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*Review Article*

# Integrated Preservation Approaches for Jassan Hill: A Case Study

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## ABSTRACT

This study investigates the preservation challenges confronting Jassan Hill, a historic site in southern Iraq characterized by vernacular mud-brick architecture and a rich cultural narrative extending back to the early Islamic period. The study is driven by a key research gap: Few studies use advanced digital tools like GIS and 3D modeling to document and monitor heritage, which could enhance traditional preservation strategies against environmental, and developmental threats. The primary purpose is to develop a robust, integrated approach that addresses the site's structural vulnerabilities, ecological pressures, and socio-cultural dimensions.

A mixed-methods design underpinned the research, involving qualitative and quantitative techniques. The study employed site surveys, GIS mapping, and physical assessments (e.g., non-destructive testing) to document and analyze the state of Jassan Hill's architectural fabric. In parallel, semi-structured interviews and archival research provided insights into community perceptions, historical development, and existing governance structures. Advanced digital tools such as AutoCAD Recap for 3D modeling and ArcGIS for geospatial analysis enabled detailed visualization of risk zones and correlations between environmental factors and structural decay.

Key findings reveal acute deterioration in several structures due to water infiltration, inadequate maintenance, and unregulated urban growth. Additionally, limited policy support and insufficient resource allocation hamper comprehensive conservation efforts. Stakeholder interviews confirm community interest in preserving the hill's cultural identity and highlight the potential for heritage tourism as an economic driver.

These results underscore the importance of an integrated preservation approach. By combining technical interventions with community engagement and informed policy measures, heritage managers can formulate sustainable solutions tailored to Jassan Hill's unique context. The adoption of advanced documentation techniques and collaborative governance models has broader implications for protecting similar cultural and environmentally vulnerable sites, ensuring their continued relevance and resilience for future generations.

**Keywords**: preservation, cultural Heritage, Iraq, Jassan hill, integrated approaches

## 1. Introduction

### 1.1. Background of Jassan Hill (geography, cultural value).

Jassan is a hill town located in the Wasit Governorate of southern Iraq, situated to the east of Al-Kut city. Renowned for its distinctive ancient urban structure, which has evolved across multiple historical periods, Jassan holds considerable historical value, underscoring the need for dedicated preservation efforts[1].

### 1.2. Research problem

There is a lack of studies utilizing advanced technologies like GIS mapping or 3D modeling for documenting and monitoring the heritage of Jassan Hill, and the digital preservation strategies are underrepresented in the literature on this region.

### 1.3. Research theme

Advanced technology, and all-inclusive preservation strategies are being integrated for the protection of Jassan Hill's cultural heritage, a theme of this research. Combining architectural preservation, environmental analysis, social, and cultural investigative methods, and stakeholder engagement, the study proposes to deliver a comprehensive framework that includes tangible and intangible considerations of heritage management. The intention here is to use this merger to consummate the gap between technical documentation options available through GIS mapping and 3D modeling, and the communities' day-to-day reality for the sake of sustainable, inclusive, and resilient preservation outcomes.

### 1.4. Study significancy and motivation

The preservation of heritage sites often requires a multifaceted approach that includes architectonic conservation technologies, historical inquiry, discussion of socio-cultural aspects, and environmental management. Jassan Hill, a site of enormous cultural and historical merit, requires an integrated preservation approach on an urgent basis. This research contributes knowledge to the scholarly discourse about heritage conservation, and directly benefits the practitioners and stakeholders involved in cultural landscape preservation.

### 1.5. Academic contribution

This study fills a key gap in heritage preservation research by addressing the interconnected physical, historical, and socio-environmental aspects of Jassan Hill. Prior studies often isolate architectural or archaeological features, overlooking broader ecological and cultural contexts. In contrast, this case adopts a holistic approach combining digital documentation (3D scanning, GIS), historical analysis (archives, oral histories), and conservation science (materials testing, climate impact). This interdisciplinary method advances theoretical models and offers a framework for studying other complex heritage sites[2].

