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Original Article

Formulating a Priority Framework for the Conservation of Heritage Structures to Function as Urban Catalysts for Regeneration

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Abstract *- Urban heritage buildings possess significant potential to serve as catalysts for urban regeneration while preserving their historical value. This research aims to establish a comprehensive set of criteria[s] for identifying heritage buildings that can act as urban catalysts and foster regeneration. Alongside these criteria, a detailed checklist of parameters has been developed to guide researchers, policymakers, and communities in evaluating and prioritizing heritage buildings for intervention. The checklist is designed to help urban planners, and researchers identify heritage structures that meet essential criteria for placemaking and redevelopment, enabling the determination of priority buildings for action and facilitating the efficient allocation of resources. The framework was developed through an extensive review of literature, which included insights from books, research papers, articles, and doctoral thesis. Initially, four thematic lists were created, focusing on (1) Urban Regeneration, (2) Urban Conservation, (3) Built Heritage Conservation, and (4) Built Urban Catalysts. These lists were reviewed, refined, and consolidated into a definitive set of criteria to identify heritage buildings that could serve as urban catalysts. Based on these criteria, quantifiable parameters were generated to establish a priority list for intervention in a group of heritage structures. This comprehensive framework provides a practical guide for governments and conservation agencies to plan targeted interventions within budgetary constraints while also enabling communities to assess and utilize their heritage assets for sustainable development. By bridging the gap between conservation and urban regeneration, this study contributes to both the conservation of historical heritage and the promotion of sustainable urban growth.*

Keywords *- Urban Heritage Conservation, Urban Regeneration, Urban Catalysts, Placemaking, Sustainable Urban Development.*

1. Introduction

Urban heritage buildings are not just concrete blocks; they tell the stories, memories, cultures, and identities of a place. As cities grow and evolve, managing the support for that growth whilst trying to preserve these gems becomes an important challenge [1]. If managed and undertaken with responsibility, the preservation of heritage buildings could be more than just keeping the memory alive; it could enliven cities, creating a better sense of vitality, meaning, and connection to the past [2]. The transformation of a city through conservation, using heritage as a vehicle to build and create because its use doesn't just define the past; it generates a future [3].

While it's been recognized that heritage buildings can play a crucial role in revitalizing urban areas, there's still a significant gap in practical methods that help stakeholders systematically assess, evaluate, and prioritize which heritage structures need intervention. Most of the existing literature tends to discuss the benefits of conserving heritage sites and urban regeneration separately, rarely combining them into a clear, actionable prioritization strategy. As a result, cities and policymakers often lack solid, evidence-based tools to guide resource allocation and intervention plans, leading to missed opportunities for meaningful urban transformation.

One of the most significant challenges in this process lies in determining the starting point. Which heritage buildings should be prioritized for conservation? How can it maximize the impact of the efforts while working within the constraints of available resources? These are common questions that researchers, government agencies, conservation agencies, and communities strive to address. The lack of definitive, actionable direction for the prioritization of heritage buildings not only undermines effective resource planning but also threatens the loss of the most potentially valuable sites for community and economic redevelopment.

This study addresses a gap by developing a comprehensive practical list of criteria to evaluate urban heritage structures and prioritize their conservation as city catalysts. By bridging the divide between theory and application, this research aims to equip urban planners, policymakers, and local stakeholders with a fact-based framework to make decisions.

The research breaks new ground by creating a wide-ranging, multifaceted approach that doesn't just combine best practices such as adaptive reuse, community involvement, and sustainability but also channelize them into a thorough, measurable priority list. Drawing from a wide range of 75 sources - including books, research papers, articles, and thesis reports - it consolidates insights into a single, comprehensive framework by integrating components from four essential domains – Urban regeneration, urban conservation, built heritage conservation, and built urban catalysts [4]. The conservation of built heritage and urban catalysts is an area of research that offers a practical tool for everyone involved in urban renewal and urban regeneration. This checklist is designed to equip researchers, policymakers, and local communities with the essential resources they need to make a real impact. It serves as a guide to identify which structures can best drive revitalization efforts and helps establish a framework for prioritization. This way, cities can preserve their heritage while also paving the way for a more sustainable and promising future.

2. Materials and Methods

2.1. Methodology

The process of establishing guidelines to showcase heritage buildings as vital components in urban regeneration begins with identifying the key criteria that enable these structures to act as catalysts for change. This method involves compiling four distinct lists of criteria, which are based on important areas highlighted through search terms such as "urban regeneration," "heritage conservation," “built heritage conservation,” and "built urban catalysts," all gathered from the Google Scholar search engine [5]. To make sure the research is trustworthy and relevant, filtered the studies were filtered using specific criteria: only included publications from the past 15 years, focused on those with a citation score above 5 to indicate their significance, and also took into account Google Scholar's relevance ranking considered [6]. The first 50 results for each search term were screened, and the sources that were most representative of the criteria lists' specified themes were shortlisted. The review process produced 75 research papers, which were organized into four thematic categories: Urban Regeneration (30 papers), Urban Conservation (15 papers), Built Heritage Conservation (15 papers), and Built Urban Catalysts (15 papers). Each paper was reviewed in detail to identify key findings, specifically critical parameters, frameworks, case studies, and relevant theories. NVivo software was used for qualitative analysis, which allowed for the coding and thematic organization of criteria across the four thematic categories [7].

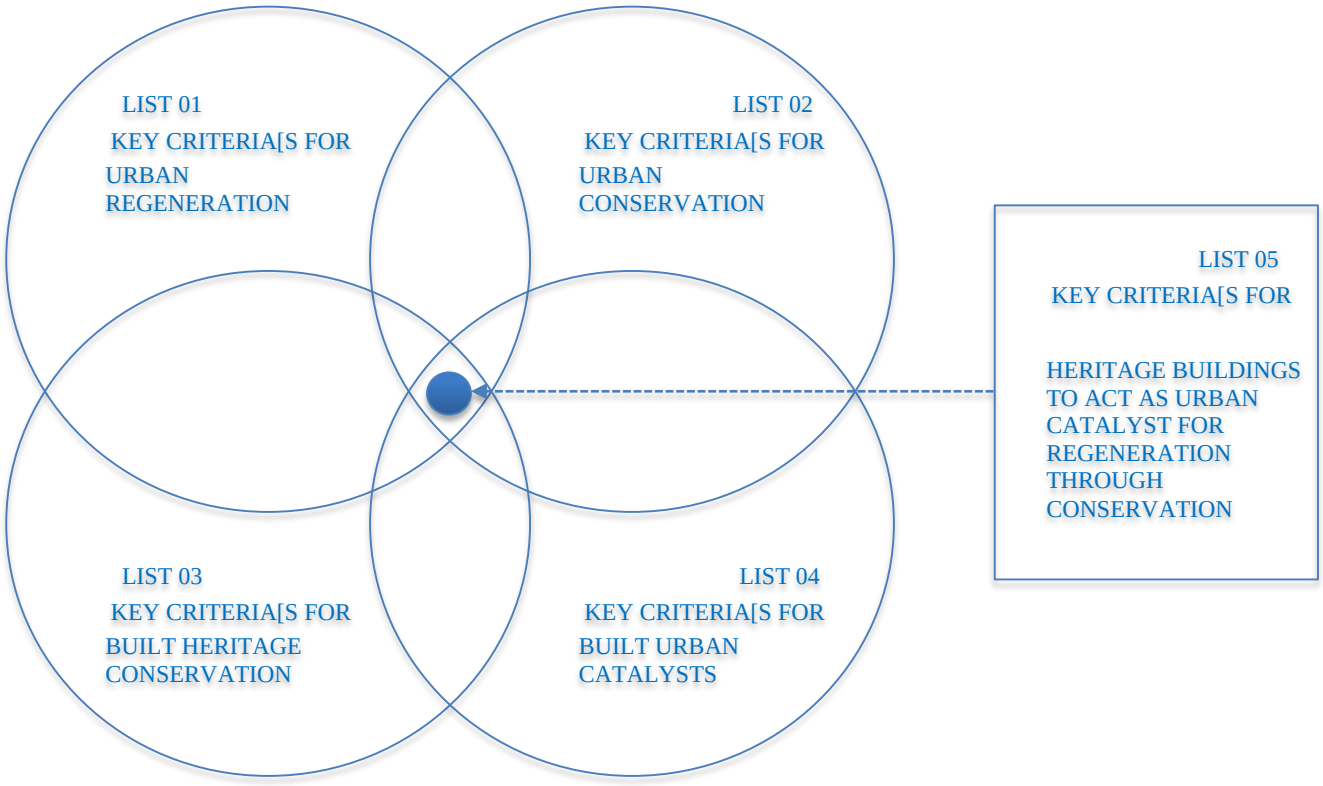

Fig. 1 Framework for deriving key criteria[s] to regenerate heritage structures as an urban catalyst

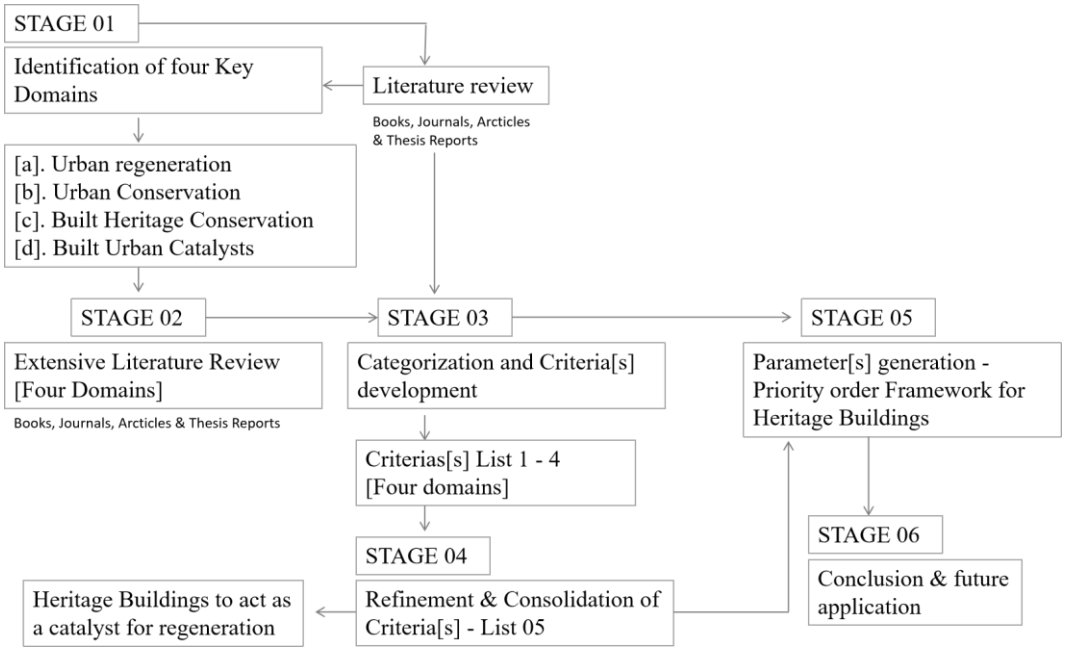

Fig. 2 Methodology framework in stages

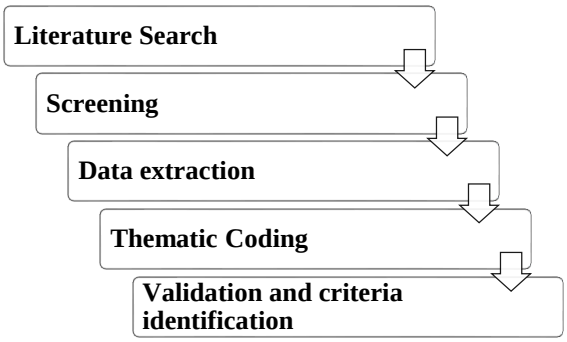

Fig. 3 Criteria identification process

The extracted data were arranged into separate categories that matched the four lists. To improve clarity and support cross-referencing, a color-coding system was listed to indicate the sources of the criteria. This visual difference facilitated effective monitoring of criteria origins and recognition of overlaps. Tables were created for each list, organizing criteria by reference and emphasizing redundancies and overlaps, which were methodically eliminated to guarantee all criteria were distinct and pertinent. The improved criteria from all four lists were merged into one complete set, emphasizing the function of Urban Heritage Buildings as Urban Catalysts for Regeneration via Conservation. The color-coded framework also enhanced the evaluation and selection of 12 important criteria according to their significance, occurrence, and possible effect on urban renewal. Expert input was requested to confirm the final combined list, guaranteeing its relevance in real-world situations. As a result, measurable parameters were obtained from the concluding assortment of 12 criteria. These parameters were intended for use with a collection of heritage structures, allowing for the creation of a priority list for their preservation. The resulting framework serves as a distinct and practical guide for utilizing heritage conservation as a strategic instrument for urban revitalization.

