and hypothesis testing. Descriptive statistics (mean and standard deviation) were used to assess the importance of climate risk factors using SPSS. Prioritisation involved ranking risks based on severity index (SI) and coefficient of variation to evaluate consistency among responses. Finally, hypothesis testing was performed using ANOVA to identify significant differences between groups ($p < 0.05$), with Tukey HSD applied for post-hoc analysis where required. This approach ensured a systematic evaluation of climate risks affecting heritage buildings.

Discussion and Conclusion

This phase interprets findings in relation to research objectives, linking climate risks with analysis results and the conceptual framework. It outlines implications for heritage conservation and risk informed management. The final chapter presents conclusions, contributions, limitations, and recommendations for future research.

Summary

The methodology adopted in this study integrates both qualitative and quantitative approaches to provide a comprehensive analysis of climate change risks affecting heritage buildings. The qualitative phase, based on a critical literature review, informed the identification of key risk factors and the development of the research framework.

This was followed by a quantitative phase involving the design and distribution of a structured questionnaire to a targeted group of experts. The data collected were analysed using statistical techniques to identify and prioritise the most significant climate risks.

The findings of this analysis form the basis for the development of a climate risk assessment tool tailored to heritage buildings. The results and their implications are discussed in detail in the subsequent chapters.

Chapter 3: Climate Change overview

Introduction

Climate refers to long-term weather patterns influenced by natural factors such as volcanic activity, solar variation, El Niño, and orbital changes (IPCC, 2023). However, current evidence indicates that climate change is largely driven by human activities, particularly fossil fuel combustion and CO₂ emissions, which enhance the greenhouse effect (Forster et al., 2023; Dessler, 2021).

Climate Change Evidence and Events

Scientific evidence shows recent warming is largely anthropogenic (IPCC, 2007), with CO₂ rising from ~290 to 385 ppm by 2009 and increasing global temperatures. Consequences include ice melt and sea-level rise (~195 mm between 1870–2004) (Bindoff et al., 2007; Church and White, 2006), projected to continue (IPCC, 2023). Climate models indicate more frequent extreme events—storms, floods, droughts, and heat waves (Forster et al., 2023) accelerating deterioration and structural risks in heritage buildings (Orr, Richards and Fatorić, 2021). These events can be classified into storms, precipitation, temperature extremes, and environmental hazards.

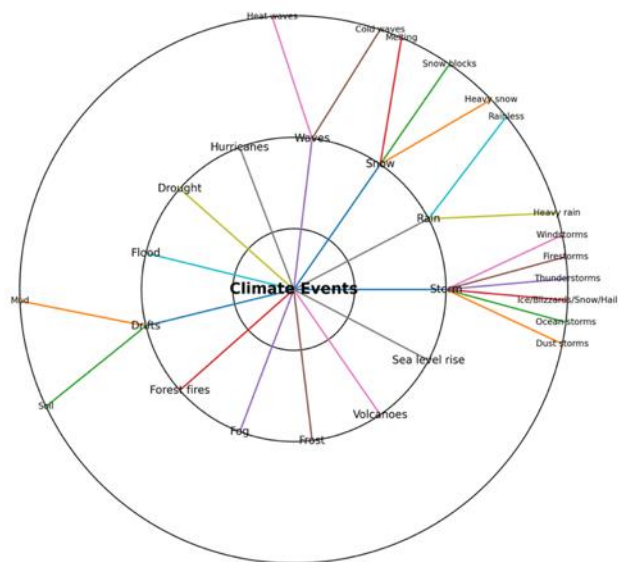


Figure10: Climate events.

Events associated with climate change

As illustrated in Figure 10, a wide range of climatic events can affect the environment. However, in the context of this research on climate change risks to heritage buildings, the focus is limited to events that have direct impacts on historic structures. Accordingly, this study examines five key climate change

factors: temperature extremes, precipitation, windstorms, sea-level rise, and flooding. These events are selected due to their significant influence on material deterioration, structural integrity, and environmental exposure of heritage buildings, forming the basis of the adopted risk assessment framework.

Climate Change Events Relevant to Heritage Buildings

Climate change introduces key stressors affecting heritage buildings, including temperature extremes, precipitation variability, windstorms, flooding, and sea-level rise. Rising temperatures intensify thermal cycles, accelerating material deterioration (Fatorić and Seekamp, 2017). Changes in precipitation, with increased intensity due to higher atmospheric moisture, contribute to flooding, erosion, and moisture ingress (Orr, Richards and Fatorić, 2021). Windstorms and cyclones, with high wind speeds, threaten structural stability (IPCC, 2022). Sea-level rise increases flood risks for vulnerable sites (Orr, Richards and Fatorić, 2021; Fatorić and Seekamp, 2017). Flooding, often driven by extreme rainfall, further accelerates deterioration and weakens foundations, particularly in urbanised and arid regions (IPCC, 2022).

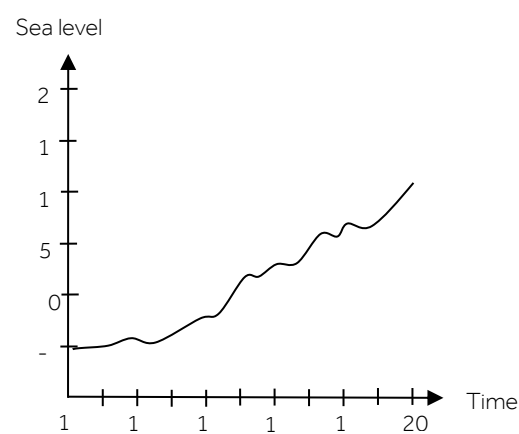


Figure 11: Global mean sea level between 1900 and 2001 (Church et al., 2004).

Table : Frequency of Climate Change Variables Identified in Previous Studies

Climate Variable	Frequency (No. of Studies)	Relative Importance
Temperature	11	High
Precipitation	10	High
Windstorms	8	Medium–High
Flood	6	Medium
Sea-level rise	5	Medium

The analysis of previous studies indicates that **temperature and precipitation** are the most frequently cited climate variables, highlighting their dominant influence on heritage buildings. Windstorms also

show significant relevance, while flooding and sea-level rise appear with moderate frequency. This distribution demonstrates that climate-related risks are not uniform, with certain variables playing a more critical role in influencing material deterioration and structural performance.

Summary

Anthropogenic climate change is widely recognised, despite ongoing uncertainties regarding the scale and pace of future impacts. In the context of heritage buildings, climate change risks can be categorised into five key groups: temperature extremes, precipitation, windstorms, sea-level rise, and flooding. Each of these factors plays a significant role in accelerating material deterioration, increasing structural vulnerability, and shaping the conservation challenges addressed in this study.

Chapter 4: Climate Change Risks

Introduction

Climate change represents a critical risk factor influencing the conservation, performance, and management of heritage buildings (Orr, Richards and Fatorić, 2021). In recent years, growing attention has been directed toward understanding its impacts on the built environment (ICOMOS, 2024), highlighting the need for focused research on heritage contexts. This chapter examines climate-related risks affecting heritage buildings and analyses their implications for material durability and structural integrity. These risks are categorised into physical, social, economic, and management dimensions to support the development of effective conservation and resilience strategies.

Climate change and the risks to heritage buildings

Climate change poses increasing risks to heritage buildings, which are both culturally significant and highly vulnerable to environmental change (Fatorić and Seekamp, 2017). Key challenges include rising temperatures, intensified wind forces, and shifting precipitation patterns (Orr, Richards and Fatorić, 2021). These factors accelerate material deterioration, weaken structural integrity, and may reduce the lifespan of historic structures (Brimblecombe and Grossi, 2022). The impacts are typically gradual but cumulative over time (Orr, Richards and Fatorić, 2021). In severe cases, intensified storms, coastal erosion, and saltwater intrusion can lead to significant damage or loss of heritage assets, particularly in exposed locations (Brimblecombe and Grossi, 2022).

Classification of Climate Change Risks for heritage Buildings Used in This Research

Previous studies have classified climate change risks to the built environment using multiple dimensions, including physical, environmental, economic, social, cultural, and management aspects, depending on the study context. For example, Orr, Richards and Fatorić, (2021) emphasise physical, social, economic, and management factors, while Fatorić and Seekamp (2017) include environmental aspects. Similarly, Bertolin and Loli, (2020) focuses on economic, social, and environmental dimensions, whereas. Fatorić and Seekamp (2017) highlight physical, social, and economic risks. Other studies incorporate cultural or regional perspectives (Adger et al., 2013; Romanello et al., 2024; Markandya, Galarraga and de Murieta, 2023), while some focus primarily on physical impacts (Brimblecombe and Grossi, 2022) or socio-economic effects (Kousky, 2024).

In the context of this research on heritage buildings, these classifications are adapted into four key categories: physical, social, economic, and management. This approach reflects the specific vulnerabilities of heritage assets, particularly in terms of material deterioration, cultural value, and conservation practices. It provides a structured framework for analysing climate change risks and supports the development of appropriate conservation and resilience strategies.

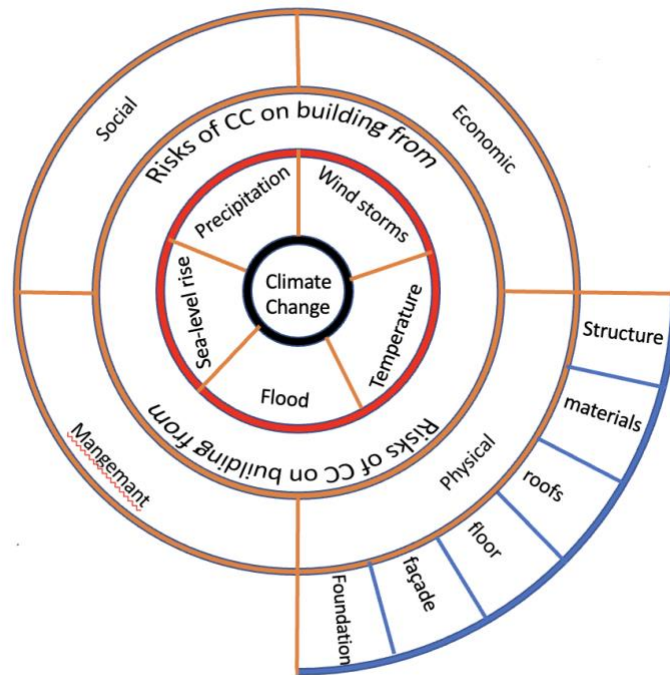


Figure 12: Classification of risks of climate change on aspects of buildings used in this research.

Risks of climate change on Heritage buildings

Physical risks

Introduction

In this study, the physical environment refers to the measurable conditions affecting heritage buildings, such as temperature, humidity, and material performance. Climate change is expected to directly influence these conditions, leading to increased deterioration and vulnerability of historic structures (Orr, Richards and Fatorić, 2021). The severity of impacts varies by location, with coastal heritage sites particularly at risk due to sea-level rise. Previous studies classify building components in different ways (Loli and Bertolin, 2018; Bertolin and Loli, 2020). However, this research focuses on key elements: structure, materials, systems, roofs, ground floor, and façade.

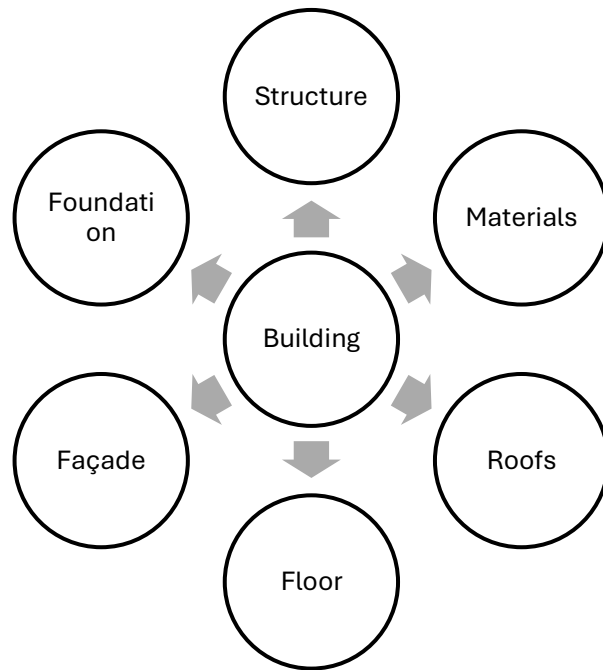


Figure: The components of a building considered in the present study.

Physical Risks from Windstorms

Climate change is expected to intensify windstorms, increasing risks to heritage buildings, especially in exposed areas (Fatorić and Seekamp, 2017). Strong winds can damage roofs, façades, and walls, and increase debris impact (Bonazza et al., 2021). Traditional materials heighten vulnerability, while humidity and salt intrusion accelerate decay and corrosion (Moncmanova, 2007; Richardson, 2001). Even minor wind increases can significantly raise damage levels (AghaKouchak et al., 2020).

Physical Risks from Precipitation

Climate change increases precipitation intensity, accelerating erosion and moisture penetration in heritage materials, especially mud and stone (Bonazza et al., 2021). Acid rain further deteriorates stone and metals (Sesana et al., 2021), while wetting–drying cycles cause cracking. Driving rain, freeze–thaw, and high humidity promote corrosion and biological growth, reducing durability (Brimblecombe and Grossi, 2022).

Physical Risks from Temperature Change

Temperature extremes cause expansion, cracking, and structural stress in heritage materials (Brimblecombe and Grossi, 2022). Increased UV and heat accelerate material degradation (Sesana et al., 2021). Drought leads to soil movement and cracks (Bonazza et al., 2021), while higher temperatures increase wildfire and biological risks (Sesana et al., 2021).

Physical Risks from Flooding

Flooding causes severe structural and material damage, particularly in vulnerable heritage buildings (Daly and Raharjo, 2023). Climate change increases flood frequency, while water pressure and ground movement damage foundations and walls, potentially leading to instability or collapse (Bonazza et al., 2021).

Physical Risks from Sea-Level Rise

Sea-level rise (~170 mm over the past century) poses major risks to coastal heritage through flooding and storm surges (Reimann et al., 2018). Impacts may be gradual or sudden, causing structural damage and drainage disruption, increasing vulnerability and reducing long-term stability (Dawson et al., 2024).

Building parts	Code	Risks	Category	References
Structure	CCRP 1	Reduction in structural integrity	windstorm	Bonazza et al., 2021
			Temperature	Sabbioni, Brimblecombe and Cassar, 2023
			precipitation	Bonazza et al., 2021
			Flood	Sesana et al., 2021
			Sea-Level	Bonazza et al., 2021
	CCRP 2	Structural corrosion and material degradation	precipitation	Bonazza et al., 2021
Facade	CCRP 3	Obstruction of building access points	windstorm	AghaKouchak et al., 2020
	CCRP 4	Biological growth (fungi and mould) on building surfaces	windstorm	Fatorić and Seekamp, 2017
	CCRP 5	Surface erosion of external walls	windstorm	Sabbioni, Brimblecombe and Cassar, 2023
			precipitation	Pescaroli and Alexander, 2021
	CCRP 6	Cracking of façade elements	windstorm	Sesana et al., 2021
			Temperature	Brimblecombe and Grossi, 2021
			Flood	Bonazza et al., 2021
	CCRP 7	Discoloration of external finishes	windstorm	Pescaroli and Alexander, 2021
			precipitation	Fatorić and Seekamp, 2017
	CCRP 8	Reduced performance of windows	precipitation	Pescaroli and Alexander, 2021

	CCRP 9	Water leakage through façade elements	precipitation	Sesana et al., 2021
Roof	CCRP 10	Reduced roof performance and efficiency	windstorm	Bonazza et al., 2021
			precipitation	Sesana et al., 2021
	CCRP 11	Water infiltration and leakage	windstorm	Sabbioni, Brimblecombe and Cassar, 2023
			precipitation	Pescaroli and Alexander, 2021
Ground floor	CCRP 12	Reduction in foundation strength	windstorm	AghaKouchak et al., 2020
			Flood	Bonazza et al., 2021
			Sea-Level	Bonazza et al., 2021
	CCRP 13	Loss of ground floor functionality	windstorm	AghaKouchak et al., 2020
			Temperature	Brimblecombe and Grossi, 2021
			Flood	Sesana et al., 2021
Material	CCRP 14	Thermal expansion and deformation of materials	precipitation	Brimblecombe and Grossi, 2022
			Temperature	Bonazza et al., 2021
	CCRP 15	Material erosion and surface loss	precipitation	Sabbioni, Brimblecombe and Cassar, 2023
	CCRP 16	Moisture-related deterioration in micro-gaps	precipitation	Bonazza et al., 2021
	CCRP 17	Biological growth on material surfaces	precipitation	Sesana et al., 2021

Table 2: Physical Risks of Climate Change on Heritage Building

Economic risks from climate change

Introduction

Climate change has significant economic implications for heritage buildings at both local and global levels, affecting public and private sectors, including insurers (Dawson et al., 2018). This section examines the economic impacts of climate change on heritage assets, with key risks to buildings summarised at the end of the section.

Economic Risks from Windstorms

Increasing windstorm intensity causes economic losses through damage to heritage buildings and disruption of tourism and local activities (Fatorić and Seekamp, 2017). Even small wind increases raise repair costs, while major storms lead to significant financial impacts and are expected to become more frequent (AghaKouchak et al., 2020).

Economic Risks from Precipitation

Changes in precipitation create economic risks for heritage buildings. Droughts affect water availability for maintenance, while increased rainfall and acid rain accelerate deterioration and raise repair costs, especially in industrial areas (Bonazza et al., 2021).

Economic Risks from Temperature Change

Rising temperatures increase cooling demand and maintenance costs in heritage buildings (Hammond and Jones, 2023). Heatwaves accelerate material deterioration, while energy demand raises operational costs and risks supply disruptions (Sesana et al., 2021). Material performance varies, with traditional masonry offering better thermal response (Hammond and Jones, 2023). Additionally, higher temperatures increase wildfire risks, causing significant economic losses (Jones et al., 2022).

Economic Risks from Flooding

Flooding increases economic risks through repair costs, higher insurance, and disruption of building use (Wing et al., 2022; Hallegatte, Rentschler and Rozenberg, 2019). Heritage conservation requires specialised work, raising costs. Infrastructure disruption, material shortages, and site inaccessibility further contribute to financial losses (Sesana et al., 2021).

Economic Risks from Sea-Level Rise

Sea-level rise increases economic risks to coastal heritage through flooding, erosion, and salinity, leading to property damage, reduced land value, and higher conservation costs (Reimann et al., 2018). Despite gradual change, long-term impacts are significant, especially in densely populated and culturally important coastal areas (Hinkel et al., 2014; Vousdoukas et al., 2020).

Table 3: Economic Risks of Climate Change on Heritage Building.

Code	Risks	Category	References
CCRE1	Increase in construction and material costs	windstorm	Hallegatte, Rentschler and Rozenberg, 2019
		Sea-Level	Hammond et al., 2015
CCRE2	Cost of material replacement due to damage	windstorm	Sesana et al., 2021
CCRE3	Business interruption and operational shutdown	windstorm	Hammad et al., 2022
		Temperature	Markandya, Galarraga and de Murieta, 2023
		Flood	Hammond et al., 2015
CCRE4	Increased maintenance demand and costs	precipitation	Hallegatte, Rentschler and Rozenberg, 2019
CCRE5	Increased labour costs	precipitation	Markandya, Galarraga and de Murieta, 2023
		Flood	Hammond et al., 2015
CCRE6	Extended construction duration	precipitation	Markandya, Galarraga and de Murieta, 2023
CCRE7		Temperature	Sesana et al., 2021

	Increased insurance costs and losses	Flood	Hammad et al., 2022
CCRE8	Reduced building efficiency and performance	Flood	Markandya, Galarraga and de Murieta, 2023
CCRE9	Rising market value and cost of buildings	Flood	Hammond et al., 2015

Social risks from climate change

Introduction

Climate change affects the social dimension of heritage buildings, impacting health, comfort, and community well-being (Romanello et al., 2024). Rising temperatures, humidity, and flooding reduce indoor comfort and increase health risks (Liu et al., 2022). It also threatens cultural identity, with vulnerable groups more exposed (Sesana et al., 2021), contributing to global health impacts (Liu et al., 2022).

Social Risks from Windstorms

Windstorms can cause displacement and social disruption in communities linked to heritage sites (Cianconi, Betrò and Janiri, 2020). Damage to culturally significant buildings weakens identity and continuity, while post-disaster conditions may increase instability (Adger et al., 2013). Loss of homes and services also leads to psychological stress, especially among vulnerable groups (Piguet, 2022).

Social Risks from Precipitation

Variability in precipitation creates social risks by affecting water availability and site usability (Sesana et al., 2021). Increased rainfall disrupts cultural activities and reduces visitor experience, while frequent wet conditions limit community engagement, impacting the social value of heritage sites (Fatorić and Seekamp, 2017; Adger et al., 2013).

Social Risks from Temperature Change

Rising temperatures affect social conditions by increasing stress and health risks, especially for vulnerable groups (Romanello et al., 2023). Poor thermal performance and ventilation reduce comfort and usability of heritage spaces, limiting social activities and public engagement (Liu et al., 2022; Sesana et al., 2021).

Social Risks from Flooding

Flooding poses major social risks, causing displacement, property loss, and disruption of heritage sites, leading to physical and psychological stress (Cianconi, Betrò and Janiri, 2020). Recurrent events reduce sense of security and place attachment, while also straining community cohesion and increasing social tensions (Adger et al., 2013).

Social Risks from Sea-Level Rise

Sea-level rise causes displacement and loss of cultural ties to heritage sites, leading to social instability, stress, and pressure on resources. These impacts threaten both physical heritage and community identity, particularly in coastal regions (Hino, Field and Mach, 2017; McNamara and Jackson, 2019).

Table 4: Social Risks of Climate Change on Heritage Building.

Cod e	Risks	Category	References
CCR S1	Displacement of occupants	windstorm	Piguet, 2022: IDMC, 2024
CCR S2	Reduced safety and security levels	windstorm	Piguet, 2022: IDMC, 2024
		Temperature	IDMC, 2024
		Flood	Tellman et al., 2021: IPCC, 2022
CCR S3	Loss of building services	precipitation	Mach et al., 2019
CCR S4	Reduced quality and availability of resources	precipitation	
CCR S5	Disruption or cancellation of activities	Temperature	
		Flood	Tellman et al., 2021: IPCC, 2022
CCR S6	Reduced indoor air quality	Temperature	Ide et al., 2020
CCR S7	Loss of building function	Temperature	Mach et al., 2019
		Flood	Tellman et al., 2021: IPCC, 2022
CCR S8	Fear of structural failure (e.g., flooding risks)	Flood	Tellman et al., 2021: IPCC, 2022

Management risks from climate change on buildings

Introduction

Climate change creates management challenges for heritage buildings, affecting operation, maintenance, and sustainability. Impacts may lead to financial risks, legal liabilities, and disruptions to planning and emergency response (OECD, 2023: Hammad et al., 2022), highlighting the need for effective management to address climate-related risks.

Management Risks from Windstorms

Windstorms increase management challenges through emergency response demands, safety compliance, and protection of heritage assets (AghaKouchak et al., 2020). They can disrupt communication systems (Pescaroli and Alexander, 2021) and cause infrastructure failures, such as power outages, hindering building operation and conservation (Helbing, 2023).

Management Risks from Precipitation

Changes in precipitation require adaptive management, including updated maintenance, monitoring, and risk planning (Fatoric and Seekamp, 2017, Sesana et al., 2021). Effective communication with authorities is essential for coordinating responses to extreme events and ensuring timely decision-making and protection of heritage assets.

Management Risks from Temperature Change

Rising temperatures require adaptive management to maintain suitable conditions for occupants and heritage materials. This includes policies addressing thermal stress and careful planning to balance comfort with conservation needs under changing climates (UNESCO, 2023, ICOMOS, 2024).

Management Risks from Flooding

Flood risks require long-term management strategies, including site protection or relocation of vulnerable assets (ICOMOS, 2024, UNESCO, 2023). Planning must ensure access, protect collections, and maintain communication during events, with significant operational and financial implications for heritage conservation.

Management Risks from Sea-Level Rise

Sea-level rise requires long-term, risk-informed management, integrating climate projections into conservation planning. Strategies may include protection, adaptation, or relocation of vulnerable assets, along with revised management plans to ensure long-term safeguarding of heritage (Nicholls et al., 2007, UNESCO, 2007).

Table 5: Management Risks of Climate Change on Heritage Building.

Code	Risks	Category	References
CCRM1	Pressure on emergency response systems	windstorm	Pollner, Kryspin-Watson and Nieuwejaar, 2010
CCRM2	Increased demand for risk mitigation tools	windstorm	IPCC, 2012
CCRM3	Failure of communication and information systems	windstorm	Pulwarty and Sivakumar, 2014
CCRM4	Increased insurance risks and claims	windstorm	Mills, 2005
CCRM5	Financial impacts from contract disruptions	windstorm	Sanders and Phillipson, 2003

CCRM6	Challenges in business continuity	precipitation	IPCC, 2012, Lisø et al., 2003
CCRM7	Increased maintenance requirements	precipitation	UNDRR, 2015
		Temperature	Mills, 2005
		Flood	Sanders and Phillipson, 2003, Lisø et al., 2003
CCRM8	Operational delays due to labour shortages	Temperature	IPCC, 2012
CCRM9	Increased administrative and operational costs	Temperature	Pulwarty and Sivakumar, 2014
CCRM10	Pressure on infrastructure and services	Temperature	IPCC, 2012
		Flood	UNDRR, 2015, Lisø et al., 2003
CCRM11	Water use restrictions	Temperature	Mills, 2005
CCRM12	Temporary closure of facilities	Flood	Sanders and Phillipson, 2003
CCRM13	Need for safe zones within buildings	Flood	IPCC, 2012, Lisø et al., 2003
CCRM14	Increased operational costs (energy, water, services)	Temperature	Mills, 2005

Summary

The impacts of climate change on heritage buildings can be examined through multiple perspectives. In this study, these impacts are structured into four key dimensions: physical, economic, social, and management. Each dimension is analysed in relation to major climate-related factors, including windstorms, precipitation, temperature change, flooding, and sea-level rise, to better understand their combined effects on the vulnerability and conservation of heritage assets.

Chapter 5: Data analysis and Ranking

Sample Characteristics

A total of 76 respondents participated in the questionnaire survey. This sample size is considered appropriate for the nature of the study, which targets a specialised group of experts, practitioners, and stakeholders associated with Qishlah Palace and heritage buildings. The diversity of participants' professional roles and backgrounds enhances the value and reliability of the findings, as it reflects the

perspectives of individuals with technical and managerial expertise, as well as those with direct experience of visiting or engaging with heritage sites. Such diversity contributes to a more comprehensive understanding of climate change risks affecting heritage buildings and supports the credibility of the study's conclusions.

Years of Experience	The frequency of responses	Percentage
0–5 Years	55	72.4%
More than 10 years	11	14.5%
5–10 Years	10	13.2%

The distribution of years of experience indicates that the majority of respondents (72.4%) have between 0 and 5 years of experience, while 13.2% have 5–10 years of experience, and 14.5% have more than 10 years of experience. This suggests that the sample includes a large proportion of relatively new users or professionals associated with the site, alongside a group of more experienced individuals capable of providing a more comprehensive and cumulative assessment of climate-related risks. Such diversity is valuable in applied research, as it enables risks to be examined from multiple perspectives, including operational, technical, managerial, and experiential viewpoints.

Analysis and Ranking Methodology

Participants' responses were coded using a five-point Likert scale, with responses converted into numerical values ranging from 1 to 5. The mean score represents the perceived importance of each factor from the respondents' perspective, while the standard deviation indicates the level of agreement or variation among responses.

In addition, the Relative Importance Index (RII) was calculated by dividing the mean score by the highest value on the scale (5). The ranking of factors was based on both the RII and mean score, with higher rankings indicating factors perceived as more important and influential within the context of climate change risks affecting heritage buildings.

In this analysis, frequency refers to the number of respondents who rated a factor as "Effective" or "Very Effective", corresponding to the higher levels of the Likert scale. This measure provides additional insight beyond the mean score by indicating the extent to which a high level of importance is shared among respondents. Consequently, it helps identify not only the average assessment of each risk factor but also the degree to which its significance is widely recognised across the sample.

Overall Ranking of Factors

The results indicate that CCRE4 ranked first, with a mean score of 4.289 and a Relative Importance Index (RII) of 0.858, reflecting its position as the highest-priority factor from the respondents' perspective. CCRM7 ranked second with a mean score of 4.184, followed by CCRE6 in third place with a mean score of 4.145. These findings suggest that risks directly associated with maintenance requirements, physical deterioration, and operational and management challenges are perceived as the most significant by the participants.

Overall, all factors recorded mean scores above the neutral point of the scale, indicating that respondents considered all assessed risks to be of practical importance, despite differences in their relative rankings. This finding is methodologically important, as a lower ranking does not imply that a factor is unimportant; rather, it indicates that it is perceived as a lower priority when compared with

higher-ranked factors. Consequently, the results demonstrate a broad recognition among respondents of the importance of climate change risks affecting heritage buildings, while also highlighting variations in the perceived severity and priority of individual risk factors.

Analysis of Results by Risk Categories

Risk Category	Number of factors	Category Mean	Mean Relative Importance Index	Mean Standard Deviation
Economic	9	3.885	0.777	0.933
Physical	17	3.848	0.770	0.923
Management	14	3.771	0.754	0.956
Social	8	3.694	0.739	0.980

When the results were analysed at the level of the main risk categories, Economic Risks ranked first in terms of the mean Relative Importance Index (RII), followed by Physical Risks, Management Risks, and finally Social Risks. This ranking indicates that risks with direct financial and operational consequences, together with physical risks affecting building components, represent the primary concerns of the respondents.

The prominence of economic risks reflects respondents' awareness of the costs associated with climate change impacts, including increased maintenance requirements, material replacement, extended repair durations, and reduced building performance. This finding is particularly relevant in the context of heritage buildings, where conservation and restoration activities often require specialised materials and skilled labour. Consequently, climate-induced deterioration is closely linked to increased financial burdens and long-term management costs.

Physical risks were also perceived as highly significant, particularly those associated with structural deterioration, material decay, water ingress, roof damage, and foundation instability. These findings demonstrate that respondents recognise the direct relationship between climate-related hazards, especially rainfall events, windstorms, and flooding and the long-term performance, durability, and safety of heritage buildings.

With regard to management risks, the results suggest that climate change generates challenges that extend beyond physical damage. Respondents highlighted issues such as increased maintenance demands, temporary closure of facilities, pressure on infrastructure and services, and the need for safe operational areas. These findings emphasise the importance of integrating climate risk management into the operation, maintenance, and conservation planning of heritage buildings.

Although social risks ranked lower than the other categories, they still achieved a notable level of importance. This indicates that respondents acknowledge the influence of climate change on building use, visitor activities, safety, and indoor environmental quality. However, these impacts are often perceived as indirect when compared with the more immediate consequences of physical deterioration and economic costs.

Analysis of the Highest- and Lowest-Ranked Factors

Rank	Code	Category	Mean	RII
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1	CCRE4	Economic	4.289	0.858
2	CCRM7	Management	4.184	0.837
3	CCRE6	Economic	4.145	0.829
4	CCRP2	Physical	4.105	0.821
5	CCRP1	Physical	4.066	0.813
6	CCRP6	Physical	4.066	0.813
7	CCRM12	Management	4.066	0.813
8	CCRP5	Physical	4.039	0.808
9	CCRP16	Physical	4.026	0.805
10	CCRP15	Physical	4.026	0.805

The ten highest-ranked factors indicate that the primary concerns are concentrated around risks associated with maintenance requirements, material deterioration, structural safety, water ingress, and damage to roofs and walls. This pattern suggests that respondents strongly associate climate change risks with impacts that are directly observable in the field, such as erosion, cracking, moisture-related deterioration, and reduced functional performance of building components.

In contrast, the lowest-ranked factors included certain social dimensions and risks that may not be directly visible or frequently experienced by respondents. Nevertheless, their mean scores remained above the neutral threshold, indicating that these factors are still considered relevant and should not be excluded from the overall risk assessment framework. Instead, they may be addressed as secondary priorities within a comprehensive climate risk management strategy for heritage buildings.

Summary of Findings

The questionnaire results indicate that climate change risks affecting heritage buildings are multidimensional in nature, encompassing physical, economic, social, and management-related impacts. Risks associated with maintenance requirements, physical deterioration, and increased costs emerged as the highest priorities, highlighting the need for a proactive approach based on continuous monitoring, preventive maintenance, and risk management.

The findings also provide a quantitative basis for the development of a climate risk assessment framework specifically tailored to heritage buildings. Such a framework can support the prioritisation of future interventions according to the relative importance of risk factors and the level of consensus among experts and stakeholders. Ultimately, the results contribute to a more systematic understanding of climate-related risks and support informed decision-making for the long-term conservation and management of heritage assets.

Chapter 6: Discussion and Conclusion

Introduction

This chapter aims to discuss the study findings in light of both the literature review and the results of the questionnaire survey. The study initially relied on the literature review to identify a range of climate change risk factors affecting heritage buildings. The significance of these factors was then evaluated

through a questionnaire distributed to specialists and stakeholders associated with Qishlah Palace and heritage buildings.

The survey results revealed that all identified risk factors achieved mean scores above the neutral point of the five-point Likert scale, indicating a general consensus among respondents that climate change poses a genuine threat to heritage buildings. The findings further showed that the highest-ranked factors were strongly associated with maintenance requirements, material deterioration, structural integrity, and the continuity of building operations. These factors represent the core relationship between climate change and the long-term sustainability of heritage buildings.

Discussion of the Highest Ranked Climate Change Risk Factors

CCRE4: Increased Maintenance Demand and Costs due to Rainfall

The literature indicates that increased rainfall intensity and frequency can significantly increase maintenance requirements for heritage buildings by accelerating moisture ingress, material deterioration, erosion, and structural degradation. These impacts are particularly severe in buildings constructed from traditional materials such as earth, stone, and lime, resulting in higher repair and conservation costs over time.

The survey findings support this view, with CCRE4 ranking first among all risk factors, achieving a mean score of 4.289, a standard deviation of 0.830, and an RII of 0.858. In addition, 78.9% of respondents rated this factor as "Effective" or "Very Effective."

The high ranking of this factor suggests that respondents view increased maintenance demand and associated costs resulting from rainfall as the most significant climate-related risk affecting heritage buildings. This reflects the cumulative nature of rainfall impacts, which contribute to cracking, moisture damage, water penetration, and the gradual deterioration of traditional building materials.

In the case of Qishlah Palace, the finding is particularly relevant due to the vulnerability of earthen and traditional construction materials to moisture. Therefore, priority should be given to preventive maintenance measures, including regular inspection of roofs, façades, drainage systems, and areas susceptible to water accumulation, in order to minimise long-term deterioration and maintenance costs.

CCRM7: Increased Maintenance Requirements due to Rainfall, Temperature, and Flooding

The literature highlights that climate change increases management and operational challenges for heritage buildings by creating a greater need for maintenance, monitoring, and preventive planning. Effective heritage management therefore requires proactive approaches that anticipate climate-related risks before significant damage occurs.

The survey findings support this view, with CCRM7 ranking second among all risk factors, achieving a mean score of 4.184, a standard deviation of 0.844, and an RII of 0.837. Furthermore, 75% of respondents rated this factor as "Effective" or "Very Effective".

This result indicates that respondents recognise climate change as a major driver of increased maintenance demands and management responsibilities. For Qishlah Palace, the finding highlights the importance of implementing a climate risk management plan that includes regular inspections, maintenance scheduling, and rapid response procedures following extreme weather events.

CCRE6: Increased Construction Duration due to Rainfall

The literature indicates that rainfall and unstable climatic conditions can significantly extend the duration of maintenance, conservation, and restoration works, particularly in heritage buildings that rely on traditional materials and specialised construction techniques. Moisture and rainfall may delay material curing, affect workmanship quality, and restrict access to roofs and external façades, resulting in longer project durations and increased costs.

The survey findings support this view, with CCRE6 ranking third among all risk factors, achieving a mean score of 4.145, a standard deviation of 0.919, and an RII of 0.829. Additionally, 75% of respondents rated this factor as "Effective" or "Very Effective".

This result suggests that respondents recognise rainfall as a factor that affects not only the physical condition of heritage buildings but also the timing and efficiency of conservation work. Delays in maintenance and restoration activities may increase operational costs and prolong the exposure of vulnerable building elements to further deterioration.

For Qishlah Palace, this finding highlights the importance of scheduling maintenance and conservation activities according to suitable climatic conditions, taking rainfall, temperature, and humidity levels into account to ensure both the quality and efficiency of the work.

CCRP2: Erosion of Structural Elements and Materials due to Rainfall

The literature identifies rainfall as one of the primary causes of deterioration in heritage buildings, particularly those constructed from earthen and stone materials. Moisture exposure accelerates surface erosion, material decay, cracking, and the gradual weakening of structural components. Repeated wetting–drying cycles further increase the vulnerability of porous materials, leading to long-term deterioration.

The survey findings support this perspective, with CCRP2 ranking fourth among all risk factors, achieving a mean score of 4.105, a standard deviation of 0.903, and an RII of 0.821. Additionally, 71.1% of respondents rated this factor as "Effective" or "Very Effective."

This result highlights respondents' recognition of the direct impact of rainfall on the physical condition of heritage buildings. The high ranking of this factor confirms that material and structural deterioration remain a major concern, as it often serves as the underlying cause of subsequent economic and management challenges.

For Qishlah Palace, the finding emphasises the need for preventive measures such as improving drainage systems, preventing water accumulation, monitoring erosion-prone areas, and repairing deteriorated render layers using materials compatible with the building's traditional fabric.

CCRP1: Reduction in Structural Integrity due to Wind, Temperature, Rainfall, and Flooding

The literature indicates that the structural integrity of heritage buildings can be affected by multiple climate-related factors, including wind, temperature fluctuations, rainfall, and flooding. These hazards often interact, creating cumulative effects that accelerate material deterioration, weaken structural components, and increase vulnerability over time.

The survey findings support this perspective, with CCRP1 ranking fifth among all risk factors, achieving a mean score of 4.066, a standard deviation of 0.899, and an RII of 0.813. Furthermore, 65.8% of respondents rated this factor as "Effective" or "Very Effective."

The high ranking of this factor demonstrates respondents' recognition that structural integrity is a critical aspect of climate risk assessment for heritage buildings. It also reflects growing awareness that

climate risks are often interconnected, with the combined effects of rainfall, temperature, flooding, and wind posing greater threats than individual hazards alone.

For Qishlah Palace, this finding highlights the importance of continuous structural monitoring, including regular inspections of walls, roofs, foundations, façades, and existing cracks, to ensure the long-term stability and sustainability of the building.

CCRP6: Cracking of Building Elements due to Wind, Temperature, and Flooding

The literature identifies cracking as one of the most common forms of deterioration in heritage buildings, often resulting from thermal fluctuations, moisture movement, water pressure, soil shifts, and wind effects. These cracks may begin as minor defects but can progressively expand if not addressed early, potentially indicating deeper structural or material performance issues.

Survey results show that CCRP6 ranked sixth, with a mean score of 4.066, a standard deviation of 0.899, and an RII of 0.813, while 73.7% of respondents rated it as "Effective" or "Very Effective". This reflects strong professional agreement on the significance of cracking as a key indicator of building deterioration.

Cracks are not merely visual defects; they can facilitate water ingress, accelerate material decay, and create pathways for moisture and salts, thereby increasing the risk of further damage.

For Qishlah Palace, cracks should be treated as early warning signs rather than superficial issues. Systematic documentation, monitoring their progression over time, and linking them to climatic events such as rainfall or heat waves are essential steps toward developing a more accurate and proactive risk assessment and maintenance strategy.

CCRM12: Temporary Closure of Facilities due to Flooding

The literature indicates that flooding and extreme rainfall events can disrupt the operation of heritage buildings by affecting access routes, building services, and user safety. Temporary closure is often necessary to protect both visitors and heritage assets, although it may also result in economic losses and interruptions to cultural activities.

The survey findings support this perspective, with CCRM12 ranking seventh among all risk factors, achieving a mean score of 4.066, a standard deviation of 0.929, and an RII of 0.813. Additionally, 75% of respondents rated this factor as "Effective" or "Very Effective".

This result suggests that respondents recognise flooding as a significant threat to the continuity of heritage site operations. The finding highlights the importance of integrating climate risk management with business continuity and emergency response planning, including improved drainage systems, safe access routes, and clear procedures for temporary closure and reopening.

For Qishlah Palace, the results emphasise the need for a flexible operational plan that minimises disruption while ensuring the safety of visitors and the protection of the building during extreme weather events.

CCRP5: Erosion of Wall Surfaces due to Wind and Rainfall

The literature highlights that external walls and façades serve as the primary protective layer of heritage buildings against climatic influences. Wind-driven particles can cause mechanical erosion, while rainfall contributes to the deterioration of surface materials, render layers, and protective finishes. These effects are particularly severe in earthen buildings, where repeated exposure to wind and rain can gradually remove surface layers and accelerate deterioration.

The survey findings support this perspective, with CCRP5 ranking eighth among all risk factors, achieving a mean score of 4.039, a standard deviation of 0.930, and an RII of 0.808. In addition, 73.7% of respondents rated this factor as "Effective" or "Very Effective."

This result indicates that respondents recognise wall surface erosion as a significant climate-related threat. Although initially appearing as superficial damage, deterioration of external wall surfaces can increase water penetration, accelerate cracking, and reduce the overall performance and heritage value of the building.

For Qishlah Palace, the finding highlights the importance of regular monitoring of wall conditions following rainfall and wind events, as well as the use of compatible traditional materials in repair and re-rendering works to maintain the long-term durability of the building.

CCRP10: Reduced Roof Performance due to Wind and Rainfall

The literature identifies roofs as one of the most climate-sensitive components of heritage buildings, as they are directly exposed to rainfall and wind. Deterioration of roof systems can lead to water ingress, moisture accumulation, and damage to internal building elements. This risk is particularly significant in heritage buildings that incorporate traditional materials requiring continuous maintenance.

The survey findings support this view, with CCRP10 ranking ninth among all risk factors, achieving a mean score of 4.026, a standard deviation of 0.848, and an RII of 0.805. In addition, 73.7% of respondents rated this factor as "Effective" or "Very Effective."

This result indicates that respondents recognise roof performance as a critical factor influencing the overall condition of heritage buildings. Reduced roof performance can contribute to moisture problems, material deterioration, and functional disruption. The relatively low standard deviation also reflects a strong level of agreement among respondents regarding the importance of this risk.

For Qishlah Palace, the finding highlights the need for regular roof inspections and preventive maintenance, as roof deterioration may trigger a chain of secondary damages affecting the wider building fabric.

CCRP15: Material Erosion and Loss due to Rainfall

The literature indicates that rainfall can cause gradual erosion and loss of heritage building materials, particularly where protective surface layers or effective drainage systems are lacking. Material loss is considered one of the most serious forms of deterioration because it affects both the structural condition and the authenticity of heritage assets.

The survey findings support this perspective, with CCRP15 ranking tenth among all risk factors, achieving a mean score of 4.026, a standard deviation of 0.848, and an RII of 0.805. Furthermore, 76.3% of respondents rated this factor as "Effective" or "Very Effective."

This result demonstrates that respondents view material loss as a significant threat to heritage buildings. Unlike many other forms of deterioration, the loss of original fabric directly affects the historical and cultural value of a site and often requires costly and specialised conservation interventions.

For Qishlah Palace, the finding highlights the importance of prioritising the preservation of original materials through preventive maintenance and conservation measures, with replacement considered only when retention of the original fabric is no longer feasible.

Discussion by Risk Category

Physical Risks

The results indicate that physical risks were among the most prominent categories, with factors such as structural erosion, reduced structural integrity, cracking of building elements, wall surface erosion, reduced roof performance, and material loss ranking among the highest-priority risks. This finding suggests that respondents perceive physical deterioration as the most direct and visible impact of climate change on heritage buildings. The results are consistent with the literature, which emphasises that traditional building materials are particularly vulnerable to moisture, temperature fluctuations, wind, and repeated wetting–drying cycles.

The researcher considers physical risks to be the starting point for understanding other climate-related impacts on Qishlah Palace, as physical deterioration often leads to economic costs, management challenges, and, ultimately, impacts on building use and social value.

Economic Risks

Economic risks achieved the highest overall category mean, indicating strong recognition of the direct and indirect financial impacts of climate change on heritage buildings. Increased maintenance demand and costs due to rainfall ranked first among all factors, while other economic risks, such as extended construction duration, increased insurance costs, and business interruptions, also received high rankings.

These findings demonstrate that climate change not only threatens the physical condition of heritage buildings but also creates a continuous financial burden for conservation and maintenance of authorities. As climate events become more severe, additional resources are required for preventive measures, repairs, and restoration of works.

The researcher believes that economic risks should be a central consideration in heritage management planning, as insufficient funding or delayed maintenance budgets may accelerate deterioration and increase long-term conservation costs. Investing in preventive maintenance is therefore more cost-effective than responding after damage occurs.

Management Risks

The results revealed the significant importance of management risks, with several management-related factors ranking highly, including increased maintenance requirements, temporary closure of facilities, business continuity challenges, and rising operational costs.

These findings suggest that managing heritage buildings under climate change conditions now requires more than routine maintenance. It demands a comprehensive risk management approach that incorporates planning, monitoring, emergency preparedness, resource allocation, and continuous updating of operational procedures.

The researcher considers management risks to be a critical component of climate resilience, as effective management can reduce the impacts of physical, economic, and social risks. Conversely, the absence of proactive management may allow relatively minor issues to develop into major conservation challenges.

Social Risks

Although social risks recorded lower average scores than the other categories, they remained above the neutral threshold, indicating that respondents still recognised their importance. Key factors

included disruption of activities within the building, concerns about structural collapse, loss of building services, and reduced safety.

The literature emphasises that heritage buildings are not merely physical structures but are also linked to identity, collective memory, social attachment, and community use. Consequently, deterioration, closure, or reduced safety can negatively affect the relationship between local communities and heritage sites.

The researcher argues that the lower ranking of some social risks should not be interpreted as a lack of importance. Rather, their impacts may be less immediately visible than physical or economic damage. Therefore, the social dimension should remain an essential component of heritage sustainability, particularly for sites that are open to visitors or hold cultural and historical significance for local communities.

Integrated Discussion

The findings of this study reveal that climate change risks affecting heritage buildings should not be viewed as isolated hazards but rather as an interconnected system of impacts. Physical deterioration often leads to increased maintenance requirements and higher costs, while rising costs create additional management challenges. In turn, ineffective management may reduce building usability or even lead to temporary closure, ultimately affecting the social and cultural value of the heritage asset.

For example, rainfall can cause erosion and water ingress, increasing maintenance needs, and associated costs. These impacts may subsequently require temporary closure of facilities, affecting visitor access and cultural activities. Therefore, a single climate-related hazard can trigger a chain of interrelated physical, economic, management, and social consequences.

The results further demonstrate that rainfall and moisture are among the most significant climate-related threats to Qishlah Palace. Factors associated with rainfall consistently ranked highly across the physical, economic, and management risk categories. This finding is consistent with the characteristics of earthen heritage buildings, which are generally more vulnerable to moisture-related deterioration than many modern construction materials.

The study also highlights the critical role of preventive management in reducing climate-related risks. Although climatic hazards cannot be fully controlled, their impacts can be significantly mitigated through regular maintenance, improved drainage systems, crack monitoring, systematic documentation of material conditions, staff training, and the development of effective emergency response plans. Such measures can enhance the resilience of heritage buildings and support their long-term conservation under changing climatic conditions.

Conclusion

This study aimed to investigate the impacts of climate change risks on heritage buildings, using Qishlah Palace in Hail as a case study. The research combined a review of the relevant literature with a questionnaire survey distributed to specialists and stakeholders in order to identify and evaluate the most significant climate-related risks affecting heritage buildings.

The findings revealed that economic, physical, and management risks represent the most critical challenges associated with climate change. Increased maintenance demand and costs due to rainfall emerged as the highest-ranked risk factor, highlighting the importance of rainfall as a major threat not only to the physical condition of heritage buildings but also to their financial sustainability and operational continuity. Other highly ranked factors included reduced structural integrity, material

erosion and loss, deterioration of roof performance, and temporary disruption of facility operations, all of which demonstrate the wide-ranging impacts of climate change on heritage assets.

The study concludes that effective protection of heritage buildings under changing climatic conditions requires an integrated approach that combines architectural conservation, climate risk management, preventive maintenance, financial planning, and institutional preparedness. Climate-related risks cannot be addressed solely through isolated restoration interventions after damage has occurred; rather, they require a sustainable and proactive risk management framework.

For Qishlah Palace, particular attention should be given to monitoring the effects of rainfall and moisture, maintaining roofs and façades, improving drainage systems, documenting, and monitoring cracks, and implementing a risk-based maintenance programme. The findings also emphasise the importance of incorporating climate change considerations into heritage site management plans to enhance the resilience and long-term sustainability of cultural heritage assets.

From the researcher's perspective, the results provide clear evidence that climate change is no longer merely a broad environmental issue but has become a direct factor influencing the management and conservation of heritage buildings. The survey findings demonstrate that specialists recognise the seriousness of climate-related threats, particularly those associated with maintenance requirements, material deterioration, and structural integrity.

As a heritage building of considerable historical and architectural significance, Qishlah Palace requires a dedicated climate-responsive management approach that takes into account the vulnerability of its traditional materials, site conditions, patterns of use, and ongoing maintenance requirements. The researcher therefore argues that future heritage conservation practices in Saudi Arabia should move beyond a reactive approach based on post-damage restoration toward a proactive model centred on prediction, monitoring, prevention, and early intervention. Such an approach will strengthen the resilience of heritage buildings and support their long-term preservation in the face of increasing climate-related challenges.

Recommendations for Future Research

Apply the proposed climate risk assessment framework to other heritage buildings in different regions of Saudi Arabia to compare vulnerability patterns under varying climatic conditions. Conduct long-term studies to monitor the relationship between climatic factors and the deterioration of traditional building materials. Evaluate the effectiveness of adaptation and preventive conservation measures in reducing climate-related risks to earthen heritage buildings. Explore the use of advanced technologies, such as GIS, BIM, and digital heritage documentation, to improve climate risk assessment and monitoring.

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Beyond Arrested Decay: Digital Anastylis, 3D Printing, and the Evolution of Authenticity in Najdi Earthen Architecture Ghasibah Tower as a Case Study

Bader Algasem

1. Historical Background and Introduction

The Wadi Hanifah basin has played an important role in settlement, agriculture, social, and political power of the central Arabian Peninsula for thousands of years. Central and southern Wadi Hanifah basin; the main western part of the basin has seen the production of wheat, barley, and other agricultural products. The Ghasibah archaeological site is of utmost importance to this significant historical trajectory, serving as the most basic groundwork for the centralization, growing and eventual establishment and predominance of Diriyah (Al Saud, 2012). Ghasibah has a history with natural fortifications and strategic geographic location behind it.

Located adjacent to the Qulayqil Tributary to the southeast and Wadi Hanifah to the northwest, the site is situated at a commanding and mountaintop level resembling a defensive corner structurally speaking (Ibn Khamis, 1978a). The geographical constraints, as access is particularly challenging and requires a steep hill range to reach this place, naturally renders it a fortress stronghold (Ibn Khamis, 1978a). Moreover, rainwater converged in various tributaries of Wadi Hanifah, providing the region with a high quality of soil fertility and an abundance of water, turning the area into an agricultural and trading center (al-Rashid, 1999). Driven by this ecological abundance and protection against invasions, it was to this end that the center of prosperity and affluence in Ghasibah and the larger Wadi Hanifah valley was promoted in the middle of the 15th century CE, the district of Ghasibah becoming one of the major centers of population attraction (al-Yawm, 2022).