### 1.6. Practical implications

This study offers a practical model for local, and regional preservation, benefiting site managers, specialists, and community stakeholders [3]. By outlining key elements like risk assessment, stakeholder engagement, and sustainability planning, it helps policymakers, and practitioners adopt best practices and avoid common errors. The Jassan Hill case provides adaptable strategies for conserving other heritage sites facing similar issues such as environmental damage, budget constraints, and development pressures[4].

Jassan Hill’s distinct blend of architecture, history, and ecology motivates this study. Although culturally significant, it remains underexplored in research, and current preservation efforts lack coordination across diverse interests. This highlights the need for an interdisciplinary inquiry that also builds local, and global support for its protection. The study aims to show how a context-sensitive approach to Jassan Hill can inform broader conservation debates, and promote more inclusive, resilient heritage management[2].

### 1.7. Objectives of the study.

This paper presents original research on ancient Jassan Hill, which has not been previously studied.

### 1.8. The importance of preservation in this area.

The application of integrated approach would provide a sustainable and meticulous way to preserve ancient Jassan Hill. The unique urban fabric of Jassan Hill, which has developed over many ages, is of great importance and deserves preservation efforts[5].

### 1.9. Previous Studies and Comparative Methodological Analysis

A review of key studies on heritage preservation shows that most adopt specialized methods targeting specific conservation aspects. Some focus on material preservation, using 3D scanning and photogrammetry to document structural conditions. Others prioritize historical analysis through archival research and oral histories. Environmental studies use GIS, and remote sensing to track hazards and landscape shifts, while social research engages communities to assess public perceptions, and cultural values.

This study adopts an integrated approach to J-Hill by uniting diverse methodologies into one framework. It combines digital tools (AutoCAD Recap for 3D modeling, ArcGIS for spatial analysis), material assessments, and stakeholder interviews to address material, historical, social, and environmental aspects at once. This method fills existing research gaps, and offers a model for holistic heritage management. It enables the concurrent assessment of structural issues, environmental threats, and socio-cultural dynamics, supporting more effective and sustainable preservation for sensitive sites like J-Hill.

### 1.10. Gaps in current preservation practices.

The current condition of ancient urban buildings varies from one building to another; some are in good condition, and are getting worse due to neglect, others are not, and the artifacts, and cultural monuments in Jassan Hill. There are no real efforts to preserve them, and there are no official conservation policies or frameworks, and insufficient funding or resources allocated to conservation efforts[1]. Lack of modern technologies, such as digital documentation, of the historical site [6]. Limited community participation or awareness of heritage preservation and insufficient coordination between local authorities, the usage of preservation approaches such Ushaiger village in KSA[7], and the public engagement in the Luxor Egypt[8]. Experts and international organizations, challenges that exacerbate preservation gaps can be listed as follows:

- Urbanization and developmental pressures lead to neglect or destruction.
- Environmental factors, such as erosion or climate change, affect structural integrity.
- Lack of research and documentation on Jassan Hill's historical value.

This leads to the loss of historical and cultural identity, a decline in tourism and its associated economic benefits, and irreparable damage to the urban fabric and archaeological heritage.

## 2. Material

### 2.1. Area of study

Jassan is located in southern Iraq in Wasit Governorate, east of Kut city, and has a population of about 13,000. Its traditional buildings are usually constructed of locally produced, hand-made mud bricks. It is located on the main national road to Iran (Figure 1). The historical hill of Jassan dates back to the early Islamic era and reflects the traditional urban fabric within the built environment according to the popular style. (Fig. 2).[1]