3. Literature Study

3.1. Theories and Definitions

Examination of the provided definitions and theories has been carried out using various secondary data sources, including research papers, scholarly articles, books, official websites, doctoral thesis, and reputable news articles.

In the past few decades, the literature on heritage conservation and urban regeneration has proliferated and is increasingly able to highlight the role played by heritage assets in developing sustainable, resilient, and inclusive cities. Recent literature highlights and emphasizes an approach that moves beyond simply conserving physical aspects of heritage, also embedding heritage in the discourse around urban development, communities, and economic recovery. Academics are indicating a shift from traditionally more conservative ways of thinking around conservation as 'a discipline' to an identifiable shift toward more adaptive, dynamic, and participatory models of heritage management. Global charters and guidelines, such as the UNESCO Recommendation on the Historic Urban Landscape (2011), advocate for conservation to be articulated in all aspects of urban development, environmental sustainability, and manage social justice.

3.1.1. Urban Regeneration

Urban regeneration focuses on rejuvenating underdeveloped or decaying urban areas, addressing

economic, social, and environmental challenges to enhance the overall quality of life.

Urban redevelopment is usually an approach to city planning that addresses critical issues like poverty, unemployment, and crumbling infrastructure, all with the aim of breathing new life into communities and enhancing living conditions [8]. Unlike the usual redevelopment strategies, urban regeneration focuses on long-term sustainability and brings together a variety of strategies, like housing, economic growth, and environmental care, to create a more lively and resilient urban space [9]. These regeneration efforts often extend beyond just physical upgrades; they strive to make a lasting social and cultural difference that uplifts the entire community [10].

Current research highlights the importance of aligning heritage-led regeneration with sustainable urban development goals. The literature suggests that the most effective regeneration projects often blend physical rebuilding with social innovation, economic incentives, and active participation from stakeholders.

3.1.2. Urban Conservation

Urban conservation is a thoughtful approach to maintaining the essence of a city's history while adapting it to contemporary needs. It focuses on preserving cultural landmarks, historic neighbourhoods, and architectural heritage to protect the identity of a place [11]. Rather than treating heritage as an obstacle to progress, urban conservation integrates it into city planning as a valuable asset. By reusing existing structures, enhancing public spaces, and involving local communities, this approach ensures that the past is not only remembered but actively contributes to the present and future [12]. Urban conservation fosters pride, continuity, and a sense of belonging, enriching cities for generations to come.

The literature further takes into account the policy frameworks, i.e., Burra Charter and Venice Charter, in preparing criteria. Also, it identifies the rising importance of adaptive reuse and community participation in successful experiences such as Amsterdam and Kyoto cities, which took advantage of synthesizing conservation with contemporary urban needs.

3.1.3. Historic Town and Conservation

Historic cities are deeply rooted in their environment, with their location, morphology, and physical characteristics uniquely shaped by the surrounding context. These cities often reflect the indigenous beliefs and wisdom of their time, showcasing human legacy through traditional, economic, political, and spatial aspects [13]. The ICOMOS "Charter for the Conservation of Historic Towns and Urban Areas" (Washington, 1987) highlights the importance of preserving the distinctive qualities that define the historic character of such towns or urban areas. Key elements include the urban patterns formed by streets and plots, the balance between buildings and green or open spaces, and the architectural character of buildings in terms of their scale, style, materials, construction, and decorative elements. The charter also emphasizes the significance of maintaining the town's relationship with its surrounding natural and built environment, as well as the diverse functions it has developed over time [14]. Preserving these attributes is essential to safeguarding the authenticity and identity of historic towns and urban areas, as any threats to these features can undermine their cultural and historical integrity.

The prevailing research indicates that historic town conservation is not merely a matter of technical competence but also one that involves sensitivity toward social dynamics, local administration, and changing urban lifestyles. Intangible heritage, like rituals, crafts, and shared memory, has come to the centre of focus in recent conservation discourse.

3.1.4. Urban Built Heritage

The definition of heritage, along with the scope of conservation and restoration for monuments and sites, has evolved significantly since the adoption of the Venice Charter in 1964 [15]. UNESCO defines urban heritage through three main categories. The first is monumental heritage, recognized for its exceptional cultural value. The second includes non-exceptional heritage elements, which, although individually modest, gain significance through coherent arrangement and abundance. The third expands the scope to encompass newer urban elements such as built forms, open spaces like streets and public areas, and urban infrastructure, including material networks and equipment. This comprehensive framework reflects the multifaceted nature of urban heritage [16]. Heritage is often defined as the intricate cultural interplay between people, memory, and place. Built heritage specifically refers to parts of the built environment with cultural significance, often categorized as tangible or immovable cultural heritage. Local heritage serves as a powerful tool to foster social cohesion and well-being [17]. By embracing the histories, traditions, values, and urban fabric of a place, heritage can significantly contribute to improving quality of life and community unity. Regardless of age, urban heritage is important as a reflection of local culture, a foundation for cultural tourism, and a key driver of societal prosperity [18].

The conventional studies emphasize the need and opportunities to manage urban-built heritage in rapid urbanization, particularly within the Global South. Concerns like gentrification, displacement, and commodification are raising more debates, with scholars advocating greater inclusive and more equitable heritage policy.

3.1.5. Built Heritage Conservation

Built heritage conservation focuses on preserving and protecting historic structures' architectural and cultural significance, ensuring their integrity and relevance for future

generations. It involves safeguarding not just the physical material and design of heritage structures but also their historical importance and cultural associations [19]. According to the National Policy for Conservation of Ancient Monuments, Archaeological Sites, and Remains (NPC-AMASR), as defined by the Archaeological Survey of India, conservation entails processes that maintain the material, design, and integrity of a monument, emphasizing its archaeological, architectural, historical, and intangible cultural values.

Conservation of built cultural heritage is vital for the long-term prosperity of cities. It improves the urban atmosphere by maintaining the eccentricity and identity of historic areas, fostering a sense of continuity and belonging among communities [20]. Furthermore, preserved heritage serves as a cornerstone for cultural tourism, promoting economic development while preserving the cultural fabric of a place. By integrating conservation principles into urban preparation, built inheritance can become a self-motivated and bearable resource that bridges the past with the future, contributing to social cohesion and cultural pride [21].

Recent approaches, including the Historic Urban Landscape (HUL) strategy, support integrating conservation with urban planning, environmental sustainability, and disaster risk management.

3.1.6. Built Urban Catalysts

The idea of "urban catalysts" has emerged as a vital concept in the realm of urban design and development. It traces its roots back to the influential work of Wayne Attoe and Donn Longa in their 1989 publication, American Urban Architecture: Catalysts in the Design of Cities. They highlighted the importance of focusing on catalytic projects in areas that are stagnant or experiencing decline, demonstrating how these initiatives can spark broader growth and revitalization [22]. Since the late 20th century, the notion of urban catalysts has gained even more traction as we've come to understand just how much the urban environment influences the communities that inhabit it. Typically, urban catalysts are buildings or structures that drive development or transformation in their surroundings, often requiring strong support from the community to succeed [23].

In numerous instances, the catalytic impact originates directly from the structure itself, irrespective of its particular purpose [24]. This is especially accurate for historic or older buildings, where restoration or adaptive reuse can revitalize the urban landscape. Such measures not only maintain cultural heritage but also foster economic and social development in the region, though they frequently require considerable investment. These catalysts serve as central elements for urban revitalization, infusing new energy into cities and promoting sustainable growth [25].

Literature also identifies risks and shortcomings of catalyst-driven strategies, such as gentrification, displacement, and authenticity loss, if not approached inclusively.

3.1.7. Built Heritage Catalysts

Heritage urban built catalysts are historical buildings or complexes in urban settings that ignite transformative change and revitalization in their adjacent neighbourhoods. These heritage buildings, with their cultural and historical significance, are not more than just vestiges. In the past, they served as active participants in urban revitalization [26]. By means of processes such as restoration, adaptive reuse, or strategic conservation, heritage structures can serve as central elements for economic development, social unity, and community involvement [27]. The transformative potential of these heritage assets resides in their capacity to motivate and draw activities that advantage the wider urban environment. Heritage urban built catalysts not only preserve the architectural legacy of a place but also integrate it into contemporary urban dynamics, fostering a sense of identity and belonging while promoting sustainable growth [28]. By leveraging the unique appeal of heritage buildings, cities can achieve regeneration that respects the past while building a vibrant and inclusive future [29].

Therefore, the literature reveals a progression from isolated conservation efforts to integrated, multidisciplinary approaches that position heritage as a driver of urban regeneration. However, a notable gap remains in the availability of practical, quantifiable frameworks for prioritizing heritage buildings as catalysts for regeneration- a gap this research seeks to address.

4. Criteria

Heritage conservation presents numerous advantages, most notably cultural identity preservation, community pride enhancement, tourism generation, and economic growth support- consideration should be given to the fact that conservation efforts equally pose considerable challenges. Conservation initiatives may sometimes result in gentrification, increased property prices, and displacement of local populations. Restoration and maintenance costs can be high, with frequent reliance on public subsidies or complicated funding schemes. Moreover, reconciling the preservation of historic character with the demands of modern infrastructure and accessibility can lead to conflicts among stakeholders. Thus, an effective conservation approach needs not only technical skills and financial investment but also inclusive planning, stakeholder participation, and adaptive management to ensure that the benefits of conservation are shared equitably and that potential adverse effects are minimized. By recognizing the opportunities as well as the challenges, this study takes a comprehensive approach to the

conservation of heritage as a driver towards sustainable urban regeneration by generating referable criteria.

4.1. Criteria[s] for Urban Regeneration

Urban regeneration is a multifaceted process aimed at revitalizing cities by addressing social, economic, and environmental challenges [30]. Drawing from 30 references, including research papers and books, this framework outlines 12 core criteria[s], carefully synthesized to provide a comprehensive guide for creating vibrant, inclusive, and sustainable urban spaces. These criteria[s] reflect a holistic approach to urban regeneration, addressing cultural, social, economic, and environmental dimensions critical to the success of regeneration initiatives. The important criteria[s], crucial ones, are pulled out of references and color-coded based on categories and subcategories within, as shown in the table below. Table 1 represents the set of references selected for generating the list of criteria, with detailed citations provided in the bibliography.

