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A Flexible Strategic Framework for Urban Heritage Management in Karbala Post-Pandemic: A Participatory Digital Approach to Achieving Urban Sustainability

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Abstract

This study examines the reality of urban heritage management in Karbala, a city steeped in religious and historical significance. Karbala faces complex challenges, including rapid urban expansion, heavy seasonal visitor traffic, and the deterioration of infrastructure and historical fabric, all within a fragile institutional and economic context exacerbated by the COVID-19 pandemic, threatening the sustainability of its urban identity.The study aims to build a flexible and sustainable strategic framework for revitalizing urban heritage by integrating participatory governance, digital technologies, and environmental and economic dimensions into city management. It adopted a mixed methodology (quantitative and qualitative) that included questionnaires, interviews, geographic information systems analysis, and an assessment of urban sustainability indicators.The results revealed weak institutional integration, low community trust, limited use of digital tools in planning and management, and a near-total reliance on religious tourism. The study recommended establishing a participatory coordination framework, developing digital platforms, leveraging augmented reality technologies, diversifying the local economy through cultural industries, and reviewing urban legislation.The study contributes to aligning Karbala's uniqueness with global trends to achieve Sustainable Development Goal 11.4, and strengthening alliances between academics, authorities, and society towards a more resilient and just urban future.

Keywords: *Strategic Framework, Urban Heritage Management, Karbala, Post-Pandemic, A Participatory Digital Approach, Urban Sustainability.*

Introduction

Background of the Study

Urban heritage plays a central role in shaping the cultural identity of societies and preserving the continuity of collective memory. Holy cities stand out as unique urban structures that blend spiritual, architectural, and symbolic values, making the preservation of their heritage a complex challenge[1]. With the accelerating pace of urban expansion, globalization, and environmental pressures, the management of these heritage sites becomes increasingly difficult, especially in contexts suffering from institutional fragility and population pressures, as is the case in many Arab cities[2].

In this context, the holy city of Karbala provides a unique model for studying the intersection of urban expansion, religious sanctity, and tourism pressures[3]. The city receives millions of visitors annually during the pilgrimage seasons, which casts a shadow over its historical fabric and associated infrastructure[4].

To accurately understand the spatial context of the study area, it is important to identify the location of the historic center of Karbala within the city's urban sprawl and its relationship to the religious centers and surrounding roads[5]. This identification helps highlight areas of urban pressure and potential interventions, paving the way for interpreting the results of subsequent spatial, social, and institutional analyses[6].

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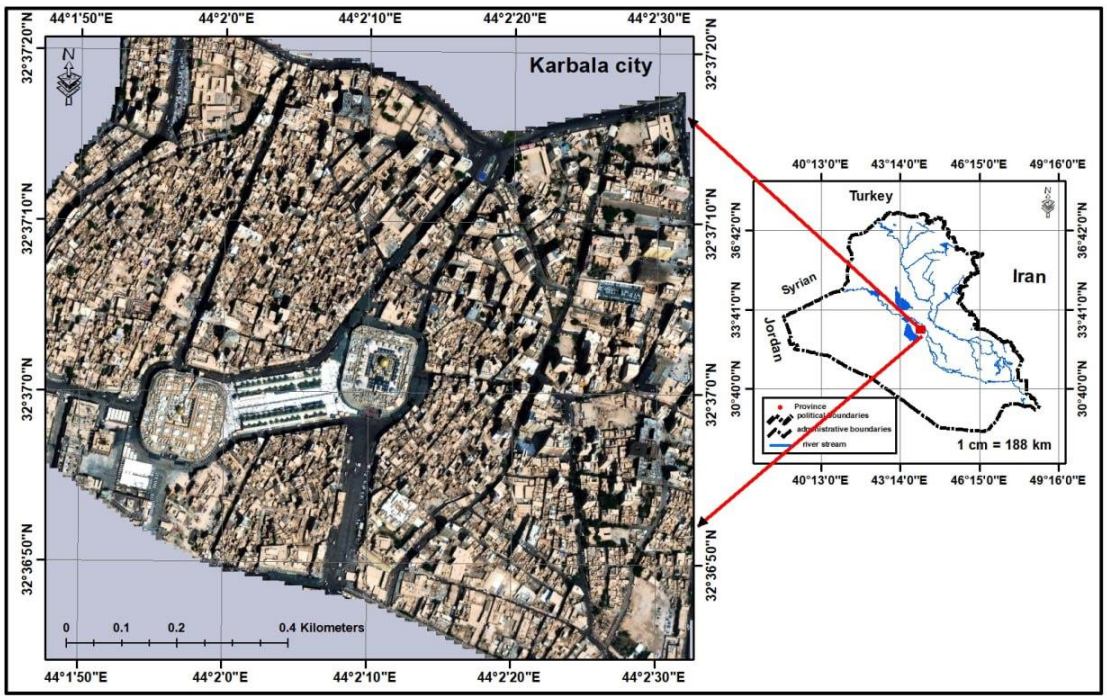

Figure (1): Location of the study area in the city of Karbala

Map Figure (1) shows the spatial extension of the historic center of Karbala, including the two holy shrines (Imam Hussein and Abu al-Fadl al-Abbas, peace be upon them), and the main ritual routes connecting them. The map illustrates the boundaries of the area subject to field analysis in this study, which experiences the highest levels of human and urban pressure, especially during major pilgrimage seasons.

The attached miniature map also indicates the location of Karbala within the national map of Iraq, placing the study within its regional and international geographical framework, given the cross-border relationships shaped by patterns of religious pilgrimage[7]. This geographical location represents a major factor in shaping the challenges facing the heritage management system, especially with the recurrence of central interventions and the multiplicity of influential parties in managing the heritage landscape[8].

The COVID-19 pandemic has exacerbated these challenges, exposing the fragility of the institutional system and leading to a significant decline in economic returns from religious tourism[9]. It has also hampered heritage preservation efforts due to restrictions on movement and funding[10].

Despite some local and international heritage conservation initiatives, the current literature remains inadequate to address the complexities of heritage management in holy cities post-pandemic, particularly in the context of the Middle East, characterized by political-religious overlap and demographic complexity[11].

Research Problem

Karbala faces a clear gap in its heritage management system, manifested in weak governance, fragmented institutional roles, low community engagement, and an overreliance on religious tourism as a sole economic source. Furthermore, the historic urban fabric lacks preventative protection mechanisms and lacks effective digital strategies for monitoring, documentation, and public engagement. The pandemic has only accelerated the deterioration and exposed underlying dysfunctions.

Hence, the need for a deep understanding of these challenges and the formulation of flexible strategic frameworks capable of accommodating post-pandemic changes emerges. Accordingly, this research poses the main question:

How can a flexible and sustainable framework for urban heritage management in the holy city of Karbala be developed in the post-COVID-19 context?

Research Aim and Objectives

The overall objective of the study is to:

Develop a resilient and sustainable urban heritage revitalization strategy in the city of Karbala post-pandemic, by integrating participatory governance, digital technologies, and environmental and economic strategies.

The following objectives branch out from this:

Analyze the impact of the COVID-19 pandemic on the urban heritage situation in Karbala in terms of deterioration, management, and community interaction.

