













## Balancing Heritage Preservation and Sustainable Development in Historic Cities: A Case Study of Old Najaf in the Context of Global Best Practices

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### ABSTRACT

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Historic cities such as Old Najaf are challenged with balancing the preservation of their cultural and architectural heritage against the pressures of modern urban development. Being one of the major religious centers for Shia Islam, Old Najaf receives annual millions of pilgrims and tourists, pressuring its infrastructure and threatening its historic façade. The aim of this study was to explore the viability of integrated approaches that balance heritage conservation with sustainable urban development, and lessons learned from international best practices, as well as stakeholder perspectives on this issue in the face of these challenges. This prompted the study to identify the challenges and opportunities for the heritage preservation and sustainable development in Old Najaf. It aims to comprehend the way residents and experts understand the dynamics of these layers through a mixed methods approach as well as derive actionable lessons learned after comparative analyses with case studies in Fes, Morocco and Kyoto, Japan. The study also explores the role that emerging technologies, regulation, and citizen engagement can play in addressing this trade-off education about Artificial Intelligence. The study shows that the major impediments for Old Najaf heritage are unplanned urban growth, inadequate infrastructure and mass tourism. Survey responses show that both residents and experts prioritize stricter zoning laws at the city's level, improved infrastructure for those corridors and sustainable tourism practices. In Fes, a city already leveraging cutting-edge technologies such as digital twins in urban planning, and building on advances made by Kyoto in GIS, comparative insights from both cities show the need to embed advanced technologies within strong policy frameworks supported by community-led initiatives. The findings underscore the need for holistic and context-sensitive strategies to protect the cultural heritage of Old Najaf, in line with sustainable development.

## 1. INTRODUCTION

Protecting cultural heritage and sustainable urban development is a challenge faced by historic cities worldwide. The such cities are often of exceptional historical, architectural and social importance, but are increasingly under threat from uncontrolled urban growth, infrastructure deficits and pressure from mass tourism, addressing these challenges calls for imaginative, integrated policies that can find the balance between historical protection and economic, environmental and social sustainability.

The city of Old Najaf is indicative of these challenges, given its incredible cultural and religious significance. Every year, millions of people visit the city to see Imam Ali's (PBUH) tomb and core of the Shia Islamic community, placing enormous pressure on the ancient fabric and infrastructure of

the city. Conversely, a lack of potent regulatory frameworks and the integration of modern technologies compound urban sprawl and inefficient utilization of resources.

Despite the growing recognition of the importance of heritage preservation, Najaf's Old City faces significant challenges due to rapid urbanization, poor infrastructure, and pressure from mass tourism. Previous studies have examined heritage conservation strategies in historic cities such as Fes and Kyoto, but have not provided an in-depth analysis of how these experiences can be applied in Middle Eastern cities, which are characterized by special social, economic and cultural conditions. Old Najaf is an important religious and historical center, requiring an integrated approach that balances conservation efforts. Sustainable urban development, taking into account the regulatory and legislative frameworks and the economic and social conditions of the city.



**Figure 1.** Sustainable development in historic cities

This research aims to bridge this gap by analyzing the challenges and opportunities related to heritage preservation in Old Najaf, and drawing applicable lessons from successful international experiences. Through a mixed research methodology that combines quantitative questionnaires, qualitative interviews, and comparative analysis, the research seeks to (1) identify the main factors affecting heritage preservation and urban development in Old Najaf, (2) analyze and prioritize stakeholder perspectives, and (3) assess the applicability of global best practices in Local context. The results of the research aim to provide practical recommendations to policymakers, urban planners and heritage conservation specialists, in order to integrate heritage conservation strategies into the sustainable development plans of historic cities (Figure 1).

## 2. LITERATURE REVIEW

Preserving cultural heritage in historic cities while achieving sustainable urban development has been extensively studied, reflecting a growing global recognition of the interplay between these two objectives. Numerous studies emphasize the challenges and opportunities arising from this intersection, offering insights into strategies for addressing them.

Unregulated urban expansion often undermines the physical and cultural integrity of historic areas. For instance, Al Ani [1] highlights how rapid urbanization can lead to the deterioration of heritage sites unless integrated preservation strategies are implemented to balance growth with cultural sustainability [1]. Similarly, Magdi and Ibrahim [2] emphasize the importance of monitoring and periodic maintenance as part of sustainable development frameworks to protect heritage buildings in urban contexts.

Tourism pressure is another significant concern identified in the literature. While tourism serves as a key driver of economic growth, it often leads to overcrowding and physical degradation of heritage sites. García-Hernández et al. [3] discuss how excessive tourist flows can compromise the conservation of urban landscapes and recommend sustainable tourism practices to mitigate these effects. Rincon and Rahmi [4] further argue for the institutionalization of preservation strategies within urban development plans to ensure long-term sustainability.

The role of technology in heritage preservation is increasingly prominent. Abdelfattah [5] demonstrates how digital tools like GIS and 3D modeling facilitate precise documentation and effective restoration strategies, thus enhancing conservation efforts. Wey and Huang [6] highlight

the importance of advanced decision-making tools in prioritizing restoration efforts based on resource allocation and stakeholder input.