This strategic and territorial position can be seen in the large and lengthy history of the site and the early history of the modern Saudi state. Further, another significant aspect of Ghasibah is the history of human habitation in the district, with documents from the region indicating the oldest inhabitants were the ancient Arab Tasm and Jadis tribes who migrated to Hajr al-Yamamah between Wadi al-Watar and al-‘Ard (now Al-Batha’ and Wadi Hanifah) during 715 BCE (al- Mutawwa’, 2003). Several centuries later, in 400 CE, the Banu Hanifah tribe trekked from the upper Najd and Hijaz hinterlands to permanently settle in Hajr al-Yamama, taking its bearings from the ancient town of Mecca, led by ‘Ubayd bin Tha’laba (Ibn Khamis, 1982).

The final turning point for Ghasibah came in 1446 CE with the establishment of Establishment of the city of Diriyah (Ibn Khaldun, 1988). The immediate ancestor of the Al Saud family, Prince Mani’ bin Rabi’a al-Muraydi, emigrated with his clan from the eastern Arabian Peninsula to Wadi Hanifah at the special invitation of his cousin, Ibn Dir’ (Ibn Khamis, 1978b). On his arrival, Ibn Dir’ gave Prince Mani’ fertile between al- Mulaibeed area and Ghasibah district (Ibn Khamis, 1978b). Prince Mani’ founded a new settlement, which was named after the al-Duru’ clan of Banu Hanifah, and appointed Ghasibah as its main seat of governance (Al Saud, 2012). After the settlement of Prince Mani’ and his descendants, massive areas surrounding and under construction by construction, agricultural plantations and urbanization boomed, as the historian al- Fakhiri describes in his book (Ibn Khamis, 1978b). Ghasibah would be the northern wall of Prince Mani’ bin Rabi’a al-Muraydi’s hegemony. (Ibn Bishr, 1982a).

Ghasibah's political and architectural maturation reached its height during the First Saudi State. By the time the Great Imam Mohammed bin Saud came to power in 1727 CE, the country has witnessed an

unprecedented increase of 40 years until his death (al-Dinawari, 1960). Recognizing the strategic need for defense, in 1758 CE, Crown Prince (later Imam) Abdulazi supervised a huge military campaign of fortification, which was ordered by his father Imam Mohammed Bin Saud. Furthermore, the impregnable wall was a 12.8-kilometer-long wall of Ghasibah which spread over an area of 4 square kilometers (al-Hamdani, 1884). The meticulous construction of such earthen walls and forts was the epitome of regional military might at that time (al-Hamdani, 1884).

The defensive system finally resulted in the building of the Ghasibah Fort between 1803 and 1814 CE, under the rule of Imam Saud bin Abdulaziz. This magnificent, fortified palace, which boasted heavy iron doors and an impassable strategic hilltop placement, was a subject of attention by the French observer Félix Mengin, who meticulously recorded the palace and referred to it as one of the most powerful in Diriyah (Mengin, 2004).

The first true test of Ghasibah's earthen architecture emerged in a brutal Siege of Diriyah in 1818 CE. During the brutal battle carried out Ottoman invading forces led by Ibrahim Pasha, Prince Saad bin Saud employed the Ghasibah Fort to fiercely defend the northern gateway of Diriyah (al-Fakhiri, 1999). Historians claim that Prince Saad fortified himself and his allies in the palace when he took the opportunity of the palace's iron doors to protect his forces (al-Fakhiri,

1999). Ibrahim Pasha instead ransacked the palace with heavy cannons and explosive grenades and fought a battle that killed the tops of the towers and shattered the fort walls (al-Fakhiri, 1999). Though it was destroyed from above, the palace's natural scale and flexibility, and the fact that many of the rooms in the palace were well-ventilated, encouraged Ibrahim Pasha to take over the ruined pen as a hospital place to receive his ill and injured men (Ibn Bishr, 1982b).

The 1818 bombardment turned much of Ghasibah's grand mud-brick architecture into fragmented ruins. In the ensuing two centuries, exposed fully to the harsh climatic conditions of the Najd region, these abandoned earthen fortifications slowly waned away, melting back into the uniform soil of the Wadi Hanifah Valley from which they had originated.

Over the recent years, understanding of the profound historical importance of the site, Saudi government organizations initiated a string of years-long archaeological excavations at Ghasibah, 1980 to date. In 2022, the last earthen tower of the site, which is the subject of this study, was subjected to a thorough documentation campaign, using digital surveying to record. Regrettably, soon after this digital documentation had been completed, the historic tower experienced an acute structural collapse during excessive intense torrential rainfall. As today's contemporary conservation attempts repair, restore, and interpret its newly fallen ruin, which is now located in the buffer zone at the At-Turaif World Heritage site, the problem is not only a matter of theory but also of research, methodology, and a challenge to our current state of thinking and practice.

What Does an Authentic Earthen Architecture Project Mean in an Arabic-Islamic Context?

Global conversation of built heritage has long been driven, dominated, and institutionalized by Western academic worldviews. The underlying principles of these conventional preservation guidelines are subtly shaped by secular, or Euro-Christian philosophical assumptions surrounding the permanence of material, the veneration of historic fabric and the principle of arrested decay. So, for anything to be an authentic earthen architectural intervention within an Arabic-Islamic city, like the historic urban fabric of Diriyah, it must fundamentally recondition how we define heritage value.

In order to understand what authenticity means for this particular cultural geography, one must interrogate the philosophical and theological foundations of the Islamic worldview. The most foundational of these concepts is '*aqidah*', the core of the Islamic belief system. *Aqidah* is the firm,

unwavering belief in the heart—free from any doubt—in Allah (God), His angels, His books, His messengers, the Day of Judgment, and Divine Decree (fate), whether good or bad. It serves as the solid foundation, or the roots, upon which all Islamic acts of worship and morals are built. In historical Western conservation philosophy, original historic material is held reverently, as if it were the sacred. To this perspective, the physical stone, timber or brick is the unique, irreplaceable primary vessel for historical truth. Thus, Western conservation dictates natural aging of any structure, and any move to simply replace previous material with new material is a fiction of history.

On the contrary, (Mahdy 2019) convincingly asserts that, in terms of authenticity of Islamic thought, in the material world there is nothing sacred, eternal, or immutable except for the Creator. The world is essentially ephemeral and material. Even at the most rudimentary level, an Islamic ideal of a solidified, sacred object one that cannot be touched or restored is close to the worshipping of the fallen mummified body of a fallen mud-brick tower, the obliterating structure without reverence of the substance which violates Islam as a faith.

In the traditional Arabic-Islamic city, architecture is primarily a living thing, functioning in practical service itself and not a static, monumental piece. The buildings are designed to meet the spiritual, social, and defensive needs of their community. When these structures finally succumb to the elements of the environmental truth that is especially relevant for buildings made up of earthen bricks, which easily disappear back into nature as a function of their absence, without continuous maintenance—they either naturally repurpose their ingredients or the structures are recreated repeatedly by later generations. Instead, this perpetual cycle of birth, decay, and cyclical renewal is regarded not as the catastrophic loss of history we imagine, but as a natural and expected response to the cosmological order. Therefore, the Western idea of "freezing" an earthen ruin in the state of arrested, undisturbed decay is an imposed construct not relevant to the historical realities of Najdi urbanism (Moscatelli, 2023).

If physical material is not the one and only, immutable base of truth, where does the "truth" of the heritage site land inside this cultural paradigm? As (Mahdy 2019) contends, in Islamic traditions, authenticity is rooted in immaterial and functional continuities, namely, the continuation of a geographical place, the continued use of the site's name, the preservation of its social or civic function, and the continuous spread of intangible knowledge (the "word"). So, reconstructing a collapsed earthen tower at Ghasibah on its exact historic footprint on the basis of historical experience, on the basis of traditional perception of geography here, not only actively protects the authenticity of the place, the functional purpose.

Moreover, there is the clear and binding principle of *'israf* (wastefulness), as well as the religious obligation to the sustainable maintenance of the world as its basic ethical principle on an Islamic planet. Traditionally, recycling of building materials in Islamic city was not just an economic incentive arising because of shortage, but rather an ethical imperative. If you refuse to leave a crumbling earthen tower standing as merely an empty, dissolved mass of mud and recycle old construction materials, and then import new high carbon industrial products to build the modern buildings next door, you undermine this traditional ethic. Reclaiming the dissolved earth of the fallen Ghasibah tower for rebuilding the building is perfectly in line with traditional Islamic

eco-values. In this framework, the real rebuilding of the tower is not a historical fabrication, but a beautifully natural testament to cultural continuity, functional restoration, and environmentally sustainable stewardship that pays homage to the settlers' original ethos.

Values and Worldviews: Integrity and Authenticity at Ghasibah

It is now clear the conceptual tension which naturally lies between the cyclic structure of earthen architecture and the demands of international conservation doctrine is no longer an academic matter that fits easily in the concrete archaeological situation of Ghasibah. These challenges are, of course, of an urgent nature: It is not just about preserving earthen life but about realizing new ways and ways of being that are capable of overcoming barriers that stand in the way of living. The state of the site at present — heavily degraded earthen mounds that bore the ruinous impact of Ibrahim Pasha's catastrophic 1818 bombardment — presents a logistical challenge for conservationists. To know how to intervene ethically in this area, the three key texts of modern heritage practice need to be compared — the Venice Charter (ICOMOS, 1964), the Nara Document (ICOMOS, 1994), and the Burra Charter (Australia ICOMOS, 2013). Each charter takes an alternative stance towards the complex evaluation of structural integrity and authenticity, through radically different cultural worldviews, directly ordering what could and could not be done to the ruins of Ghasibah.

a. The Venice Charter: The Material-Centric Condemnation of Ghasibah.

The Venice Charter was forged in Europe immediately after World War II, a traumatic historical moment marked by the catastrophic loss of such monumental stone architectural landmarks. As a result, the underlying philosophy is strictly material-centric. Most authenticity is determined according to the physical survival of original historic fabric and the existence of documented archaeological evidence (ICOMOS, 1964).

The Venice Charter, when considered in tandem with Ghasibah, creates almost insurmountable doctrinal obstacles. Article 15 so famously declares that “all reconstruction work should however be ruled out *a priori*” (ICOMOS, 1964). If conservationists maintain this charter to the letter, the Ghasibah Fort must be preserved as it exists today, a melted, heavily desecrated footprint of dissolved mud-brick. Restoring the grand, iron-doored palace built by Imam Saud bin Abdulaziz would be explicitly criticized as a historical falsification. Moreover, the charter requires that any future construction that must take place must be clearly distinguishable from the original fabric to prevent the observer from being misled (ICOMOS, 1964).

As the earthen walls of Ghasibah need to be re-mudded for cyclical reasons to endure the severe weather conditions of Najdi, the rigid and inflexible implementation of the Venice Charter sends the site into permanent decay, eliminating the notion that there really exists a cyclical maintenance that characterizes the architectural legacy of Wadi Hanifah .

b. The Nara Document: Verifying Najdi Process over Product

The Nara Document on Authenticity dramatically contested the Eurocentric dominance of the Venice Charter by officially inserting cultural relativism into the international recognition of authenticity (ICOMOS, 1994). Drawing inspiration from Eastern architectural traditions, Nara realized authenticity could no longer be established by fixed, generic, mechanical measures.

The Nara Document radically broadened the concept of authenticity to cover an entire spectrum of heritage values, from form and design, use and function, to more important traditions and techniques (ICOMOS, 1994). This philosophical advance offers a vital lifeline for the Ghasibah site. Within the Nara structure, the intrinsic value of the Ghasibah Fort does not lie in the carbon-determined age of mud-bricks shattered by Ottoman cannons in 1818

Instead, its authenticity resides with the intangible human memory of Najdi construction—how exactly its clay-rich soil, Wadi Hanifah , was formulated and tempered, and laid, historically. Nara has become a good witness to construction of Ghasibah, by validating the process and it is the tradition that provides

authenticity, through the tradition of handcraft. If the north defensive tower reconstructions based on these traditional earthen practices continue, the site integrity will continue to be preserved, and a sufficient legal and ethical justification of the undertaking.

c. Burra Charter: Restoring the Cultural Value of Diriyah

Conceptualisation and Use The Burra Charter was a foundation for the language of professional heritage, as it shifted the professional heritage vocabulary from distinct “monuments” to multi-dimensional “places” and incorporated authenticity as a fixed “topic under the heading of Cultural Significance” (Australia ICOMOS, 2013). The Burra Charter evaluates a site's preservation through a compilation of aesthetic, historic, scientific, social and spiritual values.

The Burra Charter makes a strong case for conservation of a place based on what it means to the community both yesterday and today (Australia ICOMOS, 2013). For Ghasibah, though, its cultural significance is immense: it is the physical home of the Diriyah established by Prince Mani‘ bin Rabi‘ a al-Muraydi in 1446, then most importantly became the site in which the first Saudi state was founded and finally the site of Prince Saad bin Saud's fierce resistance to the 1818 siege. To leave the site as an illegible pile of mud hides this enormous history. Burra is a very practical way of dealing with change: if the ruins of the tower are a tragic loss of social and spatial identity for the modern Diriyah community, the Burra Charter can also be invoked to justify radical acts of physical reconstruction (including total reconstruction). If re-creation can effectively re-assert the Ghasibah as a site of cultural value for the citizens of the First Saudi State rather than being an arbitrary destruction of the remnants of the archaeological record, the construction works can be considered to be a highly trustworthy response.

This synthesis indicates that between the Venice Charter which categorically prohibits reconstruction of the Ghasibah fort within rigid material dogma, the Nara Document which affirms the intervention on the basis of the authenticity of the Najdi building processes, and the Burra Charter, which supports the final outcome via its promotion of the restoration of great historical and social significance to the living community.

Digital Anastylis: Re-presentation of 3D Printing as The Digital Anastylis

Indeed, when trying to ethically reconstruct a ruined heritage building under traditional maintenance standards, the only mechanism of reconstruction given specifically by the Venice Charter, is anastylis—defined in Article 15 strictly as “the reassembling of existing but dismembered parts” (ICOMOS, 1964). Yet, with earthen architecture being physically, chemically, and structurally grounded, conventional anastylis is both scientifically and pragmatically unattainable, and a completely novel theory of structural recovery needs to be developed.

Anastylis as a concept was defined for Graeco-Roman stone structures alone. When a slab of limestone or a pediment of marble collapses in a seismic moment, the structure splits into distinct, measurable and physically differentiated volumetric zones. These solid blocks retain their internal geometric integrity and can thus be surveyed, mapped and physically reassembled by cranes and masons like a massive, three-dimensional puzzle.

Earth, on the other hand, is naturally a colloidal, homogeneous mass. As is explained in the most extensive description of earth construction in Houben and Guillaud (1994), after an unfired earthen structure collapses and is finally exposed to rainfall and seasonal wind, the clay binders and sand aggregates lose any connection of their structure immediately. The separate mud bricks from the earthen mortars do not just stand intact, piecing together, which makes for a unique mixture but, instead, they dissolve, melt and blend back together into a formless mass of raw aggregate soil.

When the historic matter disappears entirely, the "dismembered parts" which are legally sufficient for anastylosis do not exist physically anymore (Houben & Guillaud, 1994). Therefore, to remain so rigidly in the classic, stone-centric definition of anastylosis, it would require legally forfeiting all of the collapsed earthen heritage in the world to an irreversible degradation and erosion.

This paper seeks to clarify this profound theoretical puzzle by making the case for the credibility of digital anastylosis using cutting-edge 3D-printing robotics. High-fidelity documentation protocols such as Heritage Building Information Modeling (HBIM) and digital photogrammetry enable conservationists to reconstruct accurate spatial coordinates, volumetric massing, and geometric records of a built environment. As Balletti and Ballarin (2019) illustrate in their work on digital replicas, the application of modern geomatic technologies supports the precise volumetric reconstruction of heritage assets when no manual, physical reassembly is achieved.

In this concept-built approach to the Ghasibah district, lost physical geometry of dissolved mud-bricks is neatly replaced by the preserved digital geometry of high-fidelity HBIM model. The big 3D printer serves as the mechanical, contemporary agent of anastylosis. As physical parts are not capable of manually piecing together by hand with no prior foresight, the robotic arm extends the identical earthen material purely following the real spatial coordinates, historically verified in the digital model. The 3D printer is not inventing an entire new architectural form; it's putting a highly precise, data-driven reassembly of a homogeneous mixture back into its precise historic geometry. Thus, we should not see 3D printing as a modern arbitrary, destructive disruption but as the definitive, scientifically sound development of anastylosis tailored for homogeneous, dissolvable heritage materials.

The Principle of Distinguishability: Reclaiming Material Authenticity

The fundamental, frequently received criticism of architectural reconstruction in heritage conservation is of potential historic falsification – the risk future assessors, historians, or archaeologists will be unable to clearly differentiate the new modern intervention from authentic historic archaeological fabric. Article 9 of the Venice Charter directly requires that any additional work essential to restoration should have a recognisable "contemporary stamp" (ICOMOS, 1964). In particular, this same principle is widely reflected in the Burra Charter stipulation that new physical interventions should visually distinguish themselves upon close inspection (Australia ICOMOS, 2013).

Rethinking the Ghasibah earthen tower with 3D printing robots is a sophisticated, elegant solution to the issue of distinguishability, and ensures that the original material is authentic. The ultimate and strongest rationale in favor of the credibility and authenticity of 3D printing the collapsed tower is the ideas of provenance of material.

As previously discussed, the collapsed earthen tower disintegrates entirely down to a pile of uniform soil right on site in archaeology. By carefully excavating, mechanically working and pouring this very collapsed historical soil directly into the hopper of the 3D printer, the intervention draws on the literal, primary historical fabric of the monument. Even foreign architectural materials — the Portland cement, fired clay bricks, imported limestone — are absent from the soft ground. They have only changed: they went through a temporal phase transformation as with a traditional historic structure of a wall, passed through the collapse of the homogeneous soil and returned again from robotic extrusion of structured earthen.

Due to the total physical, chemical, thermal and visual compatibility with any residual archaeological footprint of the tower, a substance that is producing is essentially native within the site. This eliminates all the possibility of some type of chemical rejection or differential thermal expansion. At the same time, the specific 3D printing method meets the Venice Charter's requirement for distinguishability. In the Najd region, conventional earthen construction is based on hand-patted mud courses or

handmade sun-dried adobes, both of which create highly distinctive human tool marks, organic undulations, and uneven mortar joints (Moscatelli, 2023). A 3D-printed earthen wall — identical in chemical content to the ancient mud — is constructed by cyclical, mechanized robot extrusion. This process, like all modern engineering, results in distinctive, uniform, and mechanically precise horizontal layer lines.

From a macro point of view or at a distance, the rebuilt tower can be visually read as a harmonious, authentic earthen mass which respects the aesthetic character of the historic urban fabric to perfection and integrates into the At-Turaif buffer zone. The mechanical layer lines of the extrusion, on closer and closer inspection, reveal the structural mass plainly and honestly to be a modern, 21st-century intervention, yet again. The 3D-printed layers act independently as best kind of contemporary stamp, helping link the stern standard of the Venice Charter about the need for legibility of material with philosophical affirmation in the Nara Document on authentic material continuity.

Materials and Techniques: The Physics of Mud and Extrusion

The perfect and practical execution of a digital anastylosis through 3D printing in practice demands an extremely sophisticated science about rheology of earthen materials and structural mechanics of historic masonry. The physical reality of Najdi earthen architecture is its dynamic, breathable form. Earthen walls rest entirely upon vast thermal mass and hygroscopic properties—the ability to actively absorb and release atmospheric moisture—and in this way they remain physically stable and comfortable in a harsh and hyper-arid environment including that of the Arabian Peninsula (Moscatelli, 2023).

Traditionally, conservation methods that deliberately disregarded these physical realities were disastrous to the heritage sites. As Gomes et al. (2018) extensively documented in their work on earthen stabilization, the widespread application of impermeable, rigid, cement-based mortars to historical earthen walls creates severe, irreversible long-term material incompatibility. Portland cement traps internal moisture within the earthen core; this violently disrupts the natural vapor exchange. This retained moisture inevitably results in speedy salt crystallization, severe differential thermal expansion, at worst violent delamination of the historical fabric after the modern intervention (Gomes et al., 2018).

Moreover, to maintain the material authenticity and ensure the structural integrity of the reconstructed Ghasibah tower, the 3D-printing process should exclusively use earth-based mixtures. This heavily technical process is designed to convert traditional Najdi building mixtures, usually a mix of native clay-laden soils mixed with water and organic fibers (such as chopped straw) to reduce shrinkage cracking, to the specifications of a modern robotic extrusion machine. The earthen "ink" is to be optimally engineered in order to perform the complicated rheological tuning. The muds blended must have a plastic viscosity value sufficiently low to be constantly pumped through the printer's delivery hoses and extrusion nozzle, yet at the same time possess sufficient immediate static yield strength to adequately carry the heavy load of the next printed layers without severe stress-induced structural slumping or bulging (Giacomobono et al., 2024).

Additionally, unfired earth has excellent compressive strength but almost no tensile strength. Hence, the conversion of bare earth for large-scale 3D printing obliges today's architectural engineers to design structures according to the funicularity of the load. To print an immense self-stabilizing earthen tower without using hidden contemporary steel reinforcement, synthetic resins or temporary wooden formwork, the digital HBIM must base itself on the basic structural conventions of classic compression—catenary arch, corbelled vault, heavily battered retaining walls (Giacomobono et al., 2024). In a profound paradox, the intrinsic, spontaneous restrictions of the historical material within

this building, the site, completely necessitate that the ultra-modern robotic printing approach conforms closely to the local engineering logic and structural physics of the traditional Islamic city.

Closing Remarks.

For the ethical conservation and sustainable reconstruction of earthen heritage there must be a radical departure from the rigid, material-centered doctrines largely designed for European stone monuments. A complex new paradigm for the archaeology of places like Ghasibah emerges from carefully integrating the theological and environmental values of the Arabic-Islamic worldview, the cultural relativism as espoused in the Nara Document, and the flexible, value-based framework of the Burra Charter. When conventional anastylosis is scientifically and physically impossible due to the inevitable homogeneous dissolution of mud-brick, the newly conceived use of 3D-printed robotics for digital anastylosis provides a philosophically and legally sustainable process for reconstructing the site. The actual soil from the collapsed, original site will be preserved and mechanical extrusion will be achieved with a high degree of material authenticity by using high-fidelity digital geometries with which the HBIM captures it. The mechanical nature of the printing process, whilst also leaving a highly legible contemporary stamp, helps to honor the ethics of the Venice Charter.

This ingenious collaboration between ancient, hyper-local materials and 21st-century precision robotics brings back the cultural significance, social value, and functional legibility of the Ghasibah earthen tower without the necessity of historical falsification. However, as this innovative intervention addresses the massive theoretical divide in a relationship of historical continuity with 21st-century technology, a series of critically important questions about its physical longevity and weathering are matters never addressed. Yes, the chemical composition of the printed earth is genuine, but the mechanical behavior of the extruded layers introduces a whole new set of environmental variables. Specifically, how does the horizontal inter-layer adhesion of a 3D-printed earthen wall fare versus the monolithic compaction of traditional hand-patted Najdi mud at long-cycle weathering, and how will this unique mechanical weathering pattern ultimately alter the visual authenticity and aesthetic legibility of the Ghasibah site over the next 100 years?

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Climate Change and Aquatic Migrations in The Arabian Peninsula.

Our Intangible Heritage: Patterns of Human Mobility

Dina Alhammadi



The idea that early humans migrated to and from Arabia through only one type of body of water can be a problematic thought, given that intensive studies in the past two decades, have claimed the theory that the Arabian Peninsula's prehistoric climatic conditions were drastically different than the current dry state, (Lawler, 2014:994). These studies show that the Arabian Peninsula had thousands of river systems connecting almost the entire peninsula, this was also accompanied by the existence of coastlines and three important straits, (Lawler, 2014:995).

Antique map of Arabia printed in 1760, (Rose, 2022:6).

1-Introduction:

When it comes to the very first initial move out of East Africa, Arabia has always been overlooked as a crossroads, (Armitage et al., 2011:453). There were strong assumptions since almost the entire peninsula is covered with sand and is extremely hot, which is not conducive to human life.

In contrast, there was evidence of early humans' presence in East Africa, suggesting their migration occurred just before or during the last interglacial MIS5e, (Armitage et al., 2011:453).

Regarding its archaeological importance, this region has struggled to get adequate recognition, (Bailey et al., 2007:134), Even though Paleolithic evidence was discovered in the southern Arabian Peninsula in the mid-20th century, (Caton-Thompson 1953, cited in Bailey et al., 2007:134).

In view of the difficulty in accessing Arabian soil, the lack of surveys, and the lack of dated sites, the peninsula was assumed to be a dry chunk of land separated from Africa by the Red Sea. Hence, the Levant and Fertile Crescent received more attention in terms of research, studies, archaeological work, and theories, since that part of West Asia seemed more inhabitable and conducive to early settlements, (Bailey et al., 2007:134).

The 20th century was an era in which archaeologists were acutely aware of Arabia's place in humans' prehistory, (e.g. Field 1932, cited in Rose, 2023:1). Tompson led the first Paleolithic survey in Arabia in 1937, in Hadramout Valley, Yemen, followed by the Comprehensive Archaeological Survey Program of Saudi Arabia in the 1970s. Both turned the narrative on its head, with several Paleolithic sites being revealed. Later, sites were discovered in Yemen (Al- Ma'mary 2002; Amirkhanov 1991, cited in Bailey et al., 2007:134), along with the number of finds that were discovered in the early 2000s, (Al-Sharekh 2006, cited in Bailey et al., 2007:134), as well in Oman (Rose 2004), (Bailey et al., 2007:134).

Many clues have been spotted through lake beds, stone tools, and fossilized biological remains, along with the traces of other different materials (Lawler, 2014:994). Geological and natural materials that have been measured such as climatic proxies, lake sediments, (Parker, 2009:39), or coral expansion along the seashores and straits by linking them to times when Arabian straits such as Bab El Mandeb experienced low sea levels occurring during these paleoclimatic phases, (Bailey, 2009:19).

Andrew Lawler describes the "now-barren Arabian Peninsula" in excellent detail, telling the journey that Dr. Petraglia took in search of the now-dry lakes through the Arabian dunes which led to the discovery of a large number of brown and gray stone tools. "Arabia was considered empty", he said, as a manifestation of what he suspected of Arabia's wetland that was hospitable for humans to cross between Africa and Asia. Because Arabia was always viewed as a geographical blank, modern humans are generally believed to have begun spreading through Africa 55,000 years ago. This assumption was combined with the idea that the expansion occurred rapidly and modern humans reached Australia 10,000 years ago, east of the Indian Ocean, (Lawler, 2014:994). It is evident that this theory does not add up in connection with Arabia. This has been disproved by archaeological and geological evidence found by teams studying this topic since the early 2000s.

A lot has been debated about where the first initial movement took place, whether it was through the Sinai Peninsula up north, or through the Bab Al Mandab strait on the southern end of the Arabian Peninsula, crossing what is now Djibouti to Yemen, (Lawler, 2014:996).

All of which were contribution to draw a more nuanced image of the possibilities that made early humans exit Africa to Arabia, as well as the patterns and approaches that these humans possibly took to travel to and from Arabia.

"The Arabian Peninsula was a key migratory crossroads when humans and our hominin relatives began to leave Africa. Archaeological evidence and climate reconstructions reveal episodes when early humans inhabited Arabia."

(Dennell, 2021:338).

In this field of studying the relationship between humans and environments in Arabia, authors combine paleoenvironmental studies and archaeological evidence to examine climate change and demographic responses as a result, (Rose & Petraglia, 2009:3).

According to these previous studies, early humans had some patterns of their early movements, which dates to the earliest times of human existence, even if they were based solely on human bodies, they are nonetheless considered intangible heritage.

In addition, it is important to recognize how these early climatic studies relate directly to current climate challenges, demonstrating how early humans contributed to tackling these challenges and addressing global warming today. Therefore, archaeology is essential to connecting our past, present, and future.

This paper shall not only be focusing on the patterns of early human movements, but also the patterns of Arabian coastlines and inland settlements. This is vital because many theories about the paleo-Arabian movements suggested that early migration in Arabia was very gradual and took many climatic phases over the past 400,000 years, (Groucutt et al., 2021), and possibly further back.

By using a bibliographical approach in this paper, I will be able to generate hypotheses for my upcoming research. To accomplish this, a literature review of previous studies on early human movements in the Arabian Peninsula will be conducted. Bringing together all these studies, theories, and debates to develop a new idea that complements the existing ones.

By combining the story of early human migration with aquatic heritage, we can demonstrate that early human mobilities are indeed one of the oldest stories about travel, movement, and resilience.

2-The Early Story of Arabia's Climate:

Considering the archaeology that has been found across the peninsula, the prehistoric Arabian story and its conditions were causing some questions to be raised. Taking Dhofar southern Oman as an example, the possibility of existing populations that may have survived the last ice age was made based on the archaeology found there, which was two thousand years older than what typically assumed, particularly in this part of the peninsula, (Rose, 2022:1).

In response to this, a lost Fertile Crescent was discovered in the southern parallel of the well-known Mesopotamian and Levantine Fertile Crescents, suggesting that these earliest civilizations flourished within a full Fertile Circle, (Rose, 2022:2).

This is an important point that needs to be highlighted. Early civilizations arose in a region that are very close to Arabia and considered an extension of the peninsula, which led to climatic prehistoric studies that stressed the region's conditions that once comprised one body of water, which circulated through the whole area. It is likely that these bodies of water contributed to early humans moving around and ultimately settling and eventually becoming the first major civilizations as a result of the agricultural revolution.

In this brief example, we saw how water was the driving force behind the major movements and settlements that eventually helped early humans move within and beyond Arabia.

The lettered stone debris shows that Arabia experienced many climatic fluctuations between being hyperarid and subtropical, both of which led to early humans to thrive over the past million years, (Rose, 2022:3).

In their study, Petraglia's team used satellite data to map ancient lakes and rivers, then crossed the peninsula to confirm their findings that over a thousand ancient lakes have had some changes in their dryness and wetness. The now dry lakes and rivers contained thousands of artifacts dating back thousands of years, (Lawler, 2014:995).

This brings us to the importance of connecting these valleys with human existence through their activities, as these were ancient lakes and rivers littered with stone tools and flints. An integrated approach combining archaeology and climate science is crucial. Specifically, if special attention is paid to how these tools are located and distributed in lakes and rivers, as is the approach taken in these projects regarding prehistoric climate change studies.

Since the ice ages had a huge impact on the planet, its latitudes, and sea levels, Arabia was not out of the picture, and when early humans crossed the peninsula, they had to adapt to changing climates and environments, from wet and lush to dune-like, (Rose, 2022:20).

It is very crucial when having the conversation about the climate change that occurs in Arabia, particularly when handling the prehistoric conditions, as it has been proven through these studies that these conditions were extremely different from the current climate state of Arabia. Through studies, testing and theories, connecting the global ice age, and glacial periods to the wet periods and the existence of water, we can see how this has influenced people's migration patterns from Africa by crossing the water, as existed through the glacial period.

3- Marine Isotope Stages, Climate Models (MIS), Stages of Climate Change:

As Dr. Petraglia stated in the following quote "Climate is at the heart of this", (Lawler, 2014:995). Environment and climate change have been major influence on human movements and occupation

patterns, especially in the Arabian Peninsula, which experienced several severe climatic changes during these paleoperiods.

Identifying the periodic fluctuations in temperature, as well as the clues left behind these fluctuations on soil and marine surfaces, is a key concept in understanding how climate did indeed directly influence human movements. These clues are also known as Environmental Proxy Signals. For example, sediments of ancient lakes of the desert are an ideal location to preserve and develop these proxies, (Rose, 2022:22).

There is a commonly known weather system called the Indian Ocean Monsoon in the Arabian Peninsula, which facilitates the arrival of the seasonal rains in the south of the region. During prehistoric times, this Monsoon migration covered both southern and northern Arabia, which means rainfall was present in the interior. As a result, both interglacial and interstadial climatic phases were affected (Rose, 2022:33).

In today's climate, it is witnessed that the summer annual Indian Ocean monsoon, covering the southern parts of the Arabian Peninsula, which means even with today's Arabian dry climate, not all of its landscapes are deserts or dunes. Dhofar Province in Oman can have more than 200 millimeters of rain which lead to the greenery of these Omani hills in summer. (Lawler, 2014:995).

This current Climate model can be applied to the paleoclimate one where in the time periods that were separating the ice ages, Arabia witnessed phases of green and wet landscapes, this due to the monsoon system that been covering the north parts of Arabia as well, this been measured precisely by climate models MIS (Lawler, 2014:995).

Around 125,000 years ago, during the height of the last interglacial, there was a noticeable wet and warm climate. Monsoon shifts were less dramatic in the past 80,000 and 55,000 years. Due to water flowing through Arabia, geoarchaeologists stated that brown Arabia becomes green, (Lawler, 2014:995). During these wet periods, rivers are flowing, and lakes are covered in water, and Arabia had a forest environment similar to what is currently in East Africa (Lawler, 2014:995).

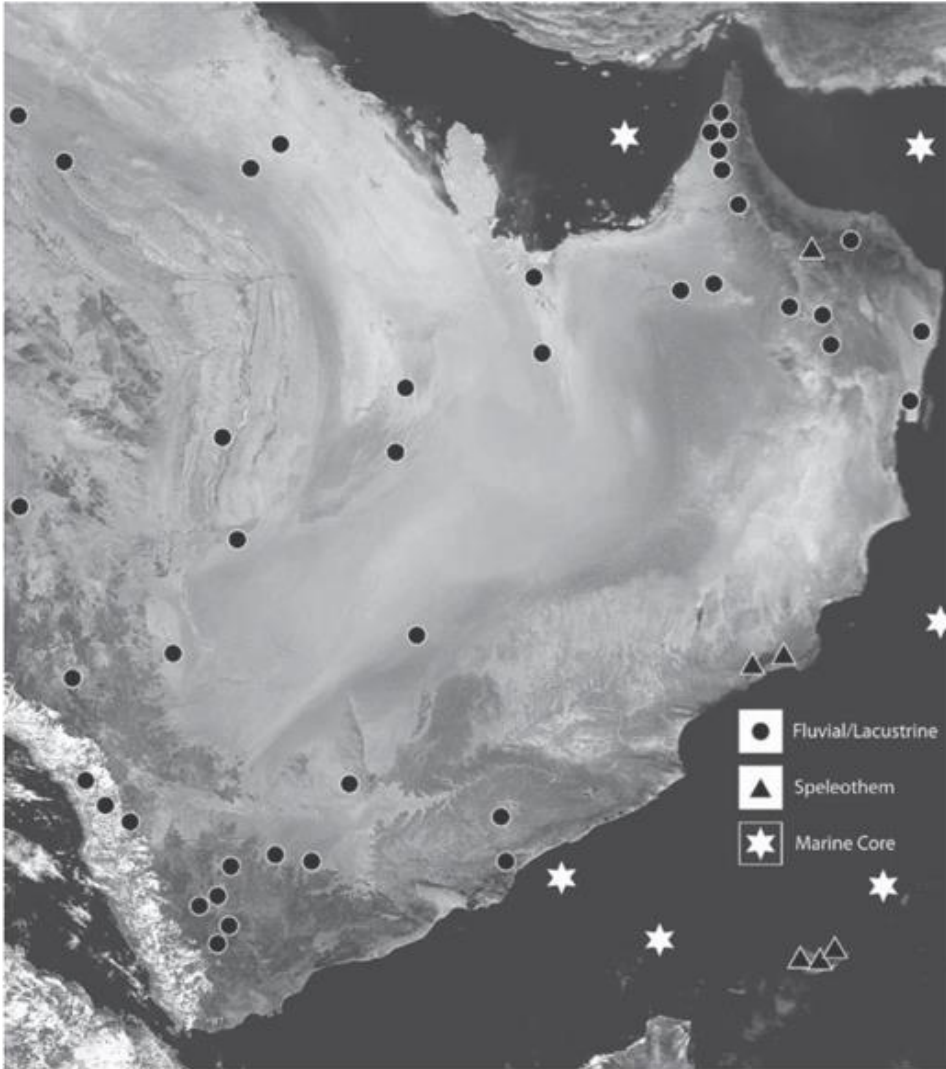
"There could be tens of thousands of former lakes and wetlands"

Paul Breeze of King's College, a hydrologist that identified 1300 paleolake and wetland sites, (Lawler, 2014:995).

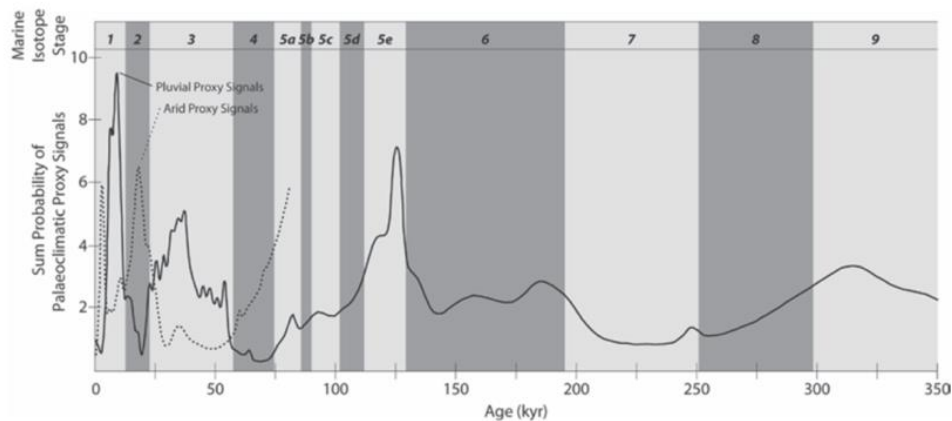
An environmental proxy signal is a method which can provide us with a timeframe for the Arabian Peninsula climate change. The Arabian Peninsula has been experiencing different climatic variations throughout the Quaternary period, as has been repeatedly mentioned. It is impossible to make this statement if these prehistoric climate theories are not measured and evidenced by ancient pluvials that can be observed in lacustrine sediments, alluvial fans and gravels, paleosols, and speleothems, and if we can describe the current Arabian landscape, three major sea sand deserts can be seen; Rub' al Khali, Nafud, and Wahiba Sands, (Parker et al., 2006a, 2006b:39).

Whenever reconstructing the early environment in Arabia, it is crucial to consider how this early environment may have influenced early migration and settlement patterns, (Anderson et al 2007, cited in Parker, 2006:40). Additionally, the current Arabian landscape bears only a very minor resemblance to that once lush landscape from the Quaternary, (Parker, 2009:40).

There can be no doubt that Arabia was constantly confronted with subaerial processes. Weathering and transportation patterns led to changes in both fluvial and aeolian environments, which resulted in denudation and accumulation of sand, which are vital for preserving clues to human occupation, (Parker, 2009:40).



A map illustrating the locations of (fluvial/lacustrine, speleothem, and marine core samples) in the Arabian Peninsula, (Parker, 2009:41).



A paleoclimatic record for Oxygen Isotope Stages 1-9, (Parker, 2009:41).

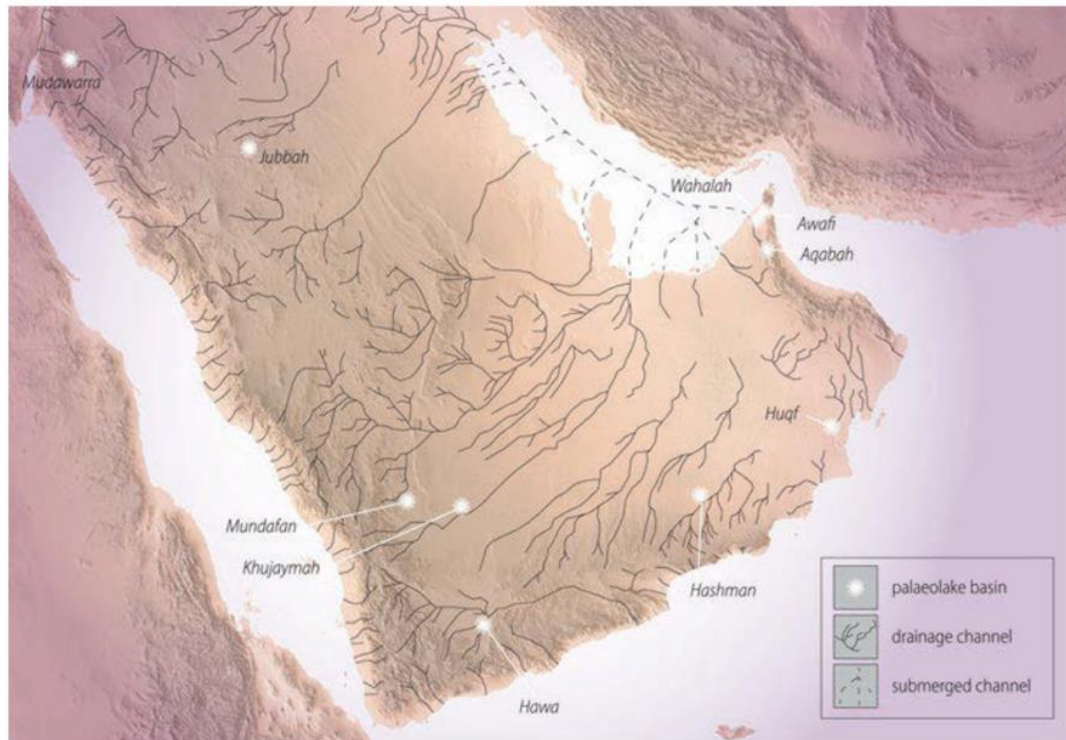
Paleoenvironmental proxy signals from the Arabian Peninsula have been analyzed in previous scientific studies to develop a chronology database for tracing climate change in this region. Starting with isotope stage 9, the oldest climate oscillation over the past 350 thousand years, (Parker, 2009:40).

Various geological phenomena, such as speleothems and cave sediments, can be measured as environmental proxy signals (Rose, 2022:37-39-44).

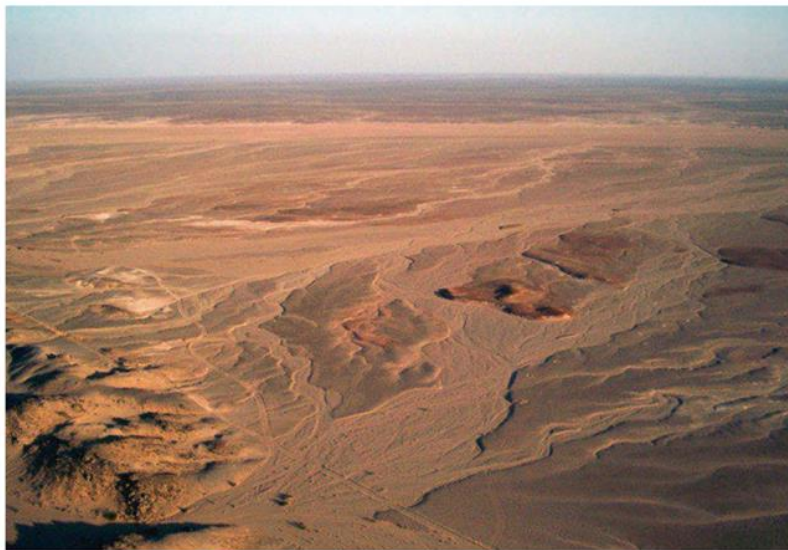
Other types of geological deposits include valleys, gravel plains, inland basins, dune fields, and shorelines, (Rose, 2022:48-52-58-61). All of which form the core idea of this work, since it considers water a medium of travel and movement.



During the Arabian Paleo past, there was a river system crossing the peninsula, as seen in this aerial photo of Najd Plateau, (Rose, 2022:49).



Map showing prehistoric rivers crossing Arabia, (Breeze et al., 2015, cited in Rose, 2022:50).



An aerial photo of river channels draining from the Hajar Mountains in Oman towards the south. (Photo Yves Guichard, cited in Rose, 2022:51).

Almost the entire Arabian Peninsula has dunes fields, which fill the interior basins with their deposits, making them one of the most prominent landscape features. Almost 7000 kilometers of coastline surround these sandy fields, along with subtropical forests and gravel plains, (Rose & Petraglia, 2009:1).

It is crucial to have a thorough understanding of the current state of the Arabian landscape and the geological state in order to choose the natural elements that can be tested.

Particularly, Environmental Proxy Signals cannot be obtained without a further understanding of the region's geology, not only its current state, but also its past ones, especially the postglacial period. As a result, more studies and theories can be developed about how early settlers ended up in and out of Arabia.

An example of that can be found in Bailey's observation of the demographic movements through the aquatic strait of Bab al Mandab. Based on an underwater study near the Farasan Islands, it has been proven that there has not been a land bridge connecting Africa and Arabia through this strait since the Pliocene Age, (Bailey 2009, cited in Rose & Petraglia, 2009:3).

Despite this, there have been discussions about the aquatic strategies that early humans used to support their rapid expansion out of Africa, which was on the Indian Ocean rim, (Stringer 2000 and Mellars 2006, cited in Rose & Petraglia, 2009:3-4).

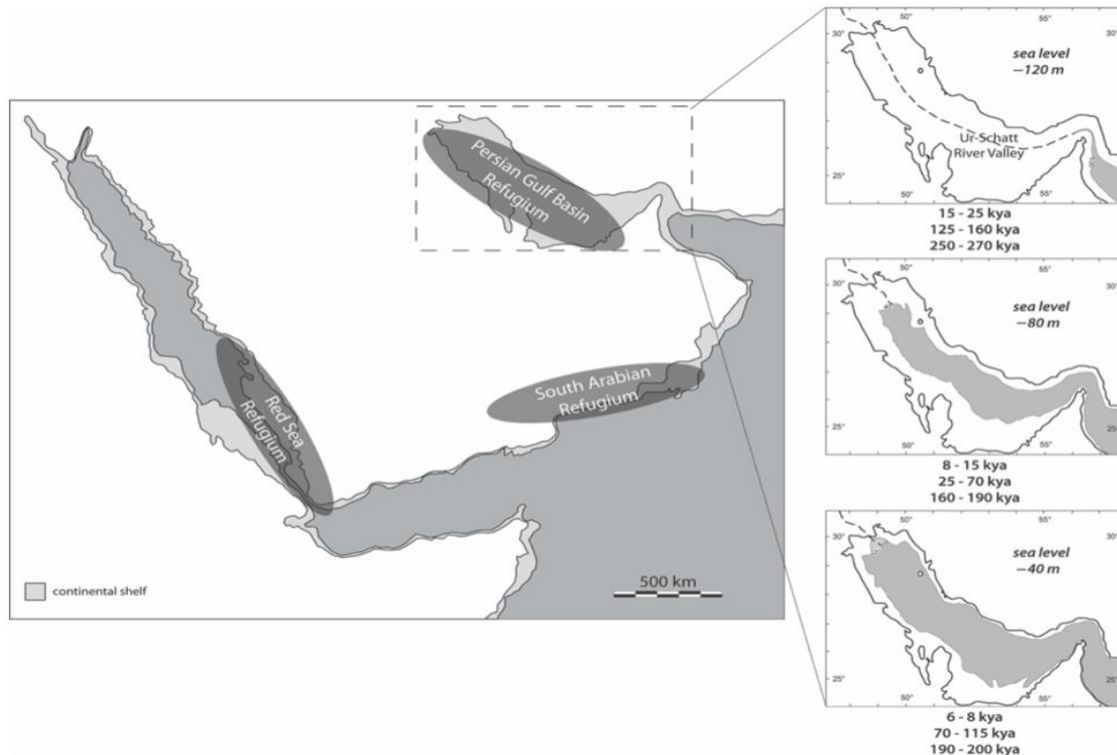
Bailey also elaborated on the weaknesses of the marine evidence in promoting the stages of coastal colonization, but he also emphasized that implying that aridity was due to glacial periods, and that all types of settlements have been eliminated except for temporary settlements, is a simplification and a significant mistake, (Rose & Petraglia, 2009:4).

In Parker (2009), a paleoenvironmental record is summarized. The record covers the last 350 ka of climate change, which provides a comprehensive database of proxy environmental signals essential for measuring pluvial-arid oscillations (Rose & Petraglia, 2009:4).

Despite what these landscapes can contribute to our understanding of early human migration. If these approaches are only present without achieving solid results, then making claims can be pointless. Even if these ideas are based on theories, it is very important to revisit and discuss them to continue retracing the path early humans took.

Early settlers might have been distributed along the coast, based on traces found in the Arabian space of Acheulean sites. It is possible that interior movements occurred within the river valleys during the wet pulses. There was a brief period during which this occurred. The process can also be reversed by contracting back into the surrounding refuge once the climatic conditions become more arid. During episodic pluvial phases, this can be accompanied by a possibility of short-term population expansions. An excellent example of this is Wadi Fatima, where this valley that had once been a river draining into the Red Sea provides a rich source of water that attracts a variety of plant and animal species. Furthermore, some discussion has taken place when it comes to the inter-regional patterning of Arabian Acheulean tools compared to those found in nearby regions, which shows that the Arabian tools are the same as the African tools, (Rose & Petraglia, 2009:6).

Therefore, it can be connected to the idea that humans who migrated from Africa to the rest of the world were able to cross Arabia by jumping from lake to lake to pursue game and useful plants. In contrast to the assumption that it would occur quickly, this could be achieved at a gradual pace (Lawler, 2014:995).



Sea levels varied throughout prehistoric times (Rose & Petraglia, 2009:6).



Theorized pattern of early human dispersal based on stone tools found near ancient lakes, (Dennell, 2021:338).

Studies have examined the effects of paleoclimate changes on prehistoric human interactions with the environment by investigating whether societies collapsed or were transformed in response to the

changes. Societies could also adapt to climatic change in different ways, including socially, politically, economically, and materialistically. An exploration of how humans interacted with ecosystems between the late Pleistocene to the Holocene where these interactions may have become notably more complex, (Petraglia et al., 2020:8263).

Archaeological research is fundamentally relevant to today's global warming debates. In archaeology, special attention is paid to the activities of early humanity, including their role in environmental and climatic changes. This is also accompanied by how archaeology can also support the understanding of climate change by examining both the impacts and the responses of early humans, which will surely and effectively help us to become more aware of the challenges we might face regarding the global warming of our planet, (Petraglia et al., 2020:8263).

Because of the severe climate fluctuations on the Arabian Peninsula, through the different stages of paleoclimates, geology and archaeology cannot be isolated if the objective is to reconstruct early human mobility. Seas, rivers, lakes, or even rainfall play an important role in facilitating early human migrations. This can provide a comprehensive narrative of recreating these cultures, specifically migration, movement, and mobility cultures, through the correlation of archaeological studies and through the remains that have been discovered at these locations. It is therefore time to represent these studies more culturally and heritage-oriented, preserving their importance in telling the story of how our ancestors were resilient in the face of early climate change, with scarce resources, but they managed to cross the globe regardless.

4- Coastal Plains:

The initial early human movement out of Africa was taken via several aquatic routes that have been the subject of so many theories and studies. The Red Sea, which is located between East Africa and West Arabia, played an important role in narrating the story of early human expansion out of Africa, as it served as a waterway between the two regions. The Arabian gulf, as a paleo river in its paleo state, also played a significant role in the early expansion of early settlers, particularly in connection with the northern Fertile Crescent and Mesopotamia.