Identify institutional and organizational gaps in the urban heritage management system.

Assess the role of local residents and stakeholders in heritage conservation and identify obstacles to effective participation.

Explore the potential of employing geographic information systems and interactive technologies (VR/AR) in documentation and management.

Propose a comprehensive, multi-level, and multi-disciplinary strategic framework for resilient and sustainable urban heritage revitalization.

Significance of the Study

The significance of this study stems from its examination of one of the major holy cities in the Islamic world, which represents an urban laboratory at the intersection of religion, architecture, and politics. It also seeks to fill a research gap related to heritage management in post-pandemic contexts, employing modern analytical tools and linking the local with the global. Its findings are expected to contribute to the formulation of more integrated urban policies and benefit decision-makers, planners, and organizations concerned with the preservation of cultural heritage.

Analytical Framework Adopted in the Study

Given the complex nature of the holy city centers and the overlap in administrative, social, and environmental dimensions they witness, this study adopted an integrated analytical framework that addresses four main axes[12]: the institutional axis, the societal axis, the environmental and urban axis, and the digital and technical axis. This framework aims to build a comprehensive understanding of the reality of urban heritage management in the Karbala city center, with a focus on the challenges that have been exacerbated by the COVID-19 pandemic[13].

This framework was designed based on a recent literature review, taking into account the nature of the available data, and ensuring that current gaps in policies and practices are addressed[14]. These axes were also identified based on their direct connection to the Sustainable Development Goals, particularly Goal 11, which aims to make cities and human settlements inclusive, safe, resilient, and sustainable[15].

The following table details each axis in terms of its analytical components, purpose of analysis, type of data used, relevant disciplines, and type of indicators adopted:

Table (1): Analytical Axes for Urban Heritage Management in Karbala After the Pandemic

Main Axis	Analytical Components	Purpose of Analysis	Type of Data Used	Relevant Disciplines	Type of Analytical Indicators
1. Institutional	- Stakeholders- Distribution of authority- Legislative gaps	Identify governance gaps and administrative fragmentation	Document analysis, expert surveys, interviews	Urban planning, public administration, law	Governance indicators, institutional role mapping

Main Axis	Analytical Components	Purpose of Analysis	Type of Data Used	Relevant Disciplines	Type of Analytical Indicators
2. Societal	- Community awareness- Participation in decision-making- Cultural perceptions	Assess societal involvement and perceptions of heritage	Citizen surveys, qualitative interviews	Urban sociology, anthropology	Behavioral indicators, community engagement indices
3. Environmental/Urban	- Use density- Seasonal pressure- Urban fabric degradation	Understand the environmental and spatial impact of visitation	Field observations, aerial imagery, map analysis	Architecture, urban environment	Urban pressure indices, density, spatial degradation
4. Digital/Technological	- GIS usage- Digital documentation- Technological interaction	Evaluate the role of technology in heritage preservation	GIS applications, VR/AR platforms	Information systems, digital design, documentation	Coverage metrics, interaction levels, digital readiness

Methodology

Research Design and Cognitive Framework

The study adopted a convergent mixed methods design, combining quantitative and qualitative data collected in parallel from field, documentary, and spatial sources. These data were analytically integrated in a unified interpretive phase, aiming to enhance the validity of the results and provide a deeper understanding of the complexity of the topic under study.

This design was chosen because the issue of urban heritage management in the holy city of Karbala requires understanding multiple interconnected dimensions, including community dynamics, infrastructure, institutional governance, and environmental and tourism challenges. The mixed design also allows for the integration of spatial data (GIS) with social and administrative inputs, enhancing the practicality of the proposed recommendations.

Study Population and Sample

The study covers the historical scope of the city of Karbala, the areas surrounding the holy shrines, and the networks associated with ritual movement. A stratified purposive sample of 200 participants was employed, divided into eight categories representing various stakeholders and stakeholders in urban heritage, as shown in Table (2).

Table (2): Distribution of the Study Sample According to Categories, Estimated Percentage, and Justifications for Representation

Category	Number	Approx. Percentage	Representation Notes
Residents living near heritage sites	40	20%	Covered multiple neighborhoods to account for spatial variation
Visitors/pilgrims (local + international)	60	30%	Subdivided into 40 local and 20 international for comparative analysis
Government officials	10	5%	Included personnel from municipalities, planning, tourism, and heritage

Category	Number	Approx. Percentage	Representation Notes
Experts and professionals (architects/planners/conservators)	20	10%	Combined academics and practitioners
Religious authorities	10	5%	Included administrative representatives of shrines and religious boards
Local business owners (markets, hotels, visitor services)	30	15%	Stratified by proximity to core ceremonial zone
Tour guides / pilgrimage organizers	15	7.5%	Included licensed guides and seasonal volunteers
Local academic/research community	15	7.5%	Researchers with published studies on Karbala and sacred cities
Total	**200**	**100%**	—

The sample included local residents, visitors (local and international), government officials, religious authorities, experts and professionals, business owners, tour guides, and researchers. To avoid bias resulting from the disparate numbers of participants in some categories, analytical weights were applied, and small categories were combined analytically in some statistical results, without neglecting their distinction in qualitative interpretation.

The table above shows the distribution of the sample across nine main categories, representing the various dimensions of governance and society in the sacred urban landscape. Visitors constituted the largest proportion (30%), reflecting the importance of the pilgrimage dimension in the context of Karbala, followed by local residents (20%) and business owners (15%), highlighting the weight of the local social and economic impact.

Despite the small number of religious officials and authorities, qualitative representation was allocated to these two categories to ensure the inclusion of institutional and religious roles in the interpretive analysis. The distribution also included guides and researchers as additional sources for understanding the cognitive and advisory dimensions associated with the site.

Sample imbalances were addressed through the application of weights and clustering analyses to ensure the consistency of statistical results without compromising the accuracy of the qualitative interpretation.

Addressing the issue of statistical representation: Reviewers pointed out sample imbalances. To mitigate this, we used weighted analytical methods in some descriptive analyses (relative weights to represent population strength or institutional influence).

Small categories (officials + religious authorities) were aggregated in specific statistical analyses due to their small size, while maintaining qualitative distinctions in the interpretive analysis.

Qualitative data were processed using thematic saturation rather than relying on numerical size alone.

Data Collection Tools

The study used an integrated set of qualitative and quantitative tools, developed and piloted to ensure validity and suitability. These tools included:

Quantitative questionnaires that assessed the physical condition of sites, the effectiveness of infrastructure, visitor satisfaction, the level of community participation and awareness, and the willingness to support conservation efforts.

Semi-structured interviews with representatives of official and religious authorities, as well as local stakeholders and experts, focused on visions, challenges, and opportunities.

Focus groups with local residents, youth volunteers, and business owners were conducted, using maps and interactive tools to identify intervention priorities.

Field visual documentation using photographs and observations to monitor deterioration, usage patterns, and inappropriate interventions.

Analysis of planning documents and institutional reports related to seasonal management and conservation plans.

GIS spatial data on historical structures, visitor routes, and usage densities.

Procedures and Analysis

Field data collection was conducted in two phases: the first during the peak season (the Arbaeen pilgrimage), and the second during the seasonal low season, to capture temporal and functional differences.