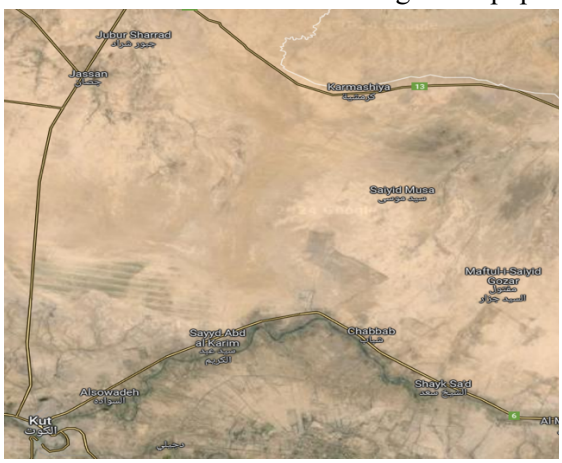


Figure 1. Jassan Location on the Map [1]

Figure 2. Aerial view of the ancient in Jassan Hill[1]

Jassan stands on a hill 10–22 m above the surrounding area and 34.75–49 m above sea level (Fig. 3), near the Al-Ghalal wadi flowing west from lands bordering eastern Iran. These geographic features influenced its ancient urban layout and traditional architectural patterns. Today, Jassan faces physical decline due to underinvestment and migration. Local authorities struggle to provide basic services, prompting residents to move to nearby towns and cities for better living conditions[6].

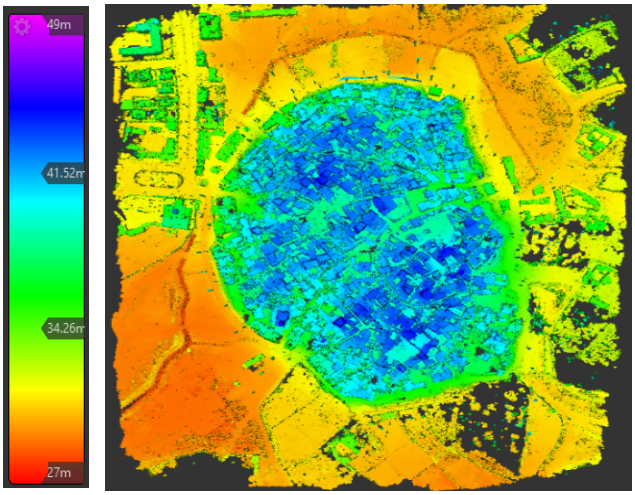


Figure 3. Height Analysis of Jassan Hill

### 2.2. Integrated preservation approach

An integrated preservation approach is essential for sites like J-Hill, where architectural, archaeological, environmental, and socio-cultural elements must be addressed together. Rather than treating each aspect in isolation, this method recognizes their interdependence linking structures, culture, ecology, and community needs. Through tools like photogrammetry, GIS, historical records, oral histories, and climate or soil assessments, researchers can better understand J-Hill's past and present. This multidisciplinary approach identifies the site's most vulnerable areas and guides targeted interventions that reduce risks while protecting its cultural integrity[9] [4].

Social acceptance and enduring conservation also hinge upon the participation of local stakeholders and the wider community. Planning to account for the different economic, social, and cultural views will guarantee public support, open up funding avenues, and inform society about the value of heritage. Engagement with the

community will allow external programs for education, tourism, and conservation to develop locally. This approach complements the flexible, adaptive manner of integrated conservation—adapting to the effects of climate change and urban pressure—while ensuring the long-term protection of the heritage of Jassan Hill in favor of future generations [2].

## 3. Methodology

The study's methodology is integrated with mixed methods that include both qualitative and quantitative approaches. The aim mixes architectural, environmental, and socio-cultural perspectives to map out an all-dimensional understanding of J-Hill. The cardinal tenet of this approach is towards better triangulation whereby data from several sources and methods can be cross verified to yield a broad and quite reliable appreciation of the historical context, current standing, and conservation demands of the site. In practice, this entails systematic sequential data gathering, analysis, and synthesis based on very stringent validity, reliability, and ethical criteria [10].

### 3.1. Research design and approaches

Two principal strands make up the research design: a descriptive-exploratory strand that seeks to characterize the present conditions of J-Hill, and an evaluative-interpretive strand aimed at assessing the effectiveness and feasibility of alternative preservation strategies. The descriptive-exploratory component includes site-specific surveys to record the architectural and environmental features, archival research to gain an understanding of the historical trajectories, and stakeholder interviews to capture socio-cultural nuances. This stage establishes a comprehensive baseline of data upon which subsequent analyses are built [10].