4.1 The Red Sea:

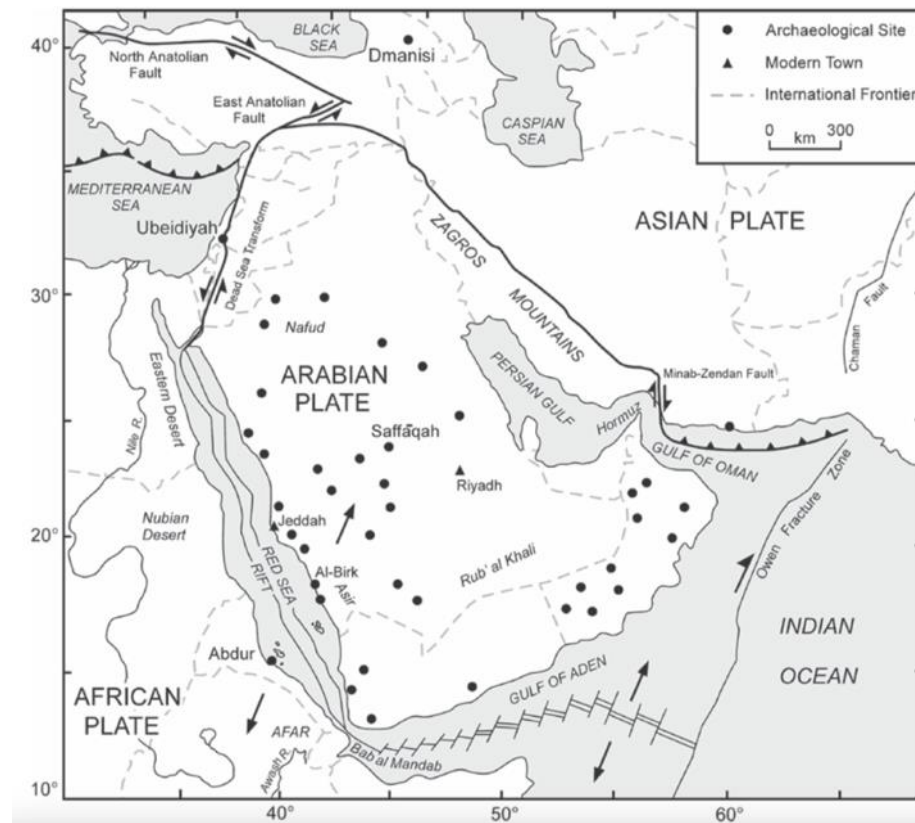
The Red Sea extends north and south for 2000 km, has an average width of 280 km, and a median width of 354 km. As a result of these measurements, it is quite evident that early settlers could not cross this body of water without the sailing technologies that evolved much later in history. Therefore, it only leaves the southern and northern tips of the Red Sea. Since the Sinai Peninsula is in the middle, one gulf deviates to the east, creating Gulf of Aqaba, while one deviates to the west, creating Gulf of Sues. As for the southern Strait, it is called the Yemeni Strait of Bab al Mandab. Only 29 km wide, this southern strait is relatively shallow and short. Sea levels at the south and north ends of the Red Sea can change frequently as a result of glacial-interglacial cycles. This is easily observed at the southern end of the Red Sea, where the sea channel is shallow to the point that it could have been closed and crossed despite low sea-level stands, (Bailey, 2009:17).

Early humans, crossing Africa to Arabia in Asia, were believed to have been blocked by the Red Sea for five million years. This body of water can only be crossed through narrow pathways located at its northern and southern ends, which can be blocked by physical and climatic factors (Bailey, 2009:15).

It should be noted that the Red Sea is not merely a barrier, since its coasts provide wet and lush environmental conditions, and climatic conditions that were conducive to the development of early settlements. In addition, its topography, which is similar to the African rift, carries all the conditions to sustain the lives of the early settlers, (Bailey, 2009:15).

A period of wet conditions was evident in both marine and inland environments, where major changes were observed because of changes in climate and sea level during the glacial-interglacial cycle, as well as the long period of tectonic movements impacts that were influenced by faulting and eruptions, and rifting, (Bailey, 2009:15).

During periods when sea levels are high, such as today's, Early Humans would need boats that are suitable for sea sailing if they decided to cross the southern end of the Red Sea, (Bailey, 2009:18).



An illustration of the Red Sea and its surrounding regions showing both plate movements and the distribution of Lower and Middle Paleolithic archaeological sites, (Bailey, 2009:16).

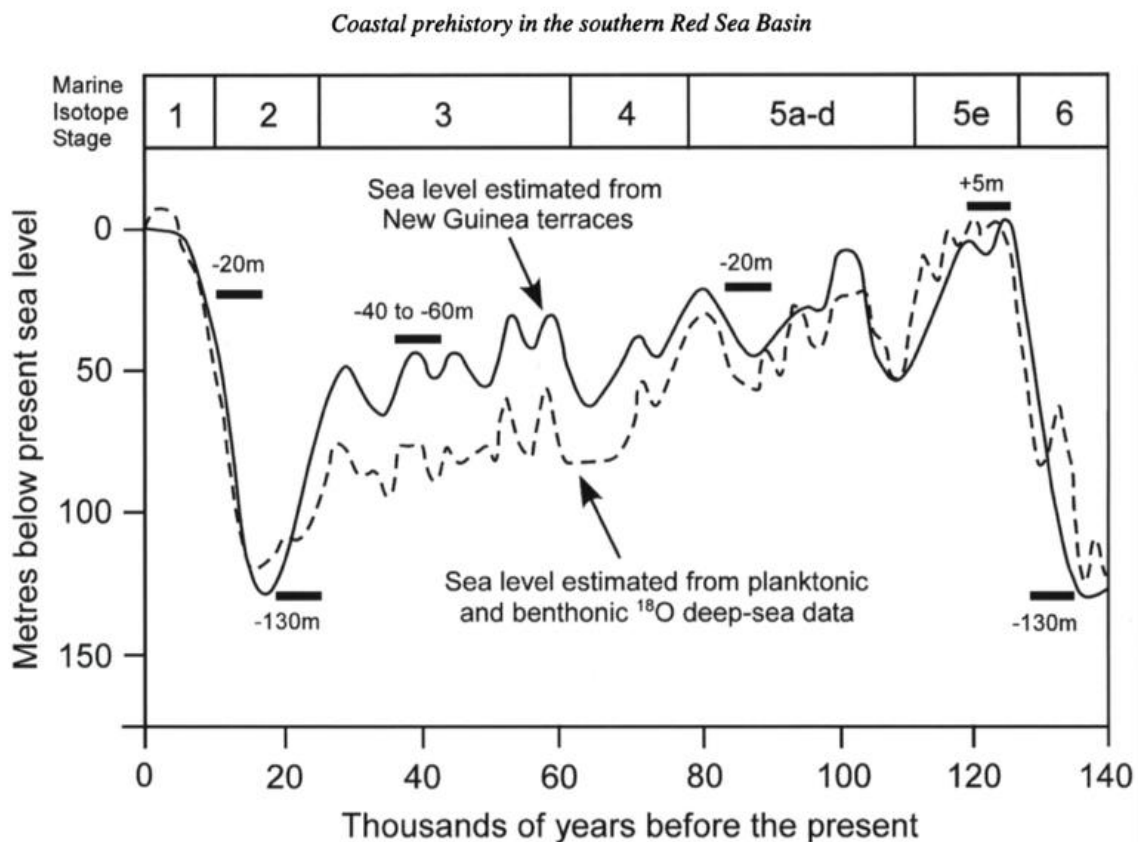
It has been discussed that early humans left the Mediterranean, but Bailey believes such a migration would require a sea crossing, which would include the Gibraltar Strait's narrowest part, and there is no substantial evidence to back it up, (Bailey, 2009:15).

Given how narrow the top end and bottom end of the Red Sea are, only by looking at this body of water, and backed theories that the Early Human Migration might have begun from East Africa, which is separated from Arabian soil by the Red Sea itself, it makes sense that the first early human migration could have begun in that region.

In a study by Bailey and colleagues suggesting the Red Sea Basin being suitable for settlement for early humans, this was assumed in the early prehistory, and that location is now considered a valid location for cultural contact and population expansion from Africa to Asia, rather than being a blocked body of water. In his study, Bailey used a global record of sea-level changes relevant to the glacial-interglacial cycle to reconstruct shoreline positions over time. Both tectonic and isostatic movements in the Earth's crust were considered in this approach. As a result, it can be said that Bab al-Mandab Strait probably had some reduction in its sea level during that period, which caused it to become a shallow

channel. Even though there was no watercraft on the island, it was quite possible to cross it during these early times when human migration may have been the first. Due to the possibility of low sea levels at that time, the records of coastal settlements would likely be impossible to access if underwater exploration missions did not take place. The prehistoric sites on the coastal plains of the current time shores, are quite difficult to examine as these finds and stone tools are surfaced levels which means they are not in a stratigraphic context, nor do they have anything that can be connected to absolute dating methods. In this mission, around 1000 sites were explored on land, including the Farasan Islands, as well as underwater archaeology. However, most of the finds are seashell mounds dating back 6000 years or more, (Bailey *et al.*, 2007:1).

Due to the expansion of continental ice sheets in the Pleistocene period, sea levels were significantly lower than they are now, so any evidence of early human settlement can be quite challenging to trace. The low sea levels at those times were a great advantage for early humans to travel across the ocean, but when it comes to determining these movement patterns, it can be challenging, as evidence must be concealed on old shorelines that are now submerged and many kilometers offshore outside of areas that have experienced rapid postglacial uplift, (Bailey *et al.*, 2007:3).



Sea level variation in the southern Red Sea Basin over the past 140,000 years, showing two glacial maxima and two interglacial periods of high sea levels, including today's postglacial levels, (Bailey *et al.*, 2007:3-4).

Possible links between early expansion and the paleotidal flows at the southern tip of the red sea during the Pleistocene low sea level epoch, using paleotopographic reconstructions of coastlines. In addition, Lagrangian particles were used to simulate passive movements. Based on the existing of

isotopic and geological data, the possibility of land crossing between the Red Sea and the Indian Ocean does seem quite evident. All of which could lead to land crossings, (Hill *et al.*, 2022:1).

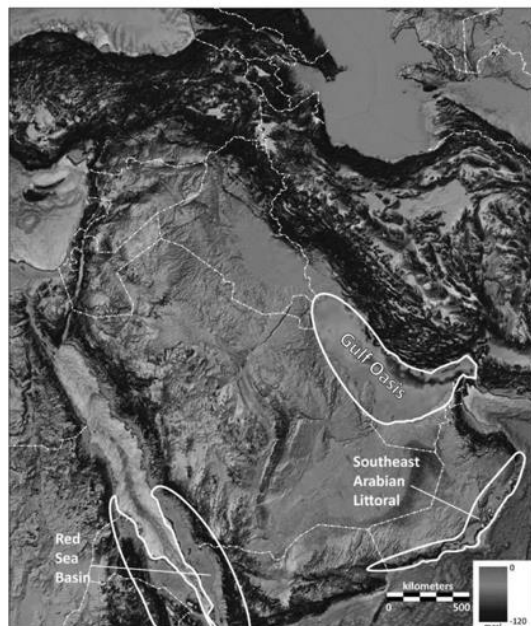
It was discussed whether island hopping might be possible. Due to low sea levels in the southern part of the Red Sea during the Pleistocene, it seems more logical to cross Bab Almandab, since that strait has never been dry according to these studies. Due to low sea levels, the crossing distance was reduced, with a shoreline appearing on the other side of the Red Sea, as well as gentle tidal waves that may have enabled early humans to pass by swimming. Based on simulations, up to 32% of drifting particles can reach the other side of the Red Sea. Humans could cross that strait, which was only 10 km wide and had a slow current, since the strait was only 10 km wide, (Hill *et al.*, 2022:10-11-12). Ultimately, the study concludes that tidal currents and sea conditions would not have prevented early human migration across the southern Red Sea, contradicting earlier arguments against this route.

Archaeological sites have been discovered on both the African and Arabian sides of the Red Sea that date back to Paleolithic times. Sites like these have been formed as coral expanded during higher sea levels. This enabled early humans to move as well as leave traces of their culture on both sides of the Red Sea. Archaeological sites have been discovered along the west side of Saudi Arabia, specifically in cities and regions such as Jeddah, Al Birk, Jizan, and as far as the Asir highlands, (Bailey, 2009:20-21).

4.2 The Arabian Gulf:

As a large fertile region in prehistoric times, the Arabian Gulf had a low sea level before being covered by waves from the Indian Ocean. This fertile region, or what was called an oasis, actually had flowing fresh water from the Tigris and Wadi Batin, as well as underground sources of water.

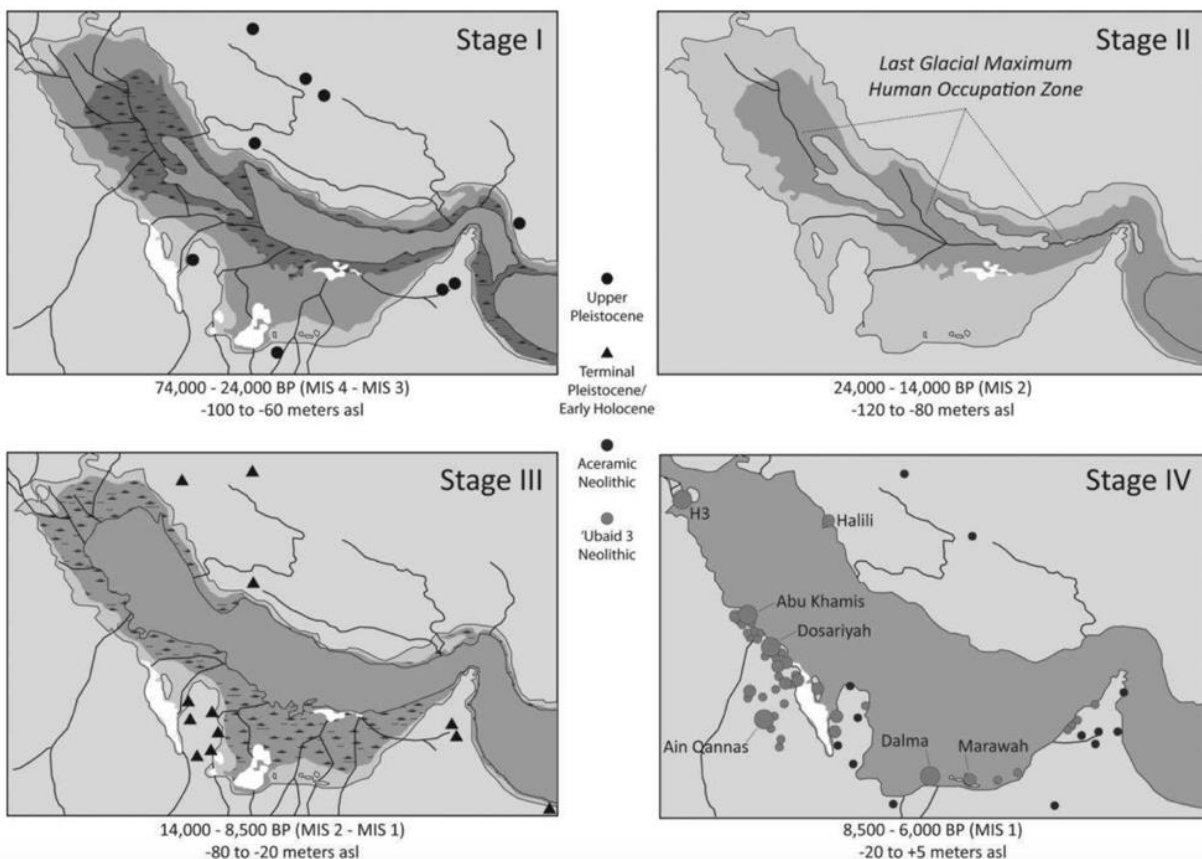
Low sea levels in the Arabian Gulf provide a suitable environment for humans to seek water and resources, despite periods of low rainfall. Researchers suggest that constant environmental changes, along with cycles of flooding and drying, could trigger humans to migrate through the Arabian Gulf Oasis. All of these events are thought to have occurred during the late Pleistocene and early Holocene ages. In this part of the Arabian Peninsula, environmental changes do have an effect on the pattern of population migration, cultural interaction, and the development of early human societies, (Rose, 2010:849).



The physical map of Arabia illustrates the littoral zones that have been exposed due to the reduction of sea levels (Rose, 2010:851).

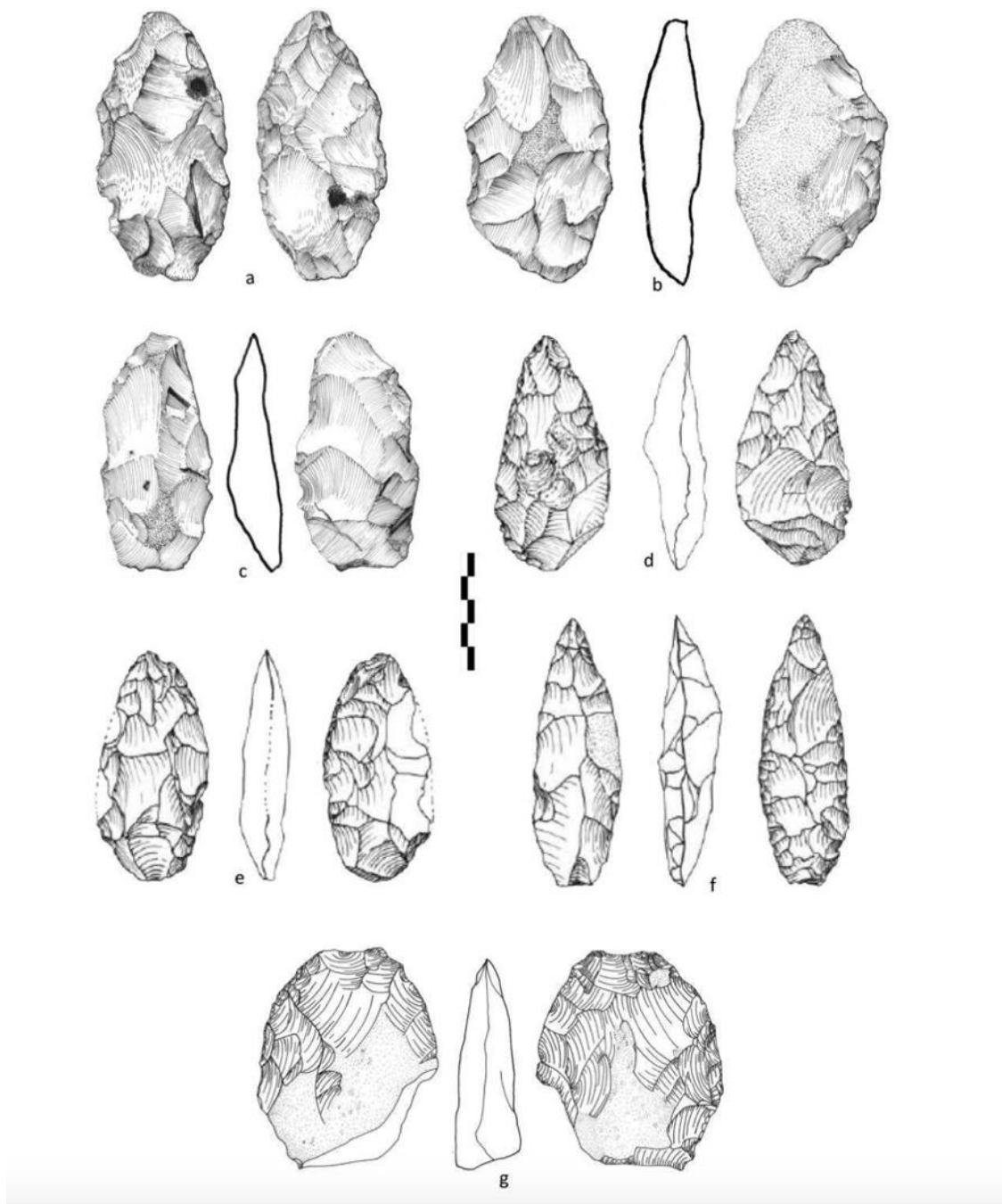
A major and evident spatial variability, this was due to the sea level changes since the last maximum glaciation in the past 18,000 years, both distant ice sheet melting and local meltwater loading have their own influence on these changes. In later times around 14,000 years ago, after an utter dry period, the Arabian Gulf was indeed experiencing a gradually elevating flooding phase, due to the opening of the Strait of Hormuz, (Lambeck, 1996:43).

Through the Quaternary period, two major climatic systems had a substantial impact on the major landscape shifts in the Arabian Peninsula. There are the westerlies, which create little rain from the Mediterranean, and the Indian Monsoon system, which brings relatively heavy rains, storms, and cool weather to the southern coast. Rains extend as far as the Empty Quarter desert due to global insolation patterns. These patterns eventually shift the Intertropical Convergence Zone (ITCZ). Consequently, the region has gone through a variety of environmental changes, creating fertile grasslands, and eventually affecting human populations, their existence, and their expansion. Having an average depth of 40 meters, the Arabian Gulf basin is considered one of the shallowest seas in the world. Due to the many lithic materials that have been found there, this body of water has been considered one of the most important inland oases of prehistoric times, especially during the MIS 4 period, when the water dropped. For 70,000 years, more than 100,00 square kilometers of land were exposed, leading to a lush, abundant environment with freshwater springs, river floodplains, mangroves, and estuaries, (Rose, 2010:853).



This prehistoric shoreline position shows the river/lake phase of the Arabian Gulf during MIS4, MIS3, and MIS2, (Rose, 2010:859).

It is estimated that the settlements within this region date back 150,000 to 200,000 years, (Beech, 2004:31). In terms of paleolithic archeology in Eastern Arabia, findings of lithic surface scatter from Ras Ushayriq on the northeastern coast of Qatar, which may display Middle Paleolithic and Upper Paleolithic characteristics, suggest that population might have existed in that part of Arabia during the Pleistocene era. (Al-Naimi 2009, cited in Rose, 2010:854-855). Radiometric dating indicates that these human occupations occurred between MIS 5 and MIS 3. Three archaeological horizons were discovered in a stratified condition. These lithic finds are similar both in technology and typology to those spotted in Jabel Faya around the shoreline of the basin. Although many of these sites are not dated, they can provide some insight into the presence of early settlers during these periods. (Rose, 2010:856-857).



A sketch of Middle Paleolithic assemblages in the Arabian Gulf basin, (Rose, 2010:858).

5-Lake beds, and ancient rivers, the northeastern African Theory:

Another theory of the early expansion of humans has been taken from northeast Africa, crossing the Nile River towards the Sini peninsula's southern tip, to the northeastern tip of the Red Sea, and continuing in the Arabian inland through the lakebeds that cover nearly all of Arabia.

Other scholars have also proposed a land-based dispersal theory, specifically exiting Africa from the northwest through the Sinai Peninsula. These assumptions were more appealing to them given the strong tidal flow in the Red Sea, especially in the south, and the narrowing of the sea channel with lower sea levels, (Hill *et al.*, 2022:1).

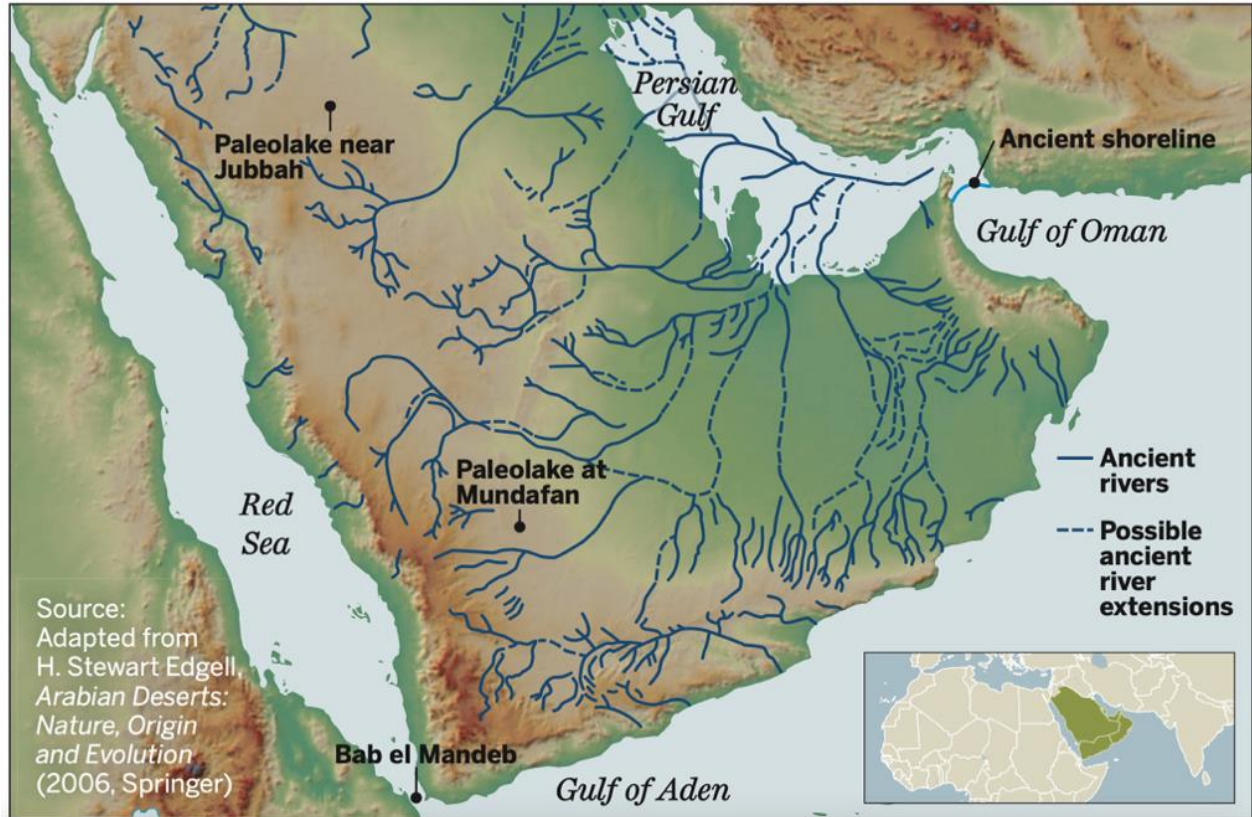
In the late Pliocene and early Pleistocene, a very tight corridor of land existed between the northern tip of the Nile River and the southern Levant. It is believed that even in low sea levels, the narrowest tip of the Sinai Peninsula, 50 km of semi-arid coastal plain surrounded by foothills and mountains,

would have become wider and more suitable during different periods during the Pleistocene. Adding Green Arabia to this theory makes the Arabian Peninsula more navigable from Northeast Africa, but keep in mind the paleoclimatic oscillations that occurred then in Arabia, (Hill *et al.*, 2022:1-2).

During times of wet climate in the Pleistocene, the Paleo-desert model focuses on the northern route to Arabia through the Sinia Peninsula. Stone tools, fauna, and human remains found at archaeological sites indicate that grasslands and lakes expanded in Arabia during the wet periods. (Groucutt *et al.*, 2015, 2018; Petraglia *et al.*, 2019, cited in Hill *et al.*, 2022:3-4). Throughout the Arabian Peninsula, the climate varies from wet and humid to dry and arid. Shifts in earth orbit and monsoon systems cause these phases to change. Increasing rainfall transforms what was once an empty desert into lakes, rivers, and lush green lands.

It is possible that humans took the Northern route from Sinia 125,000 years ago in a crucial period (Lawler, 2014:996). Findings in Qafzeh and Skhul, dated 119,000 to 81,000 years ago, suggest that early migration was through the Nile Corridor, (Armitage *et al.*, 2011:453). In the Nafud desert, 350 km from Riyadh, is the famous Jubbah cite, a dry lake that gets covered with water, reeds, and mollusks during wet periods, (Petraglia and Parton, cited in Lawler, 2014:995).

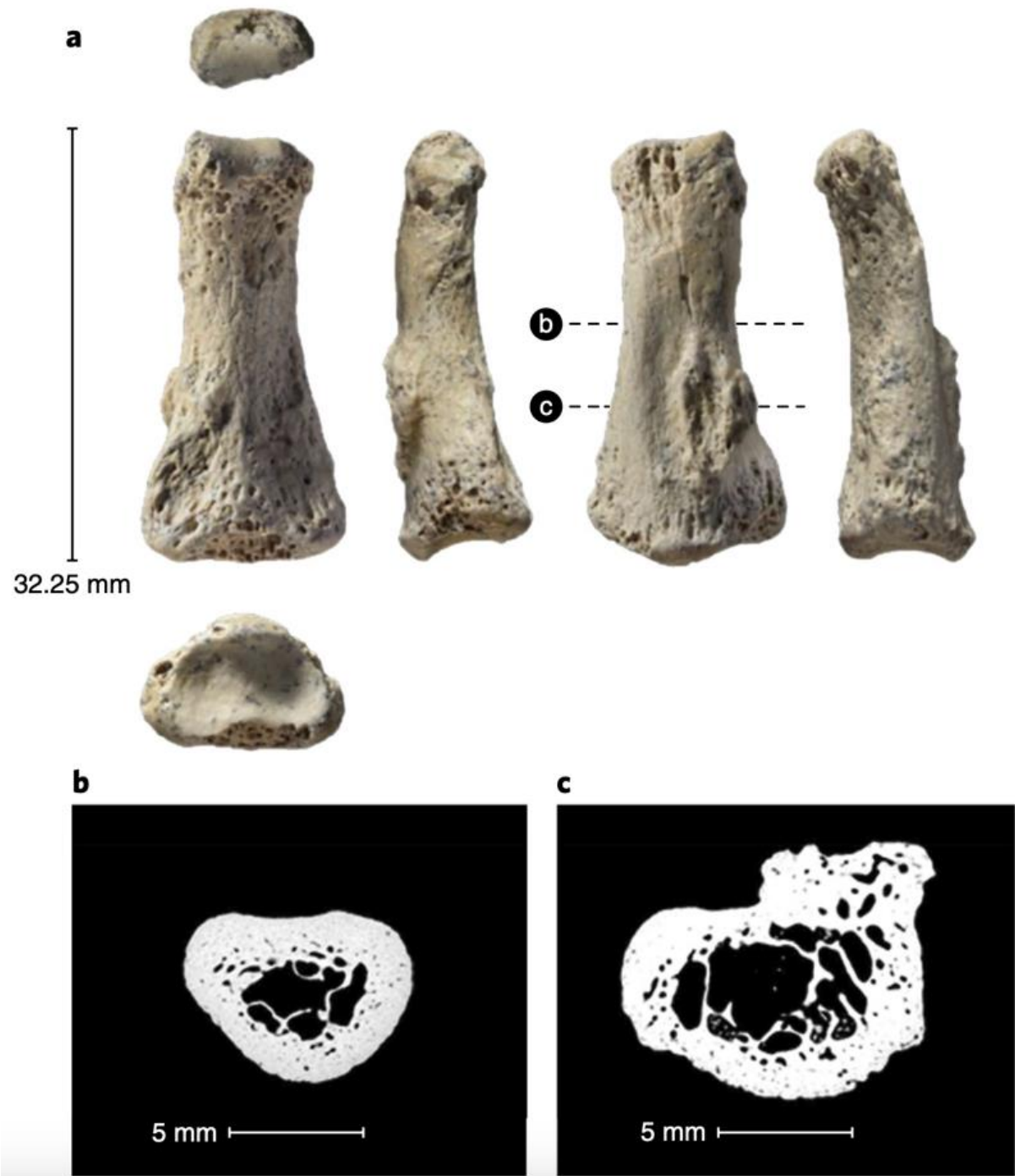
Different areas have also been found to contain prehistoric inland marine systems. Mundafan, for example, is a paleolake that extends as far as the Empty Quarter. A paleoriver system that once flowed from Yemen to central Arabia and the Arabian Gulf, was only recently discovered to be buried by dunes. An additional river system has been discovered, a river that flows from the mountains of Oman and travels up to 400 kilometers towards central Arabia, (Lawler, 2014:995-996).



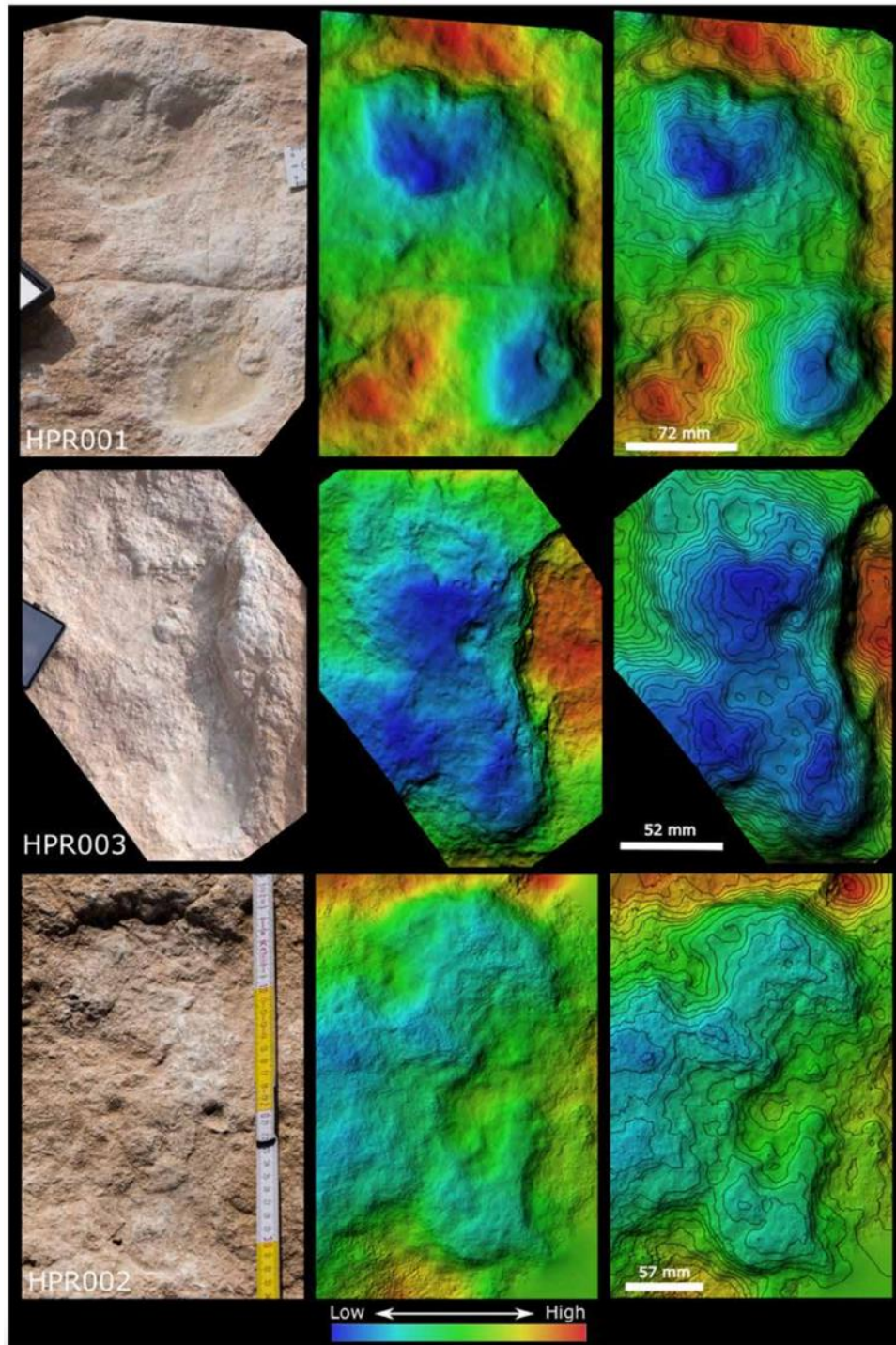
Locations of Jubbah and Mundafan, along with the inland marine system, have been spotted throughout Arabia in different projects (Lawler, 2014:996).

Over the past 400,000 years, five lakes have formed in southern Saudi Arabia, and a lake's deposit has been studied. The lakes formed during a brief period of increased rainfall, and different types of stone tools were associated with each lake. Khall Amayshan, for example, has been developed over multiple periods and has stone lithics. The fauna found on this site were similar to those found in East Africa rather than the Levant, as can be seen from the lithic assemblages, of which two were dated to MIS 11 and MIS 9, (Dennell, 2021:338).

As far as human remains are concerned, the only human remains found in Green Arabia are an 85,000-year-old finger bone and fossilized footprints dated 102,000 and 132,000 years ago. As they relate to the exitance of Homo Sapiens in Arabia, (Dennell, 2021:338).



A Homo Sapiens phalanx found in Saudi Arabia's Nafud desert at the Al Wusta site, (Groucutt et al., 2018:802).



In the interior of Arabia, tracks believed to be human footprints from the last interglacial period have been digitized, (Stewart et al., 2020:4).

6-Discussion:

In this paper, we discussed previous studies and research regarding how early humans may have moved out of Africa. The main character was the existence of aqua bodies, and the use of water as a

tool to these movements before the existence of boats and marine transportation, and the fact that human bodies were able to function as the main equipment during those early times, especially when focusing on the possibilities that took place in the strait of Bab Almandab, and the glacial periods that actually affected the sea levels, as well as the width of the strait that made it possible to travel across it.

The existence of rivers, lakes, wet areas in Arabia over the past 400,000 years ago and beyond, the use of these bodies of water, and the theories that have been generated based on the traces of these ancient rivers and lakes, with its association with archaeology and the existence of human activities within these prehistoric waterways.

There are two different conditions for water to exist, and what took place for humans to cross the Sinai Peninsula and reach the rivers and lakes that covered Arabia in the interglacial period. It may also be possible to cross the narrow Bab Almandab strait. The two theories of where the initial human aqua movement occurred depend on the Red Sea, its existence, and how it played an important role in facilitating or hindering the transition from Africa to the Arabian Peninsula.

7-Conclusion:

An oral tradition that goes along with all what have been discussed in this: "when the land of the Arabs will become meadows and rivers, like it once was." (Rose, 2022:5).

There is also a different narration of the same tradition that quotes Muhammad, "Judgment Day will not come until the land of the Arabs returns to its state of lush pasture and abundant rivers.", (Lawler, 2014:995).

Both quoted Hadith traditions are from the same oral tradition in Arabic but translated into English with different paraphrasing. It's noted how different vocabulary and emphasis have been used in translations, such as Rose skipping judgment day. Nevertheless, the record is a historical oral tradition that has been preserved and passed down through more than 1400 years, indicating Arabia was once lush and wet. It is important to tell this story from a humanistic perspective, illustrating how prehistoric humans interacted with these climates, and how we can relate our travel stories to Arabia's prehistoric wet climate. We have witnessed so many transitions and stories of our interaction with water, surviving, living, and traveling through this medium.

Globally, the ice ages had a profound effect. With the advance of glaciers across the temperature latitudes, sea levels rose and fell. Early humans living in Arabia faced extreme oscillations between verdant grasslands and barren deserts, (Rose, 2022:20).

With these brief examples of theories, sites, locations, and archaeological material culture related to prehistoric climate change, water is indeed at the heart of this. Through the use of state-of-the-art studies and scientific testing, we can reconstruct the story of early human migration where Arabia was the transitional space from Africa in different ways, allowing us to have different methods of reconfiguring the story.

The collection of studies as the basis for this paper focus only on the bodies of water and considers water as the medium through which early humans migrated, traveled, and moved.

The existence of archaeology within these ancient aqua spaces is crucial to recreating the story of early humans' movements, whether the spaces were dried ones, such as lakes and rivers where stone tools accompany them in their bids, or sea/gulf coastlines that experienced various tides fluctuating over these long centuries.

As a result of this process, a distant heritage of the very first aquatic movements could be shaped, and these types of mobility and their reasons for surviving actually contributed to the conditions that shaped not only the existence of our ancestors but also the slow accumulation of cultural events, which shaped the very early civilizations in the nearby regions during the agricultural revolution.

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Between Household and Holy City: The Adila of Medina as Living Intangible Heritage

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Abstract

The Adila profession of Medina traditionally responsible for receiving, housing, and spiritually guiding pilgrims to the Prophet's Mosque—represents one of the Islamic world's oldest yet least studied forms of living intangible cultural heritage. Operating for centuries through a hereditary document system (taqareer) that paired specific pilgrim nationalities with dedicated Medinan families, the profession forged enduring transnational relationships of hospitality and reciprocal exchange. Drawing on four semi-structured interviews with male practitioners and a focus group with women from Adila families conducted in Medina in 2026, this study examines two dimensions of the profession overlooked in existing scholarship. First, it investigates the culinary and cultural diplomacy generated through seasonal cohabitation, analyzing the domestic space as a "contact zone" where foodways, languages, and social practices intersected across generations. Second, it illuminates the constitutive yet historically invisible role of women in sustaining this heritage through household management and the practice of Rada'a (Islamic milk kinship), which established permanent, quasi-familial bonds between Medinan hosts and international pilgrims. Framed through UNESCO intangible cultural heritage guidelines, Marcel Mauss's gift theory, and Mary Louise Pratt's contact zone concept, this study contributes the first documented account of women's labor within the Adila system, enriching the broader literature on pilgrimage heritage, gender, and sacred space in the contemporary Arabian Peninsula.

Keywords: Adila, Medina, intangible cultural heritage, pilgrimage, Rada'a, contact zone, oral history.

Chapter 1: Introduction

Medina occupies a pivotal position in Islamic history. It was the first capital of the Islamic state and the second holiest city for Muslims after Mecca. It was founded approximately 1,500 years before the Prophet's migration (Hijra), during which time it was known as Yathrib. With the Hijra in 1 AH/622 CE, it transformed into the political, spiritual, and cultural center of the nascent state (Al Madinah Region Development Authority, 2023).

In the early Islamic centuries, the sanctity of Medina crystallized as "the City of the Prophet," a sacred space with its own sanctuary, boundaries, and symbolism, as Harry Mount (2014) demonstrated in his extensive study on the city's emergence as a holy city and a religious sphere subject to conflicting interpretations between jurists and political authorities during the first three centuries of the Hijra. This early establishment of the sanctity of the place made Medina a constant destination in the spiritual geography of Muslims and a hub for pilgrimage and religious visits throughout the ages.

As Medina's status as a destination for visiting the Prophet's Mosque, the Prophet's grave, and other mosques and sites associated with the Prophet's life became firmly established, a system of local roles

and services gradually emerged to serve pilgrims and visitors. Among these was the profession of guides (adila), who are specialists in receiving pilgrims, organizing their accommodation, and providing them with religious and logistical guidance within the city and its surroundings. Local accounts and official Saudi documents indicate that the roots of this profession trace back to Medinan families who worked during the Hajj season serving the "guests of God," providing them with lodging, sustenance, and care during their stay in Medina (Adilla Company, n.d.). With the increasing number of pilgrims and the development of transportation in the 14th century AH, this practice transformed from its informal, family-based nature into an organized entity. This began with the issuance of a royal decree approving the Medina Guides Authority in 1356 AH/1938 CE, followed by the establishment of the National Guides Foundation in 1405 AH/1985 CE, and later its transformation into a joint-stock company within the system of "guides" and pilgrim service providers (Al-Jazirah, 2017)

Although historical and anthropological literature on the Hajj often focuses on the Grand Mosque in Mecca and the institutions of the Tawafa (pilgrimage service) there, the profession of guides in Medina remains less addressed in comparative studies of Hajj and pilgrimage, whether in Arabic or English literature. A significant portion of the research on Medina focuses on the formation of its sanctity and its urban and mosque landscape in the early centuries, as seen in the works of Monte and others, rather than on the modern institutional practices and social services associated with receiving pilgrims (Mount, 2014).

In contrast, some contemporary applied studies highlight the linguistic and communicative needs of guides, indicating their central role in cultural translation between multilingual pilgrims, the local community, and state institutions (Abdellah & Mahdi, 2013). This highlights a research gap that this work can help fill by examining guides as a social, historical, and cultural phenomenon linked to the holy site.

This research stems from the premise that guides in Medina are not merely logistical service providers, but rather play a complex role encompassing the religious dimension (regulating the etiquette and discourse of the visit), the social dimension (building a bridge between the pilgrim and the local community), the economic and organizational dimension (integrating the profession within an institutional framework governing service providers for pilgrims from abroad and the heads of religious groups), and a cognitive-cultural dimension represented by preserving the narratives and oral history of the place (Saudi Press Agency, 2018).

Therefore, studying the history of this profession and its transformations, and analyzing its values and methods of operation, can contribute to understanding the relationship between the sacred space and the service structures that form around it in the context of contemporary Hajj.

This study aims to achieve three interconnected goals: First, to reconstruct the historical trajectory of the guide profession in Medina, from its informal family roots to the formation of a formal body, then a private institution and a joint-stock company, while linking this to the contexts of the development of Saudi Hajj regulations and state policies towards the "guides of the pilgrims."

Second, to analyze the professional and human values associated with this profession (such as integrity, serving the pilgrim, linguistic and communication proficiency, crowd management, and social

welfare), and how these values are being reformulated today in the institutional discourse and the self-images that guides project. Third, to examine the impact of guides on shaping the pilgrim and visitor experience in Medina, that is, how they contribute to producing a specific image of the city as an organized spiritual space that meets the standards of "quality," "safety," and "professionalism" promoted by contemporary Saudi policies within a broader vision for serving the guests of God (Independent Arabia, 2025).

Chapter 2: Literature Review

It can be said that the scholarly literature addressing guides in Medina as a central subject of study remains relatively limited compared to the abundance of writing on Hajj rituals in general or on the institutions of the Tawafa (pilgrimage service) in Mecca. Nevertheless, a number of works can be identified that form an important reference framework for this research, although they differ in their methodologies and approaches.

1. Direct Studies on Guides in Medina

One of the most important works written directly about guides in Medina is the report by Busrāwī (2006), published in the Journal of Medina Research and Studies, entitled: "Guides in Medina and Their Efforts in Serving the Guests of God." This peer-reviewed research was published by the Medina Research and Studies Center in 2006. The work presents the historical background of the emergence of the guide profession and its institutional development within the framework of the "National Guides Foundation." It also provides a detailed description of the nature of the services offered by the Foundation to guests of the Prophet's Mosque and its organizational and administrative roles in receiving and serving pilgrims.

Another study titled "The Guides Authority in Medina: The Honor of the Profession and the Long-standing Service" by Hawala (1999), this study focuses on the ethical and historical dimensions of the profession and its transformation from a traditional body to a structured, non-profit organization.

However, these works represent an important foundation for understanding the history of guides and their service, but they remain closer to descriptive/documentary studies and do not sufficiently delve into the anthropological dimensions and social changes within the profession.

In addition, there are official and journalistic reports of a quasi-research nature issued by the Ministry of Hajj and Umrah or the National Guides Authority. These reports contain information on the number of pilgrims served by the Authority, its administrative structure, and its transformation from a non-profit organization to a joint-stock company. However, these texts remain primary sources rather than analytical studies.

2. Guides within the System of "Tawafa"

A number of studies and books address the history of tawafa in Mecca in particular, but they include direct references to guides as one of the components of the tawafa system (mutawwifs, agents, guides, and zamzam water carriers). According to Qamar (2005) "Tawafa as a Profession" mention the stages of development of the tawafa institutions and the regulatory decisions that included

mutawwifs, agents, and guides together, such as the reforms of the 14th century AH (1960s and 1970s) and the Cabinet decisions related to restructuring these bodies.

However, King Salman Chair for the Study of the History of Makkah (2014) also published a book entitled "Tawafa and Mutawwifs," which addresses the history of the tawafa profession in Mecca, its origins and development, the jurisprudential framework regulating it, and the role of the tawafa institutions in serving pilgrims. Although this book focuses primarily on Mecca rather than Medina, it provides a general framework for understanding how the professions of pilgrims (including guides) were codified and developed within the context of Saudi reforms. This helps to place the guides' experience in Medina within the broader context of institutional transformations in serving the pilgrims.

These studies contribute to illuminating the historical and institutional aspects, but they tend to focus more on the organizational and legal dimensions (regulations, decisions, and the entities of the pilgrim guides) than on the daily practices of guides in Medina, or on their firsthand experiences and relationships with pilgrims and the local community.

3. Linguistic and Educational Studies on Hajj Guides

One of the few studies in English that addresses Hajj guides in Madinah as a case study is Abdellah and Ibrahim (2013) study, "Towards developing a language course for Hajj guides in Al-Madinah Al-Munawwarah: A needs assessment," published in the International Education Studies journal. This study focuses on assessing the linguistic and communication needs of guides who interact with non-Arabic-speaking pilgrims. It concludes that there is a gap between the required and available language proficiency and proposes a framework for an English Language Program (ESP) specifically designed for guides in Madinah. The study employs both quantitative and qualitative methods (questionnaires, proficiency tests, and unstructured interviews), making it one of the few works that examines guides in Madinah from a scientific and empirical perspective, even though its focus is limited to English language skills. This study reveals an important dimension that has not been adequately addressed in Arabic literature, namely the role of guides as linguistic and cultural intermediaries between pilgrims coming from different countries and official Saudi institutions; this opens the door to reading the profession as a multicultural communicative practice, not just a traditional organizational service.

4- Western Travel Narratives as Historical Sources.

Burton's book, *Personal narrative of a pilgrimage to Al-Madinah and Meccah*, is among the earliest Western documents to record a visit to Medina as part of the Hajj pilgrimage. It explicitly describes the role of a "local guide" whom the narrative calls "Shaykh Hamid" who accompanied the explorer, assigning him the task of guiding, organizing the visit, and directing the pilgrim within the city among the holy sites. This description is an early (mid-19th-century) testimony demonstrating that the concept of the "guide" was prevalent at the time, and not a modern invention or solely related to formal organization. This supports the hypothesis that the profession had historical roots predating its institutionalization. From a research perspective, this source offers an opportunity to compare local memory (as recorded in Arabic sources) with the Western traveler's account. This allows for a critical analytical reading of how outsiders perceived it contextually and culturally, and the questions it raises about representations, biases, and the intersection of religion and culture. Furthermore, Burton's

testimony demonstrates how services associated with pilgrimage including guidance and accompaniment were an important part of the city's visitor reception structure at the time, making it a cornerstone of your research, which examines guides as a historical and social phenomenon.

Burton (2011) introduces the Muzawwir as the spiritual guide or conductor of the "Zair" (visitor) undertaking the ritual of Ziyarat (Visitation) to the Prophet's Sepulchre in Al-Madinah. He notes that almost all citizens of Al-Madinah who do not hold official charges at the temple qualify themselves to act as Muzawwirs. They begin training as boys, learning the necessary formulas and techniques for conducting visitors, often supporting themselves "partly by begging, partly by boldness". Burton vividly details the transformation of his own guide, Shaykh Hamid, describing how Hamid exchanged his "dirty, torn shirt" for rich attire, including a light pink merino cloak, a silk and cotton shirt, a large muslin turban, and an embroidered cap. This change in clothes accompanied a shift in demeanor "from the vulgar and boisterous to a certain staid courtesy". The relationship is transactional but familiar; the Muzawwir often hosts strangers, as Hamid hosted the narrator, and demands a fee based on the guest's means.

During the actual Ziyarat, the Muzawwir directs the visitor's devotions throughout their stay, even taking responsibility for ensuring that religious obligations, such as afternoon prayers, are performed before time runs out. The guide assumes a "professionally solemn" manner, reciting the prayers aloud and instructing the visitor to repeat them. Burton notes that almost every Muzawwir possesses his own particular litany, which is "descends from father to son," and these inherited oral authorities often differ from the published textual references. This relationship transcends the visit itself; the fee paid for the Muzawwir's services does not end the connection. If the Muzawwir later travels to the Zair's home country, he expects generous hospitality and a "handsome present" upon departure. Furthermore, devout Zairs may send annual financial remittances to their guide to purchase prayers conducted in their name at the Ka'abah or the Prophet's Tomb, with the money typically secured in a sealed leathern bag (Burton, 2011).