Quantitative data were analyzed using SPSS to conduct descriptive analyses, variance tests, and cognitive factor analysis.

NVivo was used to analyze transcripts and interviews within a thematic analysis framework. Spatial data was analyzed using ArcGIS tools to produce maps of degradation, visitor density, intervention priorities, and accessibility analysis.

A real-world SWOT analysis and a comparative analysis with selected holy cities (such as Mecca and Fez) were also conducted to determine applicability and transferability.

Quality Assurances

Methodological validity standards were met through:

Data triangulation between field, documentary, and spatial sources.

Peer review within the academic team before implementing the research tools.

Participants verified the interview summaries to ensure accurate representation.

Sensitivity analysis to measure the impact of unbalanced sample distribution.

Ethical Considerations: All participants received a full explanation of the nature of the study and their rights, while respecting the privacy of participants and the sensitivities of religious sites.

Study Area: Karbala City

Geographical Location and Spatial Framework

Karbala City is located in the heart of the central alluvial plain of Iraq, approximately 100 km southwest of Baghdad, at the intersection of latitude 32°37 north and longitude 44°02 east[16]. It is bordered to the east by Babil Governorate and to the west by Anbar Governorate. It forms a strategic transportation hub between Najaf, Hillah, and Kadhimiya, giving it a central position within the seasonal religious and economic mobility networks[17].

The city's location near the Euphrates River was a crucial factor in its emergence and continuity, contributing to the consolidation of early agricultural settlement and providing the resources necessary for its urban development[18]. The current urban fabric is characterized by a complex composition that combines the traditional historic center with modern urban extensions that emerged as a result of functional transformations and the pressures of population and religious growth[19].

Spatial Structure of Heritage

The study area is divided into three interconnected rings that constitute the spatial structure of heritage in Karbala[20]:

The Central Holy Zone[21]: This includes the Imam Hussein and Abbasid shrines and the ritual path linking them. It is the religious and historical heart of the city. It is characterized by high urban and functional density and faces significant challenges related to crowd management and the preservation of traditional architectural character[22].

The Extended Historical Zone: This includes old markets, narrow alleys, and heritage buildings dating back to the Ottoman era and the 20th century[23]. It suffers from physical deterioration and uncontrolled functional transformations[24].

The Transitional Zone: This includes the city entrances, visitor parking lots, and modern expansion areas connecting the old city to its new extensions[25]. It is used for residential and service purposes associated with pilgrimage and reflects the pressure of rapid urban transformation[26].

To gain a comprehensive understanding of the nature of the urban landscape surrounding the holy shrines in Karbala[27], it is essential to utilize visual media that illustrate the spatial organization and high urban density of the area[28]. The figure below shows a recent aerial photograph of the city's historical and religious center, clearly showing the Imam Hussein Shrine and the Abbasid Shrine, along with the surrounding routes and urban areas[29].

This image helps analyze the dynamics of visitor movement, the spatial distribution of services, and crowding points during major events, particularly the Arbaeen pilgrimage season[30]. It also provides a visual basis for interpreting some of the results of surveys and interviews that addressed challenges and opportunities in heritage management and the urban landscape[31].

Figure (2): A Recent Aerial Photograph of the Historical and Religious Center of Karbala.

The aerial photograph shows the dense urban area surrounding the two holy shrines (the Imam Hussein Shrine and the Abbasid Shrine), and illustrates the urban landscape within the boundaries of the old city. The main ritual streets and congestion areas during the pilgrimage seasons can be observed, in addition to the random patterns of the historically accumulated urban fabric. This figure serves as a basic visual reference for analyzing the structure of religious and public spaces and their interactions with the flow of visitors during seasonal occasions.

Urban Analysis

Reading of the General Structural Plan for the City of Karbala

In light of the rapid urban expansion witnessed by the city of Karbala and the high number of visitors during religious occasions, especially the Arbaeen pilgrimage, the need to adopt comprehensive planning visions that accommodate the city's future challenges has emerged[32]. The General Structural Plan for the City of Karbala is a fundamental organizational document aimed at re-distributing urban functions in a balanced manner between residential and service areas, and enhancing the efficiency of infrastructure, transportation, and the urban environment[33].

The plan demonstrates the extent of the city's urban area beyond the historic center[34]. It also outlines the main axes of visitor movement and the infrastructure designated for investment, education, housing, and transportation[35]. This map also highlights the integrated functional role of the new areas

in supporting the central area through the distribution of service centers, mobility axes, and open spaces[36].

This figure represents an important analytical tool for understanding future trends in Karbala's planning and identifying areas of overlap or shortcomings in responding to the needs of visitors and residents alike. This enhances the research's ability to assess the city's readiness to deal with major seasonal phenomena.

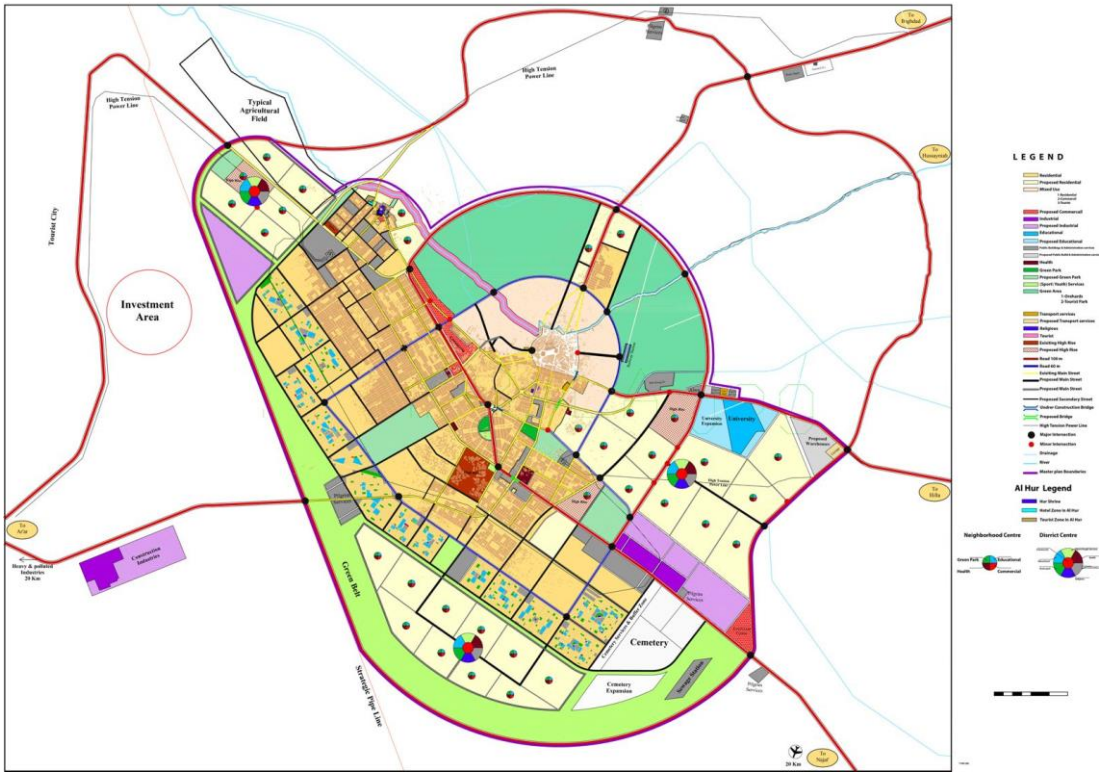

Figure (3): General Structural Plan of Karbala City - Functional Distribution of Land and Infrastructure

The figure above shows the comprehensive functional distribution of Karbala's districts within the master plan, indicating residential, commercial, educational, industrial, cemetery, and green areas, as well as transportation networks and infrastructure. This plan demonstrates the spatial relationship between the historic religious center and the surrounding urban areas, and outlines the locations of neighborhood centers, investment zones, and future extensions of the city.