The evaluative-interpretive strand exploits qualitative thematic analysis, and spatial data analytics to integrate findings from different sources. The approach seems highly appropriate for heritage sites, where intangible cultural values intertwine with tangible materiality[11]. By using interpretive tools such as content analysis of stakeholder interviews, and observational field notes, alongside spatial tools such as GIS-based overlays of environmental risks. With such a study framework, qualitative insights can be juxtaposed with geospatial patterns. Such a mixed-method design serves to enrich the evaluation of conservation priorities, thus informing decisions that will give due regard to local heritage values as well as scientific criteria for preservation.

### 3.2. Data collection and symbolizing

#### 3.2.1. Site Surveys:

In-document Observation Surveys, and Architectural recording serve as the basic backbone for physical data gathering. Survey parties adopt standardized record documentation, namely photographic logs, measured drawings, and condition assessment checklists, in cataloguing structural elements, decorative motifs, and signs of inadvisability. These methods were chosen because of their straightforwardness, and clarity. As recorded conditions, these methods have enabled the establishment of current conservation inventories[12].

#### 3.2.2. GIS Mapping:

The integration of many geospatial datasets such as topographical data, historical maps, and contemporary land-use data is what GIS stands for. GIS mapping has been selected due to its ability to integrate different data layers, and present them visually to show spatial relations, such as the proximity of vulnerable structures to natural hazards, and the distribution of historic features within the landscape. Besides, this tool can perform spatial queries, and predictive modelling, which are key to developing targeted preservation interventions[13].

#### 3.2.3. Physical Assessments:

The study includes material analyses and structural evaluations to investigate the integrity of built elements walls, foundations, and ornamental features[12]. Non-destructive testing (NDT) methods provide insight into underlying weaknesses without damaging historic fabric[14]. These methods were adopted to balance the need for comprehensive technical data with ethical conservation principles that emphasize minimal intervention.

### 3.2.4. Interviews with Stakeholders:

Engaging with local communities, site managers, and policymakers through semi-structured interviews and focus group discussions yields rich contextual information. This qualitative data captures community perspectives on heritage value, economic considerations (e.g., tourism potential), and cultural identity. The choice to incorporate interviews recognizes that heritage preservation is inherently social, requiring an understanding of stakeholder aspirations, concerns, and knowledge systems[6]. This study used a rigorous thematic analysis to interpret qualitative data from interviews, and focus groups, moving beyond basic description. The Responses were coded to identify common themes, contradictions, and what is more important than core meanings, thus giving very good insights into community views about Jassan Hill. The themes that evolved include strong local identity, weak institutional support, and more participation in decision-making regarding conservation. The analysis also yielded some subtle tensions, such as the differences emerging between heritage tourism versus preservation, which a descriptive summary would have missed.

### 3.2.5. Clarifying the Rationale for Methods

Each data collection method was chosen intentionally to validate and mutually strengthen conceptual underpinnings and designs of the wider research. Site surveys and physical appraisals offer tangible and objective measures concerning structural stability and conservation needs [15]. GIS mapping situates these results within the larger environmental and spatial context, extricating relationships that would be otherwise imperceptible from the site report[16]. Finally, interviews and focus groups are meant to capture the cultural dimensions of the site and determine whether community-based conservation is feasible. Collectively, these approaches yield a multi-scale dataset that describes not only the physical and environmental challenges at Jassan Hill but also foregrounds the socio-cultural implications of any proposed preservation initiatives[6].

This study realized that they would have to apply both qualitative coding together with GIS-based symbolization in order to code their data: using thematic analysis software to code interview responses, observational notes, etc., and using maps to literally represent features of the site, risk zones, and intervention priorities on such maps. By systematically organizing and symbolizing data, the study has ensured that multiple streams of evidence could be effortlessly compared, tracked, and updated, thereby creating a dynamic framework for future and ongoing preservation efforts at Jassan Hill.