Table 1. Criteria[s] generation - urban regeneration

CRITERIA GENERATION TABLE - URBAN REGENERATION					
1	[42]	URBAN HERITAGE REVITALIZATION		REVIVAL OF THE CITY'S IDENTITY AND IMAGE	COMPREHENSIVE PLANNING [INCLUSION OF ALL SCALE URBAN ELEMENTS]
2	[43]	HUMAN-CENTRIC DESIGN [PEDESTRIAN, CYCLISTS, PUBLIC TRANSIT]		WELL-DESIGNED PUBLIC SPACES [PROMOTE SOCIAL INTERACTION, COMMUNITY WELL-BEING, QUALITY OF LIFE]	DESIGNING URBAN ELEMENTS - TO HUMAN SCALE
3	[44]	PUBLIC SPACE - COMMUNITY ENGAGEMENT & SOCIAL INTERACTION		HUMAN SCALE URBAN ELEMENTS	PEDESTRIAN ORIENTED DESIGN
4	[45]	NEW URBANISM - COMPACT PEDESTRIAN-FRIENDLY NEIGHBORHOOD	HUMAN SCALE DEVELOPMENT	INSPIRATION FROM HISTORICAL PRINCIPLES AND LAYERS [TRADITIONAL TOWN PLANNING PRINCIPLES, TOWN CENTRES, ETC.]	INTEGRATED DEVELOPMENT
5	[46]	PERFORMANCE DIMENSIONS - FOR ASSESSING QUALITY		LEGIBILITY AND SENSE OF PLACE	ADAPTABILITY
6	[47]	ECOSYSTEM APPROACH - INTEGRATE ECOLOGICAL PROCESS AND NATURAL SETTING		SUSTAINABLE RESOURCE INTEGRATION & USE	COMMUNITY ENGAGEMENT & CULTURAL HERITAGE PRESERVATION [SOCIAL & CULTURAL SUSTAINABILITY]
7	[48]	DIVERSITY IN URBAN DESIGN [MIXED USE]		IMPORTANCE OF STREETS AND SIDEWALKS - SAFETY AND NATURAL SURVEILLANCE	COMMUNITY COHESION
8	[49]	PRECONDITION FOR CULTURAL DISTRICT - COMMUNITY WITH TRADITIONS		CONNECTIVITY TO NEIGHBORING TOWNS	TECHNOLOGICAL INNOVATION - INDIGENOUS TO COMMERCIAL [ECONOMIC STABILITY]

9	[50]	URBAN ARTIFACTS [BUILDINGS]- ROLE IN SHAPING IDENTITY [MEMORY]	TYPOLOGY TO BE ON COMMON CHARACTERISTICS THAN ON FUNCTIONS		CULTURAL AND HISTORICAL LAYER - MEMORY OF THE TOWN	
10	[51]	SMALL URBAN PUBLIC SPACES - COMMUNITY & SOCIAL INTERACTION	DESIGN OF SPACE - SOCIAL SUCCESS INDICATOR		PEOPLE - KEY INDICATOR OF SOCIAL SUCCESS [DESIGN - ABILITY TO ATTRACT]	
11	[52]	EASY TO NAVIGATE - 5 ELEMENTS INTEGRATION IN DESIGN				
12	[53]	PATTERNS AS DESIGN SOLUTION - FROM MACRO TO MICRO LEVEL	ADAPTABILITY	HUMAN CENTERED DESIGN	COMMUNITY PARTICIPATION	
13	[54]	CULTURAL HERITAGE PROTECTION & EXPANDING PROTECTION GEOGRAPHICALLY	TOURISM PROMOTION AND AS A CATALYST		COMMUNITY INVOLVEMENT	
14	[55]	VALUING THE BENEFITS OF URBAN REGENERATION INITIATIVES APPLIED	URBAN REGENERATION MONITORING BASED ON ACTIVITY TYPES			
15	[56]	HERITAGE-LED REGENERATION INITIATIVES	PLANNING FRAMEWORK - INVOLVE EXPERTS' OPINION AS INTERVIEWS			
16	[57]	HERITAGE CONSERVATION INTEGRATION INTO URBAN PLANNING	IMPORTANCE OF SWOT ANALYSIS FOR INTERVENTION		INVOLVING STAKEHOLDERS	PUBLIC-PRIVATE PARTNERSHIP
17	[58]	HERITAGE CONSERVATION IMPROVES URBAN ECONOMICS	HERITAGE CONSERVATION STRENGTHENS URBAN IDENTITY AND PRESERVES ARCHITECTURAL QUALITIES		NEED FOR MIXED USE OF URBAN FORMS AND ACTIVITIES	
18	[59]	INTERVENTION - ADAPTABILITY TO CHANGE	RESPECT FOR HISTORIC FABRIC	REVIEWING AND UPDATING POLICIES AND LEGISLATIONS	URBAN CONSERVATION - TARGET REVIVING SOCIAL IDENTITY AND ECONOMIC VIABILITY	

19	[60]	MODERNITY - THREAT TO IDENTITY [BALANCE BETWEEN TRADITION AND MODERN]		
20	[61]	HERITAGE AS CATALYST FOR TOURISM PROMOTION	NEED FOR STRATEGIC POLICIES	SWOT ANALYSIS - REQUIRED FOR ANALYTICAL FRAMEWORK
21	[62]	NEED FOR DECISION SUPPORT TOOL - URBAN TRANSFORMATION MATRIX	REVITALIZATION OF URBAN HERITAGE AND HERITAGE MANAGEMENT	COLLABORATIVE DECISION MAKING
22	[63]	NEED FOR PRESERVING HISTORICAL STREETS	BALANCE BETWEEN PRESERVATION AND DEVELOPMENT	NEED FOR INTERDISCIPLINARY APPROACH
23	[64]	SYSTEM DYNAMIC ANALYSIS - REQUIRES AN IMPACT ASSESSMENT MODEL	STRATEGIES ALIGN WITH SUSTAINABLE DEVELOPMENT GOALS	PARTICIPATORY APPROACH
24	[65]	HERITAGE-LED REGENERATION - URBAN CATALYST	PARTICIPATORY APPROACH	BALANCE CONSERVATION AND DEVELOPMENT
25	[66]	INTEGRATED REGENERATION	HERITAGE AS TOOL FOR SOCIAL AND ECONOMIC REGENERATION	
26	[67]	NEED FOR INNOVATIVE DESIGN IN HERITAGE CONSERVATION	INDUSTRIAL HERITAGE AS CATALYST FOR ECONOMIC ACTIVITIES	
27	[68]	HERITAGE CONSERVATION - DRIVERS OF ECONOMIC REGENERATION	NEED FOR PUBLIC-PRIVATE PARTNERSHIP	COMMUNITY INVOLVEMENT
28	[69]	HERITAGE - DRIVERS OF URBAN RENEWAL	CREATIVE TOURISM	COLLABORATIVE GOVERNANCE
29	[70]	CULTURAL AND HISTORICAL SIGNIFICANCE AS A BASE FOR URBAN REGENERATION	SUSTAINABILITY AND CONSERVATION	COMMUNITY ENGAGEMENT
30	[71]	URBAN TOURISM FOR DEVELOPMENT	SUSTAINABILITY CONSIDERATIONS FOR DEVELOPMENT	COMMUNITY ENGAGEMENT

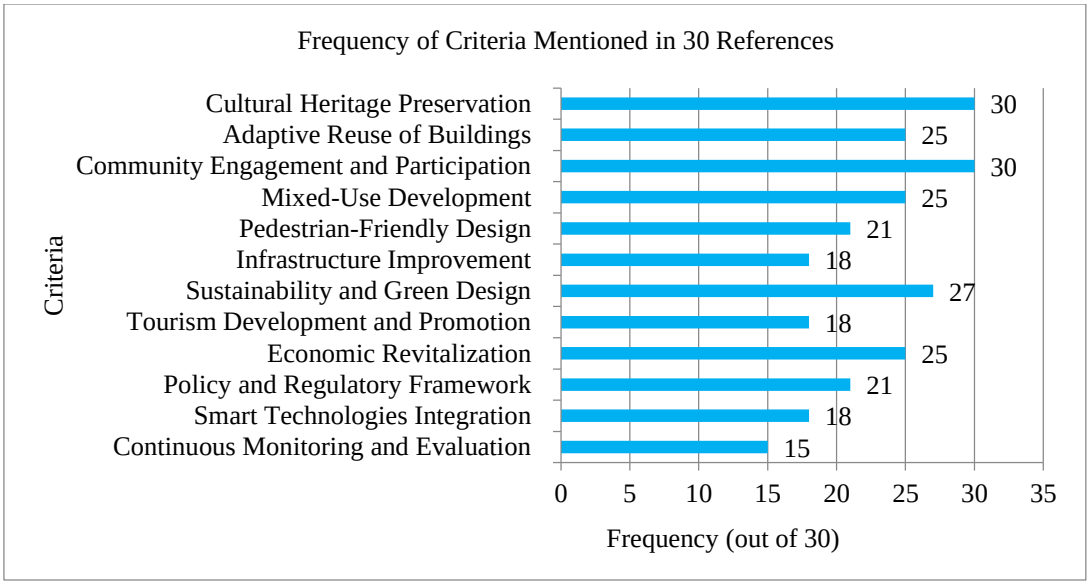

Fig. 4 Frequency of criteria[s] in urban regeneration (30 references)

The key aspects under the criteria of cultural heritage preservation include heritage protection, urban identity, and economic viability. Adaptive Reuse of Buildings covers urban artifacts, innovative heritage design, and industrial heritage reuse. Community Engagement involves cultural preservation, participatory approaches, and collaborative decision-making. Mixed-use development focuses on urban diversity, integrated forms, and balanced development. Pedestrian-friendly design emphasizes human-centric planning, small public spaces, and social interaction. Infrastructure Improvement highlights cultural districts, connectivity, and urban tourism. Sustainability includes ecosystem integration, resource conservation, and sustainable strategies. Tourism Development considers heritage-driven tourism, regeneration catalysts, and creative tourism. Economic revitalization integrates technological innovation, urban heritage management, and commercial stability. Policy Framework involves policy updates, strategic planning, and SWOT analysis. Smart Technologies focuses on decision support tools, digital infrastructure, and interdisciplinary approaches. Monitoring and evaluation emphasize performance assessment, regeneration tracking, and balancing conservation with development.

The 12 key criteria to be considered for effective urban regeneration are as follows:

- Cultural Heritage Preservation - Retain and restore historical and cultural elements to maintain the unique identity and character of urban areas, blending tradition with modernity.
- Adaptive Reuse of Buildings - Repurpose underutilized or abandoned structures into functional spaces, such as community centres, creative hubs, or commercial zones, to balance preservation with practicality.
- Community Engagement and Participation - Involve residents and stakeholders in planning and decision-making processes to align regeneration efforts with local needs and aspirations, fostering a sense of ownership.
- Mixed-Use Development - Encourage the integration of residential, commercial, and recreational uses to create vibrant, self-sustaining urban districts that promote economic and social diversity.
- Pedestrian-Friendly Design - Prioritize walkability through well-designed pathways, car-free zones, and interconnected public spaces that enhance mobility and urban accessibility.
- Infrastructure Improvement - Upgrade essential services such as transportation, sanitation, and energy systems to meet contemporary demands while improving the quality of life for residents.
- Sustainability and Green Design - Integrate eco-friendly practices, including energy-efficient retrofitting, green infrastructure, and renewable energy, to ensure environmental resilience and climate adaptation.
- Tourism Development and Promotion - Foster urban tourism by creating attractions and experiences that celebrate local culture while ensuring sustainable management of urban resources and visitor impact.
- Economic Revitalization - Stimulate economic growth by supporting local businesses, startups, and creative industries while encouraging diverse job opportunities and investments in urban economies.
- Policy and Regulatory Framework - Develop clear policies, incentives, and regulatory mechanisms to guide urban regeneration efforts, ensuring consistency, compliance, and long-term success.
- Smart Technologies Integration - Leverage technology, such as digital mapping, smart infrastructure, and data

analytics, to enhance urban management, safety, and the overall quality of urban life.