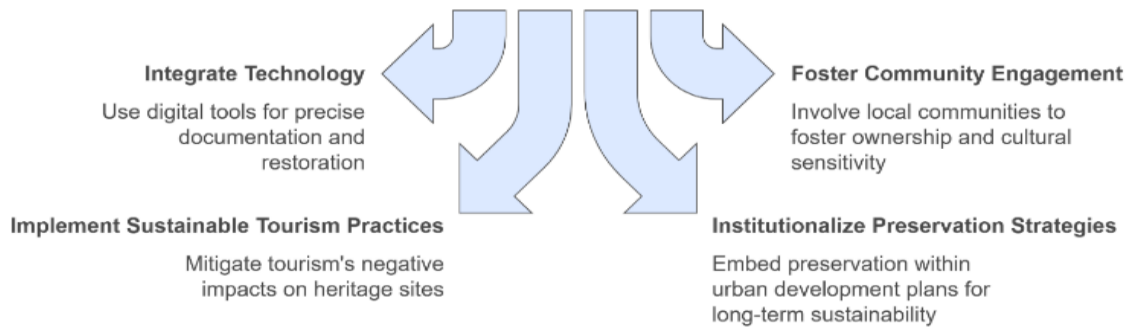
Community engagement is a cornerstone for successful heritage preservation. Teklemariam [7] underscores the importance of involving local communities in conservation efforts to foster a sense of ownership and cultural sensitivity, integrating preservation with broader economic and social objectives. Moser et al. [8] advocate for inclusive planning that aligns heritage conservation with sustainable urban development goals.

Case studies provide valuable insights into balancing heritage preservation and sustainable development. For example, studies on Erbil Citadel in Iraq demonstrate how integrating cultural preservation with urban sustainability goals can serve as a model for other historic cities [1]. Similarly, the experiences of Cairo highlight the necessity of community participation and institutional support in achieving sustainable outcomes [9].

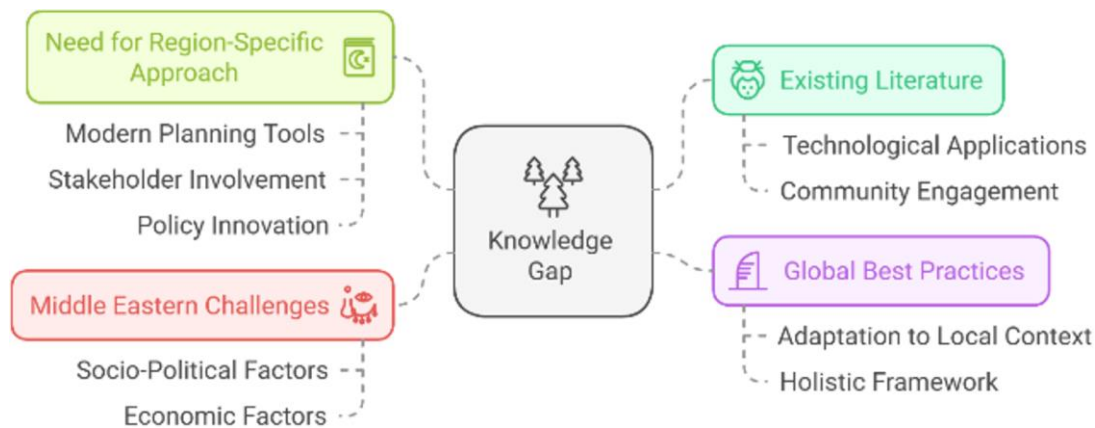
The surveyed literature highlights the challenges in reconciling heritage conservation and urban sustainability. Solutions based on the implementation of advanced technologies; taking advantage of partnering with local communities and aspirations that integrates efforts with the global sustainability initiatives are worth considering by the historic cities to tackle their unique challenges. They offer valuable insights and a solid basis for creating tailored solutions that bridge the gap between heritage preservation and urban renewal [10], see Figure 2.

### 2.1 Knowledge gap

Some key gaps in the current literature include exploring the way heritage preservation could be involved with sustainable urban development in special contexts like Old Najaf, which has its own religious, cultural and architectural value. Despite a multitude of studies that highlight the success stories of cities like that of Fes and Kyoto, there is a lack of research that does address how such examples of global best practices can be contextually translated to Middle Eastern historic cities that face socio- political and economic paradoxes of their own. Furthermore, a lot of the current work either focuses on tech applications or community involvement, often doing so in a silo and not capturing how these elements all come together within a single conceptual model. This gap highlights the need for a tailored, multi-disciplinary approach that integrates modern planning tools, stakeholder engagement mechanisms and policy innovation, all adjusted for Old Najaf specific context, see Figure 3.



**Figure 2.** Balance heritage preservation with sustainable urban development



**Figure 3.** Knowledge gap

### 3. THEORETICAL FRAMEWORK

The theoretical framework for this research explores the intersection of heritage preservation and sustainable development, drawing on contemporary theories and global best practices. This section builds upon the dual pillars of cultural heritage conservation and sustainable urban planning, integrating insights from recent scholarly contributions.

#### 3.1 Heritage preservation theories

Cultural heritage is receiving a growing recognition as a dynamic process instead of being a static concept. In designing this theoretical framework, we referred to Smith [11], who introduced the concept of "Authorized Heritage Discourse" (AHD): heritage is not a static historical artifact but a social construction negotiated through the interests of the stakeholders involved. He argues that this discourse often works to privilege expert knowledge and institutional authority whilst marginalising local voices and community engagement. This theoretical framework highlights the need to democratize heritage practices and incorporate a range of viewpoints in participatory methods.