## 3.3. Analytical method

This study has adopted an analytical approach that combines various software tools with interpretive frameworks meant to synthesize data types characterizing architectural measures from spatial coordinates and their joins to qualitative interview stories [17]. Key applications include AutoCAD Recap, Microsoft Excel, and, of course, ArcGIS. Each has its distinct role but serves to complement the processing of data. The use of AutoCAD Recap and ArcGIS reflects a greater shift in architecture and science toward becoming digital[18]. As such, digital sciences shape research and practice across fields[19].We have chosen instruments to admit current trends and to promote a preservation strategy to address the area's unique needs.

### 3.3.1. AutoCAD Recap:

AutoCAD Recap is central to digital modeling and point cloud processing, particularly for the transition of raw survey data (namely LiDAR scans, photogrammetry) into precise 3D reconstructions of Jassan Hill's buildings [20]. This enables close measurements, detection of structural anomalies, and the preparation of very detailed site schematics. The capacity to layer different datasets within the 3D environment enhances interpretive clarity, allowing researchers to visualize historical and current conditions side by side[21].

### 3.3.2. ArcGIS:

ArcGIS underpins spatial analysis and mapping, enabling the integration of geographic data such as topography, land-use patterns, and environmental risk overlays with the architectural models generated in AutoCAD Recap[20]. By constructing thematic layers (e.g., soil stability, historical boundaries, vegetation cover), the research can pinpoint relationships between physical structures and environmental variables. This geospatial approach is especially valuable for risk assessments and for strategizing conservation priorities based on proximity to hazards, visitor circulation, and community access.

#### 3.3.3. Microsoft Excel:

Microsoft Excel is instrumental for basic statistical computations, data organization, and the creation of exploratory graphs and charts. It streamlines the tabulation of findings, from material decay rates to interview response frequencies, and supports initial descriptive statistics (e.g., mean, median, standard deviation) that inform more advanced analytical steps. Excel's functions for pivot tables, conditional formatting, and data validation also contribute to data cleaning and quality control[22].
Thus, such a toolset offers multidimensional analytical vision fusing graphics modeling with quantitative, and spatial insights, giving strong possible evidence for arguing preservation strategies at Jassan Hill.

### 3.4. Data processing and statical analysis

Following data collection, a rigorous data processing stage ensures that raw inputs, whether architectural measurements, GIS layers, or interview transcripts are cleaned, organized, and standardized for subsequent analysis. Numerical data (e.g., structural dimensions, frequency counts from interviews) undergo coding and entry into Excel, where inconsistencies or outliers are identified through range checks and scatter plots. Qualitative data, primarily from interviews and observational field notes, are transcribed and systematically coded using thematic analysis software, allowing for the identification of recurring themes, patterns, and linguistic markers that highlight community perceptions and cultural values[23].
For statistical analysis, descriptive statistics serve as the foundation, offering an overview of the distribution, central tendencies, and variation within the dataset[23]t. Where applicable, inferential statistics (e.g., correlation, regression, or ANOVA) are employed to explore relationships among key variables such as the correlation between structural integrity scores and environmental stress factors. Additionally, geospatial statistics within ArcGIS (e.g., hotspot analysis, spatial autocorrelation) help reveal spatial clusters of risk or conservation priority. By triangulating results from multiple analytical methods, the study attains a multifaceted understanding of how physical, social, and environmental aspects intersect at Jassan Hill[24].

### 3.5. Validation techniques and reliability

Validation and reliability considerations are integral to ensuring the credibility of the study's findings and recommendations. Several strategies are adopted to maintain methodological rigor:

#### 3.5.1. Triangulation:

The use of multiple data sources and methods site surveys, GIS mapping, interviews, and archival research serves to cross-verify findings. Discrepancies that emerge are investigated further, ensuring that no single data source unduly influences the conclusions[25].