Research Questions:

1. How did the seasonal hosting of international pilgrims shape the culinary heritage and cultural exchange within the households of Al-Madinah?
2. What role did the women of Al-Madinah play in sustaining the intangible social practices of the Adilla?

Chapter 3: Methodology

This research adopted a qualitative approach centered on semi-structured interviews and one focus group discussion with individuals currently or previously involved in the Adila profession in Medina. Participants were selected through purposive and snowball sampling to ensure representation across different generations of practitioners and family roles, thereby capturing diverse experiences of how guidance practices transformed over time and across gender lines.

Four individual interviews were conducted with male participants whose relationships to the profession varied considerably. The first participant was a senior practitioner in his eighties, born in 1364 AH, who had documented the profession's history across 44 volumes and held living memory stretching from

the Ottoman-era taqreer system through the establishment of the National Guides Foundation in 1405 AH. The second was a member of the Bri family — whose Ottoman religious lineage in Medina spans over 140 years — who had practised the profession for approximately fifty to sixty years. The third participant came from outside the profession itself, providing an external perspective on the social and cultural role the Adila played in Medinan community life. The fourth was a practising Adila who offered a critical account of the profession's economic and institutional transformations, particularly the shift from individual taqreer-based work to the current corporate shareholding structure.

In addition to the individual interviews, one focus group was conducted with five women from Adila families who had direct experience of the domestic hospitality economy that sustained the profession. This included women who had worked alongside their fathers as assistants, women who currently hold inherited shares in Adila companies, and women whose family histories spanned the full arc from Ottoman-era taqareer through to present-day corporate structures. The focus group proved particularly productive for surfacing dimensions of the profession that individual male interviews had not addressed, including the management of pilgrim seasons from within the household, the transmission of food cultures between host families and international pilgrims, the practice of Rada'a as a kinship-forming mechanism, and the gendered structure of Adila inheritance. Group interaction also revealed internal tensions between resignation and preservation impulse regarding the passing of traditional practices, consistent with what Morgan (1997) and Wilkinson (1998) identify as the distinctive analytical value of collective discussion for occupational communities.

Semi-structured interviews allowed participants to articulate their personal trajectories, professional knowledge, and memories of how guidance practices operated across different institutional periods. The open format was essential for capturing the oral historical material including genealogical narratives, institutional chronologies, and place-based religious knowledge that forms a significant part of what this research treats as living intangible heritage. Interviews were conducted in Gulf and Hejazi Arabic dialects and recorded with participants' consent.

The interviews and focus group were analysed using thematic analysis following the framework of Braun and Clarke (2006). Five primary themes were identified inductively from the data: the household hospitality economy; women's invisible labour and kinship-making practices; oral knowledge and religious authority; institutional transformation and the erosion of practice; and identity, legitimacy, and belonging. Coding was applied at the level of the individual passage, with attention to whether accounts were firsthand experiential memory, secondhand family knowledge, or institutional description a distinction that proved analytically significant given the variation in participants' generational proximity to pre-corporate practice.

Chapter 4: Results

1. How did the seasonal hosting of international pilgrims shape the culinary heritage and cultural exchange within the households of Medina?

The data showed that the Adila household served as the primary setting for sustained cultural contact between the people of Medina and international pilgrims. This contact was built into the structure of

the profession itself. Pilgrims did not stay in hotels or separate facilities. They lived inside the homes of their guides for the full ten-day period, eating from the family table, sleeping in the household's rooms, and following its daily routines. As one senior practitioner put it, the relationship was one of complete material integration: pilgrims ate what the family ate and drank what the family drank. Any payment was offered voluntarily at departure and was understood as an expression of gratitude rather than a fee for services.

This pattern of shared domestic life created an intimate form of cultural exchange that centered around food. Participants across the interviews described how pilgrims arrived carrying preserved foods from their home countries and introduced them into the host kitchen. An external participant who had witnessed these practices as a child recalled Egyptian pilgrims bringing tin-sealed preserved chicken, packed with spices for the sea voyage, which was then prepared in the host family's kitchen. The women in the focus group gave the most detailed accounts. They distinguished clearly between the food practices of different nationalities. Indonesian pilgrims brought sun-dried meat hung on lines to preserve it. Moroccan and Turkish pilgrims brought varieties preserved in oil. One participant compared the Indonesian dried preparation to the Medinan *muqarmal*, noting the functional similarity between two preservation traditions that had developed separately. Another described the Malay-Indonesian *rendang* and compared its spicing and texture to local dishes, pointing to a shared culinary understanding built over generations of hosting.

The household kitchen therefore functioned as a space of encounter where culinary practices moved in both directions. Pilgrims did not only consume Medinan food; they also cooked their own preparations in the host kitchen, sometimes alongside the women of the household. Over time, certain pilgrim foods entered the everyday vocabulary of Medinan cooking, while returning pilgrims who had stayed with the same family in previous years would specifically request dishes they had eaten before. Food thus became a medium of personal continuity across visits and across years.

The seasonal rhythm of the Adila's work shaped the pace and depth of this exchange. The women described a two-season calendar. The first ran from after Eid al-Fitr through the Hajj period. The second followed the completion of Hajj rites through the end of Muharram. Successive groups of pilgrims passed through the household during these windows. Between groups, the household carried out intensive cleaning and preparation. Participants described this as a form of domestic readiness. Pilgrims travelling by sea from South and Southeast Asia could remain in Medina for up to five or six months because of the limits of maritime travel. As a result, contact with Indonesian, Indian, and Pakistani pilgrims was often extended cohabitation rather than a brief encounter. Participants indicated that this longer duration allowed the exchange to move beyond surface level into genuine familiarity.

Participants from different family backgrounds explained the economic side of this hospitality through the concept of *baraka*. They described how the household sustained itself during the pilgrim season not through fixed prices, but through the belief that serving the guests of the Prophet carried spiritual reward that appeared in material sufficiency. One participant recalled that however much or little a pilgrim was able to leave, the household managed. In their accounts, this understanding placed the relationship outside ordinary commercial exchange and inside a logic of sacred reciprocity. They used this framing to distinguish the earlier system from the corporate model that later replaced it.

2. What role did the women of Medina play in sustaining the intangible social practices of the Adila?

The data established clearly and consistently that women were not peripheral to the Adila profession but constitutive of it, despite being almost entirely absent from its official institutional histories. The focus group with women from Adila families produced the richest evidence on this question. This evidence had no equivalent in any of the male interviews, confirming that the domestic and social dimensions of the profession's practice were carried predominantly in women's memory and transmitted through women's networks.

The most fundamental contribution of women to the Adila's operation was the management of the household hospitality economy itself. While the male Daliil held the *taqreer*, conducted the official reception of pilgrims at the city gates, and guided them through the sacred sites, it was the women of the household who cooked for sometimes hundreds of pilgrims across a season, managed the sleeping arrangements across multiple rooms, organised the cleaning cycles between successive groups, and maintained the domestic infrastructure that made the profession's public face possible. One focus group participant described her father working with a staff of assistants to manage four hundred pilgrims, but the domestic labour that housed and fed those pilgrims was the women's domain. Another participant noted that in households without sufficient domestic help, the women worked through the night between the departure of one group and the arrival of the next. This labour was neither paid nor formally recognised within the profession's institutional structures, yet without it the Adila system could not have functioned at the scale it did.

Beyond domestic management, women sustained a set of social practices that produced lasting bonds between Medinan families and the international pilgrims they served. The most striking of these, and the one that emerged most powerfully in the focus group, was the practice of Rada'a, the Islamic institution of milk kinship through breastfeeding. One participant relayed an account she had received from a woman in her network describing how she had breastfed a sick infant from a Malaysian pilgrim family whose mother was unable to nurse. The act created a permanent kinship relationship under Islamic law between the Medinan woman and the child, and between their respective families. The father subsequently maintained contact with the Medinan family across years, and the bond was recognised and narrated by both sides as a form of family relationship. This was not described as an exceptional event but as one instance of a practice that occurred with some regularity across the community.

The focus group discussion identified the structural conditions that made Rada'a a normalised practice in Medina specifically. Participants drew attention to the spatial organisation of Medinan domestic life, the *hawsh* or shared courtyard structure in which multiple families lived in proximity, and to the extended co-residence of pilgrim families within those households over weeks or months. Women spent their days in close contact with one another and with the pilgrim women staying in their homes, sharing domestic tasks, childcare, and daily routines. In this context, breastfeeding across family boundaries was not culturally remarkable; it was a natural expression of the intimacy that the hosting relationship produced. One participant observed that the sedentariness of Medinan society, in contrast to more nomadic communities elsewhere on the peninsula, had over centuries created the

conditions for this kind of deep neighbourly and inter-communal bonding. The stability of place, she suggested, was itself a form of social infrastructure.

The focus group also surfaced a significant and previously undocumented aspect of women's formal relationship to the profession: the structure of Adila inheritance as it applied to daughters. Participants clarified that daughters of Adila practitioners inherited shares in the profession, but that those shares did not pass to their children. A daughter could hold and benefit from her inherited portion during her lifetime, but upon her death the entitlement ended rather than descending to the next generation. Sons, by contrast, passed their shares to their own children in the normal pattern of inheritance. This asymmetry meant that women were structurally embedded in the profession's economy while being excluded from its generational continuity, a form of participation without perpetuation that mirrored the broader invisibility of women's labour within the profession's official history. Participants noted that more recent reforms had modified this structure to allow daughters to pass shares to their children as generic heirs, though the title of Daliil itself remained inaccessible through the female line.

Finally, the focus group revealed a generational tension within Adila families regarding the transmission of memory about the old practices. When the researcher asked participants how they expected their own children to understand the Adila tradition, one participant responded with the phrase that is perhaps the most resonant in the entire dataset: "ما تحكوا لهم", "there is no point telling them. Another immediately disagreed: "نحكيهم", "we must tell them. This exchange captured the central stakes of the research in a single conversational moment. The women who had lived inside the hospitality economy, who had cooked for pilgrims, managed the household between seasons, and in some cases formed kinship bonds through breastfeeding, were now uncertain whether the world they were describing was transmissible to children who had grown up knowing only the corporate system. The tension between resignation and preservation impulse was not resolved within the focus group, which is itself analytically significant. It suggests that the intangible heritage of the Adila profession is not simply threatened from outside by institutional reform, but is also subject to internal negotiation about whether it remains meaningful enough to pass on.

Chapter 5: Discussion

The findings in Chapter 4 show that the Adila profession operated as more than a system of guided visits to the sacred sites. They reveal two dimensions that official institutional histories have largely left out: a domestic hospitality economy sustained primarily by women, and a pattern of transnational cultural exchange produced through prolonged cohabitation and shared daily life inside Medinan households.

These dimensions complicate the common narrative of steady organisational progress from informal family practice to regulated corporate structure. The evidence from the women's focus group makes clear that the domestic labour of cooking, arranging sleeping spaces, and managing the household between successive groups was essential to the profession's functioning at scale, yet remained largely invisible in its formal records. At the same time, the accounts of food exchange demonstrate that the Adila household acted as a space where culinary practices and tastes moved in both directions over long periods. Indonesian, Egyptian, Moroccan, Turkish, and Malay preparations entered Medinan kitchens, while returning pilgrims carried memories of Medinan dishes back to their home countries

and requested the same foods on later visits. This exchange was not organised through formal negotiation. It emerged from the ordinary intimacies of preparing and sharing meals across weeks or months of co-residence.

The seasonal structure of the work reinforced this pattern. Extended stays by sea pilgrims from South and Southeast Asia turned what might have been brief encounters into sustained relationships. Participants linked the depth of exchange to this duration. They also framed the economic dimension of hospitality through *baraka*, describing a relationship of sacred reciprocity rather than fixed commercial transaction. This framing, they suggested, distinguished the earlier Adila system from the corporate arrangements that followed.

The data on women's roles further shows that the most enduring social bonds often formed outside the official, male-led structures of the profession. The practice of Rada'a created permanent kinship relations under Islamic law between Medinan women and pilgrim children, and between their families. These bonds continued across years and were recognised by both sides as family ties. In contrast to the seasonal and regulated relationship maintained by the male Daliil through the *tagreer* system, the Rada'a bond operated without institutional oversight and produced effects that lasted beyond any single season.

What emerges from these findings is that the intangible heritage of the Adila profession resided not only in documented procedures or titles but in the social relations and daily practices that the corporate model later displaced. The tension recorded in the final moments of the focus group, between the impulse to transmit these memories and the sense that "there is no point telling them", points to a deeper question for heritage studies: how communities themselves negotiate whether and how a practice remains meaningful once the conditions that gave it force have changed. The Adila case suggests that this negotiation is not a failure of heritage consciousness, but a response to real discontinuity between past conditions and present realities. Future work could usefully examine what forms of partial or transformed transmission, storytelling, cooking, informal memory-sharing, allow elements of such heritage to persist even when institutional continuity is broken.

Conclusion

This study has shown that the Adila profession in Medina was sustained by far more than the visible work of male guides. The household itself, and the women who managed its daily life, formed the real foundation of the system. Through prolonged cohabitation with international pilgrims, these households became spaces of sustained cultural exchange, most visibly in the sharing and adaptation of food practices. Indonesian, Egyptian, Moroccan, Turkish, and Malay culinary traditions entered Medinan kitchens, while returning pilgrims carried memories of local dishes back to their home countries. What participants described was not a superficial encounter but a form of intimate, reciprocal exchange built over weeks and sometimes months of shared domestic life.

The findings also make clear that women's contributions extended well beyond practical labour. The practice of Rada'a created permanent kinship bonds that outlasted any single pilgrim season and operated outside the formal structures of the profession. These bonds, formed through breastfeeding across family lines, produced relationships that participants recognised as family ties rather than

temporary hospitality. In this sense, the most enduring social effects of the Adila system often emerged from practices that remained invisible in official histories and institutional records.

At the same time, the study reveals the fragility of this heritage. The generational tension recorded in the focus group, between the view that there is “no point telling them” and the insistence that “we must tell them”, captures a deeper uncertainty. Women who had lived inside the old hospitality economy are now questioning whether the world they knew can be meaningfully passed on to children who have only known the corporate system. This tension is not simply about loss. It reflects a rational response to the disappearance of the social conditions, extended co-residence, household-based reception, and the interpretive frame of *baraka*, that once gave these practices their force.

The Adila case therefore raises important questions for the safeguarding of intangible cultural heritage. When community members themselves are divided about whether a practice remains worth transmitting, external efforts to document or revive it may have limited effect. The findings suggest that heritage survival in such contexts may take partial and transformed forms, through storytelling, cooking, or informal memory-sharing, rather than through the restoration of the original institutional structures. Future research could usefully explore how other communities in the region are negotiating similar tensions between rapid modernisation and the desire to maintain older forms of social and cultural practice.

Ultimately, this study argues that any serious account of the Adila profession must center the domestic sphere and the women who sustained it. Without that dimension, the story of transformation remains incomplete, and the deeper social and cultural significance of the old system stays out of view.

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Architectural Heritage Assetisation Workflow: Towards the Tokenisation of Digital Heritage Assets

Abdullah Almudarra

Abstract

The accelerating development of digital technologies has broadened how architectural heritage is documented, conserved, and governed, moving practice well beyond conventional preservation. Within this expanding field, however, comparatively little attention has been given to how these technologies might be connected within a single operational workflow capable of transforming architectural heritage into governed digital heritage assets.

This study addresses that gap by identifying the operational stages involved in architectural heritage tokenisation and by examining the relationships that bind those stages together. The investigation is framed through the proposed Architectural Heritage Assetisation Workflow and pursued through a qualitative exploratory design, drawing on semi-structured interviews and thematic analysis to interpret how digital heritage processes operate within architectural heritage settings.

The findings indicate that tokenisation in this domain is best understood as a connected operational sequence rather than a set of discrete technical procedures. Progressive relationships are identified between heritage digitisation, information modelling, semantic enrichment, digital verification, and tokenisation. The study contributes to current debates in digital heritage by articulating an operational framework for the staged transformation of architectural heritage into verified and tokenised digital heritage assets.

Keywords: Architectural Heritage; Digital Heritage; HBIM; Semantic Enrichment; Blockchain Verification; Heritage Tokenisation; Digital Heritage Assetisation.

Chapter 1: Structure of the Thesis

Introduction

Digital technologies have reshaped contemporary approaches to architectural heritage documentation and conservation. Tools such as Heritage Building Information Modelling (HBIM), semantic enrichment, blockchain verification, and tokenisation have extended heritage practice well beyond traditional documentation toward broader questions of digital management and governance.

These processes, however, are most often studied in isolation. Their operational connections — how the output of one stage prepares the input of the next — have received comparatively little sustained attention. The present study addresses this through the proposal of an Architectural Heritage Assetisation Workflow, which traces how architectural heritage may progressively transition from physical form into a verified and tokenised digital heritage asset within wider digital heritage systems.

Problem Analysis

Digital documentation and modelling of architectural heritage have advanced considerably over the past two decades. Terrestrial laser scanning and close-range photogrammetry now provide reliable geometric records of heritage elements (Remondino, 2011), while Heritage Building Information Modelling has extended those records into semantically enriched, parametric representations (Murphy et al., 2013; Pocobelli et al., 2018). In parallel, blockchain and tokenisation have entered cultural heritage scholarship as instruments for verifying integrity and for governing the custody, rights, and use of digital records (Boumezbeur et al., 2024; Del Vacchio & Bifulco, 2022; Whitaker, 2019).

These two trajectories have, until recently, developed largely in parallel rather than as part of a unified workflow. Documentation and modelling research has concentrated on producing accurate digital representations; blockchain-oriented work has focused on what to do with such representations once they exist. The pathway joining the two — the route by which a documented and modelled heritage element becomes an anchored, governed digital asset — remains underspecified.

What emerges is therefore not a deficit of techniques at any single stage, but the absence of a clearly articulated workflow explaining how an architectural heritage element progresses from physical documentation, through modelling and verification, into a governed digital heritage asset. Addressing this articulation provides the foundation for the research questions, aims, and objectives set out below.

Research Questions

This study seeks to answer the following questions:

Main Research Question

How can an architectural heritage element be transformed into a digital heritage asset through an operational tokenisation workflow?

Sub-research Questions

1. What operational stages constitute the transformation of an architectural heritage element into a digital heritage asset?
2. How can these operational stages be tailored within an architectural heritage tokenisation workflow?

Research Aim

To examine the operational workflow through which an architectural heritage element may be transformed into a digital heritage asset.

Research Objectives

1. To identify the operational stages involved in transforming an architectural heritage element into a digital heritage asset.
2. To tailor these operational stages within an architectural heritage tokenisation workflow.

Chapter 2: Literature Review

Scholarship on the digitisation and governance of architectural heritage spans capture techniques, modelling practice, ledger architectures, and tokenisation frameworks. The review that follows brings these strands together along the operational stages of a single workflow, attending in each case to how a given stage conditions the next.

Capture and Documentation

In this body of work, capture refers to the acquisition of raw data from the heritage element, typically through terrestrial laser scanning (TLS) and close-range photogrammetry. Comparative studies consistently report that the most dependable records emerge from combining the two techniques rather than relying on either in isolation (Bolognesi et al., 2014; Remondino, 2011). Boumezbeur et al. (2024), working at Ahmed Bey's Palace in Constantine, Algeria, extend the capture stage further: each scan's timestamps, geospatial coordinates, equipment identifiers, and ambient conditions are cryptographically signed at the moment of acquisition, producing what they describe as "an auditable trail of data provenance" (Sec. 5).

Documentation is the broader practice within which capture is situated. The heritage literature treats it as the foundation of any subsequent intervention (Letellier, 2007), with the Nara Document (ICOMOS, 1994) serving as the customary normative reference for authenticity. Ch'ng (2019) carries the implication into the digital domain, observing that without anchoring "scarcity is not in the nature of digital copies and therefore value cannot be guaranteed" (p. 5). UNESCO had drawn a corresponding institutional inference somewhat earlier, noting that legal deposit and other traditional methods "cannot be applied as such to digital material" (Webb, 2003, Preface), and that responsibility for digital documentation must therefore be redistributed across technical and curatorial roles.

Two recent frameworks give documentation its operational shape. The Saudi Ministry of Culture's Cultural Heritage Documentation and Digital Archiving Guide (Ministry of Culture, n.d.) sets out a three-phase scheme — identification, baseline documentation, and digital archiving — and frames documentation as "an ongoing process throughout the entire cultural heritage management lifecycle" (Glossary, p. 13). Liu et al. (2025) propose a parallel three-phase model for digital cultural heritage resources — digitisation, storage and preservation, and access and dissemination — treating it as the operational layer onto which blockchain-based integrity is later mapped.

Modelling and Semantic Enrichment

Modelling reorganises captured data into an object-based digital representation. Heritage Building Information Modelling (HBIM) emerged precisely from this transition, translating scan data into parametric objects derived from architectural treatises (Murphy et al., 2013). Subsequent reviews chart its movement away from purely geometric reconstruction toward semantically enriched models that carry information on material, period, and conservation state (Pocobelli et al., 2018).

Bilogriović and Stublić (2023) read the same shift as the conceptual basis of the smart museum, in which "the use of BIM ..., IoT, blockchain technology, and other advanced technologies" allows sensor data and security logs to travel alongside the model (Sec. F). Anagnostakis (2019), drawing on the CIDOC Conceptual Reference Model (Doerr, 2003), pushes the argument further: the semantic record itself can be fingerprinted through a SHA hash of its XML document, while "the actual content of the

documentation may still relay under the copyright of the documentalist" (p. 2). Liu et al. (2025) describe a parallel development at the metadata layer, proposing "context-aware unique identifiers in blockchain" that integrate environmental conditions and restoration histories. The heritage digital-twin literature adds a temporal axis to the same record, representing the model as continuously refreshed through sensor data and intervention logs (Jouan & Hallot, 2020).

Hashing, Anchoring, and Verification

A consistent operational pattern runs through studies that bind the documented and modelled record to a verifiable on-chain reference. Boumezbeur et al. (2024) implement the pattern directly: each captured dataset is hashed with SHA-256, the resulting hash is anchored on the blockchain as proof of integrity, and the heavy point-cloud data are stored on the InterPlanetary File System (IPFS), from which they may be retrieved and re-hashed when verification is required. Basile et al. (2019) reason along similar lines for the Italian national cultural-goods catalogue, combining Ethereum, IPFS, and Elasticsearch so that Ethereum "guarantees the integrity of IPFS links and Elasticsearch identifiers while IPFS guarantees the integrity of JSON objects" (Sec. IV). Their motivation is the diagnosis that centralised heritage catalogues operate as "single-point-of-failure" infrastructures (Sec. I), which the layered design is intended to mitigate. Peruccio et al. (2025) generalise the same logic into a seven-step notarisation workflow — hash generation, transaction creation, network verification, registration, certificate issuance, timestamping, and verification document — developed for corporate archives but readily transposable to heritage records.

Read together, these contributions converge on a shared principle: anchoring is kept distinct from on-chain storage of the underlying data, only the hash resides on the ledger, and verification proceeds by recomputing the hash from the off-chain record.

Tokenisation and Governance

In this literature, tokenisation refers to the issuance of an on-chain identifier paired with smart-contract rules, rather than the financial mechanics typically associated with non-fungible tokens. Whitaker (2019) sets out the conceptual ground, arguing that distributed ledgers in the arts function less as market instruments than as a means of constructing trustworthy chains of custody — a position that Valeonti et al. (2021) carry into museum and OpenGLAM contexts. Whitaker et al. (2021), drawing on the Byzantine Fresco Foundation case, demonstrate how ownership, exhibition rights, revenue shares, and dividends can each be encoded as separate, shareable tokens, recasting tokenisation as "assigning an object a digital identity" (p. 1).

Kuznetsov et al. (2024) press this further by foregrounding the identifier function of non-fungible tokens — "the value of NFTs lies not in themselves but in the unique digital resources they link to" — and propose "global tokenization of UNESCO World Heritage sites" as a plausible application (Sec. 1). Liu et al. (2025) extend the notion through programmable tokens that "incorporate usage-rights clauses, such as exhibition limits and reproduction terms, to enforce ethical access controls." Del Vacchio and Bifulco (2022) consolidate the field through three recurring governance categories — provenance and authenticity, tokenisation and fractional equity, and rights management — a grouping that Stublić et al. (2023) substantively confirm. Duguleană et al. (2024) operationalise one such

category in the REVSHARE architecture, dividing a heritage asset into one hundred ERC-1155 shares and distributing revenue through an ERC-20 token whose price tracks visitor ratings.

Across this body of work, the token presupposes the documented, modelled, and anchored record produced upstream, and serves as the layer on which rules of use are finally made operational. Table 1 summarises the stages and the representative sources associated with each.

Table 1. Operational Stages of the Workflow and Representative Sources

Stage	Operational Activity	Representative Sources
1. Capture	Acquisition of raw data through TLS and close-range photogrammetry, with acquisition of metadata cryptographically signed at source.	Bolognesi et al. (2014); Remondino (2011); Boumezbeur et al. (2024)
2. Documentation	Production of formal records, condition reports, and lifecycle metadata within a recognised heritage documentation framework.	Letellier (2007); Ministry of Culture (n.d.); Liu et al. (2025)
3. Modelling and Enrichment	Reconstruction into a parametric HBIM aligned with the CIDOC Conceptual Reference Model; ongoing updating through digital-twin practices.	Murphy et al. (2013); Pocobelli et al. (2018); Anagnostakis (2019); Doerr (2003); Jouan & Hallot (2020); Bilogrivić & Stublić (2023); Liu et al. (2025)
4. Hashing, Anchoring, and Verification	SHA-256 fingerprinting of records and models; off-chain storage on IPFS; on-chain anchoring of hashes; verification by re-hashing.	Basile et al. (2019); Boumezbeur et al. (2024); Peruccio et al. (2025)
5. Tokenisation and Governance	Issuance of identifier tokens bound to smart-contract rules covering ownership, exhibition, reproduction, and revenue distribution.	Whitaker (2019, 2021); Valeonti et al. (2021); Kuznetsov et al. (2024); Duguleană et al. (2024); Liu et al. (2025)

Open Issues in the Literature

Several issues remain unresolved across the literature. Sappa (2023) shows that national heritage codes constrain what can be encoded in a smart contract issuing a token from a tangible element,

noting that “prevention measures ... some rules expressly ban destruction, as well as any other act or physical contact with the cultural good that is able to damage it” (Sec. II) — a restriction that bears directly on the very acts producing the record itself. Stublić et al. (2023) draw attention to an unresolved binding problem between the physical object and its on-chain counterpart, asking how physical objects can be linked to the blockchain “in a way that ensures durability and resistance to counterfeiting” (Sec. 4.2). Liu et al. (2025) caution that the immutability prized for integrity may also “freeze heritage narratives, potentially suppressing dynamic or contested interpretations.” Peruccio et al. (2025) flag a parallel tension with European data-protection law, where rights of rectification and erasure sit awkwardly alongside an immutable ledger. Woodall and Ringel (2020) add a discursive caution: “trust,” they argue, operates as a rhetorical frame through which blockchain has entered archival practice — a useful reminder that technical guarantees do not by themselves secure institutional credibility.

Research Gap

Although each stage of the digital heritage process is well represented in the literature, the operational transitions between those stages remain underdeveloped. Studies of capture and documentation rarely consider how their outputs feed into modelling; modelling studies seldom examine how a semantically enriched record is prepared for hashing and anchoring; and tokenisation studies tend to presume the existence of a verified upstream record without specifying how it is produced or maintained. Existing reviews reinforce this pattern, treating provenance, verification, and rights management as separate categories rather than as sequential stages within a single workflow (Del Vacchio & Bifulco, 2022; Stublić et al., 2023).

Consequently, no established workflow articulates, in operational terms, how an architectural heritage element moves from physical documentation, through modelling and verification, into a governed digital heritage asset. The gap is therefore procedural rather than technical: the components are available, but their interconnection has not yet been formalised.

The present study addresses this gap by identifying the operational stages of such a workflow and by tailoring them within an architectural heritage tokenisation process. The methodology that follows is designed to render these transitions explicit and amenable to examination.

Chapter 3: Research Methodology and Methods

This chapter sets out the research methodology adopted to examine how an architectural heritage element may be transformed into a digital heritage asset through an operational tokenisation workflow. A qualitative exploratory design is employed to investigate the operational stages that constitute the workflow and the relationships that bind them together.

Theoretical Framework

The study is positioned within an operational framework of architectural heritage tokenisation. It draws on current scholarship in digital heritage documentation, HBIM, blockchain verification, and tokenisation in order to examine how these stages can be understood as components of a connected workflow rather than as separate procedures (Basile et al., 2019; Murphy et al., 2013; Whitaker, 2019).

Research Approach

A qualitative exploratory approach is adopted as it offers the interpretive flexibility required to examine emerging operational relationships within digital heritage workflows. Rather than testing predetermined hypotheses, the design seeks to surface the ways in which discrete operational stages connect, and to do so in the practitioners' own terms.

Data Collection

Interviews

Approximately ten semi-structured interviews were conducted with heritage and digital specialists, drawn primarily from the Heritage Commission of the Saudi Ministry of Culture and from associated information-systems consultancies. Participants were selected purposively on two criteria: direct involvement in the digital documentation or digital governance of architectural heritage, and demonstrable familiarity with at least one of the technologies under examination (HBIM, blockchain verification, or tokenisation). The interview protocol explored the operational stages identified in the literature, the relationships among them, and the practical conditions under which they are enacted.

Focus Group

A small focus group discussion was conducted in parallel to support the interpretation of workflow relationships and to test whether the proposed stage sequence corresponded to participants' professional experience of digital heritage processes.

Data Analysis

The collected material was analysed through thematic analysis following the procedure outlined by Braun and Clarke (2006), which was selected for its capacity to identify, organise, and interpret patterns of meaning across qualitative data without imposing a fixed theoretical structure. Coding proceeded iteratively, moving from familiarisation with the transcripts through initial code generation to the construction of operational themes corresponding to the stages of the proposed workflow. The approach made it possible to attend both to the recurrence of operational categories and to the relationships participants articulated between them.

Chapter 4: Findings and Analysis

The findings indicate that the transformation of architectural heritage into a tokenised digital heritage asset proceeds through a connected operational workflow composed of progressive, mutually dependent stages. Focus group participants concurred that the principal objective of documenting architectural heritage sites through technologies such as three-dimensional laser scanning is to support conservation and preservation planning. On this basis, they emphasised that any tokenisation workflow should remain specifically tailored to architectural heritage contexts, given their specialised conservation and documentation requirements.

Figure 1 presents the proposed Architectural Heritage Assetisation Workflow in conceptual form, while Table 2 sets out the operational stages identified through the interviews and focus group discussions.

Each stage is characterised by a defined input, a set of operational activities, and a discrete output that conditions the input of the subsequent stage.

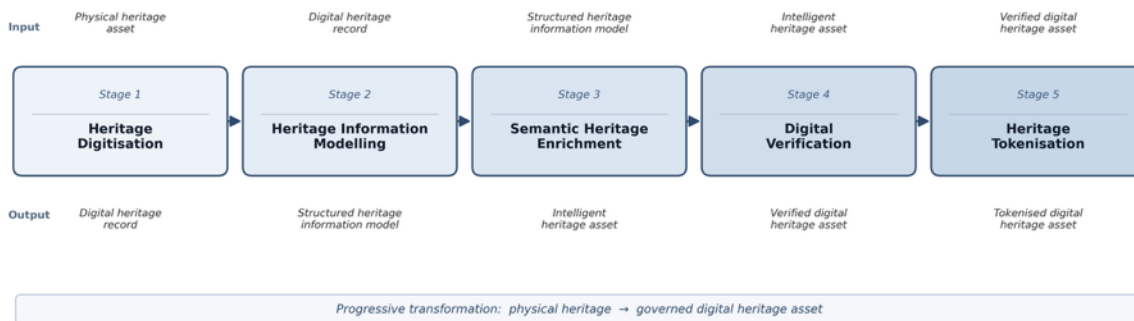


Figure 4. *The Architectural Heritage Assetisation Workflow.*

Table 2. *Operational Stages of the Architectural Heritage Assetisation Workflow*

Stage	Input	Key Processes	Output
Heritage Digitisation	Physical architectural heritage asset	• Laser scanning • Photogrammetry • Imaging • Point-cloud generation	Digital heritage record
Heritage Information Modelling	Digital heritage record	• HBIM modelling • Geometric reconstruction • Object-based modelling • Spatial organisation • Information structuring	Structured heritage information model
Semantic Heritage Enrichment	Structured heritage information model	• Metadata integration • Ontology mapping • Heritage classification • Contextual relationships • Semantic linking	Intelligent heritage asset
Digital Verification	Intelligent heritage asset	• Hashing • Blockchain anchoring • Authentication protocols • Integrity validation	Verified digital heritage asset
Heritage Tokenisation	Verified digital heritage asset	• Smart contracts • Blockchain registration • Digital identifiers • Governance protocols	Tokenised digital heritage asset

The first stage, Heritage Digitisation, converts the physical architectural heritage asset into a digital heritage record through procedures including laser scanning, photogrammetry, imaging, and point-cloud generation. Participants emphasised that the reliability of every downstream stage depends on the precision and completeness achieved at this initial step. Ibrahim Aljuwair, Director of Urban Heritage Documentation at the Heritage Commission, explained that "Today, we use advanced digital technologies to document urban heritage sites, such as three-dimensional laser scanning."

The second stage, Heritage Information Modelling, structures the digital heritage record into a coherent heritage information model through HBIM modelling, geometric reconstruction, object-based modelling, and information structuring. This stage was repeatedly described as the point at which heritage information becomes operationally manageable, supporting later interoperability and management. Abdullah Malloush, Digital Heritage Specialist at the Heritage Commission, observed that "We currently have a new project using BIM to manage urban heritage buildings. The system can

display conservation conditions, identify authentic and non-authentic elements, and document development stages."

Building on this, Semantic Heritage Enrichment functions as a transitional layer between digital modelling and digital governance. Through metadata integration, ontology mapping, semantic linking, and heritage classification, the structured model develops into an intelligent heritage asset that carries contextual and operational heritage information. Hamed Alharbi, Information Systems Specialist at the Heritage Commission, noted that "Three-dimensional models can be linked with the Urban Heritage Register to provide information about the building details, such as whether the architectural style is Najdi or whether a specific door belongs to the southern region."

The fourth stage, Digital Verification, establishes integrity and authenticity through hashing, blockchain anchoring, authentication protocols, and integrity validation. Participants associated this stage with the establishment of trust, traceability, and reliability across digital heritage workflows. Mohammed Alshahwan, Information Systems Consultant, explained that "Digital data should first undergo hashing, producing a fixed string of numbers and letters. Any modification becomes detectable, after which the data may be registered on the blockchain."

In the final stage, Heritage Tokenisation, the verified digital heritage asset acquires a digital identity and a governance layer through blockchain registration, smart contracts, and digital identifiers, producing a tokenised digital heritage asset. Mohammed Almazrou, Technology Team Leader at the Heritage Commission, observed that "The Ministry has started exploring the transformation of some assets into NFTs; however, the technology remains relatively new and still lacks a clear national governance framework."

Taken together, the findings indicate that architectural heritage tokenisation is most usefully understood as a connected Architectural Heritage Assetisation Workflow rather than as a collection of isolated technical procedures.

Chapter 5: Discussion and Recommendations

Discussion

The findings suggest that architectural heritage tokenisation is best understood not as a sequence of isolated technical procedures but as a connected operational workflow. What makes tokenisation effective in this domain, the data indicate, is the continuity that holds between digitisation, information modelling, semantic enrichment, verification, and governance — each stage producing the conditions on which the next depends. Workflow integration, according to this reading, is not an organisational preference but a structural requirement of digital heritage systems.

A particularly important finding concerns the role of semantic enrichment, which emerges as a transitional layer within the workflow rather than as an optional refinement. Through metadata integration, ontology mapping, and contextual heritage information, the model moves beyond geometric representation to become an intelligent heritage asset capable of supporting subsequent verification and governance.

A further implication concerns the broader purposes of architectural heritage digitisation. The interviews and focus group suggest that the value of digitisation extends beyond documentation and conservation to encompass digital governance, traceability, accessibility, and — over time — the possibility of structured digital heritage investment environments. In this sense, the Architectural Heritage Assetisation Workflow is positioned not only as a technical sequence but as a foundation for the longer-term assetisation of architectural heritage.

Recommendations

1. Further develop the technical procedures and operational relationships that constitute the proposed Architectural Heritage Assetisation Workflow.
2. Develop national heritage registers capable of supporting the enrichment and interoperability of tokenised digital heritage assets.
3. Extend architectural heritage digitisation beyond preservation toward digital governance and emerging heritage investment opportunities within the Heritage Conservation Value Chain.

Chapter 6: Conclusions

This study has proposed an Architectural Heritage Assetisation Workflow that connects digitisation, information modelling, semantic enrichment, verification, and tokenisation within a single operational sequence. The findings indicate that architectural heritage tokenisation should be approached as a connected workflow rather than as a set of discrete technical procedures, and that the analytical and practical value of the workflow rests on the continuity between its stages. The study further suggests that the digitisation of architectural heritage carries implications well beyond preservation alone, opening pathways toward digital governance and the longer-term assetisation of heritage within wider digital heritage systems.

Primary Qualitative Sources

The following primary qualitative sources are the interview participants and focus group discussants whose contributions are directly cited or discussed in Chapter 4: Findings and Analysis. Their participation is acknowledged here with their professional affiliations at the time of data collection.

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The Semiotics of Scaled Heritage: Reconfiguring Costume-Embedded Symbolism into Portable Tourism Objects

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Abstract

Traditional garment ornamentations form a vital repository of intangible cultural heritage, encoding regional identities, collective memory, and complex systems of non-verbal social communication. Within contemporary tourism economies, however, these heritage expressions remain physically bound to full traditional costumes. The intensive production requirements, ceremonial scale, and structural complexity of these complete ensembles restrict their routine circulation and broader market integration. This article theorizes the design-led translation of traditional costume embroidery into smaller, portable, and functional tourism objects without sacrificing their symbolic and historical coherence. Using a qualitative interpretive design grounded in narrative inquiry and complemented by an autoethnographic perspective, this study examines empirical data gathered from master artisans and tourists across three distinct cultural heritage settings in Saudi Arabia: the Banan Handicraft Exhibition week in Riyadh, Historic Jeddah, and the Writers and Readers Festival in Taif. The interpretive analysis reveals a pronounced semiotic divergence between the deep linguistic systems enacted by artisans and the aesthetic surfaces consumed by tourists, creating a conceptual field of tension. To bridge this interpretive gap, this article introduces a dual-stage conceptual framework consisting of 'symbolic condensation' and 'contextual alignment.' The model demonstrates how core embroidery elements—including motif hierarchy, structural repetition, and spatial zoning—can be structurally reconfigured and materially adapted for functional, daily-use objects. Ultimately, this paper positions design-mediated recalibration not as cultural loss or an inauthentic reduction, but as a strategic model of managed continuity that facilitates the active circulation of intangible textile heritage within the global creative economy.

Keywords: sartorial semiotics, intangible cultural heritage, sustainable tourism, creative economy, traditional embroidery, symbolic condensation, Saudi Arabia

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Embroidery represents a fundamental visual and material language in traditional apparel worldwide, serving as a sophisticated mechanism through which communities encode historical trajectories, regional affiliations, and social stratifications. Rather than operating as a secondary or purely decorative surface addition, embroidered ornamentation forms an organized visual system integrated directly into a garment's architecture (Alotaibi, 2025; Alotaibi & Starkey, 2020). Elements such as motif configuration, stitch density, color contrast, and spatial zoning function as codified markers of collective memory and local identity. Historically, key areas—most notably necklines, cuffs, front panels, and hems—have served as structured graphic zones where local ties and community

affiliations are materially expressed (Alotaibi & Starkey, 2018; Tawfiq & Marcketti, 2017). Through this internal visual logic, traditional apparel functions as an active site of non-verbal communication, mediating identity and preserving heritage across generations.

In contemporary heritage preservation, however, craft traditions face a structural paradox. While traditional costumes hold deep symbolic meaning, they are concentrated within full, elaborate garments whose ceremonial nature, complex production, and high cost restrict their routine circulation. These full ensembles do not easily align with the practical demands of international tourism markets, which prioritize portability, affordability, and everyday usefulness (Li, 2023; Wilkins, 2011). As a result, a gap emerges between preserving living archives of intangible cultural heritage (ICH) and activating them economically within tourism destinations. Traditional embroidery possesses a transferable capacity that extends far beyond the physical containment of the original garment form; yet, the design-led translation of these textile systems into compact, everyday tourism artifacts remains under-examined in current tourism and material culture scholarship.

This article addresses this academic and practical gap by examining the semiotic and material changes that occur when traditional hand embroidery transitions from full garments into functional, tourism-oriented products while retaining its compositional integrity. Moving beyond simple reductions or direct replications, this study views this transformation as a design-led negotiation among multiple stakeholders, including expert artisans who hold embroidered craft knowledge and tourists who bring specific consumption expectations. By focusing on how visual systems adapt to new dimensions, this paper explores how regional legibility is maintained under altered functional constraints. Ultimately, this inquiry advances heritage management discourse by demonstrating that design-centered adaptation can serve as a powerful mechanism for cultural sustainability, transforming static historical aesthetics into dynamic, circulating expressions of living identity.

Theoretical Foundations and Literature Review

Sartorial Semiotics: Traditional Inscription and Visual Dialects

To understand the complexities of adapting textile crafts, dress and ornamentation must be viewed as active, socially embedded systems of meaning rather than static material antiquities. Contemporary design scholarship increasingly views cultural heritage as a dynamic process through which societies build, transmit, and continuously renegotiate identity over time (Apaydin, 2019; Harrison, 2013). This perspective moves away from object-centered definitions, positioning material artifacts as nodes within an integrated network of memory, skill, and social performance. Munjeri (2004) refutes purely tangible preservation models, arguing that intangible dimensions such as craftsmanship, embodied knowledge, and symbolic transmission are the primary processes through which material culture gains value. This interdependence is formalized under the 2003 UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage, which defines heritage as a living practice sustained within communities. Tangible and intangible elements are deeply connected: material forms serve as physical carriers of intangible memory, while skilled practice animates those forms in social life.

Traditional embroidery exemplifies this relational system, operating simultaneously as a material artifact and an archive of encoded cultural knowledge. Within the Arabian Peninsula, traditional

embroidery is a historically grounded practice shaped by centuries of interaction among environmental conditions, migration patterns, regional trade networks, and belief systems (Humudh, 2016). The historical emergence of Islamic aesthetics introduced a profound reorientation in regional design language, establishing abstraction, geometry, and rhythmic repetition as dominant layout principles (Munjeri, 2004). This aesthetic system created regional visual dialects that remain highly legible today.

In the mountainous areas of western and southern Saudi Arabia (such as Taif, Al Baha, and Asir), dense, texturally heavy stitch work and bold color combinations reflect relatively sedentary lifestyles and specific climatic needs (Alotaibi, 2025). Conversely, embroidery within Bedouin nomadic contexts demonstrates structural modularity, portability, and symbolic restraint, optimized for resource efficiency and mobility (Apaydin, 2018). These regional dialects are highly structured and follow strict rules of spatial zoning and composition. As documented in major textile collections like the Mansoojat Foundation, specific embroidered bands signaling marital status, social lineage, or geographic origin were restricted to designated garment zones, such as the chest panel (rahrah) or sleeve edges (Alotaibi & Starkey, 2020; Tawfiq & Marcketti, 2017). This spatial zoning underscores that traditional garments operate as complete, self-contained communication systems. Because traditional dress functions as a complex non-verbal language, extracting motifs from this holistic matrix and inserting them into contemporary products introduces semiotic instability that must be carefully managed through deliberate design theory.

The Souvenir Interface: Mnemonic Devices and Material Circuits

In tourism scholarship, souvenirs are analyzed as critical material mediators between place, experience, and memory. Sthapit and Björk (2017) connect souvenirs to memorable tourism experiences (MTEs), framing the object as a physical anchor that extends emotional attachment beyond the travel period. In contrast, post-holiday consumption frameworks proposed by Masset and Decrop (2020) show that an object's meaning is not fixed at the time of purchase; instead, its meaning evolves as it is integrated into domestic environments and daily routines. Li (2023) notes a pervasive theoretical fragmentation across these parallel fields, observing that key concepts like authenticity, motivation, satisfaction, and material memory have developed in isolation rather than within a single, cohesive framework. This theoretical gap becomes particularly acute when examining heritage-based, craft-intensive souvenirs.

Unlike generic or mass-produced tourist items, heritage-bearing textile souvenirs do more than index memories; they carry specific cultural codes, technical expertise, and regional identities (Zhu et al., 2023). When a tourist interacts with a hand-embroidered artifact, the object functions across overlapping value systems. It simultaneously represents an economic commodity, an individual's travel narrative, and an active vehicle of cultural representation (Paraskevaidis & Andriotis, 2014). Hume (2013) emphasizes that souvenirs do not merely reflect culture but materialize and circulate it across international networks. However, intense commercialization and mass production risk standardizing cultural expressions, which can dilute perceived authenticity when artifacts are severed from their original contexts (Dumbrovská & Fialová, 2019). Material culture scholarship addresses this by rejecting static definitions of authenticity, asserting instead that authenticity is a fluid, negotiated construct co-produced through modern interactions among producers, designers, and consumers (Qiu et al., 2024).

Sustainable Heritage Management and the Creative Economy

To resolve the tension between preservation and market circulation, this study aligns with contemporary heritage management theory, which frames heritage as an actively managed and institutionally mediated domain rather than a fixed inheritance (Avrami & Mason, 2015; Silva & Roders, 2012). Cultural value is not inherent in the material object itself; it is continuously produced through selection, representation, and negotiation among diverse stakeholders (Aas et al., 2005). Sustainable heritage models emphasize that the long-term survival of craft practices depends on integrating cultural knowledge into viable socio-economic systems rather than keeping it in static, museum-based isolation (Landorf, 2009). Tradition, as Apaydin (2019) notes, persists through contextual relevance rather than historical fixity. This dynamic view directly informs the creative economy, where traditional knowledge and craft skills are repositioned as adaptive cultural capital that supports sustainable development and economic diversification (Hanafy & Hamdi, 2024).

Within Saudi Arabia's national strategy, formalized under Vision 2030, cultural heritage and craft production are structurally integrated into the economic value chain. The Ministry of Culture (2025) explicitly frames heritage-based design as a core driver of the creative economy, shifting cultural production from a secondary aesthetic expression to a recognized contributor to national growth and international exchange. Design-led innovation serves as the critical mechanism linking historical textile craftsmanship with modern tourism markets, ensuring that heritage remains an active, economically self-sustaining, and living practice (Bakhotmah, 2020).

Methodology

Research Design and Setting

This study uses a qualitative interpretive research design grounded in narrative inquiry and enhanced by a reflexive autoethnographic perspective. Qualitative interpretive inquiry is uniquely suited for examining complex cultural phenomena, lived professional experiences, and socially constructed meanings that cannot be captured by quantitative measurement (Creswell & Poth, 2018). Narrative inquiry provides the foundational orientation for this work, focusing on how human agents experience their worlds through stories, personal accounts, and material interactions within specific cultural settings (Clandinin & Connelly, 2000).

To capture the complete circuit of heritage circulation, data collection was conducted between November 2025 and January 2026 across three primary cultural environments in Saudi Arabia where craft production and tourism intersect: (a) the Saudi International Week for Handicrafts (Banan) in Riyadh, a major platform connecting regional artisans; (b) Historic Jeddah (Al-Balad), a UNESCO World Heritage Site reflecting historic urban commerce and international visitor contact (UNESCO, 2014); and (c) the Writers and Readers Festival in Taif, a creative venue blending heritage expression with contemporary creative industries.

Participant Selection and Profiles

A purposive non-probability sampling strategy, combined with snowball sampling, was used to select participants with direct experience in traditional textiles, embroidery practice, or heritage tourism consumption (Creswell & Guetterman, 2019; Marshall, 1996). Purposive sampling ensured that

participants were chosen deliberately for their capacity to provide rich, contextually specific insights into the research phenomenon.

The final sample comprised 10 key participants divided into two distinct stakeholder segments: five expert female artisans specializing in traditional embroidery and textile crafts, and five tourists encountering heritage artifacts within destination environments. The tourist cohort included three international visitors (from Australia and the Philippines) and two domestic tourists. This balanced composition allowed for a multi-layered analysis of both the production side (custodians of craft knowledge) and the consumption side (receivers of heritage translation) of embroidered cultural products. A summary of the participant profiles is provided in Table 1.

Table 1

Demographic and Professional Profiles of Study Participants

Stakeholder Segment	Sample Size (N)	Key Characteristics & Focus Areas
Expert Artisans	5	Female specialists in traditional Saudi embroidery and textile crafts. Maintained long-term embodied craft knowledge.
International Tourists	3	Visitors from Australia and the Philippines encountering traditional crafts within regional tourism hubs.
Domestic Tourists	2	Saudi domestic travelers visiting heritage sites and festivals, reflecting regional tourism consumers.

Data Collection and Analytical Procedures

Primary data were generated through semi-structured interviews lasting between 30 and 60 minutes. These interviews were conducted with the explicit informed consent of all participants under Institutional Review Board approval (Taif University, Approval No. 071-47). Interviews with artisans and domestic tourists were conducted in Arabic, whereas interviews with international tourists were held in English. Because specialized textile terms carry deep, culturally specific meanings, a systematic translation process was implemented: the primary bilingual researcher translated the Arabic transcripts into English, and two independent bilingual academic reviewers subsequently verified the translations to guarantee semantic and conceptual accuracy.

To complement the interview data, field observations were recorded to document the spatial organization of craft displays, artisan-visitor interactions, and material characteristics. Detailed photographic documentation of embroidery motifs, stitch typologies, and textile scales provided critical visual data to support the material culture analysis (Collier, 2004). The complete qualitative dataset was organized and managed using NVivo software.

The analytical procedure followed the cyclical qualitative coding protocols established by Saldaña (2016). The first cycle employed open and descriptive coding to summarize core topics, alongside in

vivo coding to preserve the exact cultural expressions used by participants. The second cycle applied pattern coding to group separate codes into higher-level analytical categories, such as heritage continuity, symbolic meaning, and product utility. Finally, these categories were synthesized into three overarching thematic fields: embroidery as living heritage, symbolic negotiation in design, and creative economy transformation. Trustworthiness and academic rigor were rigorously maintained through data triangulation across interview accounts, field observation notes, visual media, and the continuous writing of analytic memos throughout the entire coding process (Creswell & Poth, 2018; Fusch & Ness, 2015).

Interpretive Analysis and Findings

The Semiotic Divergence: Deep Language Versus Aesthetic Surface

The qualitative analysis reveals a profound semiotic divergence between the two primary stakeholder groups regarding the nature of traditional embroidery. For master artisans, embroidery is not a decorative enhancement but an embodied, structural language of geography, lineage, and collective identity. The spatial allocation of stitches and the specific syntax of geometric patterns form an internalized symbolic framework that governs visual expression. As Artisan 2 stated, "Motifs are not just decoration, but something that represents where we come from." This narrative highlights that embroidery functions as a material inscription of geographic and historical lineage. Artisans view patterns as highly regulated cultural texts; as Artisan 4 noted, "Some patterns belong to a place and cannot be used randomly." Within this framework, cultural value is enacted through the time-intensive physical process of stitching, making narrative and materiality inseparable.