The Karbala Central District is one of the most densely populated areas in terms of the overlap between religious, residential and service activities[37]. It is divided into several historical neighborhoods surrounding the Two Holy Mosques[38].

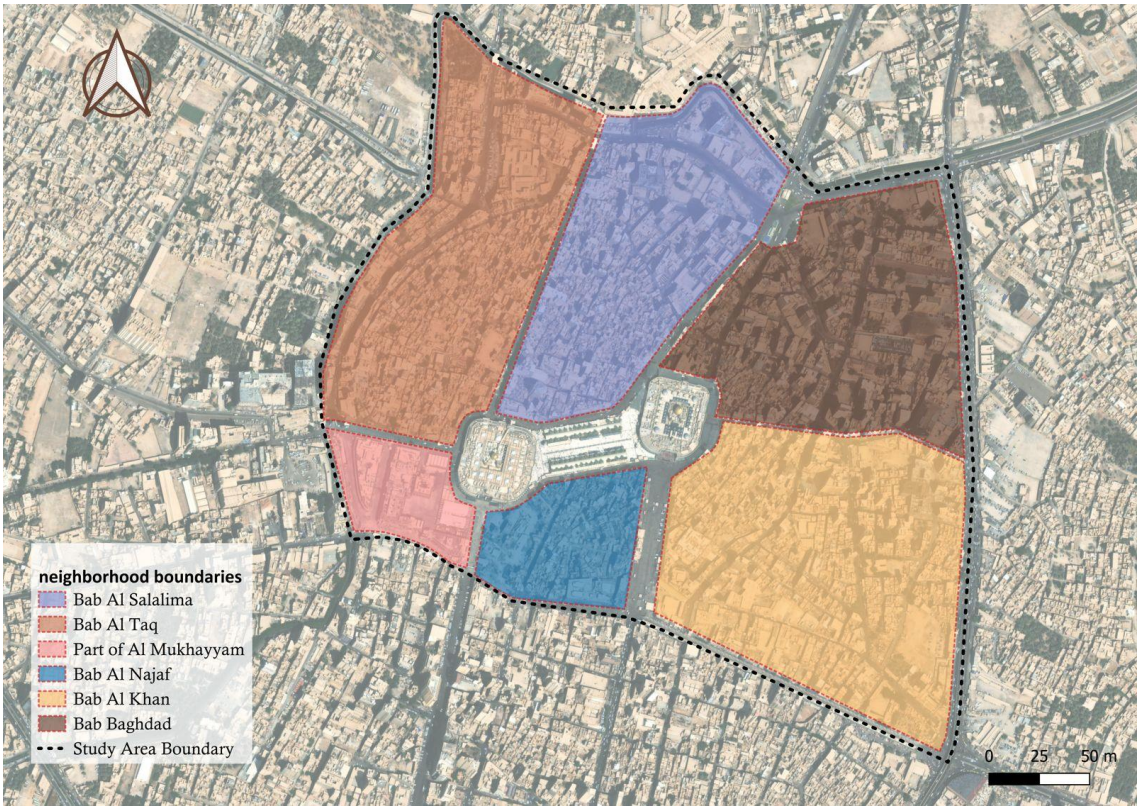

Figure (4): A Detailed Map Showing the Boundaries of the Neighborhoods Surrounding the Two Holy Shrines in Karbala.

The six neighborhoods surrounding the two holy shrines in the center of Karbala are distributed within a densely used spatial area, representing a central, interwoven fabric of religious, residential, and service functions[39].

Bab al-Salameh (purple) is one of the oldest historical neighborhoods, characterized by its narrow alleyways and traditional architecture. It also houses a number of husayniyas and guest houses dedicated to serving pilgrims, making it an important hub during major religious occasions. Bab al-Taq (pink) is distinguished by its vibrant commercial character, containing traditional markets and shops directly connected to pilgrims' routes[40].

Bab al-Najaf (yellow) represents the western facade of the al-Husayniya shrine and contains important organizational entrances and dense residential areas. Bab al-Khan (blue) is known for its service and lodging functions for pilgrims, with hotels and processions located there[41]. Bab Baghdad (brown) houses religious and educational institutions, including reference offices and several heritage libraries, giving it a significant religious-intellectual dimension[42].

The sixth neighborhood, designated "Part of the Camp (Red)," is located at the intersection of the two shrines and represents a center of symbolic religious activity, as it contains the "Husseini Camp" area, a major stop during the Arbaeen pilgrimage ritual[43].

The distribution of these neighborhoods reflects the nature of the religious-historical planning of Karbala, where the functional dimension is integrated with religious symbolism and social identity[27], highlighting the importance of a balanced rehabilitation that takes into account the sustainability of use and the preservation of the architectural and cultural heritage[44].

Historical and Religious Significance

Karbala is one of the most important holy cities for Shia Muslims, having hosted the Karbala incident in 61 AH (61 AH) and the martyrdom of Imam Hussein (peace be upon him), giving it symbolic connotations and a spiritual identity that remain active to this day[45]. The city has developed as a religious and educational destination since the early Islamic era, particularly during the Safavid and Ottoman eras, when arcades, markets, religious schools, and shrines were established[46].

The Arbaeen pilgrimage reaches its peak in attracting visitors (over 20 million), giving the city a unique global position in terms of seasonal density and spiritual and material influence, making it a unique model of interaction between religious and urban spaces[47].

Architectural Characteristics and the Urban Landscape

Karbala's urban landscape is characterized by a stark duality between a heritage structure with a local Islamic character and modern extensions with distinct planning and architectural features[48]. Traditional areas feature the use of local materials (clay, adobe), natural shading, and the presence of interior spaces, reflecting a deeply rooted climatic and social response[49].

In contrast, modern extensions are characterized by the prevalence of concrete architecture and an inconsistent grid layout, which has led to the loss of much of the spatial character and visual identity[50]. The areas surrounding the shrine are also experiencing excessive functional pressures and a shift in land use, such as the conversion of homes into hotels or seasonal shops[51].

Social and Demographic Structure

Karbala's population is estimated at between 1.2 and 1.4 million, in addition to millions of visitors from within and outside Iraq, creating a unique interplay between the settled population and seasonal visitors[52]. The city displays social and professional diversity within a unified religious framework, predominantly Shia[53].

This dynamic is reflected in public space through changing patterns of use, the growth of small projects linked to religious services, and the multiplicity of governing bodies (municipalities, endowments, shrines, security), leading to administrative fragility and conflicting planning decisions[54].