- Continuous Monitoring and Evaluation - Establish systems for ongoing assessment of regeneration projects to measure progress, address challenges, and refine strategies for sustained impact.

This framework provides a strategic approach to urban regeneration, enabling cities to evolve into dynamic, inclusive, and resilient environments that balance progress with community and environmental well-being.

4.2. Criteria[s] for Urban Conservation

Urban conservation is a strategic and multidisciplinary process aimed at safeguarding and revitalizing heritage-rich urban areas, ensuring their cultural, social, and economic relevance in contemporary contexts while preserving their unique identities [31]. This process goes beyond mere preservation; it seeks to breathe new life into historic urban fabrics, making them vibrant, functional, and integral to modern cityscapes. Urban conservation is as much about people as it is about places, recognizing the vital role of communities in maintaining and celebrating their heritage [32]. Drawing from 15 academic and professional sources, including research papers and books, this framework outlines 10 key criteria[s] critical for fostering sustainable and inclusive urban conservation practices. These criteria[s] reflect a balanced approach to preserving historical assets while addressing pressing urban challenges such as population growth, infrastructure demands, and environmental sustainability.

Urban conservation promotes the adaptive reuse of historic structures, integrates innovative design within heritage contexts, and fosters inclusive development that benefits all sections of society. By bridging the gap between tradition and modernity, urban conservation helps cities retain their soul while embracing progress. It underscores the importance of safeguarding not just the physical manifestations of history but also the cultural narratives, social connections, and economic vitality that make heritage truly valuable [33].

Table 2. Criteria[s] generation - urban conservation

CRITERIA[S] GENERATION TABLE - URBAN CONSERVATION				
1	[72]	BALANCE TOURISM WITH CONSERVATION	INTEGRATE HERITAGE WITH MODERN LIFE	INVOLVE COMMUNITIES
2	[73]	ECONOMIC VALUE OF HERITAGE - TOURISM & LOCAL DEVELOPMENT	SUSTAINABILITY IN DEVELOPMENT - SUSTAINABLE GOALS	HERITAGE AS CULTURAL CAPITAL - IDENTITY
3	[74]	CONSERVATION EFFORTS - AIM AT POLICIES APART FROM FORMAL LAWS	BALANCE - DEVELOPMENT & PRESERVATION	INVOLVING COMMUNITY AND GOVERNMENT THROUGHOUT THE PROCESS
4	[75]	INTEGRATED PLANNING - BALANCE BETWEEN DEVELOPMENT AND HERITAGE CONSERVATION.	COMMUNITY INVOLVEMENT	
5	[76]	HERITAGE SIGNIFICANCE ASSESSMENT	STAKEHOLDER COLLABORATION	SUSTAINABILITY INTEGRATION
6	[77]	COMMUNITY INVOLVEMENT	ECONOMIC VIABILITY	SUSTAINABLE INFRASTRUCTURE

7	[78]	INTEGRATED HERITAGE CONSERVATION - HISTORIC PRESERVATION WITH URBAN PLANNING	SUSTAINABLE TOURISM		COMMUNITY ENGAGEMENT	
8	[79]	INTEGRATED CONSERVATION - HERITAGE PRESERVATION WITH URBAN DEVELOPMENT	ADAPTIVE REUSE	GOVERNMENT LEADERSHIP - ENTIRE PROCESS	ECONOMIC SUSTAINABILITY	HERITAGE CONSERVATION - PROMOTING TOURISM
9	[80]	INTEGRATED APPROACH - HERITAGE & DEVELOPMENT	COLLABORATIVE MANAGEMENT - INVOLVE STAKEHOLDERS		ADAPTIVE STRATEGY - FLEXIBLE TO CHANGE	
10	[81]	SMART HERITAGE INTEGRATION: COMBINES TECHNOLOGY WITH HERITAGE PRESERVATION	COMMUNITY-CENTRIC APPROACH		FUTURE INNOVATIONS - ADVOCATES FOR ADAPTIVE TECHNOLOGIES	
11	[82]	CONSERVATION VS. MODERNIZATION - BALANCING HERITAGE MODERN NEEDS THROUGH PEDESTRIAN-ORIENTED DESIGN	COMMUNITY ENGAGEMENT		SUSTAINABILITY	
12	[83]	TOURIST TRAIL APPROACH: PEDESTRIAN-ORIENTED TRAILS	COMMUNITY CENTERED APPROACH		URBAN REVITALIZATION - ECONOMIC VIABILITY	
13	[84]	BALANCING COMMERCE AND CONSERVATION: MIXED-USE DEVELOPMENTS	ADAPTIVE REUSE		SUSTAINABLE ECONOMICS	
14	[85]	HERITAGE AS A CATALYST - URBAN DEVELOPMENT	COMMUNITY ENGAGEMENT		LONG TERM SUSTAINABILITY	
15	[86]	INTEGRATED CONSERVATION	CULTURAL IDENTITY - REVIVE		TRIPLE-BOTTOM-LINE SUSTAINABILITY: ENSURING HERITAGE CONSERVATION ALIGNS WITH ENVIRONMENTAL, SOCIAL, AND ECONOMIC OBJECTIVES	

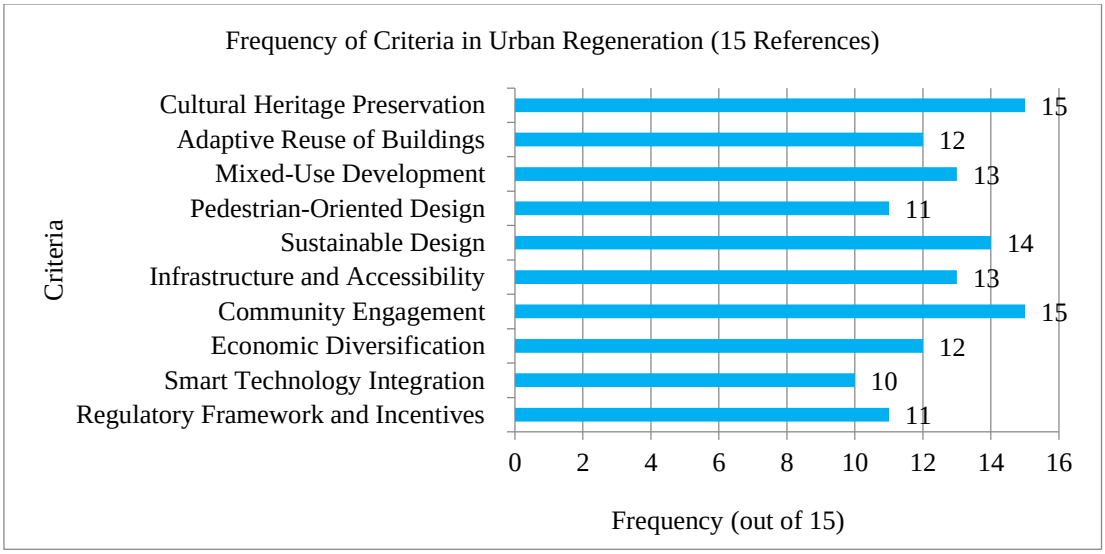

Fig. 5 Frequency of criteria[s] in urban conservation (15 references)

Cultural Heritage Preservation focuses on heritage protection, cultural identity, and sustainable tourism. Adaptive Reuse of Buildings includes urban artifacts, innovative heritage design, and industrial heritage reuse. Community Engagement promotes cultural preservation, participatory planning, and collaborative decision-making. Mixed-use development integrates urban diversity, heritage conservation, and balanced development. Pedestrian-oriented design emphasizes human-centric planning, walkability, and social interaction. Infrastructure Improvement enhances cultural districts, connectivity, and urban tourism. Sustainability prioritizes ecosystem integration, resource conservation, and long-term viability. Tourism Development leverages heritage-driven tourism, regeneration catalysts, and creative tourism. Economic diversification supports technological innovation, urban heritage management, and commercial stability. Smart Technology Integration utilizes digital infrastructure, decision-support tools, and adaptive technologies. Policy framework and Incentives involve policy updates, strategic planning, and governance for sustainable conservation.

The following 10 criteria[s] form the foundation of urban conservation strategies:

- Cultural Heritage Preservation: Protect and restore heritage structures, artifacts, and intangible cultural assets to retain the town's historical authenticity and unique identity.
- Adaptive Reuse of Buildings: Transform underutilized heritage structures into functional spaces such as cultural centers, cafes, or art galleries, balancing preservation with economic and social revitalization.
- Mixed-Use Development: Integrate residential, commercial, and cultural spaces to foster vibrant communities, enhance urban life, and minimize urban sprawl.
- Pedestrian-Oriented Design: Design streetscapes that prioritize walkability, reduce vehicular dominance, and create accessible and interconnected pedestrian-friendly environments.
- Sustainable Design: Adopt environmentally conscious practices by using eco-friendly materials, renewable energy sources, and green infrastructure to reduce the environmental footprint of development.
- Infrastructure and Accessibility: Enhance essential infrastructure, including utilities, public transport, and sanitation, while ensuring accessibility for all, including differently-abled individuals.
- Community Engagement: Actively involve local residents, businesses, and stakeholders in planning and decision-making to ensure regeneration efforts align with community aspirations and foster local ownership.
- Economic Diversification: Support a range of economic opportunities such as tourism, local craftsmanship, and emerging industries to build a resilient and diverse local economy.
- Smart Technology Integration: Leverage digital tools, IoT, and data analytics to optimize urban management, enhance safety, and improve the experience of residents and visitors.
- Regulatory Framework and Incentives: Develop clear policies, zoning regulations, and incentive programs to encourage sustainable heritage conservation and urban redevelopment while preventing inappropriate modifications.

The criteria[s] outlined above provide a framework for guiding urban conservation efforts toward more sustainable and inclusive outcomes. These principles ensure that the value of heritage-rich urban areas is not only preserved but also enhanced to remain relevant in the context of modern urban development. By applying these parameters, there will be a

delicate balance between safeguarding historical assets and addressing contemporary needs. Ultimately, urban conservation is a dynamic process that fosters the continued vitality of urban spaces, ensuring they serve as living, functional, and culturally rich environments for future generations.

4.3. Criteria[s] for Built Heritage Conservation

Built heritage conservation is a deliberate effort to protect and celebrate the historical, architectural, and cultural significance of heritage structures, ensuring they remain integral to contemporary life while safeguarding their legacy for future generations. This process involves not only preserving the physical attributes of heritage assets but also maintaining the intangible cultural narratives they embody [34]. Informed by 15 comprehensive sources, including research papers, articles, and books, this framework identifies 10 pivotal criteria[s] essential for driving effective, sustainable, and context-sensitive conservation strategies. These criteria[s] emphasize the importance of preserving the authenticity, integrity, and character of heritage sites while incorporating innovative approaches for adaptive reuse, modernization, and climate resilience. By balancing traditional values with contemporary needs, built heritage conservation seeks to promote a dynamic relationship between the past and the present, fostering cultural continuity, enhancing community engagement, and contributing to the broader goals of urban regeneration and sustainable development (Table 2).