#### 3.5.2. Member Checking:

Where feasible, preliminary findings (e.g., thematic interpretations from interviews) are shared with stakeholders' local community members, heritage authorities, and other experts to confirm the accuracy of interpretations and to solicit feedback. This collaborative review process enhances construct validity by incorporating community insights and clarifying ambiguous points[6].

#### 3.5.3. Inter-Rater Reliability:

For qualitative coding of interviews and field observations, multiple researchers may independently code segments of data to check for coding consistency. High inter-rater agreement indicates that the coding framework is clear and reproducible, reinforcing the dependability of the qualitative insights[26].

#### 3.5.4. Data Quality Control:

In the quantitative realm, standardized protocols guide data collection, entry, and processing, reducing the risk of measurement errors. Regular calibration of instruments (e.g., surveying equipment, material-testing devices) and the adoption of established guidelines (e.g., UNESCO heritage assessment protocols) further strengthen reliability[26].

#### 3.5.5. Peer Review and Consultation:

External experts, including professionals in architecture, archaeology, and conservation are consulted to peer-review the analytical methods and interpretation of results. Their domain-specific expertise ensures that the study aligns with best practices and recognizes potential limitations in data interpretation.

By adhering to these validation techniques and emphasizing transparency in data handling and analysis, the methodology upholds academic rigor and offers a solid evidentiary foundation upon which future preservation strategies for Jassan Hill can confidently be built[6].

## 4. Results

### 4.1. Overview of Site Conditions and Heritage Value

Multi-layered data collected from site surveys, GIS mapping, archival documentation, and stakeholder interviews confirm that J-Hill has significant historical and cultural value through its original urban fabric, and architectural heritage. As stated by survey groups, most of the remaining structures, made up of mud bricks locally produced, are now subjected to different degrees of weathering, and neglect due to poor or insufficient maintenance. Archival records, and oral histories further stress Jassan's development from an early Islamic settlement to a small urban nucleus, emphasizing the sustained cultural relevance of the site. These findings substantiate the claim that, notwithstanding its degraded state, J-Hill has a very special identity that needs specific conservation strategies.

### 4.2. Architectural Integrity and Physical Deterioration

Thorough circumstances assessments, and non-destructive testing (NDT), regarding the surviving architectural elements, the evidence from the scaled drawings, and photographic logs, was found to have signs pertaining to erosion, spalling, and partial collapse, usually in areas with prolonged exposure to water or lack of maintenance. Quantitatively, while certain buildings appear to have fluctuated little, a significant number have suffered increased risks structurally wherein conservation interventions will not be instituted immediately.

### 4.3. Geospatial Findings and Environmental Pressures

ArcGIS analysis mapped the spatial risks to J-Hill’s urban fabric. Layers of topography, land use, and hazard data showed that vulnerable structures cluster near the wadi bank, and steeper slopes, areas prone to erosion and seasonal runoff. Comparing historical maps with current satellite images revealed how gradual urban expansion has encroached on the ancient core, increasing stress on heritage structures, and the risk of unauthorized alterations. These spatial findings confirm that erosion, climate shifts, and unregulated development pose serious threats to J-Hill’s long-term preservation.

### 4.4. Stakeholder Perspectives and Socio-Cultural Dimensions

Interviews, and focus groups with residents, municipal officials, and heritage authorities revealed a mix of pride in Jassan’s history, and concern for its future. Many participants saw heritage tourism as a potential economic driver, contingent on better infrastructure, and awareness efforts from both government and locals. At the same time, respondents noted limited public knowledge of conservation methods, and weak collaboration between local authorities and external experts. Despite these challenges, there was broad consensus on the importance of preserving the historical core to strengthen cultural identity, and support sustainable development. This shared view highlights the need for a community-led, participatory preservation model.

### 4.5. Gaps in Current Preservation Approaches

The results confirm the core research problem: digital tools, and monitoring systems are underutilized, and no unified conservation strategy exists. Stakeholder input, archival sources, and GIS data point to major governance gaps, including the absence of formal policies, funding mechanisms, and coordination with broader institutions. The lack of technological integration—such as GIS, and 3D modeling—also limits proactive monitoring of structural risks. Consequently, interventions are mostly reactive, occurring only after significant damage has taken place.