In sharp contrast, tourists approach traditional embroidered artifacts primarily through an aesthetic and experiential lens. International tourists frequently use descriptive terms, evaluating garments as 'beautiful,' 'incredibly detailed,' and 'unique' (T1, T2). For these participants, initial engagement is driven by immediate visual appeal and surface tactility rather than an understanding of local symbolic rules. While tourists consistently value 'the story behind the object' (T3), their actual comprehension of the complex regional syntax remains highly generalized. They recognize embroidery as an authentic signifier of 'Saudi identity' or 'local craftsmanship,' but they lack the cultural codes required to decipher the regional dialects embedded within specific geometric layouts. Thus, a clear tension emerges: for the creator, embroidery exists as an internally coherent linguistic matrix, whereas for the consumer, it operates as a texturally rich aesthetic surface.

Negotiating Symbolism: Re-Authoring and the Co-Production of Value

Rather than leading to cultural alienation or communication failure, this semiotic divergence generates a dynamic field of negotiation where cultural meaning is actively translated, re-authored, and co-produced. The empirical data demonstrate that master artisans do not adhere to a rigid preservation paradigm; instead, they operate as active cultural mediators, deliberately modifying and restructuring symbolic systems to enhance accessibility for global audiences. Artisan 5 illustrated this adaptive strategy, stating that motifs must be thoughtfully reconfigured "so people can accept them but still keep the original idea." This requires a sophisticated process of symbolic translation, where artisans evaluate which core visual elements can withstand formal transformation. Furthermore, verbal

narratives and live craft demonstrations serve as critical bridges across this interpretive divide. Artisan 2 observed, "People don't always know what it means, so we explain it," showing that oral storytelling recontextualizes the aesthetic surface, turning it back into a legible cultural narrative for the consumer.

This negotiation is further driven by the practical expectations of contemporary tourists, who prioritize functionality and portability alongside symbolic authenticity. Tourist participants explicitly stated a preference for objects that are 'easy to carry' and 'something that can be used daily' (T2, T4), rejecting large, purely decorative items that do not fit into modern lifestyles. As Tourist 1 summarized, "I prefer something small but meaningful, something I can take home and actually use." This consumer demand directly shapes artisanal production decisions, forcing a transition from large, ceremonial costumes into compact, everyday object formats. Value is co-produced through a reciprocal dynamic: the artisan simplifies and scales the symbolic visual language, while the tourist validates this design-led intervention through purchase and daily utility (Aas et al., 2005; McKercher et al., 2005). Heritage continuity is consequently achieved not through archival stagnation, but through active, market-responsive participation within contemporary socio-economic systems (Landorf, 2009).

A Conceptual Framework for Material Recalibration

To systematize how costume-embedded textiles transition into modern tourism commodities without losing their cultural genealogy, this article proposes a dual-stage design model consisting of Symbolic Condensation and Contextual Alignment. This framework provides a rigorous methodology for design practitioners and heritage managers working at the intersection of traditional craftsmanship and the global creative industries.

Stage 1: Symbolic Condensation

The first stage addresses the formal and graphic reconfiguration of embroidery patterns. Traditional costumes feature dense, multi-layered visual compositions covering large surfaces, which cannot be directly copied onto small objects without causing visual clutter and a loss of structural clarity. Symbolic condensation involves two distinct visual operations:

1. **Motif Isolation and Scaling:** Design practitioners must isolate primary, high-order symbolic motifs from the overall garment layout, separate them from secondary border decorations, and adjust their physical scale. Enlarging or systematically spacing a singular motif ensures that its core graphic geometry remains distinct and highly legible within reduced spatial boundaries.
2. **Structural Simplification:** While preserving the internal geometric logic and rhythmic repetition of the original stitch configuration, designers must reduce absolute stitch density. This adjustment accommodates the faster production speeds required by the creative economy while ensuring the motif remains recognizable as a distinct regional dialect.

Stage 2: Contextual Alignment

The second stage governs the material and functional transformation necessary to embed traditional graphics into modern utilitarian settings. This phase handles the critical transition from apparel fabrics to functional product substrates through two core strategies:

1. **Material Substitution and Sustainability:** Traditional embroidery frequently utilizes delicate, structurally fragile, or historically problematic components—such as lead-based beads (found in historical headdresses) or fine metallic threads—that fail modern safety and performance standards. Contextual alignment requires substituting these with durable, sustainable alternatives (such as non-lead glass beads, high-tensile metallic threads, or robust leather bases) that replicate the reflective properties of the original craftsmanship while ensuring structural durability.
2. **Functional Utility Performance:** The final object format must be engineered to withstand rigorous daily use (e.g., heat resistance for table coasters, structural stability for storage accessories, or stain resistance for travel bags). By embedding condensed regional motifs into objects characterized by high utility performance, designers ensure that cultural heritage is continuously enacted through routine, everyday interaction rather than passive symbolic display.

Discussion: Craft Ecologies in the Global Creative Economy

The conceptual model and empirical findings developed in this study carry significant implications for the broader discourse surrounding cultural sustainability, sustainable tourism, and craft preservation. Historically, textile scholarship has often approached craft commercialization with skepticism, framing the transition from traditional use to tourist consumption as an inevitable path toward commodification, loss of meaning, and cultural erosion (Dumbrovská & Fialová, 2019). However, the evidence from this study challenges these rigid paradigms. By examining how master artisans actively negotiate and adapt their visual language, this paper demonstrates that commercialization can serve as a powerful vehicle for managed continuity. When traditional embroidery is embedded within modern utilitarian objects, it enters a global circuit of representation, expanding its visibility and ensuring its survival outside restricted ceremonial contexts (Hume, 2013).

Furthermore, this research redefines the relationship between material endurance and heritage sustainability. True sustainability does not reside in the rigid physical preservation of textile components. Instead, it lies in the continuous transmission of the underlying cultural logic, embodied skills, and symbolic codes across changing material environments. Embroidery contributes to cultural sustainability when its visual language remains adaptable, capable of re-authoring its forms to respond to contemporary socio-economic realities (Qiu et al., 2024; Zhu et al., 2023).

Within this theoretical framework, institutional venues—such as international handicraft exhibitions, living history museums, and regional heritage festivals—emerge as critical components of the living craft ecology. These spaces do not merely function as passive retail points for souvenir transactions; instead, they operate as active spaces where cultural narratives are performatively constructed and exchanged (Abdelrazik & Bin Darani, 2024; Abdelfattah & Taha, 2024). By embedding scaled, condensed embroidered artifacts within rich interpretive narratives and live crafting demonstrations, these platforms elevate the tourist's perception of authenticity, transforming a simple commercial transaction into a meaningful cross-cultural encounter. This alignment of design innovation, artisanal agency, and institutional support directly fulfills the core objectives of contemporary cultural policy frameworks like Saudi Vision 2030, which seek to leverage heritage assets to stimulate economic diversification while reinforcing national identity within a globalized creative marketplace (Ministry of Culture, 2025).

Conclusion

This article demonstrates that traditional clothing embroidery, far from being a static historical artifact tied exclusively to ceremonial dress, operates as a dynamic and adaptive visual communication system. Qualitative engagement with key stakeholders reveals that while a semiotic gap exists between the complex linguistic code of the artisan and the aesthetic appreciation of the tourist, this divergence is successfully navigated through intentional design translation and oral storytelling. The proposed framework of Symbolic Condensation and Contextual Alignment provides a clear methodology for reconfiguring costume-embedded graphics into portable, high-utility tourism objects, successfully balancing cultural authenticity with consumer market demands. Ultimately, this research concludes that design-led adaptation is an essential strategy for safeguarding intangible cultural heritage within fast-shifting socio-economic environments. By transforming static historical textiles into active, circulating cultural products, contemporary design does not dilute authenticity. Instead, it revitalizes craftsmanship, expands the socio-economic roles of regional artisans, and ensures the long-term protection and continuity of collective memory within the global creative economy.

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Cultural Heritage and Sustainable Development

Dalal Alotaibi

[Working Paper]

Abstract

Emphasizing the need to balance economic, social, environmental, and cultural dimensions of development to ensure intergenerational equity. In this context, intangible cultural heritage has gained increasing recognition as a vital resource for sustainable development, contributing not only to identity preservation but also to economic vitality, social cohesion, and cultural continuity. Building on this framework, the findings of this study indicate that cultural heritage functions as a multidimensional component of sustainability, encompassing cultural, social, economic, and institutional dimensions. Investment in and protection of cultural heritage therefore extend beyond preservation-oriented practices, acting instead as a strategic mechanism for strengthening national identity and advancing cultural investment within broader sustainable development agendas. Within the Saudi context, and in line with Vision 2030, cultural heritage has been increasingly positioned as a living resource embedded in national development trajectories rather than a static legacy. This shift reflects a broader transformation in cultural governance, where sustainability is operationalized through active cultural production, participation, and institutional support. The findings further suggest that individual cultural initiatives constitute practical manifestations of sustainability within the cultural sector. However, the rapid expansion of such initiatives highlights a critical need for more comprehensive and standardized frameworks to assess their long-term impact. Strengthening impact assessment mechanisms would enhance the effectiveness of cultural policies, improve evidence-based decision-making, and ensure more efficient resource allocation, thereby reinforcing the long-term sustainability and resilience of the cultural sector in the Kingdom.

Keywords: Intangible cultural heritage, sustainability impact, sustainable development, cultural sustainability, Saudi Vision 2030, cultural governance, creative economy, Heritage Commission, Ministry of Culture Saudi Arabia.

Introduction

Sustainability is essential for preserving cultural heritage by ensuring the continuity of culture to benefit society over time. The concept of sustainable development gained international recognition following the Brundtland Report (1987), which defined it as "development that meets present needs without limiting the ability of future generations to meet their own needs." Since then, the understanding of sustainability has been known to include not only environmental concerns but also economic, social, and cultural dimensions. As a result, cultural heritage is increasingly recognized as an important component of sustainable development due to its role in strengthening cultural identity and helping maintain continuity between past, present, and future generations. Within this framework, cultural heritage represents the historical sites, practices, and identity of societies, reflecting their values, traditions, knowledge, and cultural practices across generations. Cultural heritage consists of both tangible and intangible elements, including traditions, crafts, and arts, historic sites, architecture,

and artifacts. Accordingly, cultural heritage is not limited to preservation but has become a resource that can actively support development while ensuring the continuity of culture and identity. Cultural heritage plays a central role in achieving the different dimensions of sustainability. Economically, it contributes to the growth of cultural tourism, supports entrepreneurial industries, and creates employment opportunities through traditional crafts and heritage practices. Socially, it enhances national identity, reinforces community belonging, and facilitates the transfer of knowledge and cultural values between generations. Environmentally, the preservation of heritage sites and the use of traditional building methods and local resources contribute to environmentally sustainable practices and support the conservation of natural and cultural environments. Building on this growing recognition, international organizations have played a key role in promoting the integration of cultural heritage within sustainable development frameworks. International organizations, particularly the United Nations Educational, Scientific and Cultural Organization (UNESCO), have emphasized the importance of integrating culture and cultural heritage into sustainable development strategies. UNESCO considers culture a key element of sustainable development and an essential component in achieving the Sustainable Development Goals (SDGs) by 2030. In the Kingdom of Saudi Arabia, the cultural heritage sector received remarkable attention in recent years, particularly under Saudi Vision 2030, which recognizes culture and heritage as fundamental pillars of national development. Significant efforts have been directed toward developing heritage sites, supporting traditional crafts, promoting cultural industries, and strengthening investment in the cultural sector. These initiatives have contributed to enhancing the visibility of Saudi cultural heritage locally and internationally while positioning heritage as a strategic cultural and economic resource that supports quality of life and sustainable development. Given the close relationship between preserving cultural heritage and achieving sustainability, the idea of this research examines the impact of cultural heritage sustainability through assessing the sustainability of cultural initiatives and efforts aimed at preserving and safeguarding heritage. The research seeks to evaluate the effectiveness of these initiatives in ensuring the continuation of cultural heritage as a sustainable cultural and developmental resource.

The Impact of Sustainability in culture heritage

Measuring the impact of sustainability is considered one of the most important contemporary topics in development, economics, and cultural management. It aims to assess the effectiveness of initiatives, programs, and policies in achieving long-term sustainable development goals. Sustainability is no longer limited to environmental conservation; it now includes economic, social, and cultural dimensions, which requires the development of scientific tools and indicators to measure the outcomes of different interventions (United Nations, 2015; UNESCO, 2021). The concept of "sustainability impact measurement" refers to the process of analyzing and evaluating the long-term outcomes of projects or initiatives and their contribution to sustainable development, quality of life improvement, resource preservation, and cultural identity protection. This measurement helps identify efficiency and effectiveness levels, highlight strengths and challenges, and support decision-makers in improving future policies and strategies (World Commission on Environment and Development, 1987). Impact measurement has become a fundamental component in governmental and international institutions, where many organizations rely on specific indicators and frameworks to assess the

success of development, environmental, and cultural initiatives. These indicators include economic impact, community participation, environmental sustainability, cultural heritage preservation, and project continuity (Throsby, 2017). In the field of cultural heritage, measuring sustainability impact is particularly important due to the role of heritage in supporting cultural, social, and economic development. Heritage-related initiatives aim not only to preserve cultural assets but also to generate sustainable impact by strengthening national identity, promoting cultural tourism, supporting traditional crafts, and raising public awareness of cultural heritage (UNESCO, 2021). Measuring the sustainability of cultural heritage also helps evaluate the success of cultural initiatives in achieving their objectives and their ability to create long-term influence on society and future generations. This includes indicators such as the number of beneficiaries, community engagement levels, economic contribution of cultural programs, continuity of traditional crafts, preservation of heritage sites, and educational and cultural impact. International organizations, particularly UNESCO, emphasize the importance of developing clear evaluation tools and indicators for measuring sustainability impact in the cultural sector. This ensures a balance between heritage preservation and sustainable development while improving planning and decision-making processes. In the Kingdom of Saudi Arabia, sustainability and impact measurement have gained increasing attention under Saudi Vision 2030, which highlights the role of culture and heritage in national development. The Kingdom has launched several cultural and heritage initiatives aimed at preserving national heritage and enhancing its economic, social, and cultural value, which highlights the need for robust tools to measure their long-term impact. Thus, measuring sustainability impact is a vital scientific approach for evaluating initiatives and projects, improving decision-making, and ensuring continuous positive outcomes across social, economic, environmental, and cultural dimensions.

Measuring Sustainability in Heritage Initiatives and the Role of the Kingdom of Saudi Arabia

The cultural heritage sector in the Kingdom of Saudi Arabia has witnessed significant development in cultural governance, particularly through the establishment of the Ministry of Culture Saudi Arabia as the main authority responsible for regulating and developing the cultural sector. The Ministry formulates policies and strategies that support the preservation of cultural heritage and enhance its sustainability, in alignment with the objectives of Saudi Vision 2030, which positions culture and heritage as key drivers of national development. In this context, the Ministry of Culture has established and activated specialized entities dedicated to different components of cultural heritage. Among the most prominent is the Heritage Commission, which is responsible for protecting both tangible and intangible cultural heritage through documentation, inventorying, safeguarding heritage sites, and implementing programs aimed at ensuring the sustainability of cultural heritage as a national and developmental resource. The Commission also contributes to enhancing the presence of heritage in public life and linking it to the cultural economy and heritage tourism. The role of the Royal Institute of Traditional Arts is also prominent as one of the key institutions supporting the sustainability of traditional arts and crafts. It works on training national talents, documenting traditional arts, and transferring traditional knowledge and skills to new generations, thereby ensuring the continuity of this cultural heritage while developing it in a way that preserves its authenticity and adapts to contemporary transformations. Heritage associations and community-based initiatives also contribute to supporting the sustainability of cultural heritage by encouraging community participation

in heritage preservation, implementing awareness programs, and revitalizing cultural heritage events. These efforts strengthen the connection between society and its heritage and enhance its long-term sustainability. One of the notable initiatives is the "Craftsmen Houses" initiative, which aims to empower artisans by providing sustainable production and marketing environments that help them develop their traditional products and transform them into sustainable sources of income. This enhances the economic sustainability of traditional crafts and ensures their continuity. Regarding artisan support, national efforts and the "Barae" platform have contributed to registering more than 4,900 artisans practicing over 50 traditional crafts by 2025. This reflects the growing interest in Saudi crafts as one of the most important elements of intangible cultural heritage, particularly under initiatives led by the Ministry of Culture Saudi Arabia within programs aimed at empowering artisans and developing the cultural sector. Saudi crafts are considered one of the most important components of intangible cultural heritage, encompassing a wide range of practices such as Sadu weaving, palm frond weaving, pottery, wood carving, and metalwork. These crafts play a vital role in strengthening national identity by transmitting traditional knowledge and cultural values across generations and reinforcing a sense of belonging and cultural pride. The importance of sustaining traditional crafts lies in their dual role as both cultural and economic resources, as they contribute to supporting the local economy and promoting cultural tourism, making their support through national initiatives essential for achieving sustainable development. Accordingly, it becomes clear that the cultural governance system led by the Ministry of Culture Saudi Arabia through its specialized entities such as the Heritage Commission and the Royal Institute of Traditional Arts represents an integrated model for supporting cultural heritage sustainability. These efforts are not limited to preservation but extend to empowerment, documentation, capacity building, and community engagement. Thus, measuring sustainability in these initiatives is not limited to short-term outcomes, but also includes evaluating the long-term impact on cultural identity, the continuity of traditional crafts, and their contribution to sustainable cultural and economic development.

Research Problem and Objectives

Given the growing number of cultural heritage initiatives, there is an increasing need for a structured approach to evaluate their sustainability and long-term impact. However, the diversity of these initiatives and the limited availability of consolidated empirical data present challenges for comprehensive quantitative assessment. This study contributes to the development of scientific tools for evaluating cultural sustainability and supports policymakers and cultural institutions in improving heritage governance. It also aligns with national development priorities under Saudi Vision 2030 and international sustainability frameworks. The research aims to:

Develop a conceptual framework for assessing sustainability in cultural heritage initiatives

Evaluate the role of such initiatives in strengthening identity and community engagement

Analyze the integration of governmental, community, and private-sector efforts

Identify key indicators for measuring sustainability impact across multiple dimensions

Research Design and Theoretical Foundation

This study adopts a descriptive-analytical research approach to examine the growing importance of measuring the sustainability of intangible cultural heritage initiatives in the Kingdom of Saudi Arabia and to support the development of a future national indicator for assessing sustainability in this field. The descriptive-analytical approach is considered appropriate for investigating contemporary cultural and developmental issues through the systematic review and analysis of existing literature, policy documents, institutional reports, and cultural initiatives. The study is grounded in the concept of sustainable development as articulated in the United Nations 2030 Agenda for Sustainable Development (United Nations, 2015), which recognizes culture as an important contributor to social, economic, and environmental progress. It also draws upon the UNESCO framework for safeguarding intangible cultural heritage, which emphasizes the protection, transmission, and continuous practice of cultural expressions, traditional knowledge, customs, and craftsmanship across generations (UNESCO, 2003). From a theoretical perspective, the study adopts the view that intangible cultural heritage should not be considered solely as a cultural asset requiring preservation. Rather, it should be understood as a dynamic resource that contributes to cultural continuity, social cohesion, economic opportunities, and community development. Consequently, assessing the sustainability of heritage initiatives requires a multidimensional perspective that considers the interconnected cultural, social, economic, and institutional dimensions of sustainability.

Research Scope and Data Collection Method

The study focuses on initiatives related to intangible cultural heritage in the Kingdom of Saudi Arabia. Attention is given to initiatives associated with traditional crafts, cultural practices, heritage skills, knowledge transmission, awareness programs, documentation projects, and community engagement activities. The research does not seek to evaluate the performance of individual initiatives. Instead, it examines the broader landscape of cultural initiatives and the challenges associated with measuring their long-term sustainability and developmental impact. The study relies primarily on secondary sources of data. These sources include academic literature related to cultural sustainability, reports issued by international organizations, national policy documents, and official publications from cultural institutions. Key sources include UNESCO reports and publications on cultural heritage safeguarding, the United Nations Sustainable Development Goals framework, Saudi Vision 2030 documents, reports issued by the Ministry of Culture, publications of the Heritage Commission, and the Saudi Cultural Status Reports. In addition, previous studies addressing sustainability indicators, cultural policy evaluation, heritage preservation, and cultural development were reviewed to identify common approaches, challenges, and measurement dimensions relevant to the sustainability of heritage initiatives.

Data was collected through a literature review of institutional reports, strategic documents, and official cultural statistics. The review process focused on identifying recurring themes related to heritage sustainability, cultural policy implementation, community participation, economic contribution, institutional support, and cultural continuity. Special attention was given to identifying how international organizations and cultural institutions assess the effectiveness and sustainability of heritage-related initiatives. The analysis also examined the extent to which sustainability measurement frameworks have been applied within cultural sectors internationally and nationally .The

analytical framework adopted in this study is based on four interconnected dimensions that frequently appear in cultural sustainability literature and policy frameworks:

Cultural Sustainability: This dimension focuses on the continuity of cultural practices, preservation of cultural identity, transmission of traditional knowledge, and safeguarding of intangible cultural expressions across generations. It examines the extent to which cultural initiatives contribute to maintaining living heritage and ensuring its relevance in contemporary society.

Social Sustainability: The social dimension considers community participation, social cohesion, cultural awareness, intergenerational engagement, and the role of heritage initiatives in strengthening community identity and belonging. Sustainable heritage initiatives are expected to create meaningful social impact and encourage active community involvement.

Economic Sustainability: This dimension examines the contribution of heritage initiatives to economic development through supporting artisans, generating employment opportunities, stimulating cultural tourism, and creating sustainable cultural industries. It also considers the long-term viability of economic benefits generated through heritage-related activities.

Institutional Sustainability: This term refers to governance structures, policy support, funding mechanisms, partnerships, strategic planning, and organizational capacity. It evaluates the extent to which institutions can support the continuity and effectiveness of cultural initiatives over time.

Discussion and Analysis

The literature on intangible cultural heritage and sustainable development demonstrates a growing academic interest in this field, particularly in relation to the role of culture within broader development frameworks (UNESCO 2003; Throsby 2011). Recent studies have further highlighted the contribution of heritage preservation, traditional knowledge systems, and cultural practices to sustainable development, particularly within the Saudi context (Refae 2023; Alshami, Bryant, and Toland 2025). However, despite this increasing attention, most studies remain primarily practice oriented. They tend to focus on the preservation of intangible cultural heritage through mechanisms such as education, training, skills transmission, and the economic empowerment of artisans (Bortolotto 2015; Vecco 2010). In addition, a considerable body of research highlights the contribution of cultural and creative industries in supporting local livelihoods and integrating heritage-based practices into economic systems (UNCTAD 2018; UNESCO 2022).

Nevertheless, the literature continues to show a limitation in addressing intangible cultural heritage from a holistic and systemic perspective. In most cases, it is treated as a set of practices or activities rather than as a multidimensional driver of sustainable development embedded within cultural, social, economic, and institutional systems (Soini and Dessein 2016). As a result, there is still a need for studies that move beyond fragmented interpretations and provide more integrated analyses of how intangible cultural heritage contributes to sustainable development in a comprehensive manner.

In response to this gap, the present study reviewed and analyzed Saudi Cultural Status Reports covering the period from 2022 to 2025. These reports were selected due to their comprehensive and longitudinal nature, as well as their relevance to cultural policy and sectoral development in the

Kingdom. The analysis focused on key dimensions of cultural development, including cultural participation, institutional growth, economic contribution, and heritage-related activities, in order to capture the overall transformation of the cultural sector. The findings indicate that the cultural sector in Saudi Arabia has experienced a clear and progressive transformation during the study period. This transformation reflects a gradual policy shift from general cultural sector development to the integration of sustainability principles, and more recently toward impact-driven and evidence-based cultural governance (Ministry of Culture Saudi Arabia 2022–2024). This progression demonstrates that culture is increasingly being positioned not only as a sector for preservation, but also as a strategic component of national development planning aligned with Saudi Vision 2030 (Saudi Vision 2030 2016).

Cultural organizations and initiatives are not merely quantitative developments, but indicative of a structural transformation in the role of culture within society. Culture is increasingly embedded in everyday social practices, reflecting a shift toward participatory cultural governance in which communities are repositioned as co-producers of cultural value rather than passive recipients of cultural policy interventions (UNESCO 2022). Within a sustainability framework, this shift enhances social sustainability by strengthening inclusion, agency, and collective identity formation. At the cultural level, the observed growth in heritage-related activities, hobby groups, and community-based initiatives signals a deepening of grassroots engagement with intangible cultural heritage. This trend contributes directly to the viability of living heritage systems by reinforcing the intergenerational transmission of knowledge, skills, and practices. Importantly, such dynamics should not be understood as isolated cultural revitalisation efforts, but as mechanisms that support cultural continuity and resilience, which are central to the safeguarding of intangible cultural heritage under sustainability-oriented approaches (Bortolotto 2015; UNESCO 2003). From an economic sustainability perspective, the increasing integration of the cultural sector into national development strategies reflects a deliberate diversification agenda. The growing contribution of culture to non-oil GDP and employment indicates that cultural heritage is being repositioned as an economic asset within emerging creative economies. However, this transformation also introduces a critical tension between economic valorisation and cultural integrity, requiring careful governance to avoid reducing heritage to purely market-oriented value. When appropriately managed, investments in cultural and creative industries, alongside capacity-building for artisans, can enhance both economic resilience and sustainable livelihoods (UNCTAD 2018; Throsby 2017).

Institutionally, the development and implementation of cultural impact measurement frameworks represent a significant advancement toward evidence-based cultural governance. This institutional shift enhances transparency, accountability, and policy coherence, while also enabling the alignment of cultural policy with broader sustainability objectives. Nevertheless, the effectiveness of such frameworks depends on their ability to capture not only economic outputs but also social and cultural value dimensions, which are often difficult to quantify. In this sense, the evolution of cultural governance in Saudi Arabia reflects an emerging but still developing integration of sustainability-oriented evaluation systems within the cultural sector (Ministry of Culture Saudi Arabia 2022–2025). Overall, the findings suggest that Saudi Arabia is progressively adopting an integrated cultural sustainability model that aligns with the objectives of Saudi Vision 2030. Within this model, intangible cultural heritage is not only preserved as a cultural asset but is also actively utilized as a

multidimensional resource that contributes to cultural identity, social cohesion, economic development, and institutional strengthening (Saudi Vision 2030 2016; UNESCO 2022).

Conclusion

Taken together, the findings demonstrate that the sustainability of intangible cultural heritage constitutes a multidimensional and interdependent system that cannot be reduced to isolated interventions. It emerges through the continuous interaction between cultural, social, economic, and institutional dimensions, where each dimension simultaneously enables and is shaped by the others. Within this system, the institutional dimension plays a central role in ensuring coherence, continuity, and alignment between cultural policies and long-term development objectives. The cultural dimension remains fundamental to identity preservation and intergenerational transmission, while the social and economic dimensions facilitate the translation of heritage into tangible developmental, social, and economic values. The evidence indicates a clear transformation in the Kingdom of Saudi Arabia, where intangible cultural heritage is increasingly repositioned from a preservation-centered concept to a living developmental resource embedded within the national transformation agenda under Saudi Vision 2030. This evolution reflects a broader shift in cultural governance toward an integrated sustainability-oriented model that emphasizes activation, participation, and value creation.

Within this context, institutional development and policy reform emerge as essential drivers for strengthening the sustainability of the cultural sector. The growing emphasis on cultural impact measurement represents an important step toward advancing evidence-based cultural governance. However, the analysis also highlights a persistent gap in the availability of comprehensive and standardized frameworks capable of capturing cultural, social, and economic impacts in a holistic and longitudinal manner. The study demonstrates that intangible cultural heritage can meaningfully contribute to sustainable development when embedded within an integrated governance system that connects heritage continuity with socio-economic development processes. This requires a transition from traditional preservation-focused approaches toward a broader sustainability perspective grounded in impact assessment, institutional integration, and the active role of culture in development pathways. From a theoretical standpoint, this research contributes to the literature on cultural sustainability by reinforcing the understanding of cultural heritage as a living and dynamic system rather than a static asset. It further illustrates how sustainability in the cultural sector is operationalized through governance structures, policy alignment, and integration with the creative economy, particularly in rapidly transforming national contexts such as the Kingdom of Saudi Arabia.

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Documenting Women's Incense-Making in Saudi Arabia: An Ethnographic Heritage Study

Maryam Alotaibi

[Working paper]

Introduction:

For thousands of years, incense has been a valuable commodity that dominated trade routes, especially around 200-300 BCE when the incense trade reached its height. The two main components of incense, Frankincense and myrrh, are harvested from the *Boswellia* tree, which is native to the south of the Peninsula and the horn of Africa. The precious resins have served various religious and medicinal purposes. It has been widely used as a medicine in many medicinal traditions. In Indian Ayurvedic medicine, for instance, the resin is used to treat conditions like arthritis, inflammatory bowel disease, and asthma. (Olabode Martins Olabintan et al., 2024) In Islamic and Arabic medicine, incense is seen as having anti-inflammatory, antibacterial, and respiratory benefits. (Abdullah et al., 2025)

Incense is also deeply rooted in the Islamic tradition, with multiple narrations about the Prophet Mohammed -piece be upon Him- using incense to perfume himself and asking his companions to burn incense in Masjids. It is also reported that the Prophet described incense as what believers receive when they first enter heaven. (البخور واستخداماته والعقائد المرتبطة به, "2026") Other major Islamic figures such as Imam Ali praised Myrrh for its strengthening memory.

Incense burning has also been a significant part of other religious rituals throughout history. In ancient Egypt, in addition to relying on frankincense and myrrh in mummification, it was believed that burning a sacred mix of incense in temples formed a link between kings and the divine realm. Until today, in Orthodox and Roman Catholic churches, a censer containing a ritually prepared sacred formula of incense is swung during religious ceremonies to bless the space and crowd.

In the domestic sphere, incense has been ritualized in many parts of the Arab world. Not only is it used as a pleasant aroma, but it is also viewed as having cleansing powers, both in the literal and spiritual sense. Raw frankincense and myrrh and other various resins are used specifically to combat illnesses when a member of the family gets sick because of the belief in the sanitization properties of those resins. Another power that is attributed to incense is the ability to ward off evil spirits.

Incense mixes that contain luxurious ingredients such as oud and amber hold value as a sign of hospitality and warm welcome. These mixes are reserved for religious celebrations and seasons, such as Eid or after Friday prayer, or when receiving guests.

The presence of incense as part of these social experiences establishes positive cognitive associations, which is one of the reasons why burning incense in the Arab world turned from a religious ritual to a social one. Incense has become a household habit that exists around happy occasions, which led to this commodity constituting a large portion of the 300 million fragrance market in Saudi Arabia in 2024 alone. (TechSci Research, 2025)

While burning incense remains a coveted practice in homes and other spaces, the artisanal process behind it is largely overlooked. Not only is the process undocumented, so is the social impact of the intricate making process which the female artisans have long perfected. This hidden practiced heritage has become embedded in the identity of generations of women who developed a sophisticated craft that has been at the center of ceremonial traditions in different parts of the Arab world.

The traditional craft of incense making in Saudi Arabia has long been and is still primarily practiced in Wadi Aldawasir, a Governate located south-west of Riyadh region bordering the desert of al Rub' al Khali. It is located along multiple ancient trade routes, including the incense route, which connects the south of the Arabian Peninsula to the east (the gulf) and north of the peninsula and beyond. Wadi Aldawasir also sits on the archaeological site Qaryat al-Faw, which is a major oasis settlement and commercial station within the ancient trade networks of the Arabian Peninsula. The city of Qaryat al-Faw itself emerged as a caravan center in the middle of the 1st millennium BCE, however the wider Al-Faw landscape preserves evidence of much earlier human occupation. UNESCO documentation indicates prehistoric activity represented by Palaeolithic and Neolithic stone tools, followed by funerary and stone-built features dating to the late 3rd and early 2nd millennia BCE. The city flourished for nearly a millennium and was abandoned around the 5th century CE. (UNESCO, n.d.)



Figure 5 Ancient Routes Map. Source: André-Salvini et al. (2010, p. 28).

The archaeological and historical evidence from Qaryat al-Faw suggests that the site belonged to a wider incense-oriented commercial and ritual landscape. The discovery of cuboid incense burners and stone altars at the site point to the presence of aromatic or ritual burning practices in the religious and social life of its inhabitants. One of the tens of incense burners discovered is a four-legged cubic incense burner, decorated with triangular bands, that bears the names of aromatic substances on each of its sides, with one side carrying the Sabaic inscription "libnay", which is related to the Arabic word "liban" "لبان" both referring to the resin of the Boswellia tree commonly known as frankincense. Other discovered burners are illustrated with celestial motifs, probably used for altars dedicated to the deity of Wadd and the solar deity Shams. (André-Salvini et al., 2010)

In this sense, incense-making today may be understood not simply as an isolated contemporary craft, but as a cultural continuation of a much longer cultural memory connected to the site's history and daily practices.

The connection between the history of the land and the craft is evident in the Wadi Aldawasir's signature incense mix, "Maamoul Dawsari". The popular subtype of incense is named after the town and its residents of Aldawsari tribe, who are the expert makers and sellers of this mix. The mix contains foreign ingredients that are historically carried along the incense route. This includes resins of the Boswellia tree which are native to the south of the Arabian Peninsula, and marine ingredients that were likely harvested from the Arabian Gulf Sea and brought along the route, such as operculum. In fact, most of the mix's contents are not local to the town, apart from dates, which is used as a binding agent.



Figure 6 Incense burner from Qaryat al-Faw. Source: André-Salvini et al. (2010, p. 316).

Research problem

The contribution of women to heritage and culture is undeniably underrepresented. Nowadays, this global phenomenon has been recognized by a multitude of institutions and scholars, including UNESCO. However, gender equality was not always a concern for heritage legislators and specialists. The first World Heritage Convention, which was held by UNESCO in 1972, had no mention of gender roles in heritage preservation. (Rössler and UNESCO, 2014) Despite this, questions were raised regarding gender roles and how they affect both genders' access to heritage and cultural spaces. In 1992, the Rio Declaration on Environment and Development was presented, and in it was an emphasis on the integral role of women in sustainable development. Across the twenty-seven principles, some of which centered on women, the declaration encouraged governments to implement strategies and plans that involve women as active participants and decision-makers. UNESCO continued to adopt gender-inclusive discourse by approving the Proclamation of Masterpieces of the Oral and Intangible Heritage of Humanity program in 1997, which concluded that women play a significant role in the inter-generational transmission of intangible cultural heritage. (Blake & UNESCO, 2014)

UNESCO's efforts in safeguarding heritage reached full fruition with the 2003 Convention on the Safeguarding of Intangible Cultural Heritage, which successfully established a global standard for cultural preservation, allowing state parties to identify, recognize, and inscribe their national cultural heritage. The convention's text calls for gender equality repeatedly, in addition to a separate section on the issue, which urges state parties to "endeavour to foster the contributions of intangible cultural heritage and its safeguarding to greater gender equality and to eliminating gender-based discrimination." (UNESCO, 2024, P. 86) Despite this focus on gender equality, there were some concerns over the overgeneralization of the term "social practices and rituals" which feminists warned may accidentally include harmful practices. (Moghadam & Bagheritari, n.d.)

Shortly after the implementation of the 2003 Convention, and to enhance the inclusivity of its ICH legal instrument, UNESCO held the 2005 UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions, which described gender equality as a "priority" (Von Schorlemer & Merkel, 2025, p. 11). However, a 2022 UNESCO report concluded that gender equality remains an implementation challenge. Art and culture are referenced among the areas where women are less visible, because they are perceived as consumers rather than creators. The report also states that women are less likely to occupy leadership roles in those two fields, especially in Arab States. It is also revealed that women's self-employment rate in art and culture is statistically staggering, which led to an immense impact on the freelance market during the COVID-19 crisis. (Villarroya Planas, n.d.) UNESCO expressed its concern over "the paucity of sex-disaggregated data in the culture and media sectors" (Villarroya Planas, n.d., p. 256), which is partly due to the considerable difference in data reporting between developed and developing countries.

Saudi Women's Cultural Participation:

Besides statistical reports collected by UNESCO, a look into female representation in the Kingdom of Saudi Arabia in the media and culture sectors helps shed light on the degree of active participation of women in those fields. (Sakr, 2008) examines this correlation by analyzing women's presence in public media. The paper traces women's early involvement in the Saudi media and the opposition it faced in

the 1950s and 1960s, after which women's media involvement developed gradually until what the author called "heightened visibility" in 2005-2006. She then argues that despite this improvement, women's access to leadership roles was still limited. This discrepancy highlights a key distinction between "encouraging" and "enabling," which is the crux of why some changes remain superficial. (Sakr, 2008, p. 394)

Another obstacle that stood in the way of women's empowerment in the Kingdom was the debate around gender mixing. This concept didn't come to the forefront until the events of the Siege of Makkah in 1979, where a radical religious group rebelled against the government and attempted to take control of the Holy Mosque of Makkah. This event triggered a series of institutional changes aimed at neutralizing the conservative majority, including sexually segregating public spaces and enforcing a strict dress code on women. (van Geel et al., 2012) As the Kingdom moved away from strict laws toward women's empowerment, it ratified the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) in 2000. In the following years, the government's tried to balance between maintaining Islamic teachings while simultaneously pushing towards women's empowerment. This resulted in establishing women-only facilities as a way to enable women to participate in various economic and leisure activities. (van Geel et al., 2012)

Now that the Saudi woman enjoys even more freedom and fewer restrictions than ever before, new expectations emerge regarding cultural participation and decision-making. The Vision 2030 aims to transform the country from an oil-dependent economy into a diverse environment, creating new opportunities for Saudi citizens. One of the prominent themes of the Vision is social reform through programs tailored to facilitate achieving the ambitious objectives of the Vision, including the Quality of Life program. The program seeks to enrich the Kingdom's contribution to culture and arts while conserving and promoting its heritage. Heritage conservation is not a recent interest either; one of the earliest heritage celebrations, for instance, the Jenadriyah Festival, was held annually from 1985 until 2018.

The festival has provided a platform for women to perform a multitude of traditional customs in front of a large audience. A news article published by the Saudi Press Agency (SPA) from 1996 reported that that year's festival witnessed "a visible improvement," with women's roles exceeding folklore performances to include the supervision over other cultural activities, including lectures and seminars. (Saudi Press Agency (SPA), 2009) Another milestone that women's participation reached is the musical performance of the Festival's 28th edition, which was written by two poetesses, Mastoorah Alahmadi and Najla'a Almohaya. (رشاد, 2014) Recent examples of the evolution of Saudi women's active role as partners in the safeguarding of heritage are the number of museums owned by women, including a museum in the coastal town of Umluj, owned and run by Fatemah Muri'i, who also showcases the museum's unique items in schools to raise awareness of the region's history and culture. (البلوي, 2019)

Statistically speaking, the Ministry of Culture has the highest rates of women's employment, which reached almost 50% in 2021, only three years after its establishment. ("الثقافة السعودية: تمثيل واسع" 2021) (للمرأة في المناصب القيادية... ونصف الكوادر نساء, 2021) An increasing number of women has also occupied leadership positions within the ministry. Three out of the eleven ministry commissions are headed by women, including Dr. Sumayah Al-Solaiman, the CEO of the Architecture and Design Committee, Dina

Amin, CEO of the Visual Arts Commission, and Mayadah Bader, the CEO of the Culinary Arts Commission. In addition, the boards of directors of many of these commissions include women, such as the board of the Commission of Museums, which has half of its members as women.

While it is evident that the government's mission to conserve and promote Saudi heritage overlaps with its commitment towards women's empowerment, it is crucial to navigate the state of intangible heritage preservation and the recognition of female crafts, especially those considered part of the domestic sphere.

The preservation movement in Saudi Arabia has led to the recognition and inscription of multiple traditional elements on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. The sixteen inscribed elements encompass a range of performance arts, social practices, traditional crafts, and knowledge related to nature and food. Of the sixteen elements, only three represent female-dominant roles, including two crafts: Al-Qatt Al-Asiri and the traditional weaving of Al Sadu, and one social practice, Henna.

The above-mentioned feminine crafts were considered vulnerable before they were recognized and then revived. Pioneer craftswomen have played a vital role in promoting these crafts by establishing museums, providing training, and enhancing urban spaces to reflect local identities. (Hesham, 2019)

When examined critically, the official approaches to the restoration of traditional female crafts are product-centered and tend to ignore women's valuable perspectives. The focus on material objects is a characteristic of Authorized Heritage Discourse, which favors artistic and picturesque items often claimed as part of a collective national identity while disregarding the cultural value and meaning behind them. (Waterton & Smith, 2009). Only items that represent an objective meaning and legitimize certain values are allowed to be part of Authorized Heritage Discourse (AHD), which tips the scales in favor of elitist and hierarchical narratives.

The current heritage management system reflects centralization of limited forms of knowledge and alienation of non-expert social actors, which present ongoing challenges in the field of heritage preservation and cultural participation. While women have made significant advances in visible leadership and creative contributions, the institutional procedure often privileges expert-driven narratives and formal recognition processes, sometimes at the expense of grassroots involvement and the lived experiences of those who have traditionally maintained intangible heritage.

To move forward, it's important to build more inclusive systems that not only support women in formal roles but also recognize the knowledge that already exists within communities. Many of these community practitioners have been overlooked in national cultural efforts, even though their contributions are essential to sustaining intangible heritage.

Objectives:

In hopes of empowering peripheral female crafts, this research project aims to examine one of the many neglected domestic crafts, incense making. Unfortunately, despite the widespread popularity of incense products and their versatile applications, the production of incense by local artisans, especially women, is rarely documented or studied. Since craftswomen have a homemade approach, their process is enshrined in self-imposed privacy, and any research effort dedicated to documenting the DIY approach is obstructed by social norms such as gender segregation inside the Saudi household. Moreover, because traditions related to incense, such as infusing the home and clothes or greeting guests with incense burners, are far from vulnerable, academics fail to see the need to examine the artistry behind this timeless custom.

This research project seeks to identify and document the practices involved in incense making, both as a craft and as a social and communal activity, through a culturally appropriate dialogue that will take place in the domestic context. The researcher will optimize her position as a female researcher with a similar social background as the targeted sample of craftswomen to partner with those women in this preservation effort.

Research questions:

1. What are the social and economic practices that artisans engage in to maintain their craft? And within which networks? How do they connect with their customer base?
2. What do the artisans gain from incense-making as a craft? And how has it shaped their identities and their position in society?
3. How do artisans transmit their knowledge, and express their identities?
4. Are their strategies for transmission and economic sustainability viable in the long run?

Research methodology:

The study is an interpretive, qualitative investigation that will be informed by feminist epistemology, which recognizes the knowledge that is shaped by the social position of both the researcher and the participants. Feminist epistemology was chosen due to the gendered, domestic setting of the research. This private social space is the primary setting of the practiced heritage where knowledge has been successfully transmitted intergenerationally without any formal involvement.

Participants:

Furthermore, engagement with practitioners belonging to Heritage Practicing Communities (HPC) in formal settings revolves around the benefit of heritage institutions, where knowledge-sharing follows a top-down pattern and is affected by unequal power relations between involved parties. (Roued et al., 2025) For this reason, this research project will employ a collaborative research approach known as participatory heritage, which emphasizes empowering the research participants and involving them in the decision-making and the strategizing of cultural heritage conservation. Applying this approach will allow an underrepresented Heritage Practicing Community (HPC) to have control over expressing and preserving their personal heritage.

The targeted HPC of this research project consists of Saudi elderly female incense artisans, who are renowned for their pioneering work in incense-making. To the researcher's knowledge, most of these artisans still adopt a word-of-mouth approach in their sales and sometimes refrain from modern means such as online platforms, which further limits their visibility in the contemporary cultural and commercial contexts. Another element that adds to their limited visibility is that, as of 2025, elderly people in Saudi Arabia form a mere 4.8% of the total population, and only 3.7% of elderly women own private businesses or are self-employed. Furthermore, the cultural engagement of elderly women in the Kingdom in 2017 was estimated to be as low as 8.43%. (2021 السهلي)

The Kingdom had begun its efforts in eradicating illiteracy in 1972, and within four decades, it was able to lower the illiteracy rate among females to less than 3%, which is among the lowest in the Arab world. (Saud G, 2025) Other reports, however, paint a different picture regarding elderly women's education. According to a 2021 report published by the United Nations sexual and reproductive health agency (UNFPA), an overwhelming 91% of elderly women in Saudi Arabia have not attained any formal educational qualifications. Among those who do possess some level of education, only half have completed studies beyond the primary education level. (HelpAge International, 2024)

These statistics highlight the considerable underprivileges faced by this demographic, particularly in terms of access to education and opportunities for personal and professional development. This is why understanding the significance of incense-making from the perspectives of those elderly women not only enriches the documentation process but also brings their lived experiences to the forefront, experiences that are often absent from mainstream heritage narratives.

Sampling:

The sample will be selected using a non-probability method that enables the researcher to access unconventional and inconsistent sample groups. Therefore, only a few initial participants will be identified, after which they will refer the researcher to other participants, and the sample will grow from there in a snowball effect, hence the name snowball sampling.

As for, documentation procedure, it will be done through the lens of feminist epistemology to further amplify the craftswomen's voices. Knowledge related to the participants' lived experiences and their relationship with the handicraft will be given highest attention.

Data collection and analysis:

The data will be collected through in-depth interviews, which will be guided by ethnographic principles, with an emphasis on feminist ethnography. Since the data will be collected through in-depth interviews, and given the research's focus on lived experience, the analysis of data is key to interpreting participants' narratives and ultimately answering the research questions. Therefore, the researcher will rely on inductive methods to explain the patterns and nuances that emerge from the investigation's social settings. To this end, Grounded Ethnography will be used as the primary data analysis tool.

Grounded Ethnography emerged when ethnographers began applying the analytic procedures of Grounded Theory within ethnographic fieldwork. Grounded Theory, first developed by sociologists Barney Glaser and Anselm Strauss in 1967, emerged as a response to rigid, hypothesis-driven

research models by proposing that theory should be built inductively from empirical data through constant comparison. Later, Kathy Charmaz advanced this tradition through her constructivist version of grounded theory, which placed greater emphasis on the co-construction of meaning between researcher and participant. Ethnographers soon recognized the value of this approach for field-based research. The two approaches were compatible; Ethnography provided depth, contextual richness, while Grounded Theory offered a systematic way to analyze data while it was being collected. Grounded Ethnography is appropriate for this investigation since it helps the researcher to understand how participants make sense of incense-making, how they describe their work, and how they situate their work within wider social and cultural worlds.

Alongside Grounded Ethnography, integrating feminist epistemology will enrich the final interpretation of the biographical material by giving attention to participants' lived experiences and perspectives, while also benefiting from the flexibility that Grounded Ethnography offers. The researcher hopes that through the intimate examination of this female-dominated craft, more inclusive bottom-up heritage safeguarding policies will be proposed and implemented.

Interview questions:

Because the interviews are semi-structured, the interview questions are only meant to guide the researcher during her communication with the participants. The interviews will be dialogue-based, with the questions serving as prompts for the participant rather than a fixed interrogation. This is the preferable format for grounded ethnography, which recommends informal conversing, especially with non-expert participants. Any knowledge gaps will be filled with follow-up questions, which will limit the disruption of the participant-led narration.

1. When did you start making incense, and how? Why did you continue the craft for as long as you have?
2. How does incense-making fit into your social life? And do you make incense as part of a ritual or as a social practice/hobby?
3. How do you manage the sale of your product? And what are the factors that affect or help your sales?
4. What are you doing to help transmit the knowledge you built? And with whom do you share or want to share this knowledge?
5. What helped you or motivated you to continue making incense? (tools, people, government programs, etc.)
6. What can be done to preserve your craft sustainably? And what would you like your role to be, and with whom would you like to collaborate?

Data analysis tool:

The analysis process will follow Charmaz's (2006) method of Constructivist Grounded Theory (CGT), which although non-linear, is thoughtful and calculated, helping the researcher structure the data and findings.

CGT stresses the significance of gathering rich data. This can be done in any collection method the researcher sees fit, while making sure those data are placed in their social contexts. Secondly, as participants express how they make sense of their experiences, the researcher analytically encodes those meanings and actions. The encoding can be done in two ways: line-by-line coding or focused coding. Codes are analyzed using extensive memos, which are then converted into conceptual categories. After sorting those categories, the researcher assesses the “theoretical saturation” and whether to extend data collection through theoretical sampling to fill in any conceptual gaps. Before writing a final draft, the researcher should have enough analyzed material to establish a logical theory based on the researcher interpretation of the data.

Researcher positionality and reflexivity:

The researcher’s position is closely tied to the nature of this study. Being a female researcher who shares a similar social and cultural background with the women participating in the research may lead to more trust and easier engagement in conversations. This is particularly important in a study that takes place within domestic settings and explores a craft that is closely connected to women’s everyday lives. This proximity can help the researcher approach participants’ experiences with greater sensitivity and a fuller appreciation of the meanings attached to incense-making. This doesn’t negate the need for reflexivity, which is also part of the ethnographic nature of the study. Remaining self-reflexive and transparent and recognizing personal assumptions while interpreting the data may strengthen the validity and ethical rigor of the results.

Ethical considerations:

Because the study involves human participants in domestic settings, participants will be informed of the purpose of the study, the voluntary nature of participation, and their right to withdraw at any point. Informed consent will be obtained before interviews take place. Ethical considerations also include respecting domestic boundaries and cultural knowledge of participants.

Results:

Two in-depth interviews were conducted with one being a home visit. The interviewees were two elderly artisans who are natives of Wadi Aldwasir. The first is 60-year-old Om Habib Aldawsari, an incense artisan who has been making and selling incense for almost 40 years. She lives between Riyadh and Wadi Aldawasir but exclusively makes incense in Wadi Aldawasir.

The second is Rasmah Aldawsari, a 55-year-old artisan who has been making incense from a young age since she belongs to a family of inherent incense makers. She has been living in Alkharj for 25 years and runs her business from there but makes frequent trips to Riyadh where she acquires some of the incense ingredients.

Two other young women were interviewed. The first is Badriah Hassan, A 39-year-old incense maker from Jazan who has been making and selling incense for 9 years. The other is Hind Aldawsari, a Riyadh-based small business owner who sells incense mixes that her aunts make back in Wadi Aldawasir.

The two elderly artisans gave details about their process and the role of incense making in their lives. The first section of the data analysis will deal with technical making process, which is almost identical

for both women, while the second section will deal with the role of incense-making in their everyday and social lives, the ways they sell and sustain their products, and how they transmit knowledge to others.

The incense making process:

Before diving into the practical steps, below is a breakdown of the traditional Dawsari incense mix's basic ingredients:

Operculum:

The mix's main ingredient, operculum, (Arabic: **ظفر**) (transliterated: Zifr), which in Arabic literally means "claw," is a part of marine snail's lower shell (foot) that forms a trapdoor used by the animal to seal itself during hibernation, and when processed and roasted produce a musky smell. Because of its marine origin, raw operculum is foul smelling and need to go to multiple processing stages to extract its fragrance. It is considered the most labor-intensive ingredients.

Ambergris:

Ambergris is the rare secretion of the sperm whale's digestive extract. The waxy material is melted using heat, after which an extract called amber accord is added to the malleable wax along with various flower extracts. Amber accord is distinct from marine amber, since it is a tree resin that is treated to mimic the aroma of ambergris. The mixture is meant to liquidify the ambergris wax enough to be mixed with the other ingredients.

Lichen:

It is a slow-growing organism made up of fungal and algal elements that grows on surfaces like tree bark, rocks and soil. It is valued in incense and perfumes for its sweet earthy smell and fixative properties, which help with stabilizing the scent of incense without overpowering the other fragrant ingredients.

Benzoin resin:

Called in Arabic (luban jawi) benzoin resin is a balsamic resin obtained from trees of the *Styrax* genus, especially those native to Southeast Asia, and is known for its sweet, and slightly vanilla-like scent. This sweetness helps soften the composition of the incense mix.