Furthermore, the concept of "living heritage" builds upon this idea by stressing the idea that heritage remains relevant in the lives of contemporary communities. Zang [12] notes that the trend in heritage practice now has evolved from restrictive preservation to dynamic management and adaptive reuse, especially in Chinese colonial port cities where heritage practice intertwines historical preservation and present urban needs. This approach is consistent with international developments (e.g., Burra Charter; Panuku model) in heritage conservation, which emphasize cultural continuity and

sustainable development over static preservation approaches.

Such theories stress the multifaceted, always-changing nature of heritage and advocate for inclusive, context-sensitive solutions to achieve a balance between conservation and the societal and cultural imperatives of today's communities.

#### 3.2 Sustainable development principles

The Brundtland Report (1987) gave a clear description of the framework for sustainable development which is still at the heart of the needs of today and future generations are not compromised. As such, this principle truly acknowledges the fact that a sustainable urban development is based in the conservation of the cultural heritage. This will allow the protection and adaptation of heritage sites and ensure environmental, social and economic sustainability in the pursuit of sustainable development strategies [13].

Urban resilience theory offers another important lens through which to position a critique of heritage preservation within the sustainable development paradigm. The resilience of historic city and Climate change, Rapid Urbanisation helper solutions, Explore more about Urban Resilience [14]. This concept stresses flexible and adaptive planning strategies that can integrate heritage conservation and urban growth.

Holtorf [15] discusses heritage in the context of sustainable development. While heritage can serve as a valuable foundation for a vibrant and sustainable development agenda—contributing to environmental care, economic viability, and social equity and cohesion—it may also pose a financial burden. In some cases, heritage contributes little to the economy and diverts valuable resources. This perspective aligns with the broader integration of heritage into development policies and strategies, positioning it as a

supportive structure for fostering more inclusive and sustainable cities [16].

Together, these insights demonstrate the importance of integrating cultural heritage into the sustainable development narrative to foster cities that both honour their historical artefacts and respond adequately to the needs of living populations.

### 3.3 Role of technology in preservation

Heritage preservation practices have been transformed by technologies, allowing for more accurate documentation, restoration, and management. Digital technologies in the form of virtual museums and digital reconstructions are crucial in protecting cultural heritage and disseminating them to future generations [17]. Although the virtual cannot convey the same message as a physical museum, these methods are a powerful safeguard for historical information.

Some technologies, like 3D digital mapping and augmented reality, have been on the rise in recent years. Mendoza et al. performed a systematic review. Numerous studies also support the case for 3D technologies for digital preservation, which represent 44% of digital preservation works [18] - and for creating user engagement and education in cultural heritage contexts that allow education through augmented reality (AR) and virtual reality (VR) [18, 19]. Additionally, Zhou et al. [20] highlight the use of technology for modeling, restoration and interactive exhibitions, which allow us to engage critically with our heritage artefacts.

AI is another cutting-edge tool in heritage conservation. For example, Mitric et al. [21] demonstrate how AI-powered systems, like image recognition, can lead to automated analysis and labelling of monuments which can provide extensive historical information and assist in restoration efforts. Analogously, Liu et al. [22] found that they have used systems based on the Internet of Things to monitor the environment, which helps to avoid problems such as erosion and pollution.

Spatial analysis of heritage sites with Geographic Information Systems (GIS). According to research by Ahmed Elewa [23], GIS helps urban planners find high-risk areas and undertake any conservation as effectively as possible in terms of minimizing development impacts [24, 25]. These tools are crucial for reconciling preservation goals with sustainable urban planning.

As a heritage preservationist, I must say that the impact of technology on the field has yet to be forced into a single paradigm. Whether through digital documentation, artificial intelligence, GIS, or other technologies that help preserve historical artifacts while increasing easy access and engagement, these innovations will help ensure our heritage remains intact for future generations.

### 3.4 Community participation and social theory

Participatory planning and community engagement have become central to heritage preservation, emphasizing the involvement of local stakeholders in decision-making processes. Arnstein's [26] "Ladder of Citizen Participation" continues to serve as a foundational framework for evaluating the degree of community involvement, ranging from tokenistic consultation to full citizen control. Recent research by Rosetti [27] reveals that effective participatory practices not only enhance authenticity and ethics but also foster sustainable

cultural and social development in heritage management [27]. These practices underscore the importance of inclusive planning models that empower communities to co-create strategies for conservation.

Social identity theory also offers valuable insights into the interplay between cultural heritage and community identity. Yang et al. [28] demonstrated that communities actively participating in heritage conservation tend to develop a stronger collective identity, which reinforces social cohesion and resilience [28, 29]. Moreover, community-based heritage planning, as explored by Salimi et al. [30], illustrates how participatory approaches utilizing GIS empower stakeholders by integrating local knowledge into preservation initiatives.

These theories and practices highlight the importance of embedding participatory methods within heritage management to ensure that preservation efforts align with the values and aspirations of local communities, ultimately leading to more sustainable and inclusive outcomes.

### 3.5 Case studies: Fes (Morocco) and Kyoto (Japan)

Fes in Morocco and Kyoto in Japan are good examples of heritage conservation in the context of a sustainable urban development agenda. There are lessons to be learned from these cities about how to modernize while also protecting historical and cultural assets.

Preservation of both the medina's infrastructure, as well as traditional crafts, has been a hallmark of heritage conservation in Fes. According to the study of Alami et al. [31], the deterioration of different types building components and environmental decay are the two most important problems of the medina of Fes. Their analysis demonstrates the importance of cultural tourism as a driver of economic development and heritage preservation. Guided tourism and artisan training centers have emerged and turned out to be especially relevant initiatives to support the cultural and economic resilience of the city. Furthermore, collaborations with international organizations have also been key in restoring historic structures and encouraging sustainable urban development [32].