Contemporary Urban Challenges

Based on field surveys and document analysis, the most prominent urban challenges can be classified as follows:

Table (3): Main urban challenges in Karbala and proposed strategic treatment axes

Challenge	Detailed Description	Strategic Axis
Urban Deterioration	Absence of integrated restoration strategies has led to the erosion of historic structures and traditional urban fabric. Many heritage buildings suffer from neglect, unauthorized alterations, and lack of regular maintenance, threatening their architectural integrity and cultural significance.	Heritage Preservation & Urban Fabric Management
Seasonal Overload	Religious pilgrimage seasons (especially Arbaeen) cause extreme spikes in population density, resulting in traffic paralysis, service delivery failure, overcrowded accommodations, and strain on utilities. The city lacks responsive urban infrastructure to adapt to these temporal fluctuations.	Infrastructure Resilience & Mobility Planning
Fragmented Governance	Heritage management is distributed across multiple uncoordinated entities including local municipalities, religious authorities, and ministries. This results in overlapping mandates, unclear accountability, and inefficiencies in implementing preservation or crowd management policies.	Institutional Governance & Stakeholder Coordination
Environmental Pressures	Poor waste management, declining green cover, and visual pollution in public spaces exacerbate environmental degradation. Ritual activities and commercial overuse have intensified pressure on limited open spaces, affecting urban sustainability and visitor well-being.	Environmental Sustainability & Public Space Quality

Challenge	Detailed Description	Strategic Axis
Monoeconomic Dependency	Karbala's economy is heavily dependent on religious tourism, which creates financial fragility during crises such as pandemics. The lack of economic diversification renders the city vulnerable to disruptions in visitor flows.	Economic Diversification & Resilience
Technological Underutilization	There is limited integration of smart urban tools such as Geographic Information Systems (GIS), remote sensing, and participatory digital platforms. This hinders effective monitoring, planning, and engagement in heritage preservation and urban development processes.	Digital Transformation & Smart Heritage Management

The table above illustrates the complexity of the urban challenges facing Karbala, which intersect in their physical, economic, institutional, and environmental dimensions. This overlap reflects the need to adopt a comprehensive, multi-pronged approach capable of addressing the city's complex character as a religious capital with a global symbolic character.

On the urban level, the problem of physical deterioration requires the adoption of preventive and gradual restoration policies that take into account the heritage values of buildings and the urban fabric, in harmony with the local context. Seasonal crowd pressure requires enhancing the resilience of infrastructure and developing smart crowd management plans based on data technologies and predictive analytics.

With regard to governance, the multiplicity of actors and the lack of coordination between municipal and religious authorities and relevant ministries creates a state of organizational paralysis. This requires the establishment of a participatory institutional framework that ensures clear mandates and integrated roles.

On the environmental front, there is a need to rehabilitate public spaces and reduce visual and functional pollution through flexible urban interventions that invest in natural solutions and sustainable practices. The city's near-total dependence on religious tourism is also an indicator of economic fragility, which must be addressed by diversifying sources of income and activating the local cultural economy.

Finally, the weak use of technology represents a missed opportunity that must be overcome by integrating geographic information systems, virtual and augmented reality technologies, and interactive platforms into the urban and heritage management system.

Thus, addressing these challenges cannot be unilateral or sectoral. Rather, it must proceed from a flexible, sustainable, and multi-level strategic framework, as proposed by this research, based on the concepts of participatory governance, smart technologies, spatial justice, and environmental and cultural awareness.

Justifications for Choosing Karbala as a Case Study

Karbala was chosen as the field of application for this study based on the following considerations:

Its global religious symbolism and its connection to a transnational religious and heritage identity.

Recurring seasonal pressures, which present a paradigm case of governance challenges, congestion, and deterioration.

The presence of a threatened heritage fabric that can be analyzed and addressed from an urban and spatial perspective.

The post-pandemic context, which has highlighted the fragility of the city's economic structure.

The potential for transferring the findings to similar holy cities in the Islamic context, such as Fez, Mashhad, Mecca, and Najaf.

Results

The field and cognitive analysis conducted in Karbala reveals a highly complex picture of urban heritage management, where physical, institutional, and social challenges intersect with pressing seasonal dynamics. Data were analyzed using qualitative and quantitative tools, including

questionnaires, interviews, spatial analysis (GIS), and case studies, to generate results divided into five main axes:

Assessing the Physical Condition of Heritage

Field data showed that the physical structure of heritage sites, especially in the old areas adjacent to the Two Holy Mosques, is suffering from accelerated deterioration due to lack of maintenance, shifting uses, and the spread of unregulated construction. 72% of participants reported noticing a clear visual and architectural decline over the past five years, with more than 30 cases of demolition or alteration of buildings of historical value recorded.

Community Trust and Institutional Management

The survey results indicate a clear gap in trust between local residents and the official bodies involved in heritage management. Only 41% of residents expressed confidence in the effectiveness of municipal and religious authorities in protecting the historic fabric, compared to 75% among officials themselves. This disparity reflects conflicting perceptions of administrative performance and weak mechanisms for participatory communication between citizens and institutions.

Patterns of Participation and Involvement

Data shows that community participation in heritage conservation initiatives remains low. Only 18% of residents have previously participated in voluntary heritage-related activities, while the majority of visitors (92%) confirmed that they were unaware of the existence of such initiatives. This weakness is due to the absence of regulatory frameworks that accommodate civil society initiatives, in addition to a lack of public awareness of the importance of the community's role in preserving the historic city.

Perception of Solutions and Future Visions

Participants' views varied regarding the best ways to protect heritage. Local residents tended to demand craft rehabilitation and job creation in the heritage area, while visitors focused on improving infrastructure and seasonal organization. Officials called for legislative reform and enhanced coordination between institutions. This disparity points to an urgent need for a unified strategic framework that combines technical, social, and legislative solutions.

Comparative Analysis between Categories

A comparative analysis was conducted between three main categories: residents, visitors, and officials, and revealed the following:

Table (4): Comparative Analysis of the Perceptions of the Main Groups Towards Urban Heritage Management In Karbala

Comparison Axis	Local Residents	Visitors	Officials and Decision-Makers
Assessment of Physical Condition	Negative: Poor maintenance and deterioration of historic buildings	Discouraging: Visual degradation and inadequate services	Moderate: Financial constraints and lack of systematic follow-up
Trust in Responsible Authorities	Low (41%)	Moderate (52%)	High (75%)
Level of Engagement	Very limited (<20%)	Rare	Based on official programs and institutional involvement
Perceived Solutions	Local rehabilitation and employment opportunities	Improving infrastructure and better seasonal organization	Legislative reform and institutional coordination

Analysis of Indicators of Urban Sustainability and Resilience

The current situation in Karbala was assessed from a sustainability and resilience perspective, in line with Sustainable Development Goal 11. The analysis concluded the following:

Table (6) Analysis of Indicators of Sustainability and Urban Resilience in Heritage Management in the City of Karbala

Indicator	Performance Level	Observations
Governance Integration	Low	Multiple overlapping authorities with no unified coordination framework
Community Participation	Weak	Limited public awareness and absence of effective engagement platforms
Digital Transformation	Moderate	Presence of skilled personnel but lack of supporting digital infrastructure
Seasonal Crowd Management	Low	Frequent congestion and lack of smart alert and crowd dispersal systems
Economic Diversification	Weak	Heavy reliance on religious tourism without investment in creative alternatives
Environmental Awareness	Moderate	Youth- and media-led initiatives exist, but lack formal implementation policies

Based on the indicators in the table above, a comprehensive analytical reading of Karbala's performance in the areas of urban sustainability and resilience within the context of heritage management can be presented, as follows:

Weak Governance Integration:

The index assessment reveals that the multiplicity of responsible entities (municipality, endowments, holy shrines, security departments, Ministry of Culture, etc.) without a comprehensive coordination framework is one of the most prominent manifestations of institutional dysfunction. This negatively impacts decision-making effectiveness, creates duplication of powers, and disrupts the implementation of long-term policies.