Agarwood:

Agarwood, or Oud in Arabic, is a fragrant resinous material that forms inside in trees in the genera *Aquilaria* and *Gyrinops* when they are naturally wounded or infected. Oud is a versatile ingredient in incense because it can play more than one role within a mix. It can serve as the main aromatic note, but it can also function as a supporting ingredient that adds depth and richness. In Mamoul al Dawsari, oud can greatly affect the pricing of the final product. Most commonly, al Mamoul al Dawsari has three tiers or price ranges depending on the quality grade of the ingredients, especially oud.

Sandalwood:

Sandalwood is a dense, fine-grained aromatic wood taken mainly from the heartwood of mature trees, and can be used as chips, paste or powder. In incense it is either burned on its own or grounded and added to incense blends.

Flower extracts:

Various flower extracts are used in different stages of incense making. They can be used to infuse raw ingredients such as operculum before grinding. They can also function as both infusing and binding ingredients during the maceration process, which is one of the essential phases of incense making.

While the exact formula of the abovementioned basic ingredients may vary among artisans, but the incense making steps remain the same, and they are as follows:

Buying the raw materials:

Expert artisans choose diligently between various types of raw ingredients and formulations. They take into account the price range of the batch they are buying the ingredients for. The highest tier is called Bridal, and sometimes Elite tier. This is because it is customary that soon-to-be brides are gifted the best mixes with the most premium ingredients. The artisans employed the reputation of this niche mix to sell a product with the same high standards as the original gifted blend. Typically, all of the raw ingredients can be bought from Wadi Aldawasir. In recent years however, the capital Riyadh has become a popular destination for buying the materials. One of the main centers is Muaiqilyah, which is a flea market located in old town Riyadh near Qasr Alhukm District or Justice Palace District. Its apothecary shops cater to incense makers and consumers with a wide variety of raw materials and prepared blends. Despite its growing popularity among artisans, Rasmah Aldawsari describes the shopping experience as "a hit or a miss," stating that artisans are expected to employ their expertise and sharpened senses to assess the quality of products even from trusted sellers.

Preparing the ingredients:

The preparation process starts with preparing the operculum. Raw operculum is boiled in water multiple times to soften the meat tissue inside the shell. The first boil uses soap and bleach, and the second uses soda bicarbonate. After the two initial boils it needs to be hand washed with soap. Aromatic herbs such as cardamom and cloves are added to the final boil to extinguish any remaining fishy odors. After that the meat is painstakingly scraped off the insides of each individual shell using knives or wire mesh. Then it needs to air dry in the sun for a few days before roasting. The traditional method for roasting involves using cooking it in fine sand, which helps distribute the heat evenly, however ovens have replaced this method. The freshly roasted shells are then taken out and added to a water that is lightly infused with flower extracts to marinate. The last step is drying the shells and grinding them.

Mixing and macerating:

The ground ingredients are mixed with different market name flower extracts with various notes such as rose, jasmine, and lotus. A sticky date paste is especially prepared for the mixing process. The dates are cooked down and purified thoroughly to prevent date skin from affecting the smell of the blend. The mix is then covered and left in a dark place for anywhere between a few days up to six months.

Shaping:

The final step is the shaping of the incense blend into small balls, or less commonly small disks. This is the step where the incense maker receives help from other woman usually within her family and is usually done in one session that last for several hours.

Social practices associated with incense making:

Communal labor:

Incense making is mostly an individual effort, done by one person in most of the stages. Some parts of the recipe are measured according to the maker preferences, such as the flower extract addition, while other parts is done according to a specific formula and measured carefully, such as the addition of marine ingredients, which are measured by weight and form the basis of the mix. This self-reliance is not always optional, both artisans described a lack of interest from people around them, especially from their sons and daughters. On the other hand, Om Habib perceives the individual effort as passion, and she takes this chance to perfect her work to a meticulous level.

It isn't until the last step of the process that the artisans receive some assistance. This involvement isn't thought of as mere help, it is an intimate social gathering centered around the simple task of shaping the mix into small balls. Hind Aldawsari describes the atmosphere of the gathering as joyful, where it's customary that each woman who attends the gathering bring home-made food. Together, the women exchange stories and share food over the span of one day or evening. The gathering is both practical and celebratory, and according to Hind, it even "strengthens the bond of family members," who receive no financial compensation or even get any amount from the mix they participate in shaping. Their participation is a kind gesture and an act of respect to the female elder of the family, and also a chance to connect with their each other.

Wedding traditions:

A big part of incense making is bridal commissions. A bride is traditionally expected to dedicate a portion of her dowery to commission an artisan to make a big batch of incense for her. This commission is sometimes paid by women close to her as a gift. The artisan is commonly a relative or someone in the bride's social circle. Other times this big batch is made and gifted by the artisan herself if the bride is close to her, e.g. a daughter or a daughter in law. Before the wedding, relatives of the bride display the incense mix, which is usually packaged in a set of decorative glass jars, in a dedicated cabinet in the brides new home.

Bridal mixes are considered the best tier and made to the highest standards. According to Om Habib, these mixes are not popular in the market and are usually prepared to request due to their high cost. Gifting the bride is a big catalyst for the craft and its continuity. The name bridal mix is still used to refer to the luxury product regardless of whether the client's intended use.

Additionally, Incense makers usually make and sell other perfumery products that are part of the same wedding traditions. This includes home fragrance sprays, hair fragrances, fragrant mint candy, and a specially treated, brightly colored decorative bedding sheet that has been soaked in perfume.

Economic practices associated with incense making:

Gender roles:

Traditionally, men were responsible for obtaining the materials before they were available in local markets. This involves travelling abroad to producing countries such as Indonesia or India. Hind Aldawsari remarks that this was the role given to men in artisan's family up until two decades ago, when the materials reached the local market. Since then, women overtook this role and became responsible for choosing the ingredients. Both artisans believe that shopping for materials is a crucial step, since it relies on experience for a thorough assessment of products.

Selling and marketing methods:

Most sales start from the small community that surrounds the artisans. Even after years of continuous trading they keep a regular client base of community members and acquaintances. Expanding beyond their close-knit community is usually done through recommendations. Word-of-mouth is the primary means by which they gain new clients. The clients are loyal and one-time sales are rare. The recommendations marketing is so saucerful that they gain clients from the gulf region. Rasmah Al Dawsari states that her products reached Kuwait and that her Kuwaiti clients keep in touch with her regularly. Remarkably, the artisan's relationship with their clients is marked by longevity, even if the client isn't part of the artisan's family or immediate community. A perfect example is a client of Om Habib who has been buying wholesale from Om Habib for thirty years and sells the incense in a small stall in a women's market in Riyadh. Notably, wholesale is another popular sales technique that forms a good portion of commissions the artisans receive. Sometimes the commissioner is perfume shops, and other times it's women sellers in women markets. Other times young family relatives who are connected to the artisans and living outside Wadi Aldwasir start their own business. They either work with artisan as one family business as a mother-daughter or mother-son team, or buy the products wholesale and label and resell it, which is the case of Hind Aldawsari. This business model allowed younger generation to use their creativity and marketing skills

Recently, social media platforms have offered many artisans the chance to reach wider audience. Both artisans have dedicated social media profiles for their businesses, and they post regularly about their products. Some artisans also employed e-commerce platforms to sell their products, which is the case of Rasmah Aldawsari, who has an active online store. Om Habib however is not part of any e-commerce platforms, and she relies on personal contact through her phone numbers beside her physical shop in the women's market of Wadi Aldwasir.

Women's markets:

Flea markets are a big part of Saudi culture. Historically, women sellers clustered in a specific space either next to or separate from them main market of the town, and this space is usually referred to as the women's market. Women usually sold items that cater to the needs of other women of the time, such as perfumes, textiles, and jewelry. Other items included fresh farm produce and dairy.

The first mention of a women's market in Saudi Arabia is by Historian Othman Ibn Bishr, who recorded life in Najd during the rule of Imam Mohammed ibn Saud between 1803 and 1814. Sometimes the

women section is separated from the rest of the market by a wall, such is the case of the biggest market in Riyadh in the early 1910's, which was located near the Governance Castle. Some accounts mention that those women would come to sell only on Fridays, and that they didn't have sperate shops, but they would setup their items on a raised platform or on the floor on a piece of fabric, and this setup is known as "بسطة", transl: Basta," which translates to "spread," and the women sellers known as "بساطات", transl: Bassatat" or "spreaders." <>

In recent years, women spaces have faced increasing restrictions, from raising rents to eviction orders, even at women markets that were established as charitable initiatives. For decades, these philanthropic markets created an accessible and supportive environment of women of low-income and single income households, many of whom relied on selling their handmade goods, including incense. Additionally, most of these sellers are also the breadwinners to their family, especially in families with no male provider. (2020 (قناة الإخبارية, MBC في أسبوع - (MBC in a Week - MBC, 2019)

Another important factor that adds to the vulnerability of women selling in women-exclusive spaces is that most of them are middle-aged or seniors with little to no education. According to (Alturaif, 2013), 46% of the study's sample of 200 women sellers from 8 different women markets were above the age of 50, and more than half of the total sample were illiterate. The investigative study also identified several difficulties that face women sellers. The structured interviews revealed that 99% of the women were the sole breadwinners for their families and that 81% percent are either divorced or widowed. Another alarming denominator is that 83% earn less than the minimum wage from their sales, and that 79% reported that they live in rented homes. (Alturaif, 2013)

Despite the neglect, women markets still retain their role in providing a familiar and relatively comfortable environment for women while giving them room to support themselves. Om Habib describes how her store that she opened inside a women's market helped more than thirty years ago initiate her business: "life gotten a little harder, but then I opened my shop, and little by little my business expanded." Moreover, these markets are significant places of exchange for craftswomen since they keep practical skills and traditional knowledge in circulation and closer to market goers and consumers. Some women were able to learn the craft at the hand of artisans who sell at the women market. Om Habib mentioned that she once invited a market visitor to her home to show her how to make incense. The woman came from Medinah to women market in Wadi Aldwasir to learn making incense and start a business.

The value of the craft:

To most elderly artisans, incense is a revered family tradition which has been passed down from generation to generation. Rasmah Aldawsari is one of a line of expert artisans, and she cannot remember the exact age when she learned the skill, because she acquired it through observation. Most artisans learn the craft from a young age and continue making and building businesses around their skill which continue to old age. Incense then exceeds the walls of the home and family life into wider social and economic contexts. It becomes a reliable and steady source of income. It expands the women social circles and helps them form connection with constantly widening client base. Additionally, the artisans gain many skills beside the traditional craftsmanship. They start as humble

sellers but then they become skilled entrepreneurs and traders who go on to have successful businesses despite the absence of institutional support and training.

Not all of the artisans learned the skill from their families; some learn it as a practical response to economic need. Om Habib, for instance, at age 23, asked an expert artisan to teach her when she returned to Wadi Aldwasir after living in the Eastern Province for a few years. While living there, she worked from home as a seamstress, a skill her mom had taught her. She stated that after getting married and moving back to Wadi Aldwasir, she was seeking financial security especially that she had no degree. Similarly, Badriah Hassan, a resident of Jazan, resorted to learning and selling incense nine years ago after she and her husband, who live on minimum went through financial difficulty. She started her home business from only 50 Riyals to support her husband and four children and to pay the home rent.

These accounts show that incense making should not be understood merely as a traditional handicraft preserved for cultural reasons alone, but a viable means of financial support that evolved from a domestic skill into a more sustained economic activity. It is a form of resilience and self-reliance for disadvantaged women with limited formal education and employment opportunities.

Knowledge transmission and sustainability:

All of the artisans interviewed showed their eagerness to transmit their knowledge to others, and some of them have already implemented knowledge sharing within their practice. They have taken the steps to teach people around them especially their daughters. Om Habib said that her daughters learned from her through observation, however, she is actively teaching her middle daughter, Haya, who expressed her intent to continue her mom's project. On the other hand, Rasmah Aldawsari expressed her distaste of the new generation's attitude towards the traditional craft. Her daughters only became somewhat involved after she was invited to participate in a cultural event in Diplomatic Quarter in Riyadh. Her role in event was to showcase the process of making incense and hand out samples to guests. While travel and accommodation expenses were covered by the government agency that organized the event, she still paid for the material costs because she wanted to promote the handicraft to local and global audience. This single participation made her aware of the importance of cultural events and its effectiveness in drawing younger audience, she is grateful for that opportunity and wishes to be involved in such events in the future.

While the artisans remain dedicated to transmitting the craft, they criticized the lack of interest from new generation in making incense. The only role they play, if any, is in selling and marketing products, rather than gaining hands on experience in incense making. The prevalent structure of family incense businesses is based on generational division of tasks, where older women are in charge of incense making, and younger women, sometimes younger men are responsible for selling. Om Habib attributes this disinterest to the nature of incense making. The traditional method is time-consuming and arduous. It has been strictly maintained and rarely updated to suit contemporary needs. It also needs a wide dedicated space, which is why the rural homes of Wadi Aldwasir are ideal as working space. The incense is made in a separate room from the main residential building and needs a wide-open place such as a big yard for drying ingredients and drying the final shaped mix. This is one of the reasons why the craft rarely moved beyond its native town, and the presence of the craft in Riyadh is

exclusive to trade rather than manufacturing. This rigidity puts the handicraft at risk, and limits generational transmission, which is how the craft survived for hundreds of years. Although the incense trade is thriving in major city, the traditional knowledge needs to be passed down through practical training, starting from young incense sellers who are hesitant to start making incense due to the abovementioned obstacles.

Conclusion:

This paper attempted to shed light on the handicraft of incense making and the women who are keeping it alive. The results reveal that incense-making cannot be reduced to a simple domestic handicraft or a commercial product. Rather, it is a sophisticated practice that connects contemporary women artisans to a longer regional history of trade and inherited expertise. The study also shows that the incense making is technically complex and socially meaningful at the same time. The data illustrates a process grounded in careful ingredient selection and labor-intensive preparation. At the same time, the craft is deeply woven into social relations, from communal labor to wedding traditions and gift exchange. These practices highlight the extent to which the craft is sustained not only through production, but also through the social contexts in which it is embedded. Another key finding of the study is that incense making can function as a viable means of economic support for women, especially those facing limited educational or professional opportunities, allowing them to support their households through building small businesses around inherited or acquired expertise.

The artisans have succeeded in sustaining the tradition and simultaneously commercializing and popularizing their work, and their mixes continue to be one of the most sought after and trusted fragrances in the market. However, a well-appreciated product and a successful commodity don't mean a well-understood and documented craft. Despite the easy access to the artisans and their products, official efforts have yet to support these heritage bearers and facilitate knowledge transmission. Ultimately, this study strongly recommends that incense making in Wadi Aldawasir should be recognized as a significant form of women's intangible heritage. Future efforts to preserve the craft should therefore move beyond documentation alone and toward creating more sustainable conditions for its transmission and continuity.

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The Impact of Climate Change on Heritage Sites and Practices: A Policy Analysis of Climate Governance and Cultural Integration

Sarah Alqahtani

Abstract

Climate change poses escalating risks to both natural and cultural heritage, affecting not only physical environments but also the continuity of cultural practices and knowledge systems. While international frameworks have advanced in addressing environmental threats to heritage sites, the integration of intangible cultural heritage within climate governance remains limited and uneven.

This study examines the relationship between climate change, cultural heritage, and governance, with a focus on policy integration and adaptation processes. Adopting a qualitative approach, it combines policy analysis with a case study of the Great Barrier Reef, drawing on international reports and long-term environmental data.

The findings reveal a persistent gap between environmental policy implementation and the incorporation of cultural practices, community participation, and local knowledge systems. This gap reflects a broader limitation in technocratic governance approaches, which prioritise environmental indicators while marginalising socio-cultural dimensions.

The study contributes by advancing an integrative governance perspective that positions intangible cultural heritage and community knowledge as central components of climate resilience. It argues that effective climate adaptation in heritage contexts requires a shift towards more inclusive, multi-level, and socio-ecological governance framework.

Keywords: Climate Governance; Cultural Heritage; Intangible Cultural Heritage; Climate Adaptation; Socio-Ecological Systems; Policy Integration; Great Barrier Reef.

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List of Abbreviations:

AIMS: Australian Institute of Marine Science

BoM: Bureau of Meteorology

CSIRO: Commonwealth Scientific and Industrial Research Organisation

GBRMPA: Great Barrier Reef Marine Park Authority

IPCC: Intergovernmental Panel on Climate Change

UNESCO: United Nations Educational, Scientific and Cultural Organization

1. Introduction

Climate change is increasingly recognised as one of the most significant global challenges affecting environmental, economic, and social systems worldwide according to the Intergovernmental Panel on Climate Change (IPCC, 2021). While substantial scholarly attention has focused on its ecological and economic consequences, the implications of climate change for cultural heritage have only more recently gained sustained academic and policy attention (Fatorić and Seekamp, 2017). This is significant because heritage sites, landscapes, and cultural practices are deeply connected to environmental conditions that are now undergoing rapid transformation.

The Great Barrier Reef provides a particularly important case through which to examine these dynamics. Recognised as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage property, the Reef has experienced repeated mass coral bleaching events associated with marine heatwaves and rising ocean temperatures (Hughes et al., 2018). According to the Australian Institute of Marine Science (AIMS, 2025), recent bleaching episodes have contributed to declining coral condition across multiple regions of the Reef. These changes threaten ecological integrity, tourism economies, and Indigenous cultural relationships with Sea Country.

Despite the availability of scientific evidence and increasingly sophisticated policy frameworks, environmental degradation continues across many heritage sites. This raises critical questions regarding the effectiveness of current climate governance systems. Existing responses often retain a technocratic orientation, prioritising measurable environmental indicators while giving less attention to cultural values, local participation, and intangible heritage knowledge systems (Adger et al., 2013; Jordan et al., 2015).

This study addresses that gap by examining how climate change, heritage governance, and cultural knowledge systems interact within the Great Barrier Reef context. Drawing on socio-ecological systems theory and climate governance literature, the research argues that effective adaptation depends not only on institutional capacity, but also on the meaningful integration of diverse knowledge systems into decision-making processes. In doing so, the study contributes to more inclusive approaches to heritage resilience under conditions of accelerating environmental change.

2. Research Objectives

This study aims to:

1. Analyze international climate and heritage governance frameworks to assess how they address both tangible heritage sites and intangible cultural practices.

2. Evaluate the implementation of climate adaptation strategies within a World Heritage context using Australia as a benchmark case.
3. Identify gaps in policy integration, particularly regarding the inclusion of intangible cultural heritage.
4. Propose policy-oriented recommendations that strengthen the role of local communities in climate adaptation processes.

3. Literature Review

3.1 Climate Change and Heritage Vulnerability

Climate change is widely recognised as a major threat to both natural and cultural heritage systems. Rising global temperatures, sea-level rise, ocean acidification, and the increasing frequency of extreme weather events are altering the environmental conditions upon which many heritage sites depend (IPCC, 2021; ICOMOS, 2019). Coastal heritage sites are increasingly exposed to shoreline erosion, flooding, saltwater intrusion, and storm damage, while changing temperature and precipitation patterns can weaken the structural integrity of historic buildings, archaeological materials, and traditional landscapes (UNESCO, 2016; Fatorić and Seekamp, 2017).

Marine heritage environments are particularly vulnerable. Coral reef ecosystems are highly sensitive to rising sea temperatures, which can trigger coral bleaching, biodiversity decline, and long-term ecological degradation (Hughes et al., 2018).

The Great Barrier Reef provides a critical example of climate-induced heritage vulnerability. Repeated mass bleaching events over the last decade have demonstrated how rapidly environmental change can transform ecosystems of global significance. Research analysing the 2016 bleaching event estimated that approximately 30% of shallow-water corals died within a single year (Hughes et al., 2018). Subsequent bleaching episodes in 2017, 2020, 2022 further indicate an increasing frequency of climate-related stress events (AIMS, 2025).

However, the impacts of climate change extend beyond physical degradation. Heritage systems are embedded within social, cultural, and economic contexts, meaning that environmental disruption can also affect local livelihoods, tourism economies, cultural practices, and community identities linked to heritage places (Adger et al., 2013). For Indigenous communities, environmental change may also disrupt relationships with Country and the transmission of place-based knowledge across generations (Leonard et al., 2013).

These wider impacts demonstrate the need to move beyond purely material approaches to heritage conservation. Heritage vulnerability should instead be understood as a socio-ecological condition in which environmental change affects both physical assets and the human systems that sustain their meaning.

3.2 Heritage as a Socio-Ecological System

In response to these expanding forms of vulnerability, recent scholarship has increasingly conceptualised cultural heritage as a socio-ecological system in which environmental processes,

cultural practices, and institutional governance are deeply interconnected (Fatorić and Seekamp, 2017; IPCC, 2021).

From a socio-ecological perspective, heritage is not a static entity but an evolving configuration in which ecological conditions, cultural values, and social practices co-produce heritage outcomes (Folk et al., 2005). Consequently, environmental change can disrupt not only ecosystems themselves, but also the cultural meanings, practices, and institutions that depend upon them.

Environmental transformations are occurring at scales and speeds that challenge the adaptive capacity of both ecological and cultural systems. In marine heritage environments such as coral reef systems, ecological degradation can directly affect fisheries, tourism, ceremonial relationships, and culturally embedded connections with sea environments (UNESCO, 2016; Hughes et al., 2018).

Importantly, this perspective highlights the central role of intangible cultural heritage within wider heritage systems. Traditional ecological knowledge, seasonal calendars, oral histories, customary resource management, and place-based practices are not peripheral elements; rather, they are fundamental components that sustain continuity, identity, and resilience (UNESCO, 2003; Adger et al., 2013).

Recognising heritage as a socio-ecological system therefore has significant implications for governance and policy. It requires moving beyond site-based conservation models towards integrated management strategies that address ecological dynamics, cultural continuity, and institutional coordination simultaneously (Fatorić and Seekamp, 2017; Armitage et al., 2009). It also reinforces the need to include local and Indigenous knowledge systems within climate adaptation planning as active components of resilience rather than symbolic additions

This perspective provides an important theoretical foundation for the present study. By adopting a socio-ecological lens, the research moves beyond fragmented approaches to heritage risk and contributes to a more comprehensive understanding of how climate change reshapes heritage systems across environmental, cultural, and governance dimensions.

This socio-ecological perspective provides theoretical foundation for the present study.

3.3 Climate Governance and Policy Integration

Building on this socio-ecological perspective, climate governance refers to the institutions, policies, and regulatory mechanisms through which societies seek to mitigate climate change and adapt to its impacts (Jordan et al., 2015; IPCC, 2021).

A persistent challenge in literature is governance fragmentation. While international frameworks set broad objectives, implementation largely occurs at domestic and local levels, often producing gaps between policy ambition and practical outcomes (Jordan et al., 2015; Biermann et al., 2009).

In this context, climate governance has often prioritised measurable environmental indicators such as emissions, temperature rise, biodiversity loss, and ecosystem condition. Although essential, these approaches may adopt a technocratic orientation that underestimates cultural values, local participation, and intangible heritage dimensions (Adger et al., 2013; Waterton and Watson, 2015). As a

result, traditional knowledge systems and community-based adaptation practices are often weakly integrated into formal governance processes (UNESCO, 2025).

Australia provides a useful empirical example. National adaptation strategies, emissions legislation, and sectoral programmes such as the *Reef 2050* Long-Term Sustainability Plan demonstrate substantial institutional capacity and policy development (Australian Government, 2022; GBRMPA, 2023). However, continued bleaching events and ecological decline in the Great Barrier Reef indicate that policy presence alone does not guarantee effective outcomes (AIMS, 2025; Crowley, 2017).

Despite these governance efforts, a central issue is the mismatch between global climate drivers and nationally bounded responses. Major pressures affecting reef systems are shaped by cumulative global emissions beyond the control of any single state (IPCC, 2021). This creates structural limits to what heritage governance can achieve in isolation (Young et al., 2006). Moreover, although climate governance frameworks increasingly operate across international and national scales, their implementation remains shaped by locally specific environmental, cultural, and institutional conditions. Consequently, governance approaches developed within one heritage context may not be directly transferable to others without adaptation to differing socio-ecological realities. This highlights the broader challenge of aligning global climate objectives with context-specific heritage governance systems (Jordan et al., 2015; Adger et al., 2013).

Furthermore, although recent frameworks recognise Traditional Owner participation and stakeholder engagement, the incorporation of Indigenous knowledge into decision-making remains uneven and frequently consultative rather than transformative (Hill et al., 2012; GBRMPA, 2023; UNESCO, 2025).

Effective climate governance in heritage contexts therefore requires more than additional policy instruments. Consequently, it depends on stronger cross-scale coordination, integration of multiple knowledge systems, and adaptive governance models capable of responding to complex socio-ecological change (Chaffin, Gosnell and Cosens, 2014).

4. Methodology and Research Design

4.1 Research Design

This study adopts a qualitative single-case study design to examine the relationship between climate change, heritage vulnerability, and governance responses within the Great Barrier Reef context. A case study approach is appropriate where contemporary and complex phenomena are investigated within their real-world setting (Yin, 2014).

The Great Barrier Reef was selected as a critical case because of its global heritage significance, and prominence within international climate governance debates. It provides a strong empirical basis for examining how environmental risk, policy responses, and cultural values interact under conditions of accelerating climate change.

Single-case designs are particularly valuable when cases generate broader theoretical insight (Flyvbjerg, 2006). The Reef meets these criteria because it combines high ecological value, strong institutional attention, and persistent climate-related decline despite substantial governance

intervention. The research aims for analytical generalisation by using the case to inform wider debates on heritage resilience, adaptive governance, and socio-ecological vulnerability (Dumez, 2015).

4.2 Data Sources

The research relies on secondary qualitative data. These include policy documents, management plans, scientific assessments, government legislation, and institutional reports. Key sources include Reef 2050 Long-Term Sustainability Plan developed by the Great Barrier Reef Marine Park Authority (GBRMPA, 2023), IPCC assessment reports (IPCC, 2021; 2022), UNESCO monitoring documents (UNESCO World Heritage Centre, 2025), Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology (BoM) (CSIRO and BoM, 2022), and reef condition reports produced by the AIMS (2025).

4.3 Data Collection Method

Data was collected through systematic document review. Documents were selected according to relevance and credibility. Priority was given to recent materials published between 2015 and 2025 in order to capture contemporary governance responses and recent climate impacts.

Document analysis is appropriate for examining policy narratives and governance structures (Bowen, 2009).

4.4 Analytical Strategy

The study applies thematic qualitative analysis to identify patterns across the dataset. Coding focused on four analytical themes: (1) climate risk and environmental vulnerability, (2) governance capacity and policy coordination, (3) cultural and Indigenous knowledge integration, and (4) gaps between policy commitments and observed outcomes.

Themes were interpreted through the theoretical lenses of socio-ecological systems and climate governance. This enabled interpretation of structural governance challenges.

4.5 Validity, Reliability and Limitations

Credibility was strengthened through triangulation across scientific and policy sources. However, the study is limited by its reliance on secondary data and publicly available documents. It does not include interviews, ethnographic observation, or primary stakeholder perspectives. Findings are analytically rather than statistically generalisable.

4.6 Ethical Considerations

The study relies exclusively on publicly accessible documents and therefore did not require formal ethical approval. Academic integrity was maintained through accurate citation and transparent source representation.

4.7 Reflexive Positioning

The analysis is shaped by interpretive and theoretical choices made by the researcher. Acknowledging this position strengthens transparency and methodological rigour (Tight, 2010).

5. Empirical Case Study: Climate Governance and Heritage under Environmental Stress in Australia

5.1 Climate Change Exposure and Environmental Change

Current empirical data indicate a measurable and sustained increase in sea surface temperatures across the Australian region. For instance, according to CSIRO and BoM (2022), average temperatures have risen by approximately 1.05°C since 1900, with the rate of warming accelerating significantly after 1980. As illustrated in Figure 1, the temperature trajectory exhibits a steep upward climb, particularly between 2000 and 2020.

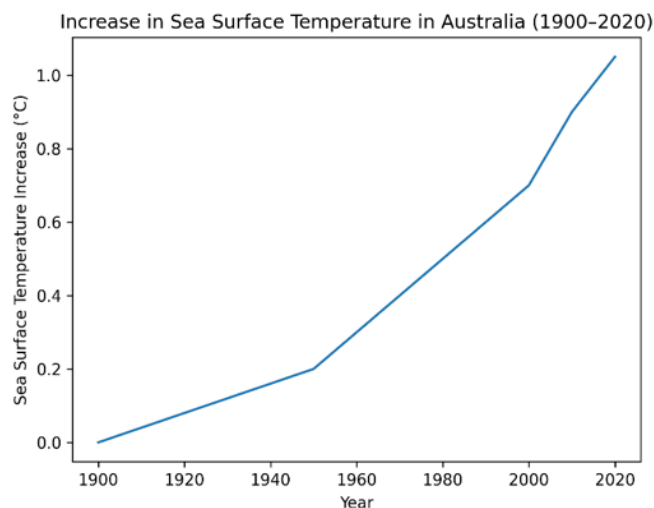


Figure 1. Cumulative Increase in Sea Surface Temperature in Australia (1900–2020).

Source: (CSIRO and BoM, 2022).

These findings align with data from the IPCC (2021), which confirms that rising sea temperatures are directly associated with the growing frequency of marine heatwaves and coral bleaching. Where repeated bleaching has been recorded over the past decade. Recent monitoring data from the AIMS (2025) shows that the Reef experienced six mass bleaching events between 2016 and 2025: 2016, 2017, 2020, 2022, 2024 and 2025. This demonstrates that the recovery windows between these disturbances are rapidly narrowing.

These findings suggest that climate exposure to the Reef is no longer episodic. Instead, it signals a fundamental, structural transformation of the environment. For heritage governance, this shift is critical; it indicates that traditional conservation strategies designed for periodic disturbance may be inadequate under conditions of repeated and accelerating climate stress.

The ecological fallout is equally evident in the declining state of coral health. According to AIMS (2025) reports, coral cover declined by up to 33% in severely affected regions following the 2024–2025 bleaching event (Figure 2). Overall, the data demonstrates repeated thermal stress and measurable ecological change across the Reef.

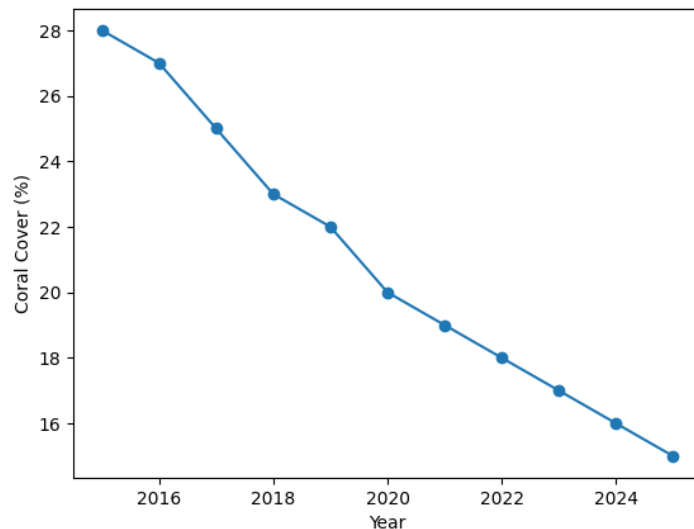


Figure 2. Longitudinal Decline in Coral Cover across the Great Barrier Reef (2016–2025).
Source: Adapted from AIMS (2025).

5.2 Governance Measures and Policy Instruments

According to policy documents, Australia has implemented a multi-layered governance framework designed to address the escalating climate risks facing the Great Barrier Reef. This framework operates across legislative, strategic, and programmatic levels. At the national level, the *Climate Change Act 2022* establishes legally binding emissions reduction targets, including a 43% reduction below 2005 levels by 2030 and net-zero emissions by 2050 (Australian Government, 2022). The Act provides the overarching context within which environmental and marine governance strategies are developed.

At the sectoral level, the *Reef 2050 Long-Term Sustainability Plan*, developed by the GBRMPA (2023), constitutes the primary policy instrument guiding reef management. Including ecosystem health, water quality, biodiversity conservation and climate adaptation. The Plan is operationalised through a range of governance tools and mechanisms, as summarised in Table 1. While the *Reef 2050 Plan* represents a comprehensive governance framework for reef management, its policy mechanisms remain largely adaptive and response oriented. The accelerating environmental changes outlined in Section 5.1 suggest increasing pressure on governance systems originally designed around assumptions of ecological recovery and management continuity.

Table 1. Governance Instruments

Governance Tool	Key Objective	Primary Source
Emissions Targets	43% by 2030; net zero by 2050	Australian Government 2022
<i>Reef 2050 Plan</i>	Long-term reef strategy	GBRMPA 2023

Water Quality Plans	Reduce land pollution	GBRMPA 2023
Monitoring Systems	Coral and ecosystem data	AIMS 2025
Indigenous Rangers	Local management	GBRMPA 2023

Source: Compiled by the author based on Australian Government (2022), GBRMPA (2023), AIMS (2025), and UNESCO (2025).

The *Reef 2050 Plan* identifies climate change as the primary long-term threat to reef systems, prioritising adaptation strategies such as ecosystem restoration, resilience-based management, and improved monitoring systems (GBRMPA, 2023). Empirical environmental data, however, reveal a stark divergence: significant ecological degradation has persisted throughout the very period these governance measures were implemented. As illustrated in Figure 3, the Reef endured repeated mass bleaching events between 2016 and 2025 (AIMS, 2025). Policy expansion coincided with continued environmental stress.

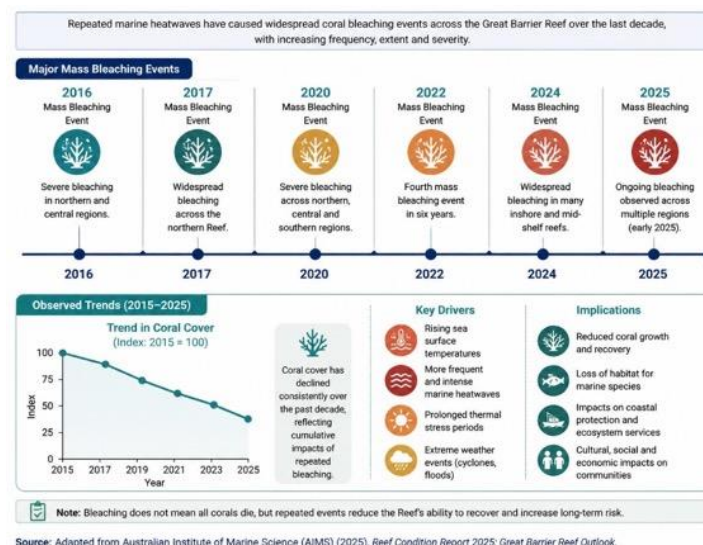


Figure 3. Timeline of Major Mass Bleaching Events in the Great Barrier Reef (2016–2025).

Source: Adapted from AIMS (2025).

A further critical dimension of this governance framework is the intended integration of Indigenous knowledge systems. Current policy frameworks formally recognise the role of Traditional Owners, establishing mechanisms for participation through co-management arrangements and ranger programmes (GBRMPA, 2023). Nevertheless, official documentation suggests a persistent implementation gap; scientific monitoring data such as coral cover metrics and temperature thresholds remain the primary basis for environmental assessment (AIMS, 2025). Consequently, there remains limited evidence of the systematic integration of Indigenous knowledge within these technical decision-making processes (UNESCO, 2025). This reflects a gap between formal recognition and operational integration within governance systems.

5.3 Cultural Heritage and Indigenous Knowledge Integration

Current policy and programme documentation indicate that Indigenous knowledge systems are formally acknowledged within the governance frameworks of the Great Barrier Reef, particularly through co-management arrangements and Indigenous ranger programmes.

At the national level, Indigenous ranger programmes are supported through federal environmental initiatives and operate across multiple regions of Australia. Government data indicate that more than 200 Indigenous ranger groups are active nationally, employing over 3,000 Indigenous rangers engaged in land and sea management activities (Australian Government, 2023). The compartmentalisation of Indigenous knowledge into 'programme reports' rather than 'national indices' represents a form of epistemic marginalisation, where custodial expertise is valued for its labour but excluded from high-level ecological assessment.

Programme documentation from the GBRMPA (2023) shows that Traditional Owners engage in sea country management through diverse activities, including biodiversity monitoring, species tracking, seasonal observation and ecosystem stewardship. These practices reflect traditional ecological knowledge built upon long-term environmental observation and intergenerational transmission.

Empirical research further demonstrates applied examples of Indigenous knowledge in environmental management. Costa et al. (2025) document co-management practices in mangrove ecosystems associated with the Great Barrier Reef, where Indigenous knowledge contributes to ecosystem monitoring. However, a closer analysis of monitoring frameworks and governance outputs indicates variation in the extent to which such knowledge is integrated into formal governance systems.

Environmental assessment across the Reef remains predominantly tethered to standardised scientific monitoring systems coordinated by the AIMS. These systems rely almost exclusively on quantitative indicators, such as coral cover percentages, species composition, thermal stress thresholds and satellite-derived sea surface temperature data (AIMS, 2025).

For example, reef condition assessments are based on repeated transect surveys and quantitative indices of coral cover, which are aggregated into national reporting frameworks such as the *Annual Summary Report on Coral Reef Condition* (AIMS, 2025). Consequently, these quantitative indices form the primary evidentiary basis for policy evaluation, funding allocation and management prioritisation.

In parallel to these technical assessments, Indigenous ranger programmes generate a distinct form of environmental knowledge through site-based monitoring, seasonal observation, and culturally embedded ecological practices. These activities produce locally specific, qualitative, and longitudinal insights grounded in a continuous, multi-generational interaction with the environment (GBRMPA, 2023). However, there is limited evidence that these knowledge outputs are systematically integrated into formal reef condition assessment frameworks. Current AIMS reporting structures do not include Indigenous observational datasets as standardised inputs within national coral monitoring indicators (UNESCO, 2025).

This distinction is ultimately reflected in the hierarchy of governance outputs. While scientific monitoring data are centrally compiled, standardised, and directly linked to policy decision-making processes, Indigenous knowledge often remains siloed within individual programme reports, local

management plans or case-specific studies rather than embedded within national-level assessment systems.

As shown in Table 2, these factors culminate in a measurable asymmetry of representation within the broader governance architecture. While scientific datasets are systematically woven into national monitoring frameworks that span the entire spatial extent of the Reef, Indigenous knowledge contributions remain spatially and institutionally tethered to specific programmes or localised regions.

Table 2. Policy vs Environmental Outcomes

Policy Objective	Observed Outcome	Source
Climate Adaptation	Repeated bleaching events	AIMS 2025
Ecosystem Resilience	Coral decline up to 33%	AIMS 2025
Knowledge Integration	Limited operational integration	UNESCO 2025

Source: Compiled by the author based on AIMS (2025), GBRMPA (2023), and UNESCO (2025).

Collectively, these findings reveal that the disparity between these knowledge systems is not a matter of absence but of structural integration. Scientific knowledge is institutionally privileged within governance systems shaping the indicators and evidentiary standards used in environmental assessment. In contrast, Indigenous knowledge despite being actively produced and applied at local levels remains only partially incorporated into the formal assessment and decision-making processes that govern long-term Reef policy.

6. Discussion: Climate Governance, Knowledge Systems and Heritage under Climate Stress

The findings of this study reveal a complex relationship between climate change, institutional governance, and the integration of diverse knowledge systems within the Great Barrier Reef. While Australia has established an extensive governance framework addressing climate risks, the empirical evidence presented in Section 5 highlights a persistent gap between policy ambition and actual environmental outcomes. The 33% decline in coral cover documented following the 2024–2025 bleaching cycle indicates that environmental change is occurring at a scale and intensity that exceeds the adaptive capacity of existing governance frameworks. This creates a critical temporal mismatch: while coral bleaching has shifted toward a near-annual frequency (2024–2025), governance instruments like the *Reef 2050 Plan* continue to rely on multi-year review cycles that are too slow to respond to such rapid ecological shocks.

From a socio-ecological systems perspective, these findings suggest that heritage systems cannot be effectively managed through isolated governance interventions. This reflects the broader challenge identified in socio-ecological theory: complex systems are defined by non-linearities, feedback loops and thresholds that are difficult to manage through conventional policy approaches.

Furthermore, the analysis highlights structural limitations within climate governance. Their effectiveness of these frameworks is constrained by the scale at which climate drivers operate. The

continued degradation of the Reef, despite rigorous national-level interventions highlights a scalar misalignment between globally driven environmental processes and nationally bound governance responses. The disproportionate focus on land-based runoff in the *Reef 2050 Plan*, while ecologically significant, may inadvertently obscure the primary driver of degradation: global thermal stress, over which domestic marine policy has no direct control. This confirms that governance capacity alone is insufficient when the primary drivers of environmental change operate beyond the jurisdiction of domestic policy systems.

A critical revelation of this study concerns the role of knowledge systems within these frameworks. According to the findings, Indigenous knowledge is not absent from reef management; rather, it is unevenly integrated across governance levels. While Indigenous ranger programmes and co-management initiatives provide clear evidence of local engagement and knowledge application, this knowledge is less consistently embedded within formal assessment frameworks and decision-making processes.

This pattern reflects an epistemic hierarchy within governance systems, where knowledge forms that are standardised, quantifiable and compatible with institutional reporting structures are prioritised. Scientific monitoring systems, based on measurable indicators such as coral cover and temperature thresholds, are therefore more readily incorporated into governance processes than qualitative, place-based knowledge systems. As a result, Indigenous knowledge remains partially external to core decision-making structures, despite its recognised value in policy discourse.

These findings have important implications for heritage governance. They suggest that improving policy effectiveness requires more than expanding governance frameworks or increasing technical capacity. Instead, it necessitates a shift towards more integrative approaches that recognise the complementary value of different knowledge systems. In this context, the challenge is not simply one of inclusion, but of operational integration. Incorporating Indigenous knowledge into governance requires institutional mechanisms capable of translating qualitative, context-specific knowledge into forms that can inform policy and management decisions without reducing its complexity or cultural significance.

Overall, the study contributes to ongoing debates in climate governance and heritage studies by demonstrating that governance effectiveness is shaped not only by policy design but also by how knowledge systems are structured, prioritised and operationalised within decision-making processes.

This study is limited by its focus on the *Great Barrier Reef* case study, and therefore the findings may not be fully transferable to heritage systems operating under different environmental or governance conditions.

7. Conclusion

This study has examined the relationship between climate change, cultural heritage, and governance through a qualitative analysis of policy frameworks and a case study of the Great Barrier Reef. The findings demonstrate that the impacts of climate change on heritage cannot be understood solely in environmental terms but must be analysed as outcomes shaped by governance structures, institutional dynamics, and the interaction of multiple knowledge systems. Despite the presence of

extensive scientific monitoring systems and comprehensive governance frameworks, the study demonstrates that environmental degradation and cultural vulnerability continue to intensify across the Reef system.

By adopting a socio-ecological and governance-based perspective, the research contributes to a more integrated understanding of heritage under climate stress. The findings reveal that governance effectiveness is shaped not only by institutional capacity and policy design, but also by the extent to which different knowledge systems are operationally integrated within decision-making processes. In this context, the study highlights persistent tensions between scientific governance frameworks and the uneven incorporation of Indigenous knowledge within formal assessment structures.

While the findings are context-specific to the Great Barrier Reef, the analytical framework developed in this study may provide a useful basis for examining similar relationships between environmental change, governance and cultural heritage in other coastal heritage contexts facing comparable environmental pressures.

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Early Islamic Settlements from Central Arabian: Ethnographical Perspective toward local economic growth

Mohammed A. Alsubaie

Abstract

The importance of the ethnographical sources as a tool to understand the archaeology of Arabia were in mind of the early archaeologists worked in Saudi Arabia since the 1970s. However, with the increase of archaeological research since that time the Islamic archaeology situated to be closely associated with political historical sources and pilgrimage routes narrative. The interest in the pilgrimage routes led to archaeological explorations of different archaeological sites in Central Arabia based on long-scale archaeological projects. Those archaeological projects revealed settlements that seemed to be flourishing in the early Islamic period (7th - 10th) Fa'id and al-Rabadha. The explanation of the flourishing of those town settlements was usually attributed to the pilgrimage routes as supporting the economy through the annual caravans.

This paper examines the flourishing of these settlements through more localized mechanisms involving the interaction between nomadic and sedentary communities and their participation in trade activities. Using ethnographic models from pre-modern Central Arabia, the study explores how nomadic populations may have been integrated into wider economic systems during the early Islamic period as part of their economic strategies. Imported archaeological materials recovered from excavations indicate the economic capacity of the inhabitants of these settlements, reflecting relatively stable local economies supported by multiple economic resources in which trade likely formed an important component.

Keywords: *Fa'id, Al-Rabthah, 'A' rāb, pilgrimage road, Central Arabia, Early Islamic Trade Arabia, Nomadic economy*

1. Introduction

Recently, a growing number of studies concerned with the invisible role of social groups have begun to incorporate archaeological evidence within interdisciplinary approaches. Such approaches attempt to move beyond the limits of the material record alone by considering the social and economic roles of nomadic communities that are often poorly represented archaeologically. Despite the limited material culture they left behind and the scarcity of information concerning their societies, nomads in the near east have increasingly become part of historical and archaeological discussions addressing different aspects of civilization and its social and economic dynamics.

In the context of Central Arabian archaeology during the early Islamic periods, the discipline developed within a tradition that positioned archaeological records within the historical understanding of the region derived from textual sources. Large archaeological projects conducted on archaeological sites in Central Arabia revealed settlement that flourished through the eighth to tenth century AD. These settlements are also located along the pilgrimage route that run from Kufa to Mecca known recently as Darb Zubbiydah. The investments of earl Abbasid Caliphate on facilitating the road with water management installations (such as digging new wells and constructing water-tanks, in its stations

mentioned in historical sources and confirmed by the archaeological works¹. With the archaeological discoveries from the recent excavation, archaeologists relied largely on the pilgrimage road narrative into explaining the flourishing of the settlement. Such approach into understanding the settlement history of the region seems to be prioritizing Caliphate view over local contexts. Historical studies that approach Muslim historical sources as interpretive rather than positive shows how these narratives were shaped by the perspective of the political authority and its broader political and ideological agendas.

Furthermore, the Muslim geographic sources who wrote about the pilgrimage roads were interested in roads track detailing water sources and road security. In their writings, detailed information was mainly about tracks, stations and their water sources while their information about social and economic aspects on the stations were very limited. On some occasions, settlements along the roads described as places or central point for the pilgrimage annual caravans for trade or providing services to those campaigns. With the tenth century AD, some settlement became a safe place for the annual caravans from the rides of 'A' rāb tribes who then became aliens with Qarmatians². The history of these settlements with local contexts are in fragmentary mentioned in different historical sources³. As a result, recent discoveries from the archaeological sites of these stations were interpreted from the pilgrimage road perspective as the main economic resources and central factor for the settlements' flourishing.



Figure 7: The main pilgrimage roads based on the Muslim geographical sources (*Roads of Arabia* 2010)

¹ Al-Rashid 1977 Al-Dail et al. 1979 Al-Helwa and Mackenzie 1980

² Bitar 2003

³ Al-Rabthah; Al-Rashid 1986. Faid; al-Sanidi 2001 and Al-Hawas et al. 2007

Such understanding for these settlements' history simplifies the local contexts for regional view that dominated by sources from urban-based Muslim writings. However, recent archaeological projects in al-Rabadha and Faid shed more light on different aspects of these settlements opening another window to the town's history. The archaeological excavations revealed settlements that occupied from at least the eighth until the tenth century AD (al-Rabthah) or even later centuries (Faid). Material culture found in the sites shows growing economic activities that including glasses production (al-Rabadha) and agricultural activities (Faid) along with basic pastoral economic resources. Such records suggested a flourished local economy along with other factors for the stability and development in the settlement occupations. Therefore, the study aims to develop an interdisciplinary approach that incorporates the fragmented textual materials, the archaeological records with an ethnographic and anthropological model on nomadic and-sedentary interactions. This study will examine what the archaeological discoveries from these settlements can contribute to understanding settlement flourishing from a local perspective, utilising the developments on nomadic-sedentary relationship in an arid environment.

2. Towards ethnographic model for integration in trading activity:

Ethnographic and anthropological approach toward nomadism as a broad phenomenon shed light into economic and social aspects within different contexts. Recent studies on nomadism as economic adaptation highlighted the integrations of nomadic society into the wider community forming interdependent economy. Nomadic with pastoral activities have been categorised based on the varying aspects such as level of migrants and economic integration. The term Badu (Bedouin) is a common synonym for nomadic groups in the Arabian Peninsula. This term includes different types of nomadic lifestyle varied in terms of mobility, economic integration with villages or urban centre. Al-Sawian (2010, 354), who used blend of sources including local history, oral memories and local poems from modern Bedouin tribes, highlighted that there are varying types of nomadic lifestyles rather than only one term. He mentioned *Shawaya* and *Qa'adiya* as another types of nomadism with more and high interaction and integration with the villages and agricultural activities. *Shawaya* refers to nomadism that was limited to a small scale of mobility and used goats and sheep as their main animals. Their relationship and interaction with surrounded oases and villages show a tied economic system with the villages and urban centre⁴. *Qa'adiya* described as those poor nomads who have no animals and enabled to continue mobility. They provide the villages with economic labours for agricultural or pastoral activities.

Furthermore, ethnographic studies that resulted from living with the Bedouin tribes shows the integration of the camel-herding Bedouin groups with the wider community. Alois Musil (1868-1944) lived with Rwala from some years and shows the different economic resources that utilised by the Bedouin individuals in the wider community⁵. That included providing services such as guides, caravan trade and trading. Also, other recent ethnographic studies show the same pattern of economic integration within the wider community among the Bedouin tribes⁶

⁴ For further details Zakria 1983, 119

⁵ Musil 1930, 201

⁶ Rawla: Lancaster 1981, al-Murra; Cole 1973, Al-Dawasir; Kurpershoek 2002

The local economic interactions between different communities in pre-modern Central Arabia may provide an ethnographic model for understanding the flourishing of early Islamic settlements such as Fayd and Al-Rabthah. However, the direct projection of these later patterns onto the early Islamic period in a complete or uncritical manner would be neither convincing nor historically realistic, given the major differences in historical contexts and the social and political developments that took place over time. Rather, such a model may serve as a broader comparative framework through which some general patterns and possibilities can be approached, while still considering the particular historical context of the early Islamic period itself.

Ethnographic studies on nomadism and nomadic economic systems have emphasized trade and its related services as important economic resources through which nomadic groups-maintained balance within their fluctuating economies. In this context, Khazanov developed the concept of "mediatory trade" as one of the patterns through which nomadic groups expanded and diversified their economic resources under different historical and environmental conditions. Within this concept, he emphasized the importance of the integration of nomadic groups into long-distance trade through their involvement in the movement and exchange of products between different sedentary societies⁷.

Al-'Uqaylat in the pre-modern period represents such economic adaptive for the economic resources available to the al-Qassim townsmen. The 'Aqīl (pl. 'Uqaylāt) traders, who originated from the towns of Najd, developed an extensive and efficient caravan trade network that connected the Arabian Peninsula with the Ottoman provinces of Iraq and Syria until the late nineteenth century⁸. Al-Sawian (2010, 367) argues that the phenomenon of the 'Uqaylāt reflects the economic integration between agricultural and pastoral production system, representing an economic outcome of the broader interdependence that characterized the societies of deserts and oasis settlements in the Arabian deserts. 'Uqaylāt Carvan main products were camels, horses and sheep from Bedouin tribes importing them to Syrian and Iraqi markets for exchange and then returned with different products⁹.

Furthermore, other short scale caravan trade is also documented in oral history for Najd towns in the pre-modern era. The oral history from Shagra town in Najd documented the annual caravan journey from the town to the al-Hasa and Kuwait. This annual journey involved a large number of caravans importing and exporting goods along with other services such as guiding and herding services.