Japan's Kyoto is a nor-faraway alternative kind of view. The city's strategy combines high-tech solutions with low-tech preservation tools. According to Santini and Taji [33], it is essential to maintain Kyoto's waterways as a component of the historically urban landscape which reflects the interrelation between urbanization and the environment. In addition, Park [34] focuses on architectural preservation in Japan, specifically for timber structures, important for Kyoto's cultural fabric. Strict zoning laws and GIS incorporation in the city; all these measures ensure that urban development will be in accord with the objectives of heritage conservation [35].

Fes and Kyoto demonstrate bridge-building between tradition and modernity, between technology and community, in forging avenues to conserve heritage. These cities demonstrate that sustainable development and cultural heritage-goal conservation are no more mutually exclusive or incompatible than would be golf courses and sustainable development, when sited under proper policies and practices.

This theoretical framework forms the basis of this approach that puts together the contemporary theories and practices related to heritage preservation and sustainable development. The extensive theoretical synthesis, spanning from living heritage and temporary urbanism to participatory planning and global sustainability policies, provides a solid footing for

examining trade-offs and synergies involved in balancing cultural heritage conservation with contemporary urban needs in the case study site. Not only does this framework shape the analysis of Old Najaf, but the project also adds to the wider conversation of sustainable heritage conservation, see Figure 4.

### 3.6 Comparative analysis between Najaf, Fez, and Kyoto

Comparing old Najaf with the cities of Fez (Morocco) and Kyoto (Japan) shows that there are successful models of heritage preservation within sustainable development strategies. Fez benefits from traditional crafts and cultural tourism to support its economy, while Kyoto relies on

technology and strict urban planning to preserve its historical identity, see Table 1.

Applying lessons learned to ancient Najaf  
This comparison indicates that several successful strategies can be applied in Najaf, such as:

1. Strengthening legislation to protect the Old City from random urban sprawl.
2. Use technology such as GIS and three-dimensional digital models to document and manage heritage sites.
3. Organizing tourism by setting specific routes for visitors and identifying special places for movement to minimize the negative impact on the urban structure.

Support traditional crafts by providing incentives for artisans to link heritage to the local economy.

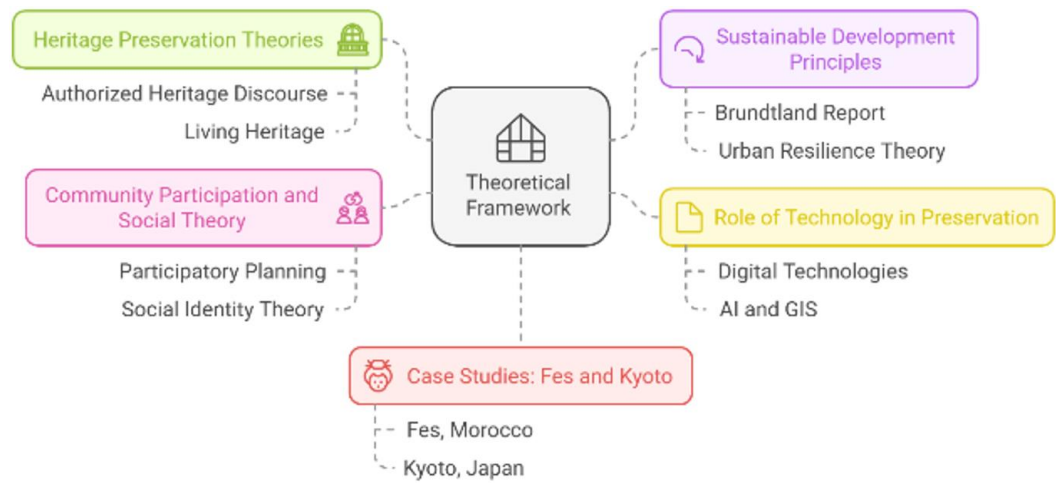


Figure 4. Theoretical framework

Table 1. Comparative analysis between Najaf, Fez, and Kyoto

Item	Fez (Morocco)	Kyoto (Japan)	Applicability in Najaf
Conservation policies	Strong support for traditional crafts and linking them to cultural tourism.	Strict legislation to preserve the urban fabric, while integrating technology.	The need to support traditional crafts and strengthen regulatory laws.
Technology	Limited use of modern techniques in conservation.	Adoption of advanced systems such as Digital Twin and GIS.	Access to GIS and digital twin to document and manage heritage.
Tourism	Focus on cultural tourism and reduce unregulated mass tourism.	Strict regulation of the movement of tourists to protect archaeological sites.	The need to regulate visitor flows, especially during religious seasons.
Community engagement	Involve artisans and residents in conservation projects.	Community awareness programs and encouraging residents to preserve the historical character.	Promote awareness of the role of the community in preserving heritage.

### 3.7 Research gap and study direction

Although previous studies on heritage conservation in historic cities such as Fez and Kyoto have provided valuable insights into policy frameworks, community engagement, and the use of technology, there is a clear gap in adapting these strategies to suit Middle Eastern cities, such as Old Najaf. Unlike Fez and Kyoto, where urban planning and heritage preservation strategies are harmoniously integrated, ancient Najaf faces unique challenges related to local governance, socio-economic conditions, and regulatory frameworks, necessitating a more local approach. Integrated. This research builds on these previous studies by analyzing how their results are adapted to suit the specific needs of heritage conservation and sustainable urban development in Najaf. By linking lessons learned from global best practices to the local context, this research seeks to develop a balanced framework that

combines heritage conservation and sustainable urban development.