Limited Community Participation:

Despite community recognition of the importance of heritage, actual engagement is very weak due to the absence of formal engagement channels and low levels of trust. This indicates an urgent need to develop participatory urban platforms and mechanisms to support community initiatives.

Incomplete Digital Transformation:

The presence of trained personnel in geographic information systems and digital documentation alone is not sufficient, as the local context lacks qualified digital infrastructure (equipment, licensed software, databases), which hinders the effective integration of technology into heritage and visitor management.

Managing Vulnerable Seasonal Crowds:

The city's ability to accommodate large seasonal influxes of people, especially during the pilgrimage season, is clearly impaired by the lack of smart routing systems and the overcrowding of critical points without alternative solutions or balanced job distribution.

To understand the seasonal challenges associated with crowd management, visitor numbers for the Arbaeen pilgrimage were analyzed during the years (2014–2025). The following table shows the quantitative visitor trends based on official sources from the Imam Hussein Shrine, highlighting changes resulting from the pandemic and projections for the near future.

Table: Estimated Numbers of Arbaeen Pilgrims in Karbala (2017–2023)

Hijri Year	Gregorian Year	Estimated Number of Visitors
1445	2023	21,698,640 visitors
1444	2022	16,327,542 visitors
1443	2021	14,553,308 visitors
1442	2020	15,229,955 visitors

Hijri Year	Gregorian Year	Estimated Number of Visitors
1441	2019	15,322,949 visitors
1440	2018	13,874,818 visitors
1439	2017	11,210,367 visitors

Source: The Holy Shrine of Imam Hussain - https://imamhussain.org/arabic/tags/1653/1

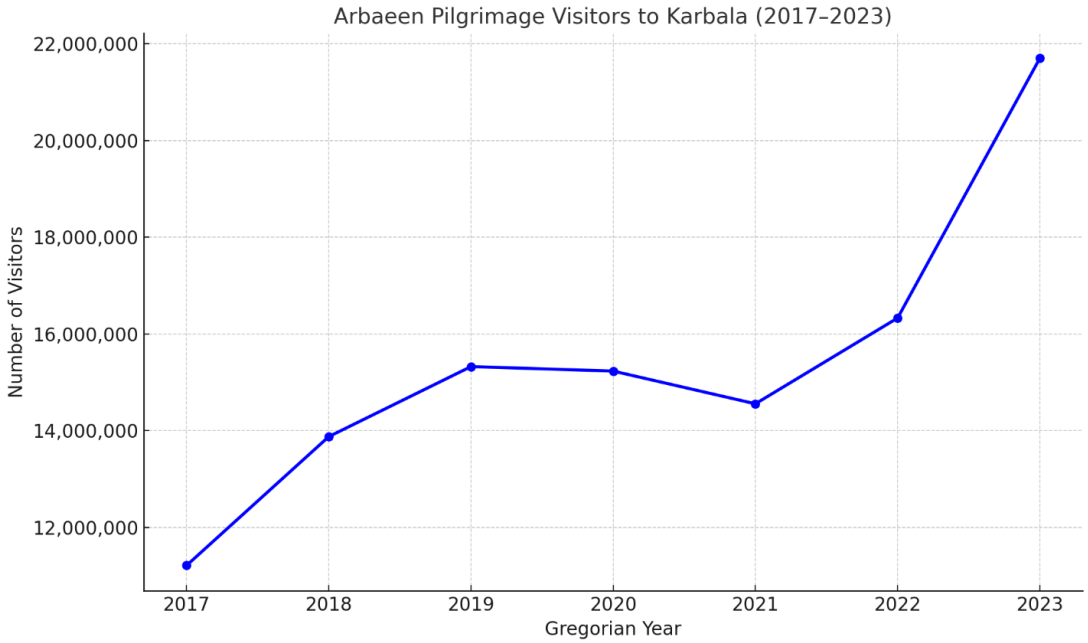

Figure 5 Time Trend of the Number of Visitors to Karbala During the Arbaeen Pilgrimage (2014–2025)

The graph shows a gradual increase in visitor numbers after 2020, with a gradual recovery from the effects of the COVID-19 pandemic, which poses increasing challenges to the infrastructure and services in the Old City.

Lack of Economic Diversity:

The city relies almost entirely on religious tourism as a source of income, making it vulnerable to economic fragility, as witnessed during the COVID-19 pandemic. Investment in alternative sectors such as heritage crafts, educational tourism, or the creative economy is lacking.

Partial Environmental Awareness:

There is positive youth and media engagement on environmental issues, but it does not rise to the level of institutional policies or implementation plans. This leaves the impact limited and vulnerable to fluctuations in time and public mood.

Indicators show that Karbala faces a multi-faceted challenge that requires a comprehensive and integrated sustainability strategy, starting with institutional reform, enhancing community engagement, leveraging digital transformation, diversifying economic resources, and developing clear, operational environmental policies. These interventions are not a luxury, but an absolute necessity to ensure the protection of heritage and enhance resilience in the face of future crises.

Analysis of the Urban Space of the Religious Nucleus In Karbala

The Old City of Karbala is characterized by an organic urban structure centered around the two holy shrines. This area witnesses a dense intermingling of religious, residential, and commercial uses. Understanding this spatial configuration cannot be separated from the symbolic and religious functions the city performs, particularly during major religious seasons such as the Arbaeen pilgrimage.

Therefore, analyzing the distribution and functions of the neighborhoods surrounding the Husseini and Abbasid shrines is essential for assessing the urban fabric's ability to respond to seasonal pressures and sustainable development requirements. The figure below illustrates the spatial pattern of these neighborhoods and the relationship between their density and their social and religious functions.