Table 3. Criteria[s] generation - built heritage conservations

CRITERIA[S] GENERATION TABLE - BUILT HERITAGE CONSERVATION				
1	[87]	INTEGRATED FRAMEWORK	STAKEHOLDER INVOLVEMENT	CORE INDICATORS -ENERGY EFFICIENCY, MATERIAL DURABILITY, CULTURAL VALUE, AND COMMUNITY ENGAGEMENT
2	[88]	MINIMUM INTERVENTION	MATERIAL COMPATIBILITY - NEW MATERIAL	REGULAR MAINTENANCE
3	[89]	CONTEXT-SPECIFIC APPROACH	SUSTAINABLE PRACTICES - ECO-FRIENDLY MATERIAL AND ADAPTABILITY	MONITORING AND DOCUMENTATION
4	[90]	COMPUTATIONAL ANALYSIS	DIAGNOSTIC TOOLS	DATA-DRIVEN STRATEGIES
5	[91]	BUILDING CONDITION ASSESSMENT	ENVIRONMENTAL AND CLIMATIC FACTORS	ECONOMIC AND INSTITUTIONAL SUPPORT
6	[92]	INTEGRATION OF HERITAGE AND URBAN DEVELOPMENT	ARCHITECTURAL INNOVATION	STAKEHOLDER COLLABORATION
7	[93]	MULTIDIMENSIONAL VALUE	STAKEHOLDER ENGAGEMENT	DYNAMIC VALUES- HERITAGE VALUES EVOLVE OVER TIME- FLEXIBLE MANAGEMENT STRATEGIES REQUIRED
8	[94]	CULTURAL SIGNIFICANCE	ASSESSMENT FRAMEWORKS	BALANCING PRESERVATION AND CHANGE

9	[95]	BUILT HERITAGE CONSERVATION EDUCATION IS CRUCIAL	INTERDISCIPLINARY APPROACH	PRACTICAL EXPERIENCE
10	[96]	HERITAGE AND SUSTAINABILITY	POLICY INTEGRATION	ACTIONABLE STRATEGIES
11	[97]	CHALLENGING TRADITIONAL NORMS	INCORPORATING INTANGIBLE HERITAGE	FUTURE-ORIENTED CONSERVATION - FUTURE SOCIETAL CHANGES
12	[98]	CULTURAL AND HISTORICAL VALUE – PRESERVING ARCHITECTURAL, HISTORICAL, AND CULTURAL SIGNIFICANCE	ECONOMIC VIABILITY – ENSURING FINANCIAL FEASIBILITY AND LONG-TERM SUSTAINABILITY	FUNCTIONAL AND ENVIRONMENTAL PERFORMANCE – ALIGNING REUSE WITH MODERN FUNCTIONALITY AND SUSTAINABILITY GOALS
13	[99]	STRUCTURAL SAFETY	CULTURAL INTEGRITY	COMPATIBILITY OF INTERVENTIONS
14	[100]	BUILDING CONDITION – ASSESSMENT	ENVIRONMENTAL IMPACT	RESOURCE AVAILABILITY
15	[101]	MATERIAL ANALYSIS	DIGITAL DOCUMENTATION	PREDICTIVE MODELING

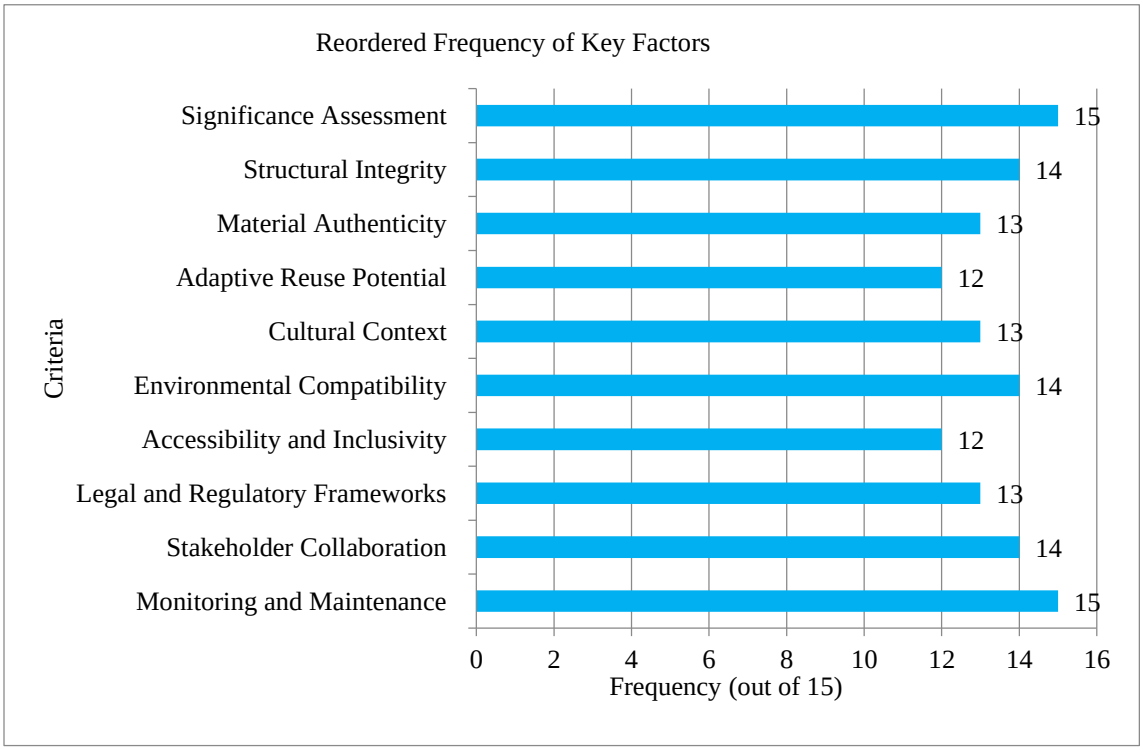

Fig. 6 Frequency of criteria[s] in built heritage conservation (15 references)

Significance Assessment includes cultural significance, assessment frameworks, and balancing preservation with change. Structural integrity focuses on structural safety, cultural integrity, and compatibility of interventions. Material Authenticity emphasizes material analysis, digital documentation, and predictive modeling.

Adaptive Reuse Potential considers sustainable practices, eco-friendly materials, adaptability, and monitoring and documentation. Cultural context involves incorporating intangible heritage and future-oriented conservation for societal changes. Environmental compatibility addresses environmental and climatic factors, economic and institutional support, and environmental impact.

Accessibility and Inclusivity ensure stakeholder engagement, dynamic and flexible management strategies, and stakeholder collaboration. Legal and Regulatory Frameworks include policy integration, actionable strategies, and interdisciplinary approaches. Stakeholder Collaboration promotes stakeholder involvement, economic viability, financial feasibility, and long-term sustainability. Monitoring and maintenance integrate regular maintenance, diagnostic tools, and data-driven strategies.

The criteria for Built Heritage Conservation are,

1. Significance Assessment: Evaluate the historical, cultural, architectural, and social importance of the heritage asset to prioritize and justify conservation efforts.
2. Structural Integrity: Assess the physical condition of the structure, including load-bearing capacity, material stability, and vulnerabilities, to ensure its safety and longevity.
3. Material Authenticity: Preserve and restore original materials and craftsmanship, using traditional methods and materials wherever possible to maintain historical authenticity.
4. Adaptive Reuse Potential: Investigate sustainable and community-based reuse practices that keep the structure's character intact and respond to contemporary needs.
5. Cultural Context: Embed the intangible heritage, customs, and traditions related to the structure to reaffirm its significance in the preservation of local identity.
6. Environmental Compatibility: Adopt sustainable and climate-appropriate conservation practices that operate within the local environmental context and help reduce the potential for damage in the future.
7. Access and Inclusiveness: Ensure all people, including those with disabilities, have equitable access while honoring and recognizing the historical significance of the structure.
8. Legal and Regulatory Considerations: Adopt good practice procedures that align with international approaches, local regulations, and zoning in an ethical and legal manner.
9. Collaboration with Stakeholders: Engage stakeholders, including communities, local government, heritage specialists, and funding bodies, to help ensure a collaborative and effective approach to conservation.
10. Monitoring and Maintenance: Develop long-term maintenance plans, including regular inspections and timely interventions, to ensure the structure's preservation over time.

The above criteria can provide guidance on a journey of built heritage preservation. They remind us that heritage buildings are not just historical objects but living representations of collective culture, collective identity, and shared stories.

Following these criteria ensures that safeguard places that will continue to inspire and connect people for generations to come. Preservation of built heritage is not simply the preservation of buildings. It is about appreciating the stories they embody and building environments of continuity, where the past and the present coexist to enrich lives and contribute to a more thoughtful and inclusive future.

4.4. Criteria[s] for Built Urban catalysts

Urban bases are the catalysts in urbanization, often leading to transformation that allows for a shift in lively urban structure to develop, addressing issues like sustainability. The catalysts can be from ideas directly to physical places like buildings or parks or opportunities for community organizations to grow their activities [35]. These catalysts cultivate the drive housing pathways promoting economic growth and empowerment of relationships between people and places, and organizations also help environmental improvement in cities.

The objective of employing urban catalysts is to create new sites whilst still working responsibly with the shared public place while exploring the variety of representation and creating a new place that explores the old place, in many cases constructing good mixes of old and new [36].

This strategy not only breathes new life into neglected areas but also helps to preserve the unique cultural and historical identities that make each urban environment special. To develop a comprehensive framework for catalyst-driven urban regeneration, an extensive analysis of 15 research papers, books, and articles was conducted. This rigorous review identified 10 pivotal criteria[s] essential for effective and context-sensitive regeneration strategies. To enhance clarity and application, these criteria[s] were further refined through a meticulous color-coded analysis.

Table 4. Criteria[s] generation - built urban catalysts

CRITERIA[S] GENERATION TABLE – BUILT URBAN CATALYST				
1	[102]	SPATIAL CONNECTIVITY	SOCIO CULTURAL SIGNFICANCE	ADAPTABILITY
2	[103]	STRATEGIC LOCATION	MIXED USED POTENTIAL	SUSTAINABILITY FOCUS
3	[104]	CULTURAL & HISTORICAL INTEGRATION	COMMUNITY ENGAGEMENT / STAKEHOLDER INVOLVEMENT	ECONOMIC AND URBAN REVITALIZATION
4	[105]	REVITALIZATION OF NEGLECTED SPACES	RIPPLE EFFECT – PROMOTING GROWTH &REGENERATION IN THE SURROUNDING NEIGHBOURHOOD	SUSTAINABLE AND INCLUSIVE DESIGN
5	[106]	GOAL-ORIENTED PLANNING	TRANSFORMATIVE IMPACT	CONTEXTUAL INTEGRATION
6	[107]	STRATEGIC INTERVENTION	SYNERGISTIC RELATIONSHIP: FOSTERING CONNECTIONS BETWEEN PEOPLE, ACTIVITIES, AND SPACES TO AMPLIFY URBAN VIBRANCY	LONG TERM IMPACT: DESIGNING CATALYST TO ADAPT AND SUSTAIN
7	[108]	UTILIZING INFORMAL DYNAMICS	TEMPORARY INTERVENTIONS	ADAPTABILITY AND EVOLUTION
8	[109]	URBAN CONTEXT INTEGRATION	CATALYTIC DEVELOPMENT	COMMUNITY FOCUS
9	[110]	PURPOSEFUL DESIGN	COMMUNITY CONNECTION	ECONOMIC GROWTH
10	[111]	SPATIAL DYNAMICS	BUILT ENVIRONMENT FACTORS	SEASONAL ADAPTABILITY
11	[112]	CONTEXTUAL DESIGN	ECONOMIC AND SOCIAL IMPACT	CHALLENGES IN IMPLEMENTATION
12	[113]	VERNACULAR ADAPTION	SUSTAINABILITY	URBAN REGENERATION
13	[114]	TEMPORARY USE AS INNOVATION HUBS	INTEGRATION OF INFORMAL PROCESS	DYNAMIC PUBLIC SPHERE: TEMPORARY USES CATALYZE PUBLIC ENGAGEMENT
14	[115]	CATALYTIC DESIGN	CONTEXTUAL RELEVANCE	INDIVIDUAL BUILDINGS AS CATALYST
15	[116]	INTEGRATION OF ICTS	ENHANCING SOCIAL INTERACTION	DESIGNING FOR THE DIGITAL AGE