## 4. RESEARCH METHODOLOGY

This research is based on a blended research approach, combining quantitative and qualitative methods to achieve an integrated understanding of the challenges and opportunities related to heritage conservation and sustainable development in ancient Najaf. This approach allows for in-depth insights through the analysis of both empirical and theoretical data, enhancing the accuracy and applicability of the results.

### 4.1 Research design

The research is based on exploratory-descriptive design,



where the exploratory component aims to highlight the challenges and opportunities related to heritage preservation, while the descriptive component focuses on analyzing the current reality of urban conservation practices and urbanization in ancient Najaf. This design makes it possible to combine a deep assessment of existing phenomena with the systematic extraction of applicable results.

#### 4.2 Data collection methods

Data was collected using four main methods: surveys and questionnaires, semi-structured interviews, field observations, and case studies. The surveys targeted two main stakeholder groups, namely local people and experts in the fields of heritage conservation, urban planning and sustainable development. The representative sample included 200 participants from the local community in Old Najaf, along with 30 experts in the fields of urban planning, architectural design, and sustainability.

The questionnaires were designed with closed and open-ended questions, where the closed questions used the Likert scale to assess perceptions about heritage conservation, the impact of tourism and urbanization, while the open-ended questions allowed participants to provide detailed insights into possible challenges and solutions. Quantitative data was analyzed using descriptive statistics and crosstables to discover trends and relationships between variables, while qualitative data were analyzed using objective analysis to derive applicable patterns and insights.

Semi-structured interviews were conducted with government officials, representatives of cultural organizations, NGOs and experts in heritage conservation and sustainable development. These interviews provided in-depth qualitative data on challenges and opportunities, with a flexible protocol that allows critical issues to be addressed according to the context of the discussion.

In addition, direct field observations were conducted to document the actual conditions of heritage sites, patterns of urbanization, and tourism interactions. Observations included assessing the status of conservation, monitoring the impact of unregulated urban sprawl, and analyzing tourism flows and their interaction with the local community.

The study also included a comparative analysis of international cases, where heritage conservation and sustainable development policies were reviewed in Fez (Morocco) and Kyoto (Japan). The comparison was based on the analysis of secondary data from academic sources, government reports and UNESCO documents to derive best practices applicable in Najaf.

#### 4.3 Verification of reliability and validity

To ensure the reliability of the research tools, questionnaires and interview guides were pre-tested on a small sample of target groups, and adjusted based on feedback to ensure clarity and relevance. Credibility was enhanced through cross-verification, where multiple data sources, including surveys, interviews, field observations, and case studies, were integrated, helping to validate the results and increase their reliability. The study also adhered to ethical standards, where informed consent was obtained from all participants, while ensuring data confidentiality. Respect the cultural sensitivities of ancient Najaf.

#### 4.4 Data analysis

Quantitative data was analyzed using specialized statistical software to identify descriptive measures, variance, and correlations. Intersectional tables were applied to study the relationship between demographic factors and perceptions about heritage conservation and urban development.

For qualitative data, interview transcripts and field observations were analyzed using objective analysis, where key topics reflecting the challenges and opportunities identified by the participants were categorized. A comparative analysis of Najaf's findings and international best practices was also conducted to identify lessons learned and strategies applicable in the local context.

#### 4.5 Research limitations

The study recognizes some limitations that may affect the generalization of results, such as the possibility of bias in respondents' responses to questionnaires and interviews, as well as the limited possibility of generalizing results due to the study focusing on only one case. The research also faced some challenges related to the access to detailed government data or information on urban conservation projects.

### 5. STUDY AREA: OLD NAJAF

#### 5.1 Geographical location

Old Najaf is in southern Iraq, in the central Euphrates area, nearly 160 kilometers (100 miles) southwest of the capital, Baghdad. The city on the edge of the Iraqi desert maintains a hot and dry climate for most of the year. Najaf is among the most famous cities in Iraq and has a significant religious status specifically for Shia Muslims. With its strategic location, the city as a major destination for pilgrims, particularly during occasions like Arbaeen, see Figure 5.



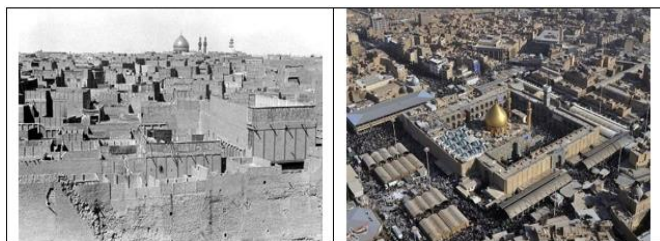
Figure 5. Study area: Old Najaf

#### 5.2 Demographic and natural characteristics

Characteristics demographic: Najaf is one of the sites visited by visitors, especially religious seasons, class of residents, or the local people. The population of the city is approximately 1.5 million people within the wider Najaf region, although it can swell during peak pilgrimage time.

Social features: One of the most important features of Najaf is its religious identity, and most of its residents are students at the Hawza (Shia seminary), as well as in professions such as traditional trade, shopping, and crafts.