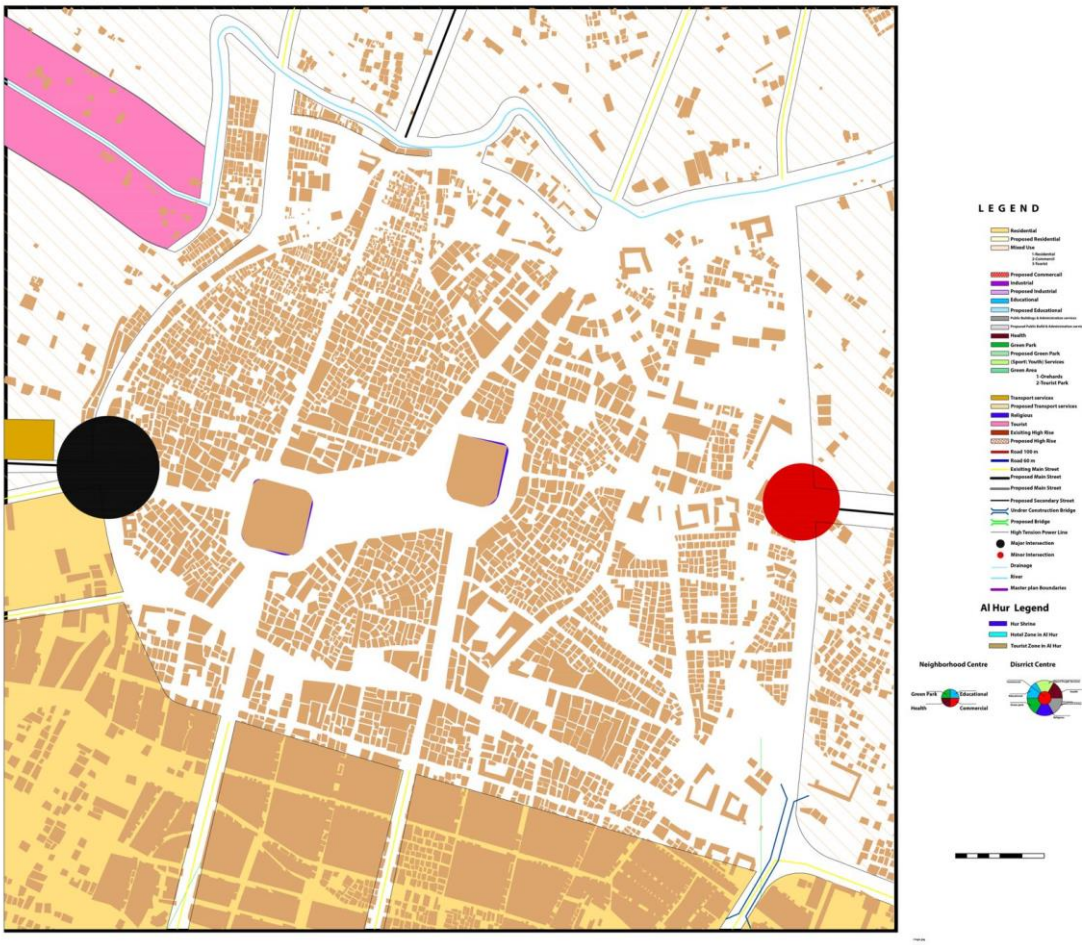

Figure (6): Map of the Distribution of Traditional Neighborhoods Around the Al-Hussaini Shrine in Old Karbala and Their Spatial and Social Implications

The figure above shows the spatial distribution of the traditional neighborhoods in the old city of Karbala, which surround the holy center of the Two Holy Mosques. These neighborhoods perform multiple roles, combining residential, commercial, and religious functions. This gives them exceptional importance in understanding the city's dynamics, especially during major seasonal events such as the Arbaeen pilgrimage.

Bab Baghdad Neighborhood

One of the most important historical entrances to the city from the eastern side, it is a major gateway for pilgrims from Najaf and Baghdad. The neighborhood hosts intense commercial activity, in addition to seasonal pilgrimage accommodations, and is home to small hotels and husayniyas.

Bab al-Khan Neighborhood

Distinguished by its high commercial density, it houses a historic market that is still active and serves as a link between pilgrims and the routes leading to the Two Holy Mosques. It experiences heavy seasonal congestion, making it a vital hub for spatial and traffic analysis.

Al-Mukhayam Neighborhood

It has a highly symbolic dimension, as it houses the historic "Imam Hussein Camp" and is a major ritual site during religious pilgrimages. Its religious function dominates it and it has undergone frequent expansions to accommodate pilgrims.

Al-Abbasiya Neighborhood

Divided into eastern and western districts, it is characterized by a medium population density and semi-permanent residential functions, with some commercial activities associated with pilgrims. It plays an important role in absorbing the population density away from the vicinity of the shrine.

Al-Husayniya Neighborhood

Located in the northwestern part of the city, it combines a popular character with high participation in rituals. It reflects the cultural identity of Karbala'i society and hosts numerous councils and processions.

Al-Sa'diya Neighborhood and Al-Maqla' Neighborhood

Located on the outskirts of the old city, they play a supporting role in terms of logistical supply and accommodation services for pilgrims. They are considered urban expansion areas that were later absorbed into the old urban area.

Al-Shuhada (Old) Neighborhood

It is one of the oldest neighborhoods in the city and the one most closely associated with the shrines. It is characterized by its heritage architecture and dilapidated buildings. It holds high historical and societal value, making it a priority for urban interventions.

Analysis of the intermediate space between the two thresholds and its religious and social dimensions during the million-person occasions

The intermediate space between the two holy shrines in Karbala (the shrines of Imam Hussein (peace be upon him) and Abbas (peace be upon him) constitutes the heart of the religious and spatial landscape of the old city and a central axis for ritual activity during the millions of pilgrims, most notably the Arbaeen pilgrimage. The importance of this exceptional urban space is highlighted by its role as a major ritual arena, where symbolic dimensions intersect with organizational, service, and security considerations within an extremely dense and complex urban fabric.

This space contributes to supporting ritual performance by accommodating the large numbers of pilgrims, regulating entry and exit, and ritual transportation between the two shrines. It also provides temporary and permanent infrastructure for shelter, catering, and medical services. Based on this, the following figure is included to provide a clear spatial interpretation of the area, highlighting its urban connections, and paving the way for a functional analysis of this space within the scope of this study.

Figure (7): A Satellite View Showing the Pivotal Relationship Between the Shrines of Imam Hussein and Abu Al-Fadl Al-Abbas in the Center of the Holy City of Karbala.

The figure clearly demonstrates the organic relationship between the shrines of Imam Hussein (peace be upon him) and Abu al-Fadl al-Abbas (peace be upon him), and the central space connecting them, which has become one of the most ritualized spaces in the Islamic world. It can be seen that this space penetrates a dense, irregular urban fabric, posing significant challenges to urban planning processes, especially during major religious occasions.

A spatial analysis reveals that the intermediate space is not only a hub of movement, but also serves as a functional and spiritual bridge between the two shrines, enhancing its symbolic and religious significance. The elongated rectangular organization of the central space also reflects an urban adaptation to the flow of visitors, given the limited horizontal urban expansion within the Old City.

This figure helps support hypotheses related to the integration of the religious dimension with the city's infrastructure and establishes a deeper analysis of the impact of this relationship on the planning of services and public spaces, particularly during peak times such as the Arbaeen pilgrimage.

Discussion

Governance Gap and Fragmented Institutional Roles

The results revealed a structural flaw in urban heritage management resulting from the multiplicity of relevant institutional bodies (the municipality, the Tourism Authority, the shrines, the Shiite Endowments, the police, and others) without a unified coordination framework. This leads to conflicting decisions and weak follow-up. This fragmentation weakens the effectiveness of any initiative and makes restoration or seasonal organization projects hostage to bureaucracy or disputes between authorities. This finding is consistent with the findings of similar studies in cities such as Mecca and Fez, which demonstrated that centralized governance within a clear legal framework is a prerequisite for sustainability.