### 4.6. Efficacy of an Integrated Preservation Strategy

While the study revealed major shortcomings in current practices, the mixed methods approach proved effective in addressing Jassan Hill’s complex preservation needs. Combining architectural documentation, spatial analysis, and socio-cultural research produced a strong dataset that identified key priorities: stabilizing structures, controlling unregulated development, and increasing public awareness. The integration of GIS-based risk mapping with stakeholder interviews offered a context-specific roadmap for targeted interventions. These

results show that a balanced approach—combining technical accuracy with community involvement—can improve the effectiveness, and sustainability of preservation efforts.

Thus, the challenges involved in safeguarding Jassan Hill in the face of heightened environmental, infrastructural, and socio-economic pressures are highlighted by the findings. These argue for coordinated strategies across many disciplines to preserve the site's cultural heritage by addressing not just the physical decay but also issues relating to governance and engagement at larger scales.

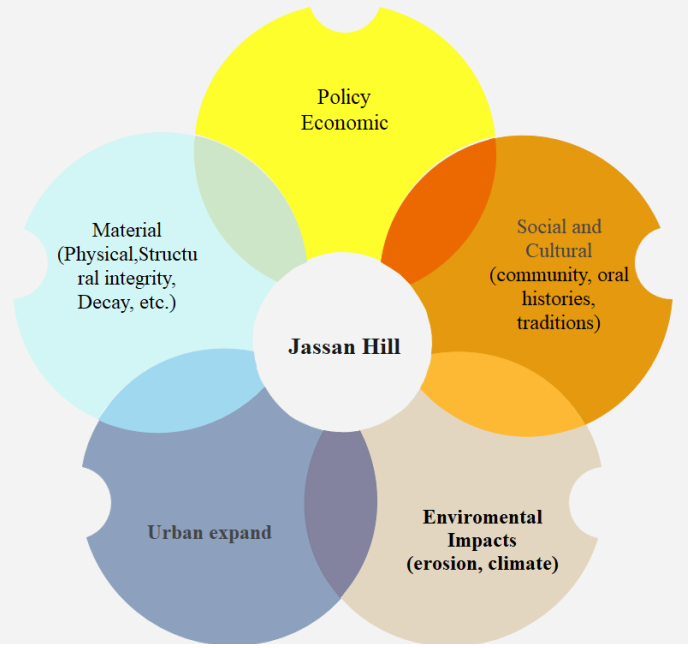


Figure 4. Conceptual Model of the Integrated Preservation approach

### 4.7. Evaluation of Comparative case study analysis

Contextual rights of findings at Jassan Hill are found through including a comparable case study of sites both regionally and internationally. The objective of the paper is to use public reports and scientific documentation to analyze sites where architecture describes the layered histories within environmental risks. A comparison of the challenges that Jassan faced, to the stakeholder models and technology tools of sites like Ushaiger village in KSA [7], shows that support governance, and including the period of funding, are necessary for such success. It is these sites that have clearly defined policies with local activities of operation, such as archaeological complexes in Iran or hilltop settlements in Jordan, that have produced more sustainable end outcomes for conservation. The comparative review also highlights digital documentation, such as 3D scanning and GIS mapping, as very high-end practices in the heritage conservation domain. Case studies that utilize these tools for monitoring and community engagement demonstrate improved site management and stronger public support, which supports the strategy proposed by J-Hill of employing such technologies in continuous assessment and planning. They also show shared cultural and social values that enhance community empowerment via forums, training, and tourism in local governance promotion. Given limited resources and no conservation framework at J-Hill, technology-plus-stakeholder-involvement indeed might offer viable pathways toward sustainable heritage management.