Natural characteristics: Najaf being a desert-like province has hot dry weather all year around. Summer temperatures soar up to 45°C and the city is faced with a number of challenges, such as water shortages, which affect both the conservation of green areas and the sustainability of his heritage conservation work, see Figure 6.



**Figure 6.** Najaf characteristics

### 5.3 Historical and cultural context

**History:** Najaf has existed since the 7th century, but the site gained prominence after the burial of Imam Ali ibn Abi Talib (PBUH) in 661 CE, becoming a significant center for Shia Muslims.

**The Old City:** Najaf is home to some religious significance landmarks like the Imam Ali Shrine; and it's known for its Hawza (Shia religious school) that has delivered Ali (AS) scholars and thinkers in the history of Islam.

**Culture:** Najaf is a center of religion and culture. The city is known for holy places, including the Imam Ali Shrine, as well as traditional shopping (souks) and residential areas that preserve their historic style. It is also known for its craftsmanship, including Islamic decorations and calligraphy that form part of its cultural heritage.

### 5.4 Significance of Najaf for the research

Old Najaf - a potential case study for heritage preservation in historically-religiously-culturally significant historic cities

**Religious and cultural significance:** As one of the holiest cities in Shia Islam, Najaf represents a significant spiritual and cultural hub for millions of believers worldwide.

**Problems:** The city faces a lot of problems like, demographic growth, mass tourism, preservation issues. It is especially well placed as a site for studying the balancing act of heritage conservation and sustainable urban development.

**Socio-economic implications:** Mapping the relationship between urban growth and tourism pressure in Najaf will provide valuable information on how sustain improvements of its infrastructure with preservation of cultural heritage and sustainable tourism.

The study area Old Najaf is of unique nature regarding its preservation challenges and the site as a religious and cultural focal point. This study aims, through investigating these difficulties in (Najaf) context, to provide the strategic solutions that are able to harmonize between the preservation of heritage and sustainable development with the religious and historical uniqueness of (Najaf).

## 6. RESULTS AND ANALYSIS

This section presents a detailed analysis of the survey responses from residents and experts, supported by tables and

statistical tests. The results are discussed comprehensively to explore their implications for heritage preservation and sustainable development in Old Najaf.

### 6.1 Quantitative analysis

#### 6.1.1 Residents' survey

The responses from the residents' survey provided valuable insights into their perceptions and priorities:

**Urban expansion:** A majority of residents (60%) strongly agreed that urban expansion significantly impacts the historical character of Old Najaf, with 25% agreeing. The remaining responses were neutral (10%), disagree (2.5%), and strongly disagree (2.5%), as shown in Table 2.

**Table 2.** Residents' perception of urban expansion

Response	Percentage (%)
Strongly Agree	60.0
Agree	25.0
Neutral	10.0
Disagree	2.5
Strongly Disagree	2.5

**Infrastructure Adequacy:** Over half (50%) of respondents strongly disagreed that infrastructure such as electricity, water, and sewage systems is adequate. An additional 30% disagreed, indicating a critical view of existing services, while only 10% expressed neutrality, and 10% agreed or strongly agreed (Table 3).

**Table 3.** Residents' perception of infrastructure adequacy

Response	Percentage (%)
Strongly Disagree	50.0
Disagree	30.0
Neutral	10.0
Agree	5.0
Strongly Agree	5.0

**Heritage priority:** An overwhelming 70% of residents strongly agreed that preserving cultural heritage is a priority, with an additional 20% agreeing (Table 4).

**Table 4.** Residents' perception of heritage priority

Response	Percentage (%)
Strongly Agree	70.0
Agree	20.0
Neutral	7.5
Disagree	1.5
Strongly Disagree	1.0

#### 6.1.2 Experts' survey

Experts provided critical insights into potential solutions and strategies:

**Effectiveness of solutions:** Experts strongly emphasized the importance of stricter laws, technology, and community engagement:

- Stricter laws: 75% strongly agreed on their importance, with 20% agreeing.

- Modern technology: 65% strongly agreed, while 30% agreed that tools like digital twins and 3D mapping are vital.

- Community engagement: 60% strongly agreed, and 30% agreed on the necessity of engaging local communities.

**Table 5.** Comparative analysis of perceptions on urban expansion

Group	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Residents	60.0	25.0	10.0	2.5	2.5
Experts	70.0	20.0	5.0	3.0	2.0

**Table 6.** Age group vs Perception of urban expansion

Age Group	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Under 18	55.0	30.0	10.0	3.0	2.0
18-30	65.0	25.0	7.0	2.5	0.5
31-40	50.0	30.0	15.0	3.0	2.0
41-50	45.0	35.0	15.0	3.0	2.0
Above 50	40.0	30.0	20.0	5.0	5.0

## 6.2 Comparative analysis

### 6.2.1 Residents vs Experts

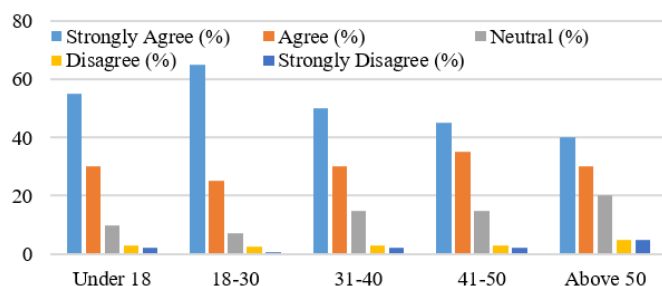
Table 5 compares residents' and experts' perceptions of urban expansion, illustrating broad agreement that it poses significant challenges. However, experts emphasized solutions like stricter laws and technology, while residents were more focused on immediate impacts like infrastructure adequacy.