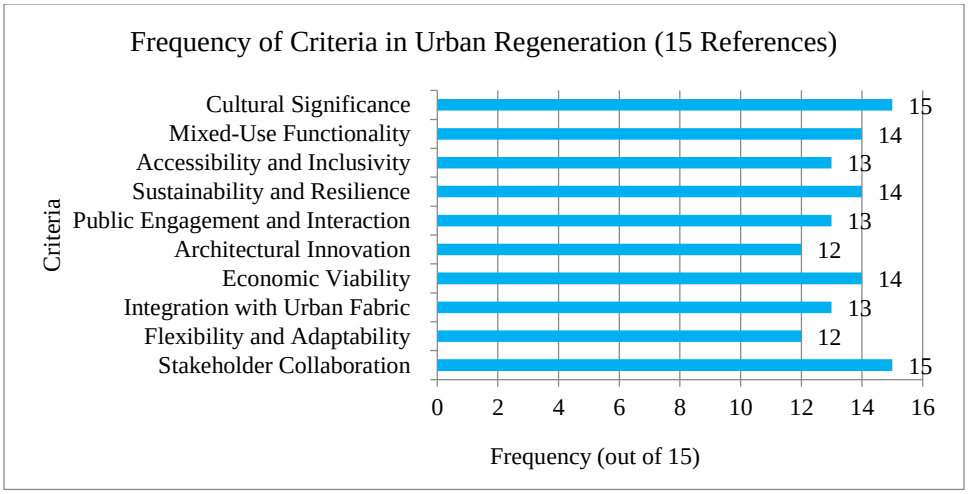

Fig. 7 Frequency of criteria[s] in built urban catalysts

Cultural significance emphasizes socio-cultural identity, community engagement, and stakeholder involvement. Mixed-use functionality focuses on diverse usage, sustainability, and contextual integration. Accessibility and Inclusivity ensure spatial connectivity, urban integration, and community connection. Sustainability and resilience prioritize eco-friendly design, seasonal adaptability, and inclusive growth. Public Engagement fosters regeneration, dynamic public spaces, and catalytic development. Architectural innovation highlights contextual relevance, transformative impact, and adaptive design. Economic viability drives growth through urban revitalization and built environment factors. Urban Integration blends regeneration, economic impact, and design challenges. Flexibility supports adaptability, evolution, and informal process integration. Stakeholder Collaboration strengthens synergistic relationships, cooperation, and shared decision-making.

The criteria[s] are,

1. Cultural Significance: Emphasize the building's role in representing and strengthening the cultural identity and heritage of the area, fostering a sense of pride and belonging within the community.
2. Mixed-Use Functionality: Design spaces that serve diverse purposes, such as residential, commercial, and recreational, to encourage continuous activity and attract a variety of users throughout the day and night.
3. Accessibility and Inclusivity: Ensure the structure is accessible to everyone, including people with disabilities, while seamlessly integrating it into public transportation systems and pedestrian pathways.
4. Sustainability and Resilience: Apply sustainable design approaches, incorporating energy efficiency, eco-friendly materials, and climate-responsive strategies to ensure long-term environmental and economic durability.
5. Public Engagement and Interaction: Create vibrant public areas, such as parks, plazas, or event spaces, to encourage social interactions and active community participation. Temporary structures can also be introduced, or existing structures can be repurposed for short-term uses, fostering dynamic engagement and flexibility.
6. Architectural Innovation: Introduce an iconic, contextually relevant design that becomes a visual landmark, enhancing the area's identity and attracting visitors.
7. Economic Feasibility: Foster economic benefits (job creation, increased foot traffic, and tourism) to invigorate the local economy.
8. Integration into Urban Fabric: Design the project as an integrated whole while respecting the scale, form, character, and texture of the existing urban fabric, as well as including modern building performance.
9. Flexibility in Use: Design spaces with multiple uses to adapt to changing needs and uses over time to make the building more appropriate and usable over time.
10. Collaboration between Stakeholders: Promote collaboration with local communities, government agencies, private investors, and professionals to ensure the development aligns with broader urban development goals.

The concept of urban catalysts encourages a re-examination of planning strategies and tools, advocating for innovative approaches to urban development. By taking into account the above criteria(s), urban planners and stakeholders can effectively manage how cities change, ensuring they remain vibrant, resilient, and relevant to the needs of their inhabitants.

4.5. Criteria[s] for Urban Heritage Buildings to Act as Urban Catalysts for Regeneration through Conservation

Heritage buildings play a vital role in urban regeneration, blending their historical importance with modern development to breathe new life into communities and encourage sustainable growth. By giving these structures a new purpose and weaving them into today’s urban settings,

cities can maintain their cultural identity while also boosting economic and social revitalization [37]. This strategy not only protects architectural heritage but also nurtures a sense of place and continuity within the urban landscape. To create a solid framework for heritage-led urban regeneration, a thorough analysis of 75 research papers, books, and articles was carried out. This in-depth review pinpointed 12 key criteria that are crucial for effective and context-sensitive conservation strategies. To enhance clarity and practical use, these criteria were further refined through a detailed, color-coded analysis. This involved using insights from both bar charts and radar charts. The bar chart showcased the relative importance of each criterion, making comparisons easy, while the radar chart highlighted the balanced relationships among grouped categories. Together, these tools offer a clear and user-friendly guide for practitioners and policymakers, ensuring they can make informed decisions in urban regeneration projects.

Table 5. A comprehensive color-coded categorization of the primary criteria[s] categories from the four lists

NO	COLOUR CODE	LISTS OF CATEGORIES FROM SECONDARY DATA SOURCES	NO	COLOUR CODE	LISTS OF CATEGORIES FROM SECONDARY DATA SOURCES
1		CULTURAL HERITAGE PROTECTION AND CONSERVATION, HERITAGE LED DEVELOPMENT	16		POLICIES & PROGRAMMES
2		TOURISM PROMOTION	17		DYNAMIC ANALYSIS, MONITORING, IMPACT ASSESSMENT
3		HISTORICAL PRINCIPLES AND LAYERS	18		COLLABORATIVE DECISION MAKING - STAKEHOLDERS
4		HUMAN CENTRIC - PEDESTRIAN DESIGN	19		ECONOMIC VIABILITY
5		PUBLIC SPACES & CONNECTIVITY	20		SMART HERITAGE, TECHNOLOGY INTEGRATION
6		INTEGRATED URBAN DEVELOPMENT, ENVIRONMENTAL -ECOLOGICAL APPROACH	21		CONTEXT SPECIFIC APROACH
7		PERFORMANCE DIMENSIONS	22		MATERIAL COMPATIBILITY
8		LEGIBILITY & SENSE OF PLACE	23		DIAGNOSTIC TOOLS
9		ADAPTABILITY	24		ARCHITECTURAL INNOVATION
10		DIVERSITY IN URBAN DESIGN	25		INTERVENTIONS - INFRASTRUCTURE IMPROVEMENT, RESOURCE AVAILABILITY
11		SUSTAINABILITY	26		STRUCTURAL SAFETY
12		COMMUNITY ENGAGEMENT	27		PRACTICAL EXPERIENCE, HANDS ON LEARNING
13		NAVIGATION ELEMENTS	28		PROMOTING GROWTH - STRATEGIES
14		PATTERNS AS DESIGN ELEMENTS	29		URBAN CATALYST, TEMPORARY INTERVENTIONS
15		SWOT ANALYSIS NEED	30		NEED FOR MIXED USE DEVELOPMENT

Table 6. Consolidation of criteria[s] from lists 1 to 4 – highlighting similarities

SNO	CRITERIAS IN LIST 01	CRITERIAS IN LIST 02	CRITERIAS IN LIST 03	CRITERIAS IN LIST 04
1	CULTURAL HERITAGE PRESERVATION	CULTURAL HERITAGE PRESERVATION	SIGNIFICANCE ASSESSMENT [CULTURAL ETC]	CULTURAL SIGNIFICANCE ASSESSMENT
2	ADAPTIVE REUSE	ADAPTIVE REUSE	ADAPTIVE REUSE	ADAPTIVE REUSE
3	COMMUNITY ENGAGEMENT & PARTICIPATION	COMMUNITY ENGAGEMENT & PARTICIPATION	STRUCTURAL INTEGRITY	COMMUNITY ENGAGEMENT & PARTICIPATION
4	MIXED USE DEVELOPMENT	MIXED USE DEVELOPMENT	MATERIAL AUTHENTICITY	MIXED USE FUNTIONALITY
5	PEDESTRIAN FRIENDLY DESIGN	PEDESTRIAN FRIENDLY DESIGN	ACCESSIBILITY & INCLUSIVITY	ACCESSIBILITY & INCLUSIVITY
6	INFRASTRUCTURE IMPROVEMENT	INFRASTRUCTURE IMPROVEMENT	ENVIRONMENTAL COMPATIBILTY	INTEGRATION WITH URBAN FABRIC
7	SUSTAINABILITY & GREEN DESIGN	SUSTAINABLE DESIGN	CUTURAL-INVOLVE INTANGIBLES	SUSTAINABILITY & RESILIENCE
8	TOURISM PROMOTION		STAKE HOLDER COLLABORATION	STAKE HOLDER COLLABORATION

9	ECONOMIC REVITALIZATION	ECONOMIC DIVERSIFICATION		ECONOMIC VIABILITY
10	POLICY & REGULATORY FRAMEWORK	REGULATORY FRAMEWORKS	POLICY & REGULATORY FRAMEWORK	ARCHITECTURAL INNOVATION
11	SMART TECHNOLOGY INTEGRATION	SMART TECHNOLOGY INTEGRATION		
12	MONITORING & EVALUATION		MONITORING & MAINTAINENCE	

Table 7. A comprehensive table of final criteria[s] generated through color code analysis

1	CULTURAL HERITAGE PRESERVATION AND SIGNIFICANCE ASSESSMENT
2	ADAPTIVE REUSE FOR MIXED USE FUNCTIONALITY
3	COMMUNITY ENGAGEMENT AND PUBLIC INTERACTION
4	ACCESSIBILITY AND INCLUSIVITY
5	SUSTAINABILITY AND ENVIRONMENMTAL RESILIENCE
6	TOURISM DEVELOPMENT AND ECONOMIC VIABILITY
7	INTEGRATION WITH URBAN FABRIC AND ADJACENT SPACES
8	SMART TECHNOLOGY INTEGRATION
9	MONITORING, MAINTAINENCE AND REGULATORY FRAMEWORK
10	FLEXIBILITY AND FUTURE ADAPTIBILITY
11	STAKE HOLDER COLLABORATION AND POLICY ADVOCACY
12	PLACEMAKING AND IDENTITY REVIVAL