## 5. Discussion

Heritage conservation at J-Hill, thus, becomes a complex process through the interplay of architectural integrity, environmental degradation, and socio-cultural dynamics. The challenge is central in climate-sensitive buildings like mudbrick structures, and require active community participation. The need for community involvement has been corroborated through multiple methodologies, including site surveys, GIS mapping, physical assessments, and stakeholder interviews. The study shows that effective preservation cannot be achieved by relying solely on technical means but requires an integrated social, cultural, and governance strategy. Structural and spatial analysis identified high-risk zones, while community feedback has focused on cultural identity and heritage-based tourism, which are often missing in purely technical assessments. Such synchrony between data-driven

means and local engagement establishes a sound foundation upon which context-sensitive, scientifically underpinned, and socially acceptable conservation policies can be drafted.

The discussions reveal systemic gaps in preservation practice, including the absence of coherent frameworks, limited funding, and underuse of digital tools like remote sensing and 3D modeling. These challenges reflect broader regional issues—J-Hill is not an outlier but a case representative of widespread constraints in heritage management. Comparative studies show that sites with strong governance and community-driven initiatives achieve better outcomes, underscoring the need for legislative clarity, improved stakeholder coordination, and training in advanced documentation methods.

Looking ahead, the sustainable preservation of Jassan Hill depends on balancing technical capacity with community engagement. Strengthening political support at municipal and governorate levels, ensuring consistent funding, and encouraging local governance through education, tourism incentives, and inclusive planning will build site resilience. Ongoing digital monitoring and integrated risk assessments will enable proactive rather than reactive responses. With an adaptive and integrative model, Jassan Hill could serve as a model for heritage conservation in Iraq and the wider region.

## 6. Conclusion

The study concludes that preserving J-Hill requires a holistic, interdisciplinary approach that addresses architectural, environmental, and sociocultural factors. Through field surveys, geospatial mapping, interviews, and archival research, the team identified key vulnerabilities structural decay, environmental pressures, and limited political, and public support. Findings confirm that technical solutions must be paired with social engagement and effective governance. Digital tools, and analytical frameworks proved essential for assessing and prioritizing conservation needs. By merging 3D modeling, and spatial analysis with community insights, the study highlights both tangible, and intangible heritage aspects and offers a model for other sensitive sites. Continued collaboration among authorities, communities, and experts—backed by political will, and stable funding is vital to preserve J-Hill's legacy, and support its future cultural, and economic relevance.

## 7. Recommendation and Future direction

### 7.1. Short-Term Action

***Strengthening Policy Frameworks and Resource Allocation;*** develop policy frameworks and ensure that sufficient financial and human resources are directed for the heritage management.

### 7.2. Medium-term action

***Formalize Preservation Mandates***: Develop clear legal and administrative guidelines at the municipal, governorate, and national levels to clarify roles, responsibilities, and funding mechanisms for heritage preservation.

### 7.3. Long-term action

***Secure Sustainable Funding***: Establish dedicated budgets possibly through public-private partnerships or tourism revenue allocations to ensure stable long-term financial support for conservation work.

## 8. Institutional and Legislative Challenges

Despite the promise of the integrated approach for J-Hill, institutional and legal barriers may hinder its implementation. A key issue is the lack of a clear national policy on heritage management, leading to fragmented efforts and inconsistent enforcement. The absence of centralized governance creates unclear roles, and overlaps authority across municipal, regional, and national levels. As a result, heritage initiatives often face weak accountability and poor coordination.

Fragmentation among authorities remains a major barrier to effective preservation. Local agencies, city planners, and heritage institutions usually work in isolation, which makes decision-making greatly disjointed and leads to the late realization of collaborative opportunities. Because all sector goals are vying for the scanty financial resources, it becomes even more difficult as there has not been any establishment of a well-defined and sustained targeted fund. This means not being able to access vital technologies such as GIS, 3D modeling, and remote sensing, making it difficult to build long-term capacity and maintenance. Dealing with these problems may require a better analysis of existing policy gaps to create a mainstream governance framework

for heritage preservation, which coordinates agency action with lines of dedicated funding. All these improvements will increase applicability in an integrated approach while enhancing the role of heritage management policy under similar situations.

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