### 6.2.2 Demographic insights

A cross-tabulation between residents' age group and their views on urban expansion (Table 6, Figure 7) revealed that younger residents (18-30) were more likely to strongly agree about its impact (65%), while older groups showed greater diversity in responses.

The demographic analysis in Table 6 provides important insights into how different segments of society in Old Najaf perceive the issues of heritage conservation and sustainable development. Data show that the younger age group (18-35 years) adopts more advanced views on the integration of modern technologies into heritage management, while older groups (over 50 years) prefer traditional methods of conservation. This discrepancy reflects the need to strike a balance between technological innovation and respect for traditional heritage methods in future conservation policies.

The level of education also has a clear impact on perceptions of heritage conservation, with participants with a university education showing greater awareness of sustainable urban planning concepts. These findings are in line with previous studies conducted in historic cities such as Fez, where community participation in heritage conservation projects increased with a higher level of educational awareness. Understanding these demographic differences is vital to designing awareness campaigns and policies targeting different segments of society in Old Najaf.

**Figure 7.** Age group vs Perception of urban expansion

The Chi-Square test for this analysis ( $\chi^2 = 354.67$ ,  $p <$

0.05) confirms the statistical significance of these differences, suggesting demographic influences on perceptions.

## 6.3 Qualitative analysis

Thematic analysis of free-text responses revealed several common themes:

- Residents' suggestions: Developed infrastructure with improved electricity and water systems. Awareness campaigns to either community on heritage preservation.

- Experts' recommendations: Zoning reforms and enforcement mechanisms. Increase use of advanced technologies such as 3D mapping for documentation and restoration.

## 7. COMPARATIVE ANALYSIS WITH GLOBAL CASE STUDIES

The following review puts Old Najaf in context and compares it with two international examples of heritage cities, Fes (Morocco) and Kyoto (Japan). The lessons these city experiences teach about how to (re)integrate heritage preservation with sustainable urban development are pearls of wisdom, which have global validity but are also locally applicable.

### 7.1 Fes, Morocco: Balancing between traditional crafts and tourism management

Example 5: Fes — Morocco (UNESCO: World Heritage Site). It has successfully integrated cultural heritage preservation along with sustainable economic development. The approach is centered on utilizing traditional crafts and establishing formal tourism routes.

**Maintenance of traditional crafts:** The craftsmen of Fes are part of the living identity of the city, their craft a living heritage. Modules for artisans and incentives for indigenous practices have, in fact, protected not only the cultural identity, but also the economic sustainability. It is a method that guarantees the passing down of these trades to our heirs, conserving our heritage as well as aiding our economy.

**Tourism management:** To combat the overwhelming of the Medina (Old City), Fes has set up guided tourism routes. These measures alleviate the physical and environmental burden that heritage buildings endure and allow visitors to have an optimal experience. Part of our contribution was also made through our collaboration with international organizations like UNESCO where they contributed funding for restoration projects and infrastructure improvements to the



Medina.

Relevance to Old Najaf: Similarly, Old Najaf can boast of crafts and religious significance to provide sustainable economic models, just like Fes. Promoting traditional artisanal skills in Najaf could be a two-pronged strategy—helping preserve heritage and create economic opportunities. During religious seasons, overcrowding in Najaf has increased thus requiring the establishment of guided tourism routes that are beneficial for both pilgrims and residents.

## 7.2 Kyoto, Japan: Technology and urban regulation

Kyoto is known for carefully preserving cultural heritage despite urban pressures. The city's approach blends high-tech tools with tough regulatory regimes.

Integration of advanced technology: Digital Twin technology at Kyoto has proven a game-changer for preserving heritage. The usefulness of digital twins in creating detailed documentation on historical sites which affords predictive maintenance and restoration. It means monitoring urban growth patterns, and judging their impact on urban heritage sites using GIS. Although widespread interest in virtual tourism somewhat waned once the pandemic settled down, the ideas linger, as you certainly noted as you researched this article: Technology affords access to cultural heritage without actual wear and tear on the site.

Strict urban zoning laws: Kyoto has also enacted strict building codes to ensure new construction reflects the city's historical aesthetic. Such laws serve to prevent urban sprawl from encroaching on these sacred heritage zones and to keep the visual integrity of the cityscape. Heritage organizations work closely with local governments to assess proposed developments in sensitive regions.

Relevance to Old Najaf: That historic city could use technology like digital twins and GIS to monitor and document its historic sites. These tools would help with predictive conservation and minimize the costs of restoration and physical degradation. Enacting zoning regulations suited to Najaf's surrounding landscape would temper uncontrolled urban sprawl and safeguard its architectural and cultural integrity.

## 8. CONCLUSION

This study has laid out a comprehensive exploration of the intricate relationship between the archaeological heritage preservation context and the virtuous urban development in the historic city of Old Najaf. Having applied a mixed-methods approach that combines social/qualitative with statistical/quantitative considerations, the research has shed light on key challenges and contextual opportunities to consider in the management of the city's distinctive cultural and historical legacy.

Our findings indicate that Old Najaf is at a crossroads in which it is confronted with extreme pressures from unregulated urban growth, an underdeveloped infrastructure, and a growing need for mass tourism. All of these factors are threatening the historic fabric and cultural identity that form the heritage of this place. These voices from the community and experts agree on the importance of combating these issues while highlighting Old Najaf's heritage as a cultural, religious, and historical treasure.