3. Al-Rabadha and Faid in Early Islamic period:

3.1. General Political context:

Central Arabia, with the Islamisation of the region and the move of the capital from al-Hijaz to Damascus and then Baghdad, became secondary to the caliphate. Tribal populations continued to inhabit the region and its oases, the occupation in general is thin and spread over a large territory. Sedentary occupations concentrated on large oases areas in al-Yamāma such as wadī Ḥanīfa and al-'Aflaj. In the Najd area, which located in the Arabian Shield, the regions characterised as high plain with vast grazing lands and very few oases' locations. With the increase demands for connection between

⁷ Khazanov 1983, p202

⁸ For further details see Al-Wahaibi 2017, Musil 1930, 202

⁹ Al-Wahaibi 2017, 21

al-Hijaz and Iraq new cities, military campaigns used the roads that cross Central Arabia toward Iraq as the quickest option. Faïd and al-Rabadha were in the initial phase as centre for a *hima* area (government-controlled pasturing preserves) where governmental camels and houses for the military and other purposes grazed. Historical fragmented sources show that the settlements grow and become part of the wider political context¹⁰. With the Umayyad period extended control over the different parts of Arabian Peninsula during ‘Abd al-Malik b. Marwān reign become under the Umayyad Empire

Information about the rulers of al-Rabadha and Faïd for the early centuries is very scarce. The region and its local tribes were attached to the governors of Madinah who appointed rulers to the towns and tribes in his province region. Fragments mentioned about their history show that the settlements were managed through rulers appointed by Madina governors. Among the governors' responsibilities was to assure the security in the region and to collect revenues and *zakaṭ* from the inhabitants and tribes. The rulers can appoint ‘*arīf* (pl. ‘*arafā*) from each tribe or sub-tribe to organize the process of collecting the annual revenue or *zakaṭ* and to manage local affairs¹¹. The relationship between the ruler, the ‘*arīf* and the tribal community characterised with tension and fluctuation as shown from the poems and events from that period¹². However, the region as a whole seems to have a security among inhabitants within the Umayyad and early Abbasid period.

The road connecting al-Hijaz with Baghdad attested a significant improvement with the rise of Abbasid Caliphate. The road from Kufa-Mecca (Darb Zubaydah) attracted extensive constructions and water management installations during the early Abbasid period. The Abbasid Caliphates with other princes and leaders led several annual Hajj journeys through the road.¹³

During the Abbasid period, however, the control of provincial governors over the Bedouin tribes appears to have weakened. This situation became particularly evident during the reign of Al-Wathīq (r.845-847AD), when the governor of Medina confronted the tribe of Banu Sulaym but was defeated and was forced to request assistance from the caliphate. In response, the caliph sent an army led by the commander Bugha al-Kabīr, who succeeded in suppressing the revolt¹⁴. The restoration of Abbasid authority encouraged the inhabitants of al-Yamāma to seek similar assistance against the rebellion of the tribe of Banu Numayr. An Abbasid force was dispatched and engaged them in battles, which ended with the defeat of the tribe.

3.2. The inhabitants of al-Rabadha and Faïd: ‘A‘rāb as fluid term

The steppe and swan or the Badu and Hadr paradigm have long been dominant within the history of the Arabian Peninsula, leading to minimizing the use of local dynamics for understanding historical development.¹⁵ Central Arabia and its vast desert were the place of pastoral nomadic tribes migrating for grazing and pastures. Historical studies regarding the economy in Early Islamic period in Central Arabia mentioned the integration of pastoral communities with urban or semi-urban centres for

¹⁰ Al-Rbthah; al-Rashid 1986 Faïd; Al-Snidi 2002

¹¹ Al-Jasir 1993, 22, al-Saif 1983, 175-184

¹² Al-Jasir 1993, 22, Al-Sanidi 2002, 112

¹³ Webb 2025

¹⁴ Al-Ṭabṛī, v9, 146

¹⁵ Magee 2007, Al-Sawian 2010, 345

product exchange as basic economic practice.¹⁶ However, the historical records lack any further detailed information of the social and economic aspects with emphasis on tribes' genealogy and Ayam al-Arab. This approach toward Arabic tribes misleadingly pictures the nomadic tribe as to be one block¹⁷, while in ground each branch lived on its own. Within the vast desert especially in the margin of the deep steppe some oases were distributed in the region with varying size and resources. The desert region hosted pastoral nomadic tribes of which Islamic historical sources mentioned nothing about their lifestyle and economic system but describing them as 'A' rāb.

The term 'A' rāb underwent changes and meaning developed from the prophet time from a religious and political term describing groups who did not migrate to Muslim Madina community. With a few centuries later the term becomes a description of pure Arabs with authentic linguistic features and cultural properties¹⁸. By the tenth century AD onwards, Muslim geographers and historians who were based on urban cities use the terms 'A' rāb describing Bedouin groups lived in the marginal areas and adopting raiding as part of their economic resources¹⁹.

The Muslim geographical sources about the pilgrimage roads and their station used different terms describing the inhabitants of Faid and al-Rabadha. The main inhabitants of this town settlement seem to be from local tribes mentioned sometimes by the tribe names or as 'A' rāb and Bādiya. Ibn Rustah (d. after 905) mentioned al-Rabadha as a *manzil* with 'A' rāb, water sources and a mosque. Unlike al-Rabadha, Faid continued to be occupied and road station after the tenth century and mentioned by other several historical sources. Historical sources mentioning the inhabitants of Faid show the majority to be from the local tribes from Ṭaiyy (bnu Nabhan) and Asād tribes²⁰. Additionally, the sources also mentioned other inhabitants that seems to settle on the settlement through time. For al-Rabadha Al-Harby, I. b. Ishaq (c.898) said al-Rabadha belong to the descendants of al-Zubayr b. al-'Awwām²¹. Other figures from different tribes also mentioned to be settled in al-Rabadha²². Similarly, in Faid along with the local tribe, Yaqout mentioned different individuals and groups from different tribes²³.

However, the use of the terms 'A' rāb and Bādiya in historical sources to describe local tribes, including groups that were at times settled within these settlements, makes it difficult to clearly identify the nature of nomadic–sedentary relationships²⁴. The frequent association of the 'A' rāb with attacks on pilgrimage caravans has also contributed to a perception that separates local tribal groups from the settlements themselves, obscuring the social and economic dynamics that connected both sides within the same economic and social system. Nonetheless, as discussed earlier regarding the meaning of the term A' rāb in historical sources, the term was often used loosely and did not refer to a unified social or political group. References to rebellions or attacks carried out by the A' rāb should therefore not be understood as representing behaviour of all local tribes or pastoral communities. Rather, tribal

¹⁶ Al-Saif 1983

¹⁷ Donner 1980

¹⁸ Leder 2015

¹⁹ Leder 2015

²⁰ Al-Sanidi 2001, 99

²¹ Al-Jasir and Al-Ali p328

²² See al-Rashid 1986, 159, Yaqout v3, p.25

²³ Yaqout v4, p.282

²⁴ See Leder 2015

groups were diverse in their political and economic positions, and some may have remained connected to, or integrated within, the settlements and their local economic systems. For example, Hishām b. al-Kalbī narrates the account of the Day of al-Muntahib (*Yawm almunhib*) during the reign of Marwan ibn Muhammad, when some tribes of Ṭaiy refused to pay tribute, while other branches, banū Jurm and banū Nubhān, remained loyal and did not join the rebellion.

3.3. Textual evidence for trading activities:

Trading activities mentioned in Central Arabia are also fragmented with only small information about the local and regional trade. The Umayyad and early Abbasid period in general attested a growth in Maritime trade. Historical and archaeological studies show the increased use of Arabian Peninsula ports during this period²⁵. Historical studies on inland trade focused on Mecca and Madina. From the prophet time and afterwards Medina economic growth and Hijaz in general is suggested to continue for some centuries²⁶. Different markets in Mecca and Madina were in use during the early centuries, but also more markets emerged with developments and extension²⁷. Those markets seem to be connected with other parts of the region from inland caravan trade as shown from the textual sources. For example, textual sources about political events in Madina in 682AD mentioned the presence of four hundred Bahriynain merchants trading in perfumes²⁸. Also, Bahriynain caravan trade is mentioned to be attacked during Kharijites rule in al-Yamama before the Umayyad control²⁹. Textual sources also mentioned the presence of Iraqi merchants in Mecca³⁰. Mentions of trade in settlements in Central Arabia are also fragmented with less frequency. In Al-Rabadh, textual sources mentioned some figures who come to stay and trade in the town, for example Ibrahim b. Hamza from Zubayrids³¹.

As shown from the above studies based on the historical sources, the region seems to grow in the economic activities for early centuries in Islam. Even the scale of trade and its organisation is still a challenge, but sources indicated the presence of caravans from different parts of Arabia and Iraq. The mention of trade and caravan at least indicated its presence even in its ambiguous way. Carvan trade that cross central Arabia during the early Islamic period provided economic opportunities for local people as an economic resource.

4. Contribution from Archaeology:

4.1. Faïd:

The archaeological site is situated within an oasis characterized by the availability of water resources and cultivable land. The remains of the latest occupation phase are distributed across two separate areas: a walled settlement and an open settlement area.

The walled area covers approximately 3.6 hectares and contains a central enclosed complex in which a monumental, fortified palace is located. The second part of the site lies roughly one hundred meters

²⁵ Indian ocean Priestman 2021; Eastern Arabia Gaoud 2025; Red Sea Morriss and Whitcomb 2020

²⁶ Munt 2014, 149

²⁷ Al-Halabi 2003, 199

²⁸ Al-Jumayh 2003

²⁹ Al-Jasir 1991

³⁰ For a comprehensive historical study of trade in al-Hijaz and Najd in early Islamic centuries Al-Saif 1983

³¹ Ibn Sa'ad alṭbaqat v5, 506

away, separated by agricultural fields and palm groves. Unlike the walled settlement, this open area has no clearly defined boundaries, however, satellite imagery suggests that it extends over approximately 15 hectares.

Excavations have mainly concentrated on the walled area, revealing agricultural units, streets, and other architectural features. According to the excavator, the occupation of the site extended from the eighth to the twelfth century³². Ceramic assemblages reported from the excavations include several types associated with ninth-century occupation, particularly those related to the Samarra horizon. In addition, radiocarbon samples obtained from Horizon B in Area C within the walled settlement produced dates ranging between the ninth and tenth centuries³³.

The high number of imported ceramic sherds found during the excavation can be as indicator for the involvement of the settlement and its local publication in the trade network. The archaeological report of the first three excavation seasons (2006-2008) confirms the high number of ceramic sherds imported from Baghdad. The total number of pottery sherds is 8028 while the glazed sherds are 2245 with percentage of 28%. The turquoise alkaline ceramic sherds, which originated from Iraq³⁴, were the most common glazed ceramic type in the ceramic collection³⁵.

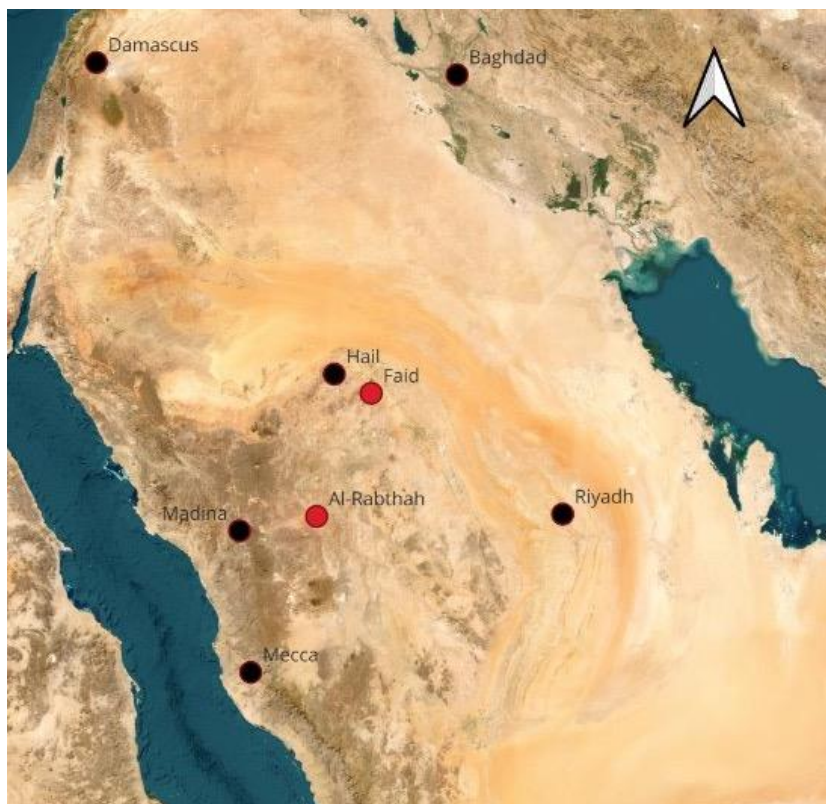


Figure 8: Location of the archaeological sites al-Rabadha and Faid

³² Al-Hawas et al. 2007, 43; Al-Hawas et al. 2020, 56; Al-Hawas et al. 2021

³³ Nassr et al. 2023

³⁴ Priestman 2021b, 89

³⁵ Al-Hawas 2019

4.2. Al-Rabadha:

The site is located in the deep steppe of Najd. The archaeological site consists of a buried town with still visible two large water tanks. The architectural remains are deserted, leaving small mounds on the ground surface. The archaeological area extended over about 60ha as suggested from the fence that enclosed the site. Excavations revealed about 1.7ha of the site with different architectural features. They revealed a large mosque, fortified houses, residential area and a walled residential area with a mosque. Unlike Fayd, al-Rabadha was abandoned from the tenth century based on historical sources and confirmed by the archaeological materials from the excavation.

During the excavation (1979-1985), two different sequential layers distinguished representing the occupation from the late seventh century to the tenth century³⁶. Coins found in the site also suggested the site to be continually developed from the eighth century onwards. From the material found in the excavation, several imported objects reported among them are ceramics. A high number of ceramic sherds were collected during the excavation including turquoise alkaline ceramic and Samarra horizon ceramic types³⁷.

5. Discussion and Conclusion:

An ethnographic approach to the history of these settlements allows for alternative narratives concerning their flourishing, challenging the common interpretation that pilgrimage traffic alone represented the main economic factor behind their development. Furthermore, the fragmentary nature of the historical sources, together with their political orientation, makes the reconstruction of the local social and economic context difficult and often incomplete.

The archaeological excavations at Fayd and al-Rabadha demonstrated the presence of material culture imported from different regions, particularly from Iraq. The large quantity of ceramic sherds originating from Iraqi production centres indicates the capacity of the inhabitants of both settlements to acquire and consume such imported and relatively luxurious objects. Other materials, including glass vessels and personal adornments, reflect a similar pattern, suggesting that sections of the local population possessed access to regional exchange networks and the economic means to obtain these goods.

Previous interpretations have often emphasized the pilgrimage roads as the primary explanation for the flourishing of these settlements and their increasing access to imported luxury materials. However, such interpretations may reduce the role of regional and local trade networks and the economic opportunities they provided for local communities. Although the archaeological record itself does not provide direct evidence for local involvement in commercial activities in all cases, the broader interpretation of the material culture suggests that trade likely formed an important factor within the economic life of these settlements. This possibility becomes more convincing when considered alongside the political context of the Umayyad and early Abbasid periods and the integration of nomadic and sedentary communities into wider economic systems and commercial opportunities.

³⁶ Al-Rashid 1986

³⁷ Al-Rashid 1986, 105

The trade caravan within Arabian deserts might be operated or at least involved local inhabitants providing services as economic resources. As shown from the textual fragmented materials some merchants crossing central Arabia toward Mecca and Madina as their main destination. With the limited economic resources for the nomadic people and the increased use of *hima* in Najd area, which limited their pasture capacity³⁸, trading services might have resulted in high demands for them. The mention of Hijazi elites, such as Zubayrids and Alids³⁹, in al-Rabadha and other settlements with trading activities possibly suggests involvement of Hijazi elites. If such caravan trade were crossing Central Arabia from Iraq to Hijaz, Mecca and Medina as urban centres with economic importance⁴⁰, nomadic local population might take it as economic resources providing them with services such as guiding and protection and so on.

For the settlements, these trade networks connecting major sedentary urban centres were also reflected at the local level. While the participation of nomadic groups in caravan trade represented an important economic activity for them, the settlements likewise benefited from these commercial movements, which provided an additional source of economic activity. As Khazanov pointed out about the role of towns within trade system in the "mediatory trade" between urban centres. Towns and settlements often functioned as centres where craft production, exchange, and trade activities were concentrated. Within Central Arabia, such settlements may be understood not as isolated stations dependent solely on local subsistence, but as part of wider and relatively stable commercial systems linking the Arabian Peninsula with the urban regions of Iraq and other neighbouring areas. The continuity of these settlements was likely supported by their role within broader regional systems of trade and movement rather than by occasional or unstable interactions alone. He also argued that participation in such economic systems was not equally accessible to all nomadic groups, as opportunities for involvement in trade and related economic activities were shaped by social and economic differences within nomadic society itself. In this context, engagement in exchange networks could become concentrated among wealthier groups or tribal elites, for whom trade served as a means of strengthening and stabilizing their economic and social positions within the local and broader regional system.

Therefore, further historical studies, together with archaeological and ethnographic approaches focused on the local contexts of Central Arabia, may contribute to a broader understanding of the stability and continuity of these settlements, in which agriculture and other economic activities likely played significant roles alongside pilgrimage-related activities. Emphasizing local contexts and distinguishing them from the larger political narratives connected to the caliphate can also provide a more nuanced understanding of the region during these periods, when the inhabitants of Central Arabia were often broadly categorized in historical sources under general labels such as Aʿrāb or Bādiya.

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³⁸ Webb 2022, 258

³⁹ Munt 2018

⁴⁰ Munt 2025

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The Potential of ICH as an Integral Part Of Saudi Arabian Diplomacy

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Introduction

In the contemporary geopolitical landscape, the traditional currency of diplomacy has shifted from military and economic 'hard power' to the strategic domains of cultural capital and narrative sovereignty. Cultural diplomacy, defined by Schneider (2003) as the systematic exchange of ideas and traditions, has emerged as a critical instrument for states to project a coherent national identity. Within this framework, Intangible Cultural Heritage (ICH) stands out as a unique, performative resource. Unlike fixed monuments, ICH thrives through living practices and social rituals, fostering authentic emotional connections that transcend geography (UNESCO, 2024). For Saudi Arabia, Vision 2030 marked a transformative era in cultural governance. The establishment of the Ministry of Culture in 2019 signaled a shift toward institutionalizing culture as a core component of the Kingdom's soft power strategy (Konopka & Strykhotzkyi, 2021). However, a significant gap remains despite having 18 UNESCO-recognized elements, the incorporation of ICH into formal diplomacy remains conceptually nascent and institutionally fragmented. While the Kingdom excels at hosting mega-events, it lacks a unified framework to leverage this local authenticity for sustained global impact. As Al-Mansur (2025) notes, in today's narrative arms race, geopolitical legitimacy belongs to those who can masterfully control their national story. The urgency of this study is underscored by Saudi Arabia's recent ascent to the 17th position globally in competitiveness and 18th in the Global Soft Power Index (2025). To sustain this momentum, the Kingdom must transition from general branding to a specialized framework that utilizes ICH as a primary engine for long-term influence. Accordingly, this paper asks: How can Saudi Arabia strategically mobilize its living heritage beyond event-based visibility to create a cohesive and internationally resonant national narrative? By synthesizing international best practices with Saudi institutional realities, this study formulates a transformational, ICH-infused model for cultural diplomacy.

Literature Review

As a form of real behaviour, expression, and common knowledge, ICH is a rich, culturally relevant tool that nations can use to tell their stories and raise their cultural awareness and international reputation. This review takes a closer look at the theoretical foundations of ICH in cultural diplomacy, examines successful foreign models, and positions the Saudi context within broader global movements. Okur et al. (2021) argue that ICH is a unique mechanism for visibility and can enable states to present a person-centric image that resonates more deeply than state-sponsored propaganda. Yet there persists a major gap that needs to be filled: one acknowledges that heritage and soft power are bound up. There remains a huge gap though — though the association between heritage and soft power is acknowledged, the institutional mechanisms necessary to translate living traditions into tangible diplomatic effects remain understudied. The ICH mobilization in the Middle East is often linked to

Nation Branding. Emerging global actors such as Saudi Arabia have drawn on ICH as a bastion of authenticity in a rapidly modernising culture (Al-Mansur, 2025). But the issue is in the story conflict between the traditional preservation of culture at the communal level, and then the public diplomacy of the culture. Building on these insights, this study contends that ICH is an asset to be maintained, not just preserved, but managed as a strategic opportunity through integrated cultural governance.

International Best Practices: Comparative Insights. This study examines three models of ICH-driven diplomacy to shape the Saudi framework. The framework of multi-dimensional benchmarking by choosing France, the UK, China, and Turkey. These countries embody a spectrum of diplomatic maturity, beginning with the yearslong institutional autonomy of the West and concluding with the rapid, narrative-driven rise of the East, a series of lessons that offer various but relevant insights for Saudi Arabia's ever-changing cultural fabric.

The Institutionalized Model: France and the UK To implement a similar strategy, France employs a "cohesive ecosystem" where the Institut Français combines gastronomy, craft, and festivals into a single national brand (Adleiba & Sakaev, 2019). The British Council professionalizes cultural governance by doing so in permanent and non-temporary partnership (Ichijo, 2012).

Key Lesson for KSA: Institutional Autonomy—organisations that will bring Saudi heritage to the world with a global professional voice.

The Narrative Pathway: The 'Storytelling' Approach of China. China's "telling China's stories well" approach (Ling, 2024) illustrates how ICH can be digitized and leveraged by a variety of global audiences. China has also repositioned its ancient crafts as icons of peaceful development, by using UNESCO platforms.

KSA: A Lesson in Narrative Adaptation Local Saudi Rituals and Adaptation for Humankind (e.g., Al-Ardha, Coffee culture) Transforming them into universally accepted themes of hospitality and courage.

Identity Driven Model: Turkey. The Yunus Emre Institute has explicitly employed ICH (poetry, music, calligraphy) for "attraction instead of persuasion" (Okur et al., 2021). Turkey's success is thanks to its appeal to the East and West as a cultural bridge.

Conclusion: KSA: Establishing the Kingdom as a Civilizational Crossroads using the ICH model to promote intercultural dialogue.

Saudi Context Vision 2030 and Organizational Development. Saudi culture has transitioned from the pre-2018 era of fragmented activities to a post-2019 era of institutionalization. The establishment of the Heritage Commission and the Ministry of Culture also demonstrates the state-level effort in promoting cultural sovereignty (Konopka & Strykhotzkyi, 2021). At present, however, diplomatic endeavors have prioritised mega-events and creative industries (e.g., film and fashion) above the systematic assimilation of ICH. New successes like the global performances presented by the Saudi National Orchestra illustrate the dormant essence of ICH. However, as Khan et al. (2025) argue, these initiatives are still "event-based" instead of "strategy-based." A Unified Narrative Framework linking the Kingdom's 13 regions' diverse traditions into an internationally coherent identity is a well-documented need. The "fragmentation" identified from the professional practice (Researcher Observation, 2024) is the main barrier to achieving soft power efficiency.

Synthesis & Research Gap: From the lens of a blueprint of global development from international models, the Saudi case presents a singular challenge: marrying cultural change with long-standing traditions. The literature indicates that the Kingdom has the "content" (ICH) and the "ambition" (Vision 2030) but that lacks the connective tissue of a specialized diplomatic structure that transmutes local heritage into sustainable global influence. This lacuna has thus been filled in within the present study by integrating international best practices with local institutional contexts to identify a tailor-fitting model for Saudi cultural diplomacy.

Methodology

A Framework for Interpretivist Diplomatic Inquiry.

A foundational tenet of this study is its Interpretivist Epistemological position and the constructivist basis of the field of International Relations. It does so while challenging traditional realist paradigms that rely, by default, on military or economic indices of power; rather, instead, it investigates the how of diplomatic production how meanings, identities, and heritage narratives are socially produced, institutionally curated, and strategically communicated to a global audience. Selected through this view, the study acknowledges that cultural diplomacy is not a static transfer, but a dynamic process of meaning making that occurs at the intersection of state policy and living tradition. This research employs qualitative documentary analysis as its primary data collection tool. By critically examining the Saudi Vision 2030 Annual Report (2025) and the Ministry of Culture's State of Culture Report (2024), the study triangulates official strategic objectives with empirical progress data. This approach ensures that the proposed IDIM model is not merely theoretical but is grounded in the latest institutional reforms and diplomatic trajectories of the Kingdom.

2.1 Study design

Multi-layers qualitative approach. In order to investigate the multiplicity of the Saudi cultural world, the research adopts a tripartite framework to bridge the gap between elite policy and grassroots heritage:

Strategic Policy Analysis of Vision 2030 and Cultural Vision for the Kingdom of Saudi Arabia (2019) - A review on performance. This analysis approaches policy documents not as administrative protocols, but as the core narratives of the state's globalized project and its redefinition of national identity as well as its efforts to construct and communicate the state's aspirations internationally and to construct narratives about how it redefines nationhood at the global level. Discourse Analysis- This dimension considers the selective rhetorical tools through which Saudi cultural actors engage with and communicate "authenticity" and "modernity" through thematic framing of language, metaphor, or imagery. It examines how the Kingdom manages the struggle around conserving its singular heritage with international relevance. Research Method: The analysis uses benchmarking comparing established global institutions (British Council UK, Institut Français France, China Storytelling strategy). This difference of interest provides insight into the potential "best practices" in the sector and allows insights into their adjustment to Saudi practice as well.

2.2 Corpus of data and criteria for selection of information

The literature for this research was obtained through a purposive sampling by primary and secondary sampling. To maximize the validity of the sample, the Selection Criteria for the corpus are as follows:

- Officiality: Analysis is limited to official government strategies and reports from both the Ministry of Culture and the Heritage Commission.
- Alignment: Documents need to be relevant to either the international outreach programme or the implementation of the UNESCO 2003 Convention in question.

- Temporal Relevance: A focus on the "Transformative Era" (2018–2025) in order to capture all of current institutional changes.

Once no novel patterns of institutional cooperation, governance or framing of the story emerge in the corpus, the study is at the point of Thematic Saturation and the paper has produced a composite, consistent interpretation of the current diplomatic terrain.

2.3 Researcher Position: Insider-External Advantage.

One unique strength of this project is the insider-outsider status of the researcher. Working for the Saudi Heritage Commission, the researcher enjoys excellent on-the-ground insider access to the organizational workflows, in house policy discourse, and direct involvement in UNESCO ICH practices. Adopting an Interpretivist approach, the study recognises the researcher's status as an insider in the Saudi cultural sector. This dual perspective, which combines professional engagement and academic rigour, provides for a more nuanced understanding of cultural symbols that outsider observers may ignore. To reduce bias, the data were cross-referenced with international frameworks such as Nye's Soft Power Theory (2004) and Smith's Authorised Heritage Discourse (2006).

Analysis / Discussion

Deciphering the Saudi Narrative Gap An analysis of Saudi cultural diplomacy today demonstrates a structural narrative paradox that is difficult to untangle. While the Kingdom has made a good deal of use of its institutions, the Ministry of Culture, the Heritage Commission, and a number of sector-specific organizations, its diplomatic output often lags behind such benchmarks. In this section, we consider policy positioning, institutional silos, and narrative framing as the three layers of the challenge.

6.1 Policy Position: Heritage, Economy, or Diplomacy?

The first finding of the study implies a tension in the positioning of ICH in national priority frameworks. ICH currently switches between three identities.

- Heritage for Preservation: Documentation and UNESCO inscriptions as a defence strategy. With 16 ICH elements currently on UNESCO's Representative List, the Kingdom has a rich cultural inventory that necessitates a formal diplomatic framework to transcend from local preservation to global narrative sovereignty (UNESCO, 2024)
- Economy and Tourism: Monetising and giga-projects focused, and more extractive than pro-business.
- Diplomacy as a Soft Power: focusing on influence, dialogue, and taking action. While Economic and Preservation layers have large amounts of support, the Diplomacy layer is often a neglected aspect, the statistics show. ICH often serves as a backdrop for diplomatic summits rather than the principal diplomatic message. In order to achieve Narrative Independence, Saudi Arabia needs to change its position of the ICH from a sub-sector of tourist attractions to a significant piece of foreign policy. The findings indicate that Saudi Arabia is currently navigating a tripartite identity for its ICH: preservation, economic commodification, and diplomatic influence. To achieve full Narrative Independence, the Kingdom must shift its

perspective from viewing ICH as a mere backdrop for summits to what Joseph Nye (2004) calls as a key source of attraction. By moving beyond the Authorised Heritage Discourse (Smith, 2006), which frequently prioritises state led institutionalisation, Saudi cultural diplomacy can use the organic authenticity of its living traditions to foster a more profound, person centric global resonance that goes beyond traditional political branding.

6.2 Institutional Gaps

The Tensions of Siloed Excellence. As observed from the experiences of researcher practice and policy formulation, the main barrier to successful cultural diplomacy is the Institutional Siloing itself. The Ministry of Culture and Heritage Commission (The Custodians): Understand the technical depth of ICH. The Ministry of Foreign Affairs (The Communicators): Head of international platforms often lack cultural proficiency. The Giga-Projects (The Amplifiers): Largely visible, but at times prioritize "modernity" over real heritage. Indeed, this fragmentation results in what this research describes as Narrative Friction, where the global perception of the Kingdom oscillates between ultramodernity and traditionalism and there is no universal logic. Successful models, like the British Council and the Alliance Française, succeed because they operate under a Unified Cultural Mandate, providing assurance that the Heritage Expert and the Diplomat share an identical language.

6.3 Narrative Framing: From What to Why

The results suggest that marketing of Saudi ICH is descriptive, not symbolic. The world is told what Al-Ardha or Saudi Coffee is, but we don't often explain why it is important to an audience in other countries. As shown in the Chinese Model (Ling 2024), ICH should be linked with universal values. China has identified its silk heritage with peaceful trade; however, Saudi Arabia is still in the process of optimizing its rich intangible legacy; while symbols like Saudi Coffee exemplify local hospitality, their evolution into strategic instruments of soft power remains a significant frontier for the Kingdom's cultural diplomacy. The difference, of course, is not in the abundant material but how it is translated into a diplomatic value system. While current initiatives successfully communicate what Saudi ICH is, there is a strategic need to explain why it is important to a worldwide audience. Drawing on the Storytelling Pathway (Ling, 2024) and Cull's (2019) public diplomacy foundations, the suggested IDIM model advocates for a semiotic shift. For example, the Year of Saudi Coffee should be defined not just as a beverage promotion, but also as an expression of The Ethics of Encounter, a universal ideal of hospitality. This is consistent with Schneider's (2009) concept of humanising the state, in which ICH serves as a bridge to reduce geopolitical polarisation by sharing human narratives.

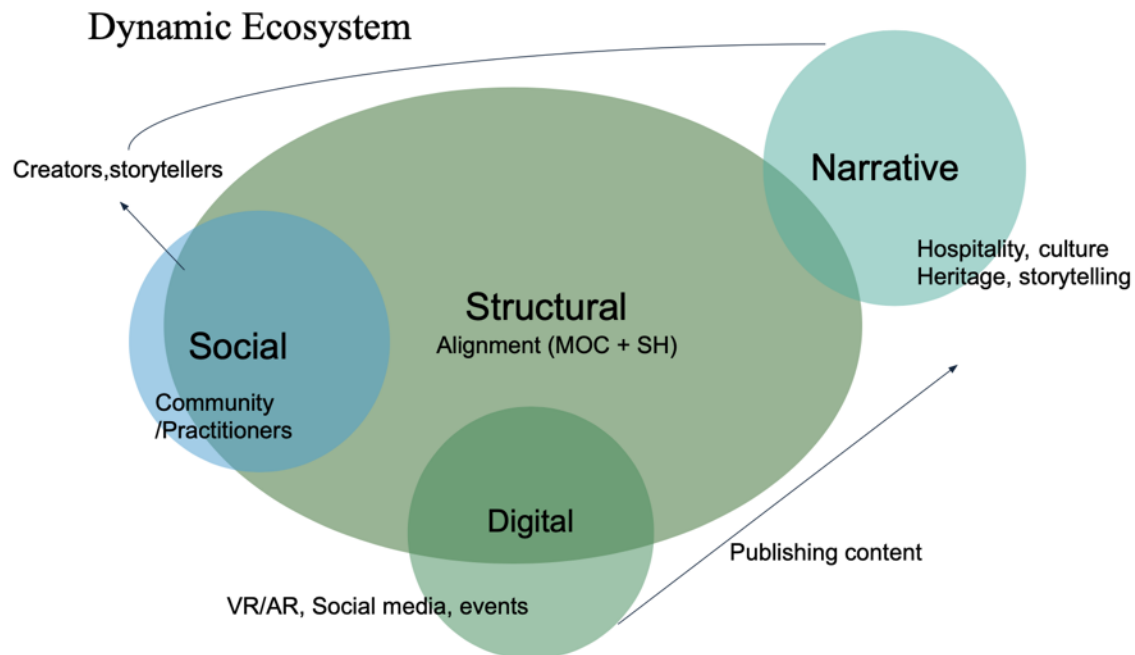
6.4 A comparison with the Other: What's the missing Saudi Connection?

By comparing the Saudi stance with that of the Yunus Emre Institute in Turkey and Goethe-Institut in Germany, it is evident that Saudi Arabia is focusing mainly on a large programme of event-based diplomacy one-off events rather than a presence-based diplomacy historical cultural institutionalisation. The shortcoming: The absence of any permanent cultural centres that cultivate Living Dialogue. The answer: to create sustainable creative outlets that extend well beyond short-term exhibitions, providing ongoing exchanges between Saudi artisans and global designers and support exchanges via intensive, year-round workshops. The Proposed Framework The ICH-Diplomacy

Integration Model (IDIM). The IDIM model serves as the study's analytical framework. Each layer of the model (Narrative, Structural, Digital, and Social) served as a classification category for examining contemporary cultural policies. This methodical alignment ensures that the research pinpoints specific Utilisation Gaps between the Kingdom's extensive cultural collection and key diplomatic output. To remedy the mentioned structural and narrative deficiencies, this paper proposes a distinctive strategic model, ICH-Diplomacy Integration Model (IDIM). This toolkit aims to turn Saudi Arabia's intangible cultural legacy from a fragmented set of customs to its strategic global tool chest. The IDIM framework acts as a comprehensive engine, operating on four synergistic layers:

- Narrative Anchor Content Layer: facilitates the shift from cultural description to universal symbols. It pays attention to the semiotics of heritage, in this case taking Saudi Coffee as a traditional beverage and making it a symbolisation of The Ethics of Encounter. The model presents Saudi Arabia not just as a host country but also as a world leader in hospitality and intercultural interaction. The findings of the 2024 State of Culture Report indicate a large content abundance that is underutilised in permanent diplomacy. In 2024, the Kingdom successfully inscribed four new ICH elements, bringing the total number to sixteen UNESCO recognized elements. This factual evidence, together with the achievement of eight World Heritage sites meeting the 2030 target six years ahead of schedule (Saudi Vision 2030, 2025), verifies Saudi Arabia's Cultural Inventory to lead a robust regional narrative.
- Strategic Coordination Structural Layer: In order to de-silo institutions, this layer advocates a National Cultural Diplomacy Task Force. layer envisions a National Cultural Diplomacy Task Force. "In doing all this the organization is a bridge and ties together technical strengths from the Heritage Commission, and communication capacity from the Ministry of Foreign Affairs. This guarantees a Single Voice approach whereby heritage expertise becomes a conduit to real time foreign policy objectives.
- Digital Heritage Sovereignty (Dissemination Layer): This layer employs state-of-the-art digital storytelling techniques for virtual Majalis, including VR/AR and metadata preservation, to break through the boundaries of physical displays and restrictions on travel. It also allows international audiences to experience Saudi ICH in a real and participatory way, guaranteeing the Kingdom's Narrative Sovereignty when it comes to digital platforms. The suggested IDIM model's Digital Layer is supported by the Kingdom's rise to seventh place globally in the UN Electronic Participation Index. The Ministry of Culture (2024) claimed a 124% growth in digital publishing and the preservation of more than 307,000 cultural materials. This digital maturity creates a fertile environment for Digital Heritage Sovereignty. Structurally, the implementation of over 1,000 regulatory reforms outlined in the Vision 2030 report serves as a standard for the Joint Committee proposed in this study to institutionalise cultural brightness as measurable diplomatic output.
- Community-Led Diplomacy (Social Layer): Understanding that true ambassadors are the people of any country, this layer puts practitioners ahead of state figures. The framework provides a Cultural Envoy Program to support international residencies by Saudi master craftspeople, poets, and performers. Not being the State-Manufactured Heritage, the

Kingdom gains diplomatic credibility and emotional resonance by representing Heritage as human led. Despite a 69% cultural contribution rate among Saudis, the 2024 State of Culture Report reveals a persisting regional clustering of cultural events in big cities. This distribution disparity highlights the importance of the IDIM's Social Layer, which argues for empowering over 9,000 registered artisans throughout all thirteen regions to function as true grassroots ambassadors, shifting away from event-based diplomacy and toward a people-to-people engagement approach.



Visualisation & Implementation

Now we see it in the IDIM framework, where all four of these levels operate as a mutually reinforcing feedback loop like the framework does. The Narrative Anchor carries the message, the Structural Layer is the platform, the Digital Layer is reach and the Social Layer is legitimacy. Such a holistic strategy is the guarantee that Saudi cultural diplomacy moves beyond the transient spectacle of mega-events to a paradigm of permanent civilizational engagement. The proposed IDIM model finds strong empirical support in the 2024 State of Culture Report, which documents a transformative phase in Saudi Arabia's cultural diplomacy. A key indicator is the Kingdom's proactive engagement with UNESCO, successfully inscribing 4 new ICH elements in a single year to reach a total of 16 registered elements, a feat that reflects high institutional efficiency. Moreover, the report highlights a 124% increase in digital publishing output and the archiving of over 307,000 cultural assets, providing the essential infrastructure for the 'Digital Layer' of the IDIM framework. However, while 69% of the population actively participates in cultural activities, the report identifies a geographical concentration

of events in major cities. This finding reinforces the urgency of the IDIM's 'Social Layer,' which advocates for decentralizing cultural diplomacy and empowering local practitioners to serve as global ambassadors.

Conclusion

There is no longer simply a nostalgic relic of the past, but a powerful weapon of sovereign soft power and a fundamental component of current world politics as demonstrated through this study.

Under the banner of the revolution of Vision 2030, Saudi Arabia has a colossal and unique civilisational resource - yet strategic underuse is very apparent on the diplomatic map. And the research indicates that the next major frontier for the Kingdom is the transition from cultural infrastructure-oriented building to narrative sovereignty. By moving towards a formal, narrative-infused, and institutionally based approach, Saudi Arabia could transform its living heritage from a domestic power to a credible, identity-based instrument for the purposes of international presence. The main contribution of this paper is the proposed ICH-Diplomacy Integration Model (IDIM). This framework provides a strategic roadmap for this evolution, calling attention to the critical role of the Single Voice strategy in which the Heritage Commission combines technical knowledge for a solution with the Diplomatic engagement through the Ministry of Foreign Affairs. This strategy, which utilizes the IDIM model, has four layers of narrative, structural, digital, and social, as an underlying strategy to transition Saudi cultural engagement from short-term performance to long-term civilisational presence. It ensures that legacy is not only on display but strategically enmeshed into the Kingdom's foreign policy objectives. What the findings suggest is that the future of Saudi cultural diplomacy cannot rely as much on the one-way projection of heritage but must instead move towards the paradigm of heritage reciprocity. This approach seeks to use ICH to bridge the gap between civilisations and find common human narratives in an ever-battling global age, including those that relate to issues of sustainability and social cohesion to our own more polarised society. The kingdom's ability to articulate its living traditions with lucidity and veracity will be the determinative factor in its international status as the game of global soft power intensifies and narrative arms races inform the geopolitical space. Ultimately, our research shows that cultural diplomacy works best when it mirrors a society's intangible heritage internationally, putting its practitioners, the true guardians of Saudi identity at the center of the global message. International intangible culture indicates that during a time of globalization and accelerating digitalization, authenticity still represents the most useful resource and connects countries.

While official statistics show that Saudi Arabia accomplished its quantitative legacy targets ahead of schedule, our study identifies a qualitative utilisation gap. The proposed IDIM model provides a strategic roadmap to close this gap by combining institutional maturity and social authenticity. Saudi Arabia can shift from a Cultural Radiance to a Sustained Diplomatic Presence approach by using the Kingdom's excellent E-participation position (seventh) and expanding UNESCO portfolio (eighteen items). It is recommended that the Joint Committee envisaged in this framework coordinate with the Public Investment Fund's (PIF) investment capabilities to develop ICH sites into permanent global diplomatic hubs.

In conclusion, if institutional coordination is effectively implemented, Saudi Arabia will be well positioned to move beyond adapting international best practices and toward developing new forms of

heritage-based cultural diplomacy. The Kingdom's combination of living heritage, policy commitment, and international cultural visibility positions it to become a global leader in the strategic use of Intangible Cultural Heritage for diplomatic engagement

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Unlayering The Mnemonicpalimpsest: Digital Heritage and the Socialtopography of Al-Gara, Abha

Yara Aseeri

Abstract

Al-Gara, one of seven historic ensembles that formed the old city center of Abha in southwestern Saudi Arabia, was demolished during modernization in the early 1990s. With no official archives only a single 1964 aerial photograph remains. This paper asks: how can we reconstruct the intangible spatial narratives of a demolished urban environment using only collective memory and one visual record? Drawing on 10 semi-structured interviews with former residents (elders, merchants, women, and second-generation), the study employs a three-phase visual protocol (unprompted sketch → 1964 aerial photograph → 2D/3D models) and a two-stage coding strategy that prioritizes participants' own spatial terms before mapping them to Kevin Lynch's urban elements. A transparent Memory-Authority Protocol handles conflicting memories, preserving them as "discrepancy zones" rather than erasing them. The findings reveal that memory clusters around residual landscape features (Wadi Abha, well sites, Al-Bahar Square) and socially constructed reference points (family-named *sabeels*, *dakkah* platforms, *bastah* courtyards) – acting as surrogate spatial anchors.

Introduction

The historic neighborhood of Al-Gara once stood in the heart of Abha, a mountain city in the 'Asir region of southwestern Saudi Arabia. At an altitude of 2,200 meters, Abha was a key node on ancient trade routes. Al-Gara, together with six other ensembles (Shamasan, Al Noma'an, Al-Qabel, Al-Moftaha, Munather, and Nusub) (Figure 1), formed the dense, traditionally built old city center – a fabric of stone and mud buildings, narrow shaded alleys, courtyard houses, and vibrant public spaces.



Figure 9: Old Abha ensembles and roads network Analysis. Author, 2025

In the early 1990s, as part of widespread modernization and urban renewal, Al-Gara and several of its neighboring ensembles were demolished. While most of these foundational ensembles were lost to modernization without an official paper trail, selecting architectural witnesses remain vital to reconstructing the region's urban history. Chief among these is the Al-Moftaha ensemble, which stands as a critical site where physical structures and their evolutionary phases—from agriculture to culture—are preserved and technically documented (Gadah, 2000). Paralleling this history of survival and documentation is the Al-Nusub historic district in the city of Abha. Driven by the Saudi Heritage Commission, this integrated restoration project carefully preserved Al-Nusub's original elements—including its stone and clay facades and traditional wooden fixtures—while modernizing its infrastructure with advanced drainage and lighting to ensure structural sustainability. Far from an isolated conservation effort, this initiative operates within the broader strategic framework of Saudi Vision 2030, which targets the cultural sector as a pillar for sustainable development. By shifting the paradigm from passive preservation to active revitalization, the state effectively transforms static historical sites into dynamic, living spaces capable of driving cultural tourism.

Formal inquiries directed toward the local municipality to retrieve administrative records for Al-Gara, to date, yielded no primary documentation. Consequently, the empirical basis of this study is currently

restricted to the longitudinal analysis of a 1964 aerial photograph (Figure 2) and qualitative data gathered through semi-structured interviews with long-term residents of the area.



Figure 10: Aerial Photo – 1964

This research is anchored in a community initiative that seeks to safeguard the collective memory of Old Abha's seven foundational ensembles. In June 2025, residents from multiple generations convened in an art gallery to share experiences of their former neighborhoods, marking a pivotal moment in grassroots heritage preservation (Figure 3 & 4). The meeting featured a visually aided presentation of the 1964 aerial photograph of Old Abha, accompanied by a suite of drawings and diagrams that reconstructed the city's historic urban layout. The presentation focused on a single neighborhood Al-Gara (Figure 5), illustrating the spatial interplay among public spaces such as the plaza (Sahat Al-Bahar), weekly market (Souq Al-Thulutha), and the mosque, as well as the surrounding alleys, houses, farms, and connecting roads to the city. The inclusion of these visual representations markedly intensified participants' recollections, yielding richer and more detailed narratives than earlier gatherings that relied solely on oral testimony. One long-time resident remarked that viewing the drawings and models of his childhood neighborhood made him feel as if he were reliving his past experiences. This powerful response reinforced the study's emphasis on legibility and imageability as memory anchors, echoing Kevin Lynch's assertion that environmental images emerge from a "two-way process between observer and observed".



Figure 11: June 2025 – Taken by Author



Figure 12: June 2025 – Taken by Author



Figure 13: Al-Gara Masterplan – Author, 2025

narratives, making community-led approaches not only methodologically sound but ethically necessary. In post-destruction contexts, Trudi Rico (Rico, 2016) demonstrates that local heritage practices can counter globalized, standardized narratives, centering the voices of those who lived the loss.

This research treats second- and third-generation residents' memories as the primary data source, aligning precisely with Lynch's finding that environmental images function as "the result of a two-way process between observer and observed" (Lynch, 2008). Yet Lynch's framework is deepened by recognizing, as the authors of the Nanjing study argue, that "collective memory depends on spatial and locational anchoring for its formation and continuation" (Qiu et al., 2025). These anchoring matters because contemporary urbanization—driven by efficiency, form, and capital—produces spatial homogenization and "placelessness" that erode residents' emotional attachment and public identity (Relph, 2008). By reviving Maurice Halbwachs's collective-memory theory, which sees memory as a group-oriented construct characterized by collectivity, continuity, and constructiveness (Halbwachs & Douglas, 1980), this research reframes Old Abha's oral histories not merely as personal recollections but as a shared spatial framework that once rendered the city legible.

Aims and Objectives

This participatory methodology is therefore not merely about data collection, but about reconstructing the essential perceptual framework that once made Old Abha legible to its inhabitants. The method recognizes that environmental images are essential for both memory preservation and future design sensitivity, framing the digital reconstruction as a tool that actively shapes physical form to enhance structure and identity. The approach further aligns with three thematic strands identified in

This condition exemplifies a broader challenge in heritage studies: how to reconstruct a place when the conventional evidentiary base – physical remains or institutional archives – is absent. Laurajane Smith has critiqued this very reliance on what she terms the Authorized Heritage Discourse (AHD) as a Western-elite paradigm that privileges expert-led, monumental, document-based heritage and systematically dismisses community memory as unreliable (Smith, 2006). The AHD would, in a case like Al-Gara, declare the site irrecoverable.

Yet, as Rodney Harrison argues, heritage is not a static collection of objects but a "dialogical process"—an ongoing negotiation between communities, experts, and the past. Discrepancies, gaps, and conflicting memories are not errors to be corrected; they are the very substance of heritage (Harrison, 2013). Similarly, Lynn Meskell (Meskell, 2018) has shown how top-down heritage institutions often override local

recent scholarship: first, "collective memory and space/place" explores how specific buildings and spatial configurations construct collective identity and historical consciousness (Foxall, 2013); second, "collective memory and landscape" builds on Guy Debord's notion of the "spectacle," where urban space becomes a mediated reality reflecting power structures and formalized memory (Debord, 1994); and third, collective memory and ritual/tourism examines how performative practices in public space reinforce shared identity (Liao & Dai, 2020). Its logic mirrors the Nanjing framework: "urban collective memory originates from place and acts as a cultural symbol of locality, embodying unique historical and cultural attributes" that cannot be reconstructed but only evoked through commemorative acts and visual anchors (Qiu et al., 2025).

Consequently, this paper investigates the systematic collection, coding, and visualization of collective memory to reconstruct the intangible spatial narratives of demolished urban environments lacking official archival documentation. The inquiry is addressed through the development of a replicable and transparent methodology derived from the analysis of semi-structured interviews with former residents of Al-Gara, a three-phase visual protocol, two-stage qualitative coding, and manual annotation of the 1964 aerial photograph. This research introduces a "Memory-Authority Protocol," which prioritizes community recollection except in instances where photographic evidence is corroborated by multiple sources. Any unresolved contradictions are preserved within the analysis as "discrepancy zones." The contribution of this study is twofold:

- **Methodologically:** It establishes a framework for digital heritage reconstruction in "absent-archive" scenarios.
- **Theoretically:** It extends Maurice Halbwachs' conceptualization of spatial anchors to post-destruction contexts, operationalizes Laurajane Smith's critique of the Authorized Heritage Discourse (AHD), and provides an empirical application of Rodney Harrison's dialogical heritage model.

Carefully studying the collective memory of urban space is essential for better planning: it delivers an applied methodological tool, developed through a sociological lens to evaluate spatial value, inform cultural continuity, and build urban resilience by linking the built environment to social identity. Without such study, planning risks perpetuating placelessness; with it, cities can pursue comprehensive development, integrating robust physical systems with durable cultural foundations, ensuring that future development honors the deeply inscribed memories that give neighborhoods and cities their lasting meaning.

By translating residents' memories into observable spatial symbols—"paths, nodes, landmarks, districts, and edges" (Lynch, 2008)—this research makes the "invisible values" of "collective memory" visible and measurable, it offers urban planners a method for appraising the capacity of spatial environments to shoulder public identity, stimulate historical consciousness, and foster ongoing cultural transmission. (Halbwachs & Douglas, 1980).

Context: Al-Gara Before Demolition

Location and Urban Form



Figure 14: Al-Gara Masterplan - Author planning. Al-Gara's irregular street network was shaped by social negotiation—a fact that becomes critical when interpreting participants' memories of how natural landscape features and human agency co-produced the historic space (Figure 6).

Demographics and Social Structure

The social and spatial stability of Al-Gara was underpinned by deep intergenerational continuity, with many families occupying the same quarter for generations. Based on participants' oral histories, the estimated population of the ensemble hovered around 1300 residents. The neighborhood operated as a largely self-contained urban ecosystem, sustained by an integrated network of civic, commercial, and utility infrastructures. At its core sat a central Friday Mosque and a primary market (souq)—which operated as a vital weekly economic and social hub for the wider community. Water resource management was localized across three distinct public wells—each serving a designated sector of the quarter regulated by strict customary agreements among local farmers to govern equitable distribution (Figure 7). Furthermore, participants highlighted the neighborhood's vernacular waste-management infrastructure as a defining technical feature: each 'sikka' integrated an engraved, stone-cut drainage channel designed to direct wastewater away from domestic units toward centralized collection points optimized for routine maintenance (Figure 8). This infrastructural self-sufficiency was complemented by communal amenities, including collective ovens 'furn' and several prominent social nodes (bastah or saha), which functioned as the primary spatial arenas for daily civic interaction.