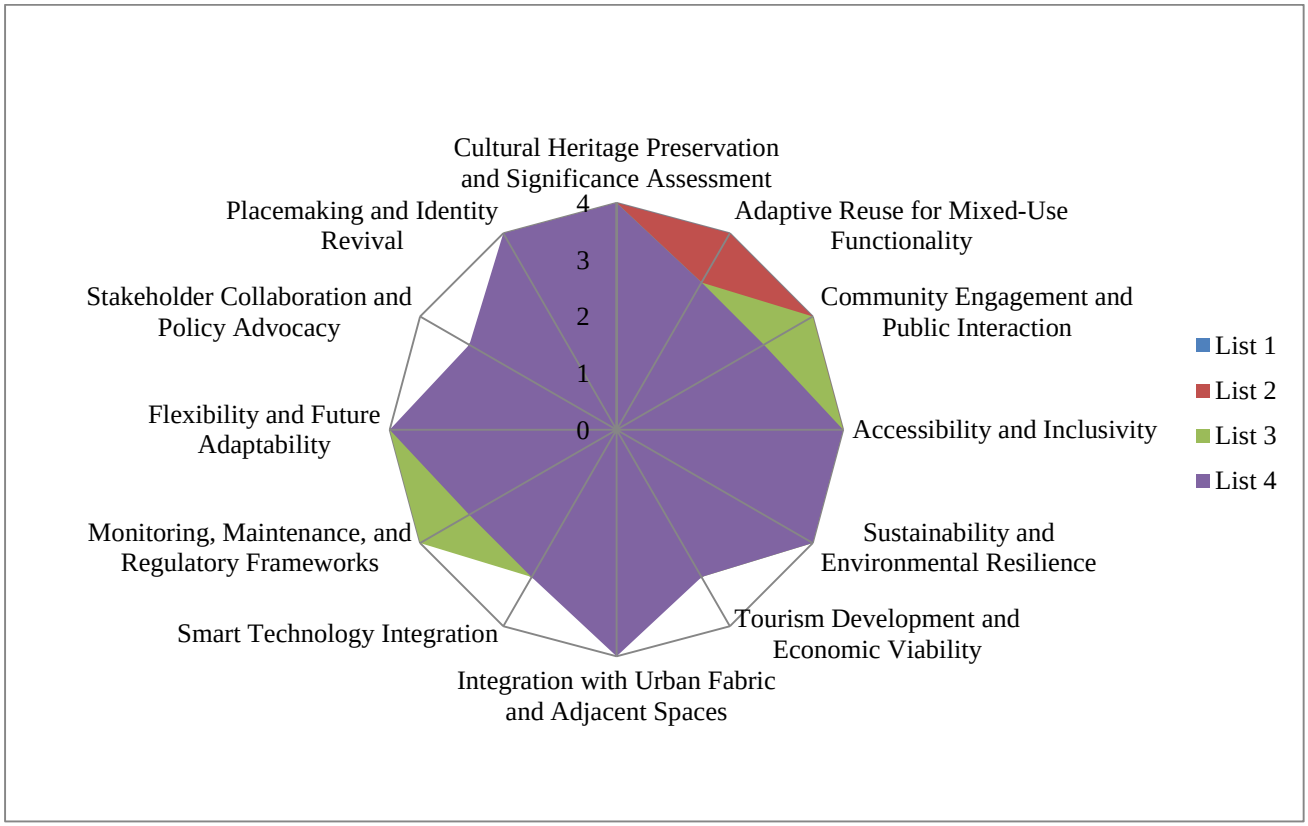

Fig. 8 Comparative radar chart: alignment of criteria across lists 1 to 4 for urban heritage buildings to act as urban catalysts for regeneration through conservation

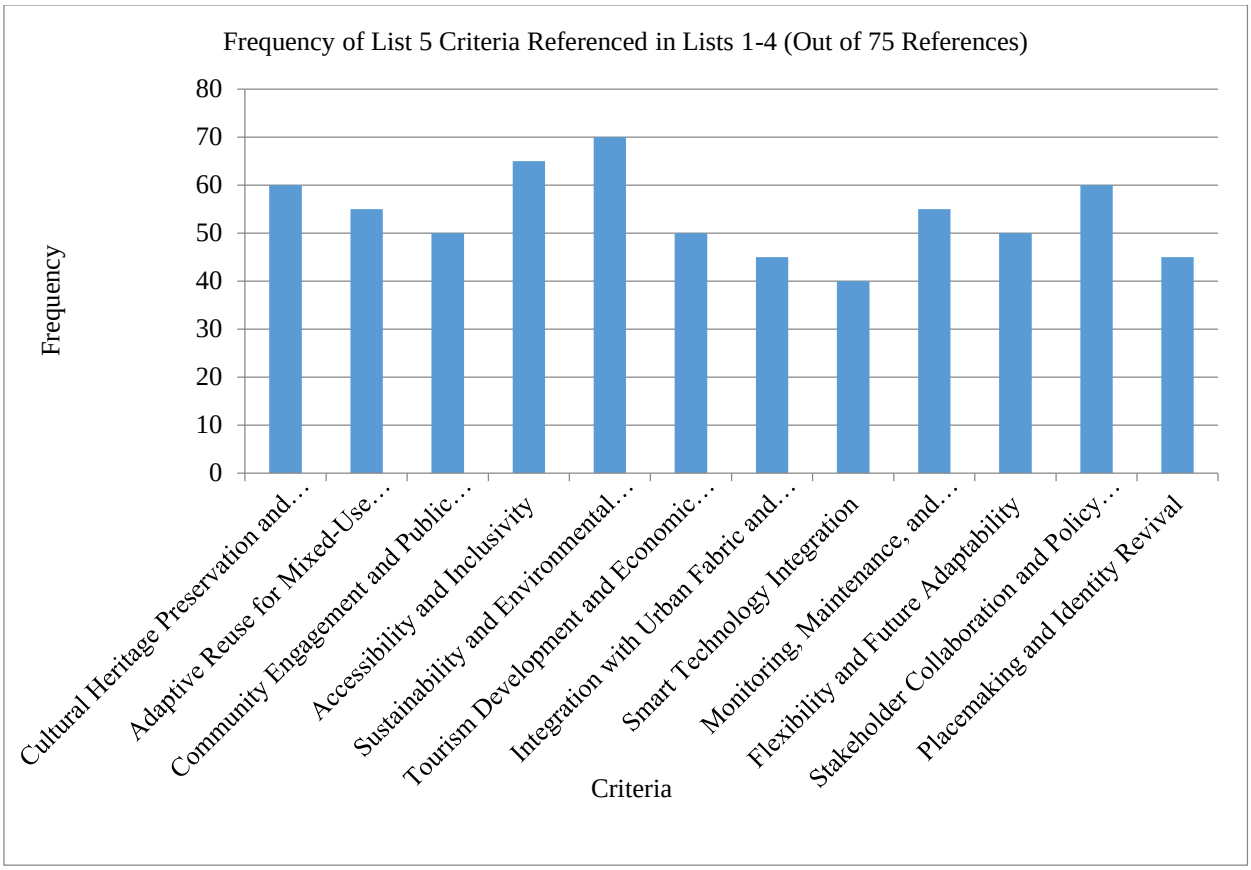

Fig. 9 Consolidation of criteria[s] from four lists & final criteria[s] for urban heritage buildings to act as urban catalysts for regeneration through conservation

The 12 crucial criteria[s] for Urban Heritage Buildings to Act as Urban Catalysts for Regeneration through Conservation are,

4.5.1. Cultural Heritage Preservation and Significance Assessment

- Preservation of Architectural Integrity: Retain and restore essential architectural features, materials, and craftsmanship to maintain historical authenticity.
- Incorporating Intangible Heritage: Include traditions, festivals, and narratives linked to the heritage structure to enhance its cultural relevance and identity.
- Establishing Protective Zones: Designate buffer zones around heritage sites to manage inappropriate development and ensure aesthetic harmony.
- Historical Documentation and Research: Carry out archival research, document oral histories, and create digital maps to capture and evaluate the site's heritage significance

4.5.2. Adaptive Reuse for Mixed-Use

- Transformative Repurposing: Adapt heritage structures into multi-function spaces/community hubs/cultural spaces/artisan markets, etc.
- Encourage Diversity of Use: Promote commercial, residential, and recreational uses together to enhance economic and social vitality.
- Contextually Sensitive Interiors: Modify internal layouts to accommodate modern requirements while preserving the building's heritage essence.

4.5.3. Community Engagement and Public Interaction

- Participatory Conservation and Education: Engage communities and stakeholders throughout any decision-making process to use their voices to inform conservation priorities and adaptive reuse considerations. Use the site for workshops, cultural education, and public awareness campaigns on the importance of heritage conservation.
- Fun Public Spaces and Cultural Opportunities: Create interactive courtyards, plazas, and open spaces for visitors to enjoy, and encourage social interactions with events, programs, festivals, and community-initiated cultural opportunities to solidify the site's position as a cultural and social destination.

4.5.4. Accessibility and Inclusivity

- Inclusive Design: Make sure to include ramps, elevators, and tactile pathways so that everyone, regardless of their needs, can access the space without any barriers.

- Enhanced Connectivity: Boost access to heritage buildings by providing well-connected public transport options and creating pedestrian-friendly routes.
- Wayfinding and Information Systems: Set up clear, multilingual signs, maps, and interactive displays to help guide and engage visitors effectively.

4.5.5. Sustainability and Environmental Resilience

- Eco-Inclusive Modifications: Integrate features such as rainwater collection, grey-water reuse, green roofing, permeable pavements, and renewable energy systems like photovoltaic arrays to promote environmental sustainability while retaining an appropriate historic character.
- Energy Efficient Systems: Use energy-efficient technology such as solar panels in a way that respects the aesthetics of the historic structure.
- Sustainable Materials: Utilize environmentally sustainable materials to curb environmental impacts from repair and maintenance.
- Climate-Responsive Design: Use conservation strategies confirmed by factors of local climate, for example, passive cooling, natural ventilation, or thermal insulation.
- Biodiversity and Green Network Integration: Create a better landscape with improved native vegetation, green buffers, and eco-corridors to support local biodiversity and the health of the environment.
- Circular Resource Utilization: Encourage recycling and reuse of any materials when undertaking restoration work, repurpose salvaged materials, and carefully implement conservation waste management processes to mitigate the environmental impact of a conservation project.

4.5.6. Tourism Development and Economic Viability

- Heritage Tourism Promotion: Let's bring in guided tours, cultural events, and hands-on experiences to draw in a wide range of visitors.
- Support for Local Economies: It should promote local artisan markets, food stalls, and souvenir shops to help uplift community livelihoods.
- Public-Centric Events: Organizing exhibitions, festivals, and cultural performances at the heritage site can not only generate revenue but also foster greater community engagement.

4.5.7. Integration with Urban Fabric and Adjacent Spaces

- Urban Context: Ensure that the design responds to the urban context appropriately in terms of scale style, and function so it will be compatible with other built-form in the area.
- Traffic Considerations: Improve safety and access for visitors and residents by creating pedestrian crossings and on-site designated parking and allowing only one-way vehicle flow.
- Buffer zones & Landscape: Provide large plazas and green spaces around the heritage structure to enhance visibility and provide adequate spill-out space.

4.5.8. Smart Technology

- Interactive narrative tools: Use Augmented Reality (AR) and Virtual Reality (VR) to convey the history and cultural significance of the heritage building.
- Smart monitoring systems: Use IoT real-time monitoring to maintain the health of the structure, energy and visitor usage.
- Visitor engagement: Provide mobile applications and QR code self-guided tours, event registration, and real-time updates.