This comparative exercise with Fes and Kyoto reveals how

global best practices can offer insights into tackling common issues observed in heritage cities. Notably, these case studies illuminate the utilization of contemporary tools, community engagement, and cultural awareness in heritage management, establishing a broader discourse to consider the way Old Najaf may approach its current challenges.

By so doing, this body of work deepens research dialogues on the viability of heritage longevity both in terms of its utilization and in response to urbanization, while clarifying the tortuous road that historic settlements in a state of convoluted socio-cultural and spatial health must navigate in a delicate i.e. interplay between their past (or culture) and the use of their present (or however operates now). The results emphasize the need for a multidimensional, context-oriented process in which the cultural legacy of Old Najaf remains a source of identification, knowledge, and inspiration for future generations.

The experts' recommendations stress the need for a more structured governance framework, enhanced community participation, and the integration of digital tools into heritage conservation processes. Among the key suggestions made by the experts were the adoption of GIS and digital twins, strategies that have proven successful in cities such as Kyoto, where these technologies enable accurate documentation and proactive management of heritage sites.

In addition, experts stressed the importance of providing economic incentives to local artisans, similar to the Fes model, which linked traditional crafts and heritage tourism as a means of supporting the local economy. However, implementing these recommendations in Old Najaf requires addressing challenges such as the shortage of specialized cadres and existing regulatory constraints. Progressive implementation through pilot projects and capacity-building programs can be an effective approach to ensure long-term viability and sustainability.

## 9. RECOMMENDATIONS

In light of the results of this work and its reflection, the following recommendations are suggested to contribute to solving the problems faced by Old Najaf within the framework of a system of principles for the conservation of its heritage and sustainable urban development. The recommendations that follow are grouped according to major thematic areas identified in the research.

This requires sound zoning legislation development and application to safeguard the historical fabric of Old Najaf from rampant exploitation. Such laws should also impose a moratorium on high-rises and new construction in sensitive areas to maintain the historical and architectural character of the city. These rules should be strictly adhered to through proper monitoring, for which, a heritage management authority needs to be established. You can ensure developers and others (with vested interest parties) cooperate and leave the city's heritage intact by enforcing a strict policy with penalties for not sticking to it.

The transformative potential of Advanced Technologies in Conserving Heritage 3D mapping and enriched digital twins should be deployed to accurately document and monitor heritage sites that would enable predictive maintenance systems to identify risks and allow timely interventions. Utilising GIS, scholars are able to examine trends in urban expansion and suggest upgrades to infrastructure that will

impact historically significant places the least. Virtual tourism initiatives could Explore and visit cultural and heritage sites from anywhere in the world, helping to ease the burden of visiting the physical location while exposing the worldview and interest.

Improving Old Najaf's infrastructure is a pressing task. The electrification of the residents, water supply and sewage systems will improve the quality of life of the residents as well as meet the needs of the city's tourism. To minimize congestion in heritage areas, sustainable urban mobility solutions must be made available, including pedestrian zones and eco-friendly public transport. Also, well maintained and accessible pathways to the prominent heritage sites shall ensure the smooth experience between the locals, tourists, and pilgrims, especially in peak seasons.

This is because mobilizing the local community is essential for the sustainable preservation of heritage. For example, some outreach programs to create awareness about the socio-economic benefits of preserving cultural heritage could be organized, and heritage education can also be introduced to children at the school and community level to give them a better understanding of the subject matter. When it comes to involving local communities in planning and decision-making processes through a shared vision for the city's future. This would allow for platforms among residents, policymakers, and experts to facilitate engagement and dialogue. By providing traditional artisans with financial incentives and training programs, the city will maintain crafts that are crucial to the city's fabric and economy.

Such tourism management strategies are very important to diminish its pressure on the Old Najaf heritage. Early "pilot projects" with guided tours and designated visitor routes may help relieve overcrowding in sensitive areas. Distributing pilgrimage events and tourism activities throughout the year will help alleviate pressure from peak season, managing visitor flow. Informative and interactive exhibits in heritage sites can contribute to the tourist experience and offer insights into historical impositions of Old Najaf. International standards require competent recreation areas including standings and interpretation. Some of the money tourists spend on tourism revenue should be earmarked for conservation efforts, as well as infrastructure upgrades and programs that benefit the local populace.

Global partnerships can offer Old Najaf technical knowledge, resources, and assistance on preservation initiatives. Working with partners like UNESCO provides additional visibility that can help city governments get the resources they need. We will show Old Najaf to the world that it is a model of for-heritage development by active engagement with international networks. Collaborations with cities such as Fes and Kyoto, long celebrated for their successful preservation methods could be beneficial. Mainly conferences and workshops will motivate Old Najaf as a part of global discussion on sustainable heritage management.

A sound preservation strategy is built on sustainable funding. The preservation of heritage should be an area of national priority in terms of government spending. And utilize public-private partnerships (PPPs) to generate additional resources for large-scale conservation and infrastructure projects. The introduction of a heritage preservation fee for visitors is an argument for ensuring that tourism directly contributes to the maintenance of heritage and the development of the city's heritage.

This includes consideration of site climate adaptation

strategies, to protect our heritage sites from environmental impact. The restoration projects must adopt climate-resilient materials and techniques for long-term sustainability. Rearranging green spaces and sustainable landscapes in the precinct of heritage sites would strengthen their resilience and serve aesthetic and environmental targets of the city.

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