Weak Community Participation and the Trust Gap

Although residents and visitors recognize the importance of heritage in Karbala, participation in actual initiatives was very low. This reflects a trust gap between the community and official bodies and confirms the absence of genuine engagement mechanisms, such as local councils or urban laboratories, that enable people to influence decisions. Literature such as UN-Habitat (2021)

recommends the importance of empowering residents as part of participatory governance mechanisms, which can be achieved by integrating community representatives into urban conservation committees and launching public awareness campaigns.

Fragility of Urban Structures and the Impact of Seasonal Pressure

Data indicates that seasonal pressure (particularly during the Arbaeen pilgrimage) exacerbates the deterioration of infrastructure and the urban landscape in heritage areas. Crowds cause functional congestion, damage to physical structures, waste accumulation, and the ill-considered use of spaces for temporary purposes. This pattern is observed in cities such as Mashhad, Iran, which have addressed these challenges through dedicated visitor itineraries and flexible scheduling. Therefore, developing a smart dispatch system based on live data, as the study's findings suggest, represents a strategic opportunity.

Deficiencies in Digital Transformation and Smart Management

Despite the availability of local technical competencies, the lack of digital infrastructure and supportive policies limits the implementation of GIS systems or the use of augmented reality and artificial intelligence tools to monitor, document, and analyze heritage. This gap opens the door to opportunities for collaboration with universities and the private sector to provide open-source digital platforms and smart applications for crowd management and monitoring urban degradation.

Limited Economic Diversification and Weak Resilience

Karbala demonstrates a near-total dependence on religious tourism as a primary economic source, leaving the city vulnerable to crises, as witnessed during the COVID-19 pandemic. The absence of supporting cultural industries (crafts, exhibitions, digital content, knowledge tourism) limits opportunities for sustainable economic growth. This contrasts with the experiences of cities like Fez and Cordoba, which leveraged their heritage to launch creative industries and support entrepreneurship. Karbala must adopt diversified models that take into account its sacred nature, without remaining hostage to a single season or visitor pattern.

Potential for Development Based on Study Findings

The study findings provide a realistic basis for building a multi-level intervention framework, beginning with short-term measures (such as improving sanitation and spatial orientation) and extending to long-term plans (such as developing unified governance and stimulating digital innovation). Indicators also show a willingness among some groups (such as experts and young mentors) to engage in developing modern tools, which represents an opportunity to build internal coalitions that drive change.

Conclusions

Fragile Governance and Multiple Actors Without Effective Coordination

It appears that the absence of a unified institutional framework has led to the fragmentation of responsibilities among municipalities, endowments, religious shrines, tourism, and security agencies, hindering the effective implementation of any heritage strategy.

Weak Community Trust and Low Public Participation

Despite symbolic recognition of the importance of heritage, actual participation in its protection remains very limited, due to a perception gap and the absence of effective engagement platforms.

Immense Seasonal Pressure Weakens Urban Resilience

Pilgrimage seasons, particularly the Arbaeen, place excessive burdens on infrastructure and the historic fabric, accelerating deterioration and limiting preventive maintenance capabilities.

Lack of use of Smart Digital Tools

Despite the availability of local expertise, the absence of a digital strategy and limited technical resources prevent the use of GIS systems or virtual reality solutions for documentation and management.

Sole Economic Dependence on Religious Tourism

Karbala has not yet implemented economic diversification tools, such as cultural and educational tourism, making it vulnerable to economic shocks associated with a decline in visitors or crises.

A Latent Readiness for Change in Some Groups

Study indicators indicate a relative openness among groups such as youth, experts, and small business owners to participate in participatory planning and digital transformation processes.

Recommendations

1.In the Area of Institutional Governance

Establish a coordinating body for heritage management that includes municipal, religious, and civil authorities under a unified legislative framework.

Define the roles and powers of each entity within a clear governance document that regulates the relationship between the center, the governorate, and endowment authorities.

2.In the Area of Community Participation

Launching "Urban Labs" in the old neighborhoods to activate the community's role in restoration, planning, and cultural activities.

Adopt comprehensive awareness campaigns that include schools, mosques, and markets to promote a sense of heritage.

3. In The Field of Digital Transformation and Smart Management:

Develop an open-source digital platform to document heritage sites and monitor their condition using aerial imagery and remote sensing.

Incorporate augmented reality (AR) technologies into the visitor experience to alleviate physical pressure on sensitive sites.

4.In The Field of Seasonal Pressure Management:

Design a smart visitor routing system based on live data and specific routes to ensure safety and reduce encroachment on the urban fabric.

Improve basic services in surrounding spaces, such as restrooms, lighting, and spatial orientation, to enhance the visitor experience.

5. In the Field of the Local Economy:

Stimulate heritage-related creative industries, such as handicrafts, educational tourism, and digital content production.

Support small and medium-sized enterprises through low-interest financing programs for business owners in the historic area.

6. In The Field of Legislation and Policies:

Review urban planning laws to allow greater flexibility in the reuse of heritage buildings.

Include heritage as a priority in local development plans and link it to national strategies for environmental security and sustainability.

The implementation of these recommendations can only be achieved through a long-term, participatory local coalition that integrates academic knowledge, institutional will, and community voice. Karbala's unique character as a holy city with a ritualistic character must also be taken into account, requiring management models characterized by flexibility, cultural respect, openness to modern technologies, and consistency with the Sustainable Development Goals, particularly Goal 11.4 on the conservation of cultural and natural heritage.

Future Studies

In light of the results of this study and the analysis of knowledge and practice gaps in urban heritage management in Karbala, several future research paths can be proposed that could contribute to the development of the theoretical and applied framework for the topic. These are as follows:

Developing digital simulation models for managing seasonal visitors and crowds

By integrating GIS spatial analysis tools and live data to create predictive models that contribute to alleviating pressure on heritage sites and studying their impact on urban landscape maintenance.

Measuring the impact of participatory digital platforms on local residents' awareness of heritage

By conducting applied field studies that test the effectiveness of mobile applications or interactive maps in promoting community belonging and participation.

A comparative analysis of the experiences of other holy cities in the Islamic world, such as Mashhad, Fez, Najaf, and Mecca, to evaluate heritage management policies in the context of seasonal flows and the extent to which their successful models can be adapted to the specificities of Karbala.

Exploring alternative financing possibilities for urban conservation projects, including community endowments, Islamic bonds, and crowdfunding mechanisms, and examining their acceptance by the local community.

Analyzing national policies related to cultural heritage and assessing their consistency with international frameworks such as the 1972 UNESCO Convention and the Sustainable Development Goals, particularly Article 11.4, to identify legal and procedural gaps.

Examining the relationship between religious identity and heritage sites in public spaces, to understand how ritual and religious patterns contribute to the reproduction of urban meanings and their impact on urban policies.

These research paths represent a call to continue scientific and professional efforts in the field of urban heritage, especially in cities with a spiritual and religious dimension such as Karbala. They also emphasize that heritage preservation is no longer merely a technical task, but rather a multidimensional, participatory endeavor that requires community engagement, the use of digital tools, environmental awareness, and integrated cultural policies.

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