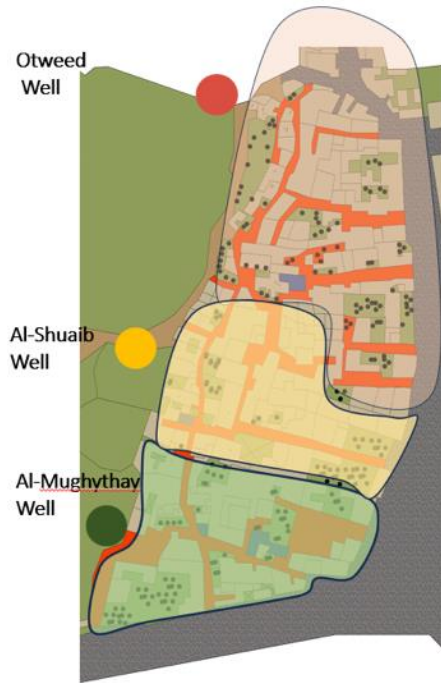


Figure 15: Al-Gara Wells- Author



Figure 16: AL-Gara Drainage System – Author

Gender and Spatial Practice

While the public spaces of Al-Gara were predominantly male-dominated and women's spatial mobility was structured by prevailing norms of modesty, women nevertheless exercised a vital, dual agency in both the agrarian economy and the physical maintenance of the vernacular built environment. Women were actively involved in agricultural labor, working the surrounding fields and managing crucial aspects of farm production. Furthermore, they played an indispensable role in structural preservation; because the region's seasonal rainfall frequently degraded the external and internal clay compositions of the mud houses, women were primarily responsible for the material upkeep of these structures. This architectural stewardship was most visibly manifested in the maintenance and intricate painting of interior walls (Figure 9)—a vernacular art form that combined structural waterproofing with cultural expression. Concurrently, women's engagement with changing institutional landscapes was reflected in their attendance at local schools, which began reshaping traditional spatial trajectories. Consequently, women's spatial knowledge was not merely passive but was dynamically produced through specific, functional pathways: from the domestic sphere to the agrarian fields, the localized wells, and kinship networks. This distinct gendered mapping of Al-Gara fundamentally shapes how former residents reconstruct their memories of the ensemble, serving as a central analytical lens for the findings of this study.

Economic Life

The economic life of Al-Gara was anchored by a highly synchronized regional market dynamic, centered around the historic weekly market known as *Souq Al-Thulutha* (Tuesday Market). Standing as one of the oldest and most enduring vernacular market centers in the Asir region, this commercial institution served as a vital regional node where isolated agrarian communities intersected with urban trades. For generations, the market operated on a cyclical rhythm: merchants and farmers from surrounding villages would travel days in advance, driving livestock and transporting local produce, grains, and handcrafted goods to old Abha. Historically relying on currency like the French Riyal or direct commodity barter systems, *Souq Al-Thulutha* functioned as more than a space for economic transactional exchange; it served as a crucial socioeconomic catalyst that cemented Al-Gara's self-sufficiency and integrated its residents into a wider network of inter-tribal and regional relations. Crucially, the study's findings revealed the central importance of this marketplace through the participants' oral histories. For the former residents, the market was not merely a backdrop for commerce but a foundational pillar of their collective memory, with their narratives vividly reconstructing the sensory, social, and logistical realities of the *souq* to demonstrate how its weekly cycle dictated the spatial and temporal rhythms of the entire quarter.

Research Problem and Questions

The core research problem is the absence of any official archive for Al-Gara. Conventional heritage reconstruction methods (architectural survey, archival mapping, stratigraphic analysis) are impossible. Yet, as Rico (2016) and Smith and Eisenstein (2019) have shown, demolished neighborhoods can be rebuilt from memory – provided the methods are transparent and collaborative. Our specific research questions are:

1. How do the emic spatial terms used by former residents of Al-Gara (e.g., *sikkak*, *batash*, *souq*) map onto Kevin Lynch's etic taxonomy, and which urban structures demonstrate the highest durability in collective memory?
2. What specific spatial coordinates act as primary mnemonic anchors for former residents, and where do the resulting "Memory Intensity Heatmaps" reveal the highest density of vivid, meaning-laden recollections across the demolished fabric?
3. As a vital next step for this research, how can these 2D Memory Intensity Heatmaps be structurally extruded and translated into an immersive 3D digital heritage product, and in what ways can this multi-dimensional palimpsest serve as an interactive educational tool for future generations to experience and preserve the erased history of Old Abha?

Methodology

Defining Sense of Place and Memorial Reconstruction through Visual and Oral History

"The concept of sense of place describes the multifaceted weave of symbolic meanings, experiential qualities, and attributed values that become associated with a given geographical area, whether recognized explicitly or felt implicitly (Batool & Bahaiddin, 2025). This concept encompasses three fundamental characteristics: "place identity, place dependence, and place attachment" (Jorgensen & Stedman, 2001), which together form a dynamic and evolving phenomenon shaped by individual and collective interpretations. Crucially for the study of demolished neighborhoods, "sense of place is

understood as a slow process based on memories", where lived space "encompasses the subjective realm of human experiences, including behavior, emotional memory, and interactions with surroundings" (Elden, 2004). Henri Lefebvre linked the production of lived space directly with memory, indicating that "it is influenced by the historical recollection of users and shaped by everyday experiences over time" (Elden, 2004). As Lewicka emphasizes, "memory also gives people identity, while "historical traces and urban reminders actively influence memory formation (Lewicka, 2008). This theoretical foundation establishes that place meaning is not merely retrospective but constitutes a living framework through which displaced communities maintain continuity with their erased landscapes.

Methodological Approach

While scholars like (Batool & Bahaiddin, 2025) have successfully mapped the 'lived space' of *existing* historic urban fabrics, a significant methodological gap remains for the study of *demolished* sites, where the physical 'perceived space' is absent. This research addresses this gap by proposing a methodology of 'mnemonic reconstruction,' where the digital model acts as a prosthetic for the lost physical fabric, enabling the recovery of 'lived space' through memory.

To systematically analyze the spatial remnants embedded in oral histories, this study deploys Kevin Lynch's elements of city image as an organizational framework. Lynch's taxonomy (Figure 9) of "paths, edges, districts, nodes, and landmarks" (Lynch, 2008) provides a structured vocabulary for inhabitants to articulate the physical organization of Old Abha, translating fragmentary recollections into coherent

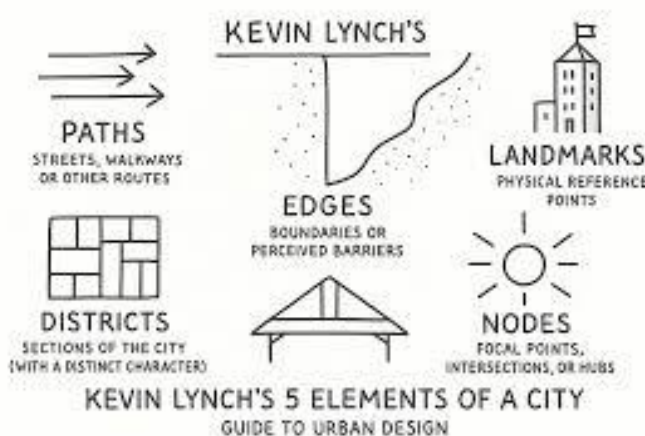


Figure 17: Lynch, K. (1960).

spatial narratives. The framework operationalizes sensory elements acting as cultural markers, enabling participants to reconstruct mentally navigable environments from destroyed physical fabric. This methodology directly confronts a significant omission in current scholarship: the absence of detailed analysis that integrates the construction of lived space within historic urban settings that have been demolished.

The integration of Lynch's elements addresses concerns in digital humanities

becoming "colonization by computer scientists." By grounding computational work in a humanistic framework developed specifically for understanding how people perceive and remember urban space, interpretive authority over technical processes remains with the domain researcher. To avoid forcing Kevin Lynch's Western urban taxonomy onto the indigenous spatial concepts of Old Abha's former residents, this study will implement a two-stage coding procedure. First, open thematic coding will identify all spatial references using the participants' own terms—such as *wadi* paths and *souq* thresholds—without any a priori categorization into Lynch's five elements (paths, edges, districts, nodes, landmarks). This emergent phase respects local epistemology and allows culturally specific

spatial logics to surface directly from the narratives. Only after this initial coding is complete will a second, mapping phase be conducted, where emergent categories are systematically compared to Lynch's framework. Alignment is noted where it occurs, but divergence is treated as equally significant, revealing how Al-Gara's lived spatiality may resist or enrich imported taxonomies.

Furthermore, the interview protocol will be restructured to include a dedicated unprompted mental mapping phase before any visual aids are introduced. Participants will first be asked to sketch Al-Gara from memory and provide a verbal walkthrough ("Where would you enter? Which way would you go?") without reference to the 1964 aerial photograph, annotated drawings, or 3D models. This baseline phase captures raw, unaided spatial recall and establishes a genuine measure of long-term memory retention. Only after this free-recall phase will the staged visual cascade begin, allowing the researcher to distinguish between elements that are deeply embedded in collective memory and those that are cued or reconstructed through external prompts. Together, these modifications ensure that the resulting digital palimpsest honors indigenous spatial knowledge rather than imposing a pre-determined Western grid.

Data Collection Methods

Participant Recruitment and Selection

Based on grounded theory conventions and precedents in similar heritage studies, the research will recruit 20-25 participants with direct lived experience of Al-Gara. This sample size is informed by (Fagerholm et al., 2021) participatory mapping framework, which emphasizes quality and diversity over sheer numbers when working with community knowledge holders, and aligns with saturation principles—the point at which no new themes emerge from successive interviews. Following Guest, Bunce, and Johnson (2006), who found that data saturation often occurs within the first twelve interviews (Guest et al., 2006), the research will assess saturation after every three interviews and ceased recruitment after three consecutive interviews yielded no new spatial themes or Lynch elements. Recruitment will employ purposive and snowball sampling to ensure diversity across key stakeholder categories:

- Elderly long-term residents (target: 8-15 participants): Individuals aged 65+ who lived in Al-Gara before demolition.
- Former merchants and shop owners (target: 5-6 participants): Those who operated businesses in the neighborhood.
- Younger second-generation residents (target: 1-2 participants): Individuals aged 40-60 who experienced the neighborhood in their youth
- Women household (target: 3-4 participants): To capture domestic and social spaces often overlooked in male-dominated narratives.

Sampling quotas will track age range, gender (targeting 40% female representation to balance traditional male-dominated historical narratives), length of residence (minimum 5 years in Al-Gara), and functional relationship to different parts of the ensemble (residential vs. commercial vs. religious spaces).

Saturation criterion: Assessment of saturation will occur after every three interviews, tracking the emergence of new Lynch elements, spatial themes, and emotional narratives. Following established grounded theory protocols, data collection will cease when three consecutive interviews yield no new categories or substantially alter existing ones.

Interview Protocol and Staged Visual Deployment

Semi-structured interviews will serve as the primary data collection method, with each session lasting 60–90 minutes. The interview guide divides into three complementary sections:

- Everyday Practices: Daily routines, movement patterns, social interactions, work activities.
- Cultural Memory: Community events, religious festivals, marketplace traditions, social hierarchies.
- Spatial Perception: Organized explicitly around Lynch's five elements—paths (circulation routes), edges (boundaries), districts (distinct zones), nodes (gathering points), and landmarks (memorable features).

The distinctive methodological contribution of this approach lies in the staged visual deployment of mnemonic anchors. This two-phase protocol progressively introduces visual materials to intensify and focus recollection:

Phase 1 - Unprompted Recall: Participants first sketch their mental map of Al-Gara without any visual aids, capturing their "raw memory baseline." This creates a control measure for assessing how subsequent visual stimuli enhances or reshape recall.

Phase 2 – Visual-aided Recall: 1964 aerial photograph of Al-Gara will be presented, with participants asked to identify and annotate locations, routes, and landmarks. This creates an "intermediary layer" between abstract memory and concrete architectural detail. In addition to, 2D and 3D digital models' documentation will be introduced. These materials ground abstract memories in tangible spatial relationships and architectural and urban proportions.

This progressive revelation strategy responds to research showing that visual stimuli capture the emotional and cognitive dimensions of place attachment more effectively than verbal prompts alone, while also addressing the module's emphasis on the need for researchers to actively guide conversation rather than simply "letting the data speak."

Data Capture

The Data capture will be multi-modal:

- Audio recording (with explicit consent) for verbatim transcription
- Photographic documentation of participant-drawn maps and annotations
- Field notes recording non-verbal cues, emotional responses, and contextual observations

- Standardized coding sheet completed immediately post-interview to log: drawn Lynch elements, verbalized landmarks, functional verbs (e.g., "we gathered," "merchants sold"), and emotional adjectives (e.g., "crowded," "peaceful").

Ethical Protocols and Informed Consent

Informed consent will be obtained in writing (or audio-recorded), with clear explanation that:

- Participation is voluntary and can be withdrawn at any time.
- Anonymity will be maintained in all publications unless participants explicitly request attribution.
- Findings will be shared back with the community through member-checking sessions.

1.1 The Memory-Authority Protocol

Following (Harrison, 2013) and (Smith, 2006), a formal protocol is developed to handle conflicting memories:

1. Document all versions. When a conflict arises (participant vs. participant, or memory vs. photograph), record each account in full.
2. Seek multiple corroboration. A memory is treated as "high confidence" if ≥ 3 independent participants mention the same location with consistent detail, or if the 1964 photograph clearly shows the feature.
3. Privilege community memory unless the photo is unambiguous. In the absence of any official archive, lived experience is the primary source.
4. Preserve discrepancies as "discrepancy zones". Conflicting versions are presented side-by-side in the final output, not resolved.

This protocol inverts the AHD's default hierarchy (Smith, 2006) and embodies (Harrison, 2013) dialogical heritage. It also aligns with (Giaccardi, 2012) participatory culture model, treating participants as co-authors, not mere data sources.

Data Analysis Approach

Initial Thematic Coding

To avoid forcing a Western urban taxonomy onto indigenous concepts, a two-stage thematic coding procedure was implemented (Al-Hathloul, 1996); (Lynch, 2008):

- Stage 1 – Open emic coding: Transcripts were coded line-by-line using the participants' own terms: 'sikka' (alley), 'wadi' (valley edge), 'Bastah/Saha' (social nodes), 'hawsh' (courtyard), 'souq' (market). No Lynch categories were used at this stage.
- Stage 2 – Mapping to Lynch elements: After open coding, emergent categories were systematically mapped to Lynch's paths, edges, districts, nodes, and landmarks. Divergences were retained as separate emic categories. Emotional valence (positive, negative, ambivalent) was coded manually, supplementing NVivo's sentiment analysis tool with manual verification for Arabic dialect.

Axial Coding

The axial coding stage correlates spatial references from thematic coding stages with emotional, functional and social narratives. For example, the "Main Market Street" path might connect to themes of "economic fluidity," "generational teaching" (if fathers taught sons their trade), and "social cohesion" (if the path facilitated daily encounters). This stage uses NVivo's matrix coding queries to cross-tabulate Lynch elements with thematic categories.

Selective Coding

The final stage of the analysis involves selective coding to consolidate emergent concepts into overarching categories that define the "sense of place" of the demolished fabric. Adopting the thematic precedents established by (Batool & Bahaiddin, 2025), this study identifies "community lifestyle as a cultural barometer," focusing on "social signaling" and "historical reliance" on traditional urban morphologies. This approach operationalizes the framework of (Fagerholm et al., 2021), transitioning from basic exploratory mapping to the modeling of complex functional and affective relationships.

To achieve this, the research utilizes Grasshopper—a generative modeling and visual programming environment within Rhinoceros 3D—to bridge the gap between qualitative narrative and spatial visualization (Figure 10). Grasshopper facilitates a parametric workflow, allowing for the algorithmic translation of non-spatial data (the frequency of emic mentions and coded valence from NVivo) into precise geometric intensities. These intensities are mapped directly onto the 1964 aerial photograph, which serves as the primary planimetric source and spatial anchor for this research. By georeferencing the qualitative data onto this historical baseline, the study reconstructs the lost urban grain with high contextual accuracy.

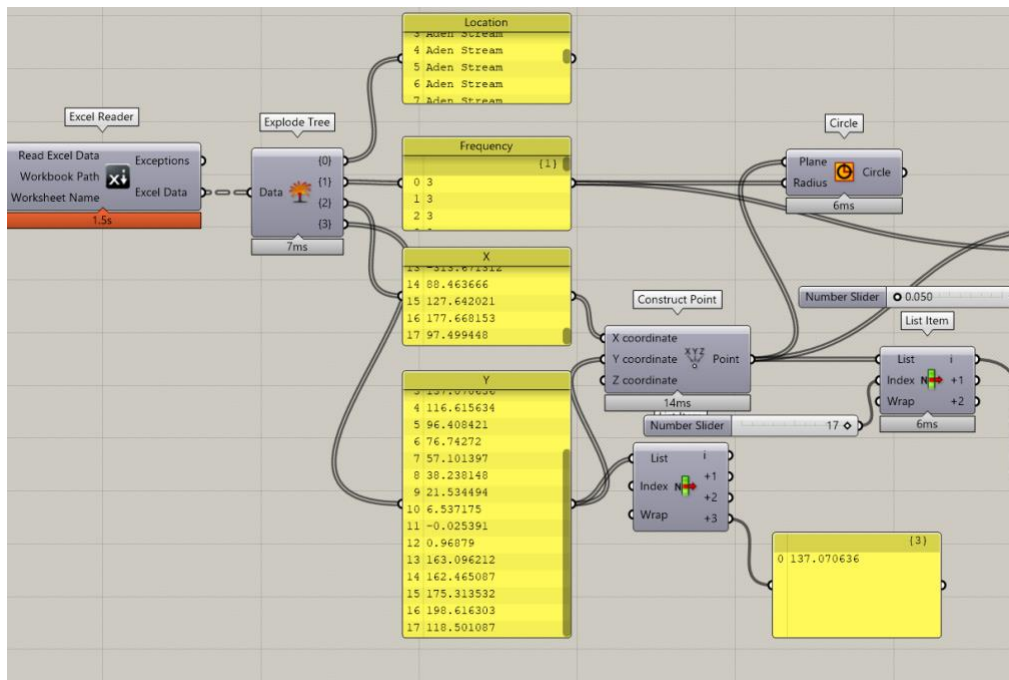


Figure 18: Grasshopper Workflow, Author

By employing specific scripts to process these datasets, the study generates three distinct Memory Intensity Heatmaps:

Functional Hotspots: A spatialization of the "historical reliance" on traditional urban patterns, movement networks, and economic nodes, anchored to the physical structures visible in the 1964 record (Figure 11).

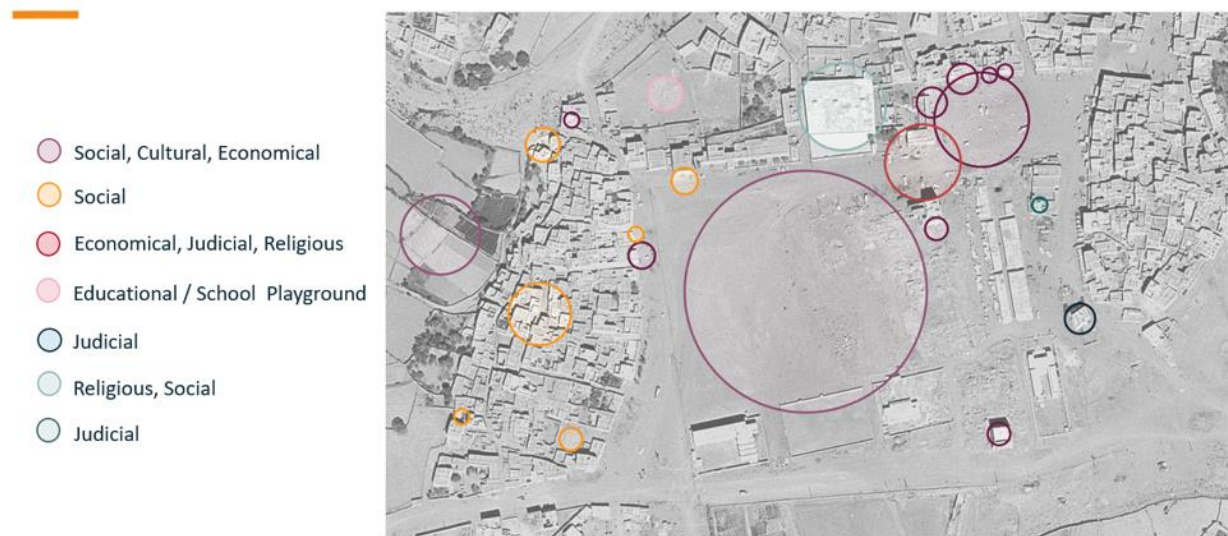


Figure 19: Memory-Intensity Heatmap

Social Hotspots: A parametric visualization of communal interaction and "social signaling" within vernacular nodes such as the *Basta* or *Saha*.

Emotional Hotspots: A mapping of the affective resonance of the lost environment, derived from the manual verification of emotional valence.

This computational methodology serves as a formal mechanism to realize (Hayden, 1997) principle of "making invisible histories visible." By synthesizing oral histories with the 1964 aerial evidence into layered spatial intensities, the research provides a rigorous, ethically defensible framework for heritage recovery. As (Kalay et al., 2008) argue, such reconstructions are vital when the objective is to extract profound qualitative insights into a displaced urban identity through the lens of digital heritage.

On-Site-Observations

At this stage of the research, the primary focus is to systematically collect, code, and deeply understand the memory of place through a two-phase visual interview protocol. This protocol is applied to all participants before any on-site observations or digital reconstruction work begins.

Only after completing all two phases with participants – and after the coding and analysis of memory narratives are well underway – will the research proceed to on-site observations and the construction of the digital palimpsest. For extant fragments of Al-Moftaha's restoration documentation (Gadah, 2000), as well as Al-Nusub restoration, on-site observations will be conducted to triangulate interview

data, document architectural details, and record current spatial uses. Furthermore, the integration of local case studies (Gadah, 2011) –most notably the UNESCO-tentative-listed village of Rijal Almaa—further grounds the research in the specific cultural context of the 'Asir region. These serve multiple purposes:

- Triangulating interview data with current physical conditions.
- Recording adaptive reuses and continuities of spatial practice.
- Photographically documenting architectural details mentioned in interviews.
- Observing current foot traffic and spatial usage patterns.

This triangulation strategy reflects the emphasis on the "accountability of computerized processes" using multiple data sources to validate findings rather than relying solely on digital tools.

Findings

Lynch Element in Al-Gara (Overview)

Lynch Element	Frequency (across 10 participants)	Emic terms
Paths	15	Wadi, Sabeel, Aqabat
Edges	15	Wadi Abha
Nodes	22	Bastah, Belad, Hawsh, Dabab, Dakah, Al-Bier, Al-Habel, Bustan
Landmarks	31	Saha, Qasir, Masjid, Ras Al-Malah, Souq
Districts	5	Shamasan, Al Noma'an, Al-Qabel, Al-Moftaha, Munather, and Al-Nusub

Landmarks: Anchors of Memory, Trade, and Festivity in Al-Gara

Within Kevin Lynch's framework, landmarks are external, point-reference elements that stand out from their surroundings and help people navigate and structure their mental image of a city. In the collective memory of Al-Gara's former residents, landmarks not only oriented movement but also concentrated economic, religious, festive, and social life. Using NVivo, six distinct landmark cases were identified under the Lynch node "Landmark". Below, each is presented in turn, supported by verbatim participant excerpts.

1. Ras Al-Malah served multiple functions: a judicial site, a place for religious lectures, and a node for inter-village gatherings.

Religious lectures: Merchants whose goods had sold out would listen to lectures: *“At Ras Al-Malah, there are those who give religious lectures, and some merchants whose goods had emptied would listen to those lectures.”*

Caravan stops and social gathering: Caravans stopped at Ras Al-Malah near Shada Palace. One female participant mentioned families coming from other villages: *“Families from other village to spend the night of Tuesdays to facilitate their early-morning market preparations”*.

2. Shada Palace appears as a landmark associated with caravans and overnight stays.

Caravans stop and Overnight zone: *“Between Shada Palace and the White Palace, there are empty houses where the merchants stay the night”*

3. The White Palace functioned as a reference point for security, trade storage, and overnight accommodation as noted earlier.

Collectively, these landmark narratives reveal that Al-Gara’s former residents recalled not only *where* things were, but *what happened there*, *who participated*, and *from which vantage point*.

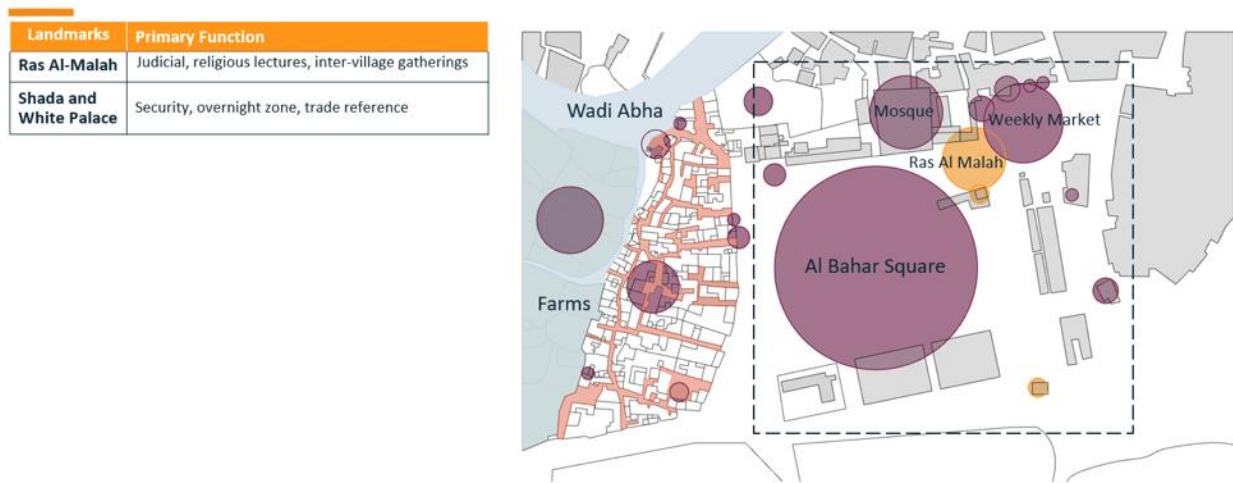


Figure 20: Landmarks Heatmap

Landmarks	Primary Function
Ras Al-Milh	Judicial, religious lectures, inter-village gatherings
Shada Palace	Caravans stop, overnight zone
White Palace	Security, overnight zone, trade reference

Paths: Sensory Corridors of Al-Gara

In Lynch’s taxonomy, paths are the channels along which people move – streets, walkways, trails. In Al-Gara, paths were not officially named. Instead, they were identified through social geography: each

'Sabeel' (meaning "way" or "path") was known by the family or families who lived along it. This vernacular naming system meant that to locate a house, a resident would say: *"Take the Sabeel of the Al-X family, then turn left."* No municipal signs existed, yet every quarter knew precisely which "Sabeel" was meant.

The Eight Sabeels and the Long Path (Al-Sabeel Al-Taweel): Al-Gara's main square (Al-Bahar) was intersected by eight Sabeels running east–west, plus one major Sabeel cutting north–south. This north–south artery was universally known as Al-Sabeel Al-Taweel ("the Long Path"). Everyone – from children to elders – recognized it as the backbone of the neighborhood. When participants were asked to point to their home on the 1964 aerial photograph, they almost always referenced a Sabeel first: *"My house was on the Al-Mutwa'a sabeel family, halfway down, on the right."*

Sensory Memory in the Shaded Alleys: The paths of Al-Gara were narrow, winding, and largely shaded by overhanging mud walls. Participants recalled these alleys as vivid sensory landscapes. One of the most cherished memories was the scent that rose when rain fell on the mud-brick and stone walls– a damp, earthy smell that, for many, distilled the very essence of home. Children played football in these sabeels, their shouts echoing off the high walls. The soundscape was equally distinctive: the soft pad of footsteps, the murmur of neighbor's greeting each other, and, on certain days, the distant jingle of cows' bells.

Paths as Announcements of Economic Movement: Paths did not merely lead from one place to another; they announced the weekly economic rhythm. Beginning on Monday afternoon, participants could hear the approach of merchants and their caravans heading toward Al-Bahar Plaza in preparation for the Tuesday market (Souq Al-Thulutha). The sound of hooves (horses and camels) and the low chatter of traders travelling along the main roads served as an auditory signal that the week's busiest trading day was about to begin. One participant noted: *"From Monday afternoon, you could hear them coming – the footsteps, the camels, the merchants calling out to one another. The paths themselves told you the market was near. And at around 10 am, near the recess, the school would let us out so we could go help our fathers in their shops (dokkan)."*

The Sound of the Sawani – A Morning Path Narrative: One participant provided an exceptionally vivid description of his morning journey to school, linking the acoustic environment of the path to the social values of the community:

"The sound of the Sawani (water extraction wheels) at the well in the morning before school. People would sing chants about how agriculture allowed them to welcome guests and pay off debts, or how destiny finds you whether you are at home or away."

Paths in Al-Gara were never neutral conduits. They carried social names, seasonal scents, economic signals, and sang philosophies. By recovering these sabeels – especially through the auditory memories of the Sawani and the Tuesday market caravans – we move beyond a purely physical reconstruction of the neighborhood. We begin to hear and smell Al-Gara as it was lived.

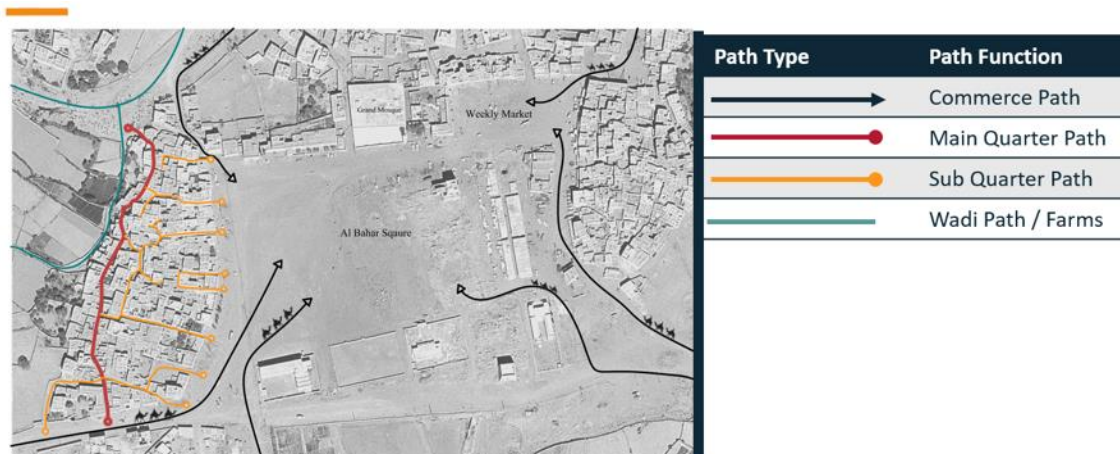


Figure 21: Paths Heatmap

Paths	Primary Function	Key Characteristics
Sabeel (family-named) Scented alley	Unnamed officially; known by resident families; wayfinding through social geography. Narrow, shaded, mud/stone walls	Intimate, locally rooted Scent of rain on mud; childhood football games
Major artery	North–south; known to everyone	Collective orientation
Routes leading to Al-Bahar Plaza	Heard from Monday afternoon; caravans, camels, merchants. Economic announcement	Sound of footsteps, hooves, chatter – anticipation of market day
Natural path: Abha Wadi	West–east watercourse; used for direction and travel	Dynamic, seasonal, requiring local knowledge
Well-farm path	Connected quarter to farmland; used for water, picnics, work	Leisure, family outings, labor
Acoustic path	Sound of Sawani (water wheels) and farmers' chants	Rhythmic creaking; lyrics about hospitality, debt, destiny

Nodes: The Micro-Social Hubs of Al-Gara

In Lynch's framework, nodes are strategic spots into which an observer can enter – intensive foci of activity, gathering places, or junctions. In Al-Gara, the most frequently mentioned nodes were not large public squares (though Al-Bahar functioned as a macro-node) but rather small, often semi-private, threshold spaces called 'dakkah', semi-private courtyard called 'bastah', the school yard, and the municipality area near Barzan Mosque. These micro-nodes structured daily social life, mediated between public and private realms, and carried distinct gendered and generational patterns of use.

1. **Sahat Al-Bahar (Albehar / Albahara Square)** Al-Bahar Square was the most frequently mentioned landmark, recalled by both male and female participants as a hub of trade, celebration, performance, and daily life.

Economic and social rhythm: The square became active from Monday afternoon onwards, reaching a peak on Tuesday:

"The Bahar square would start filling up on Tuesday night, creating a buzz of trade and social activity. In winter, caravans gathered around fires at night with their camels, performing chants or the Southward Khatwa dance, which we joined."

Festivals, sports and folk arts: *"Ramadan and Eid transformed the square into an arena: "Activities concentrated in the Bahar square, including sports and games."*

It was also a stage for poets and storytellers: *"Poets and literature enthusiasts would move between neighborhoods during occasions, performing in the Bahar square."*

A daily navigation anchor: For one male participant, the square was an unavoidable point on the route to school: *"The school was next to my house, but our farm was in between. I couldn't cross the farm, so I walked through the Bahar square – the mosque would be on my right and the school gate on my left."*

The female perspective: watching from the roofs:

Women experienced Al-Bahar Square differently – from above. A female participant recalled: *"Al-Bahar holds grand celebration for schools, governmental, Eid, king coronation or deceased. Women watched from the roofs of the houses facing Albehar."*

2. **Souq Al-Thulutha (Tuesday Market)** Though primarily an economic node, Souq Al-Thulutha was remembered as a landmark because of its fixed weekly rhythm and the heavy goods left there.

Weekly peak: Movement began on Monday and peaked on Tuesday morning: *"There is clear movement for preparation from Monday. And on Tuesday, the movement is at its peak from after the dawn prayer until noon and decreases gradually until sunset."*

Security and stored goods: Heavy merchandise could not be transported easily, so it was left near the White Palace under guard: *"Some sellers, such as owners of household equipment and heavy wooden supplies, would leave their goods at the Tuesday Market until the following Tuesday due to the difficulty of transporting heavy merchandise near the White Palace, where the security guards – known as Al-Asah (the night watchmen) – were present."*

3. **The Grand Mosque** was the central religious landmark, structuring weekly and daily life, especially for men.

Friday as a day revolving around the mosque: One participant when asked to describe a typical Friday from dawn until evening, he responded: *"The day revolved around the Grand Mosque."*

Ceremonial dimensions: Soldiers lined up to salute the prince before and after Friday prayer: *"What distinguishes Friday is 'Al-Salam Lak' (Peace be upon you), where the soldiers come and line up in two*

opposite rows, with each row having 10 to 15 soldiers to salute the prince... It would be before and after the prayer with the entry and exit of the prince from the mosque."

Acoustic landmark: The mosque produced a distinctive soundscape: *"before Friday's prayer, everyone reads the Qur'an, so the sound is harmonious, as each person reads in a low voice until silence prevails upon the raising of the Adhan and the start of the prayer."*

Ramadan cannon: The mosque's Mu'addhin signaled the Iftar cannon on Shamsan Mountain: *"The sound of the cannon to announce the time of Iftar, and this happens by the Mu'addhin climbing to the roof of the mosque to carry a flag to give a signal to the owner of the cannon located on Shamsan Mountain to fire the cannon."*

4. The Dakkah – A Threshold Node Between Home and Alley

The dakkah is a raised platform built on the exterior wall of a house, facing a sabeel (alleyway) or inside a bastah (courtyard). It acts as a spatial threshold: residents can sit, converse with passers-by, monitor the neighborhood, or rest during daily routines without compromising domestic privacy.

Dakkah facing Al-Bahar Square were particularly favored: *"Houses facing Al-Bahar square would have Dakkah. People after prayers would gather there and exchange conversations. Facing Al-Bahar where most of the landmarks are visible and partially one can see Souq Al-Thulutha, makes spaces attractive and promote socializing."*

These dakkah offered a commanding view of the neighborhood's main stage – the square, the market, the coming and going of caravans. One male participant recalled a specific routine during Ramadan: *"In Ramadan after Isha prayer, the series of 'Umm Hadijan' on the radio, we listen to it. Sometimes we listen to the radio at the house of our neighbor's dakkah facing Sahat Al-Bahar."* Thus, the dakkah became not only a place of face-to-face conversation but also an auditory node where radio programs were shared collectively – a hybrid of oral and broadcast tradition.

Dakkah as a consultative node: *"Next to the grand mosque there was a clinic that had 'dakkah' where elderly and wisemen gathered for consultation or important news."*

This transformed the clinic's threshold into an informal advisory node – a place where news, disputes, and community decisions were negotiated before they reached any official authority.

5. Bastah (Courtyard) – The Enclosed Node of Neighbourly Warmth

The bastah is a courtyard around which a cluster of houses face, with sabeels leading into it. Unlike the dakkah facing Al-Bahar square, the bastah is shared by multiple families. It is a semi-public node that balances accessibility with enclosure.

One female participant offered her first visual memory of Al-Gara – a memory that captures the essence of her childhood of the bastah as a node of daily reunion: *"The first scene that comes to mind is the 'Basta' after the Asr (afternoon) prayer when the farmers come back home with their cows after a long day. Bastah would gather them until sunset for chats and lovely conversations. That scene is so warm where neighbors come together and end the day in this beautiful way."*

6. The School Yard – A Youth-Centered Node of Play

"The school yard was one of the nodes that the participants mentioned. They had a football court where they played most of the day." For boys especially, the school yard was a space of unstructured social bonding, competition, and physical expression.

7. The Municipality Node – Supervised Market Order

"On Tuesdays, the Abha Municipality supervised the market next to Barzan Mosque, providing services through market inspectors, and any dispute that might occur in the market was resolved." This node was institutional and regulatory.

8. Barzan Mosque – A Node of Water and Worship

The mosque itself is a religious node, but participants highlighted a specific functional feature: "Water-providing services were available at most shops using water skins (Qirab) for passersby. Near Barzan Mosque, there was a well containing a tank equipped with taps. This tank was filled for drinking and performing ablution (Wudu)."

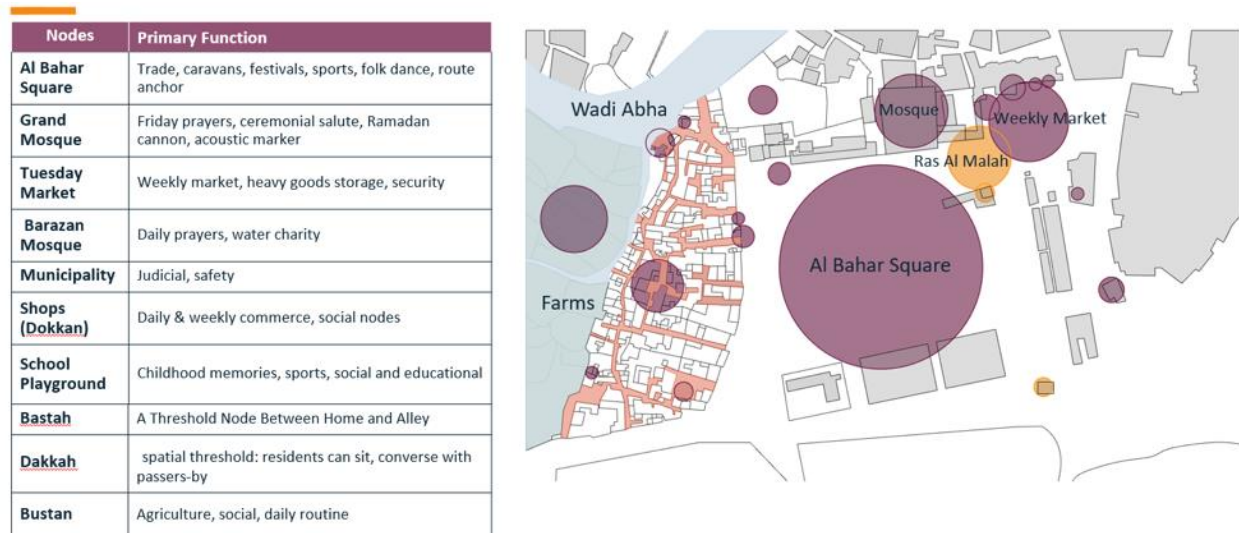


Figure 22: Nodes Heatmap

Node Type	Location/Example	Primary Function
Al-Bahar Square	Focal urban zone	Trade, caravans, festivals, sports, folk dance, route anchor
Souq Al-Thulutha	Focal urban zone	Weekly market, heavy goods storage, security
Grand Mosque	Focal urban building	Friday prayers, ceremonial salute, Ramadan cannon, acoustic marker

Dakkah (exterior platform)	Houses facing Al-Bahar Square	Conversation, radio listening, watching the square
Dakkah (clinic)	Next to Grand Mosque	Elderly consultation, news, dispute resolution
Bastah (courtyard)	Clusters of houses, after Asr prayer	Neighbourly gathering, end-of-day rest
School yard	Adjacent to school building	Football, unstructured play
Municipality zone	Near Barzan Mosque, Tuesday market	Market supervision, dispute resolution
Barzan Mosque well area	Next to Barzan Mosque	Drinking water, ablution (wudu), hospitality

Edges: The Perceived Boundaries of Al-Gara

In Lynch's typology, edges are the linear elements that a city's inhabitants do not use as paths – boundaries, shores, walls, or other physical or perceived breaks in continuity. For Al-Gara's former residents, the neighborhood's edges were identified by a combination of natural features, infrastructural landmarks, and socially significant buildings. Although individual participants occasionally emphasized different reference points, the majority described a consistent four-sided perimeter.

- Northern edge: The Wadi Abha (Abha Valley) was the most frequently cited northern boundary. This seasonal watercourse cut across the city from west to east and formed a natural barrier that separated the dense residential fabric from the terraced farmlands beyond.
- Southern edge: Participants designated the Hospital Road – or, in some cases, the hospital itself – as the southern limit of Al-Gara.
- Eastern edge: The Al-Bahar Square was unanimously recalled as the eastern boundary. Although the square was also a major node (gathering place), its position at the edge of the built-up area made it a threshold.
- Western edge: The western side was most often described as the farms – the agricultural belt that sustained the quarter. Some participants identified a more precise landmark: the wells that fed those farms, which acted as a functional boundary between cultivated land and residential clusters. Additionally, the Bint-Mihmas house was singled out by several participants as a western-edge landmark because of its distinctive social role: it hosted travelers and functioned as a traditional *motel*, thus marking the periphery where outsiders were welcomed before entering the quarter proper.

All these indications converge on a coherent mental map of Al-Gara's limits (Figure 10). Although individual participants varied in whether they named a road, a building, or a natural feature, the majority agreed on the four cardinal directions: Wadi Abha (north), Hospital Road/the hospital (south), Al-Bahar Square (east), and the farms/wells/Bint-Mihmas house (west). As confirmed by the 1964 aerial photograph, this convergence demonstrates that collective memory reliably reconstructs spatial boundaries despite the lack of official cartographic records.

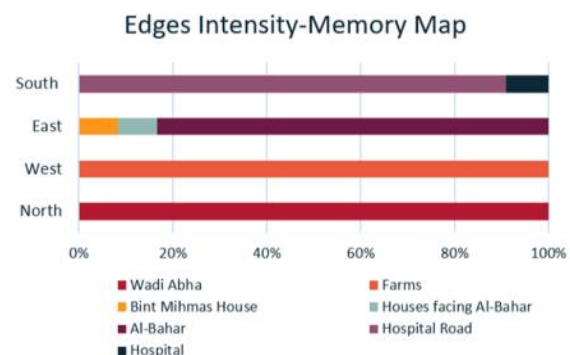


Figure 23: Al-Gara Edges

Districts: Al-Gara as a Unified Quarter Defined by Neighboring Ensembles

In Lynch's framework, districts are medium-to-large sections of a city that observers mentally enter "inside of" and recognize as having a common, identifying character. For Al-Gara, all participants consistently indicated that the ensemble itself did not contain any further internal subdivisions. Rather than naming distinct quarters, neighborhoods, or zones within old Abha, residents identified the ensemble as a single, coherent district whose identity was defined by its relationship to the surrounding historic ensembles. The boundaries of this district were articulated exclusively through the neighboring ensembles that encircled Al-Gara. Participants listed the following adjacent districts: Shamasan, Al-Noma'an, Al-Qabel, Al-Moftaha, Munather, and Nusub.

Al-Gara Limitations Residents Acknowledged

Al-Gara's vernacular construction, while thermally and acoustically effective, imposed real constraints. Sanitation infrastructure was limited — bathroom facilities were basic by modern standards, despite the neighborhood's notably functional drainage and waste collection systems. More critically, organic growth was structurally impossible: shared walls meant any expansion risked damaging adjacent homes; timber spans were too short for larger rooms; load-bearing capacity was unknown, making vertical expansion hazardous. Several participants were not simply nostalgic — they were also ready to leave. The promise of reinforced concrete represented, for them, not a loss but a liberation.

Discussion

The findings from Al-Gara offer empirical grounding for several interconnected debates in heritage studies, urban memory, and digital reconstruction. By systematically collecting, coding, and mapping the recollections of former residents onto the 1964 aerial photograph, this study demonstrates that collective memory can reconstruct a demolished neighborhood's spatial logic with remarkable coherence — even when no official archive survives.

Extending Halbwachs: Surrogate Spatial Anchors

Maurice Halbwachs (1992) argued that collective memory requires durable spatial anchors — physical places where social groups inscribe their shared past. In Al-Gara, those built anchors were erased. Yet memory did not evaporate. Instead, it clung to residual landscape features (Wadi Abha, the well sites, the trace of Al-Bahar Square) and to socially constructed reference points (the *sabeel* names, the *dakkah* platforms, the *bastah* courtyards). These surrogate spatial anchors are maintained through oral narration, periodic gatherings (such as the June 2025 community meeting), and the repeated viewing of the 1964 aerial photograph. Thus, Halbwachs' framework remains valid but must accommodate the observation that spatial anchors can be *substituted* — they need not be permanent built structures; they can be topographic, performative, or even negative (the felt absence of a familiar building).

Inverting the Authorized Heritage Discourse

Laurajane Smith (2006) critiqued the Authorized Heritage Discourse (AHD) for privileging expert-led, document-based, monumental heritage and dismissing community memory as unreliable. The Memory-Authority Protocol directly inverts this hierarchy. By defaulting to community memory unless the 1964 photograph is unambiguous, and by preserving conflicts as “discrepancy zones” rather than erasing them, the study operationalizes a democratized heritage practice. The fact that participants disagreed on the orientation of the main market street or the precise location of the well does not weaken the reconstruction; rather, it reveals the living, contested nature of place-memory – a finding that aligns with Harrison’s (2013) dialogical heritage model and Rico’s (2016) post-destruction ethnography.

Dialogical Heritage in Practice

Rodney Harrison (2013) theorized heritage as an ongoing, negotiated process. Our discrepancy zones (e.g., the conflicting memories of Al-Bahar Square’s role or the name of a *sabeeh*) turn that theory into a practical method. In the final digital palimpsest, users will be able to toggle between different versions of the same location, reading the divergent quotes side-by-side. This design choice embodies the principle that heritage is not a single correct narrative but a conversation across generations, genders, and individual life trajectories. The women’s rooftop perspective on Al-Bahar Square – watching celebrations while men participated on the ground – is not a secondary account but a distinct, equally valid spatial archive.

The Role of the 1964 Aerial Photograph as a Boundary Object

The 1964 aerial photograph functioned as a boundary object – a visual reference that all participants could point to, annotate, and use as a common anchor, regardless of their age or literacy. The historical photograph carries an aura of authenticity and invites collaborative interpretation. It also disciplined the analysis: when a participant’s memory contradicted the photo, the Memory-Authority Protocol required explicit documentation rather than erasure. This dual role – as both evidential source and stimulus for recall – justifies the continued use of historical imagery in absent-archive research.

Limitations

While the study offers a replicable methodology, several limitations must be acknowledged.

1. **Sample size and representativeness.** The analysis is based on 10 participants. Although saturation was reached (no new Lynch elements emerged after the 4th interview), the sample is not statistically representative of all former residents. Purposive and snowball sampling may have introduced selection bias, favoring those with strong emotional attachment or available social networks.
2. **Single-ensemble focus.** The research concentrated on Al-Gara within Old Abha. While this allowed depth, it limits generalizability to the other six demolished ensembles (Shamasan, Al-Noma’an, etc.), which may have had different spatial configurations or social dynamics. Comparative work across multiple ensembles is needed.
3. **Absence of independent archival verification.** Despite formal inquiries, no engineering drawings, census records, or municipal documents were located. The 1964 aerial photograph

remains the only external check on participant memories. Consequently, some memory distortions (e.g., conflation of events from different decades) may have gone uncorrected.

4. **Manual annotation vs. GIS.** For this working paper, spatial visualization was done in Grasshopper rather than through QGIS. While this sufficed for qualitative mapping, it precluded kernel density estimation, generational overlay analysis, and network-based “problem trip” validation. The memory intensity heatmaps presented in the findings are therefore descriptive, not statistical.
5. **Temporal distance.** The demolition occurred in the early 1990s, approximately 30–35 years before the interviews. Retrospective idealization, forgetting, and post-demolition narrative smoothing are inevitable. The three-phase visual protocol (unprompted recall → aerial photo → 3D model) mitigated but could not eliminate these effects.

Conclusion

Al-Gara is gone. No engineering drawings, no census records, no municipal documents survive. Only a single 1964 aerial photograph and the memories of its former residents remain. This paper has demonstrated that those memories – when systematically collected, coded, and mapped – can reconstruct not only the physical layout of a demolished neighborhood but its emotional, gendered, and sensory landscape.

Methodologically, a replicable framework for absent-archive heritage reconstruction: a three-phase visual interview protocol (unprompted sketch → aerial photograph → 2D/3D models), a two-stage coding strategy (emic terms first, Lynch taxonomy second), a transparent Memory-Authority Protocol for handling conflicts, and manual annotation of the sole surviving photograph. This framework respects indigenous spatial knowledge (e.g., sabeel naming, dakkah thresholds, bastah courtyards) while remaining legible to planners and digital heritage practitioners.

Theoretically, the study extends Halbwachs’ concept of spatial anchors to post-destruction contexts, showing that surrogate anchors (residual landscape features, socially named paths, even the absence of buildings) can sustain collective memory. It operationalizes Smith’s critique of the Authorized Heritage Discourse by privileging community recollection over absent archives. And it embodies Harrison’s dialogical heritage by preserving discrepancies as “zones” of ongoing conversation, not as errors to be corrected.

Future Directions

The current working paper represents the first phase of longer research. Subsequent work will proceed along three interconnected tracks.

Spatial Analytics: From Manual Annotation to GIS Heatmaps

The manually annotated maps will be migrated to QGIS. This will enable kernel density estimation to generate statistically robust “memory intensity heatmaps” for each Lynch element.

From 2D Heatmaps to an Immersive 3D Digital Palimpsest

As foreshadowed in the research questions, the next major milestone is the construction of a parametric 3D model that extrudes the memory intensity data into volumetric space. Using 3D modelling software, the model will be exported to an interactive web-based platform, allowing users to click on any sabeel or bastah to reveal the underlying oral history quotes and photographs.

This digital palimpsest will serve as an educational tool for younger generations, as well as a planning reference for any future commemorative or interpretive interventions on the site.

Expanding the Comparative Base

The methodology will be applied to other demolished ensembles of Old Abha (Shamasan, Al-Noma'an, Al-Qabel, Munather, Al-Nusub) for which some archival fragments or extant structures (e.g., Al-Moftaha, Al-Nusub) can provide triangulation. Cross-ensemble comparison will reveal whether the spatial logic and mnemonic patterns observed in Al-Gara are unique or shared across the quarters.

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