4.5.9. Monitoring, maintenance, and regulatory frameworks

- Use of surveys and preservation plans: regular condition assessments using diagnostic equipment to identify structural vulnerabilities and create pre-emptive maintenance strategies.
- Heritage-compatible zoning and regulation: enact zoning laws and guidelines that prioritize the preservation of heritage structures while maintaining compatibility with surrounding development, as well as spatial visual harmony.
- Awareness and Financial Support Mechanisms: Consistently update property owners, developers, and other stakeholders on subsidies, tax credits, and grants available for conservation purposes. Offer workshops or assistance in walking them through the procedures involved in securing applicable subsidies.

4.5.10. Flexibility and Future Adaptability

- Modular floor plans: Create flexible floor plans that can be reasonably adjusted as the community grows and the dynamic needs and functions arise.
- Scalable uses: Ensure the building can accommodate all levels of use, from small community gatherings to large city festivals as a gathering place.
- Disaster Preparedness: Identify features that are climate responsive and resilient to adverse events so the building provides safety during either natural or other human-made disasters.
- Phased development: Develop designs with phased renovation/growth or ancillary_ designs that demonstrate that community needs and available resources may grow and change over time.
- Mixed-function spaces: Develop spaces that can easily accommodate changes to use, such as exhibits, workshops, or social functions, with as much flexibility as possible.
- Technology for adaptability: Incorporate smart technology, including Internet-of Things (IoT) systems

and modular offerings, to allow for easy adaptation and changing functionality.

4.5.11. Collaboration with Stakeholders and Advocacy for Policies

- Partnerships: Foster relationships between government, private investors, NGOs, and community groups to finance and manage conservation programs.
- Empowering Communities: Establish local trusts or cooperatives so the community can own and take care of heritage buildings in the future.
- Urban Policies: Integrate heritage conservation within a cityscape strategy to develop comprehensive urban renewal solutions.

4.5.12. Placemaking and Identity Reinvigoration

- Energetic Streetscape Engagement: Engage and activate the surrounding streets and public spaces with pop-up art installations, cultural vendors, and performance spaces that are in line with the heritage of the site.
- Cultural Identity Branding: Promote the site's appropriate branding as a local culture through marketing materials, festivals, and social media.
- Diverse Visitor Opportunities: In the heritage site and proposed location, designate spaces for recreation, storytelling, and cultural engagement that also establish emotional attachments to the community and to visitors.
- Evening Activation**:** Create dip lights, offer evening markets, provide cultural activities in the evening where the site activity does not end, and enable opportunities for people to engage way into the evening.

By conceptualizing these criteria[s], urban planners and community owners can establish and optimize heritage assets to thrive in parts of the economy for growth and regeneration. That is to ensure that development sustains heritage assets, which should respect historical values, which are called for by contemporary livelihoods and economies. This balanced approach not only preserves the past but also envisions a vibrant and sustainable future for urban environments.

5. Parameters for Generating the Priority Order

Based on the criteria generated across lists 1 to 5, major themes were identified, including structural condition and visual appearance, current usage and community engagement, socio-cultural and heritage significance, and accessibility and location. Guided by these themes, frequency charts were developed. Key parameters within these broad categories were explored and refined into a set of quantifiable parameters.

A total of 60 crucial parameters have been carefully generated, drawing from the synthesis of criteria across 75 research papers and five established frameworks for heritage conservation. These parameters serve as a comprehensive checklist to systematically evaluate and prioritize heritage structures for regeneration. By addressing critical aspects such as structural integrity, socio-cultural significance, spatial adaptability, environmental sustainability, and modern infrastructure requirements, this framework provides a foundation for constructing a priority order.

Below are the 60 parameters categorized into key evaluation areas, ensuring a holistic approach that balances historical preservation with contemporary needs and policy alignment.

5.1. Structural Condition and Visual Appearance

1. Are there no major structural damages (e.g., severe cracks, tilting, collapsing parts)?
2. Are architectural elements (e.g., roofs, walls) and details intact or repairable without significant interventions?
3. Does the structure retain aesthetic, historical, or cultural significance?
4. Is the site free from visible dangers (e.g., loose stones, broken glass, unsafe areas)?

5.2. Current Usage and Community Engagement

1. Is the structure actively used by the community for cultural, social, or economic activities?
2. Does the structure play a role in local festivals, traditions, or cultural practices?
3. Is the site open and accessible to the public for daily or occasional use?
4. Does the structure hold strong emotional or historical value for the local community?
5. Are there infrastructure elements (e.g., power, water, sanitation) already present or easily integrated into the site?

5.3. Socio-Cultural and Heritage Significance

1. Is the structure near other heritage or cultural sites, enhancing its significance as part of a cultural cluster?
2. Does the structure reflect the architectural or cultural identity of the region?
3. Is the site documented in heritage records, archives, or maps?
4. Is the structure linked to local stories, legends, or traditional knowledge that enhances its intangible heritage value?

5.4. Spatial and Economic Viability

1. Is there adequate open space around the structure for facilities like parking, seating, or walkways?
2. Can the structure be adapted for commercial, residential, or cultural purposes?
3. Is the structure located near marketplaces or economic hubs that increase its potential for reuse?

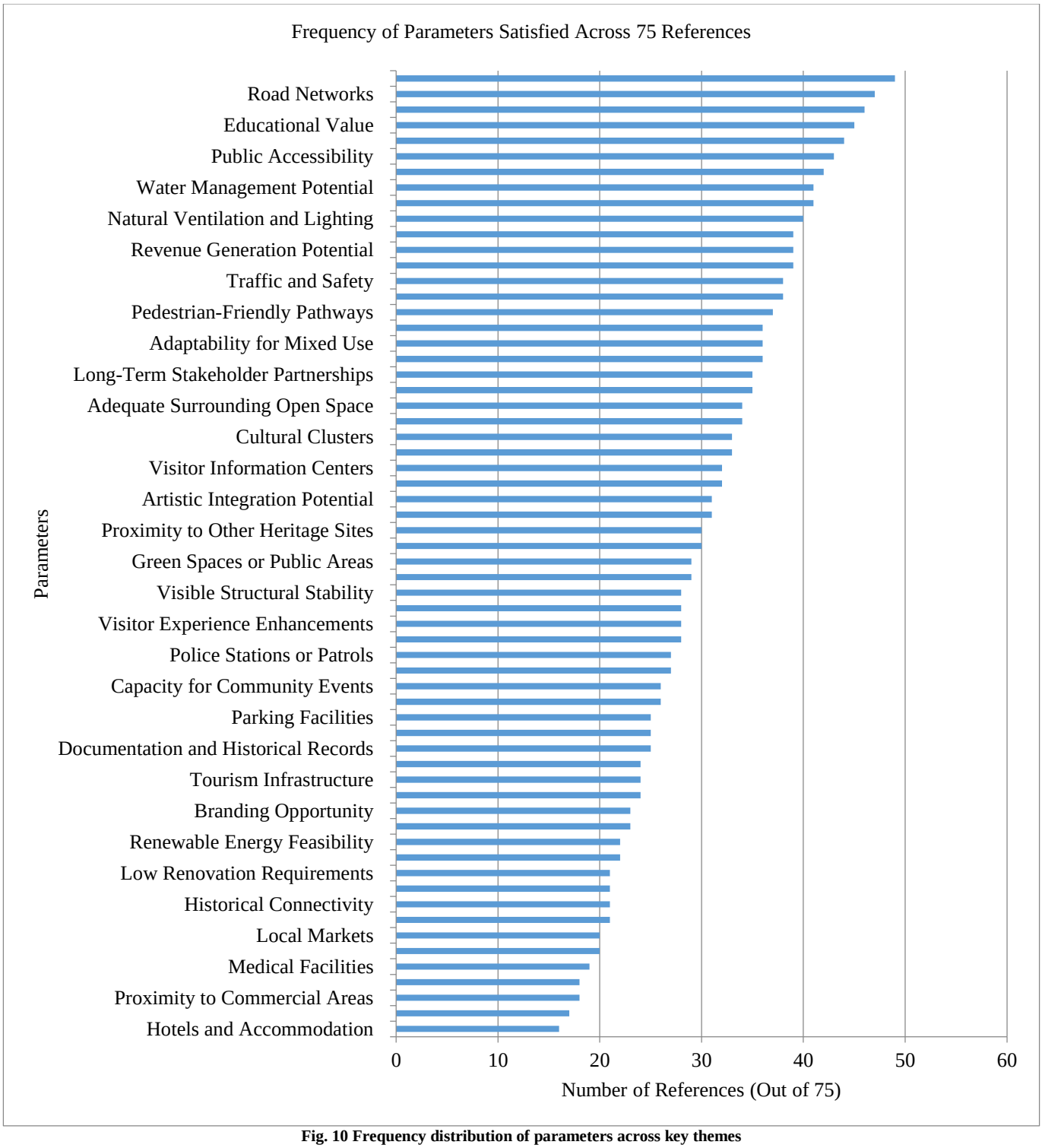

Fig. 10 Frequency distribution of parameters across key themes

1. Can the site generate revenue through tourism, events, or rentals?
2. Is there extra space available to add features like ramps, elevators, or a Building Management System (BMS)?
3. Can energy-efficient tools (e.g., solar panels, LED lighting) be added without disrupting the heritage character?

5.5. Maintenance and Documentation

1. Has the structure been regularly maintained over time?
2. Is the ownership clearly documented and undisputed?
3. Are there records of past restoration efforts available to guide future interventions?

5.6. Connectivity and Urban Integration

1. Does the structure integrate well with the surrounding urban environment, blending in scale and function?
2. Are nearby streets manageable for increased traffic and visitor activity?
3. Is the structure near parks, plazas, or other public gathering spaces that enhance its appeal?
4. Is the structure located in a visible or strategic area, enhancing its prominence as a landmark?
5. Are the roads leading to the site well-connected and navigable for vehicles and pedestrians?
6. Are there cycle paths or rental facilities available for eco-friendly transport in the vicinity?
7. Are there provisions for differently-abled individuals (e.g., ramps, tactile walkways) either at the site or nearby?

5.7. Community Involvement and Support

1. Are there active advocates (e.g., local groups, NGOs) for the structure's preservation or reuse?
2. Does the site have space to host public events, workshops, or cultural performances?
3. Are local volunteers willing to participate in the site's maintenance or programming?
4. Can the site be used for heritage walks, educational workshops, or cultural lectures?
5. Are there religious or ceremonial spaces (e.g., temples, mosques, churches) within 1 km that add spiritual significance to the site?

5.8. Tourism and Public Interaction Potential

1. Can essential facilities (e.g., restrooms, seating) be added without disrupting the site's heritage character?
2. Does the structure have unique qualities that make it appealing to cultural tourists?
3. Can features like guided tours, interpretive signage, or storytelling platforms be added to enhance visitor experiences?

5.9. Tourism Infrastructure

1. Are there hotels, guesthouses, or homestays nearby to support tourism?
2. Is there an information kiosk or tourism office located within 1 km to guide visitors?
3. Are there non-heritage attractions (e.g., parks, museums) nearby that complement the visitor experience?

5.10. Safety and Security

1. Is there a police station or regular patrol presence nearby to ensure security for visitors?
2. Are streets around the structure well-lit, ensuring safety during evening hours?
3. Are there clinics, hospitals, or first-aid centers nearby for emergencies?

5.11. Economic and Commercial Proximity

1. Are there traditional or modern marketplaces located nearby?
2. Are there dining options such as cafes or restaurants available within 1 km?
3. Are there spaces for local artisans or craftsmen to showcase their skills or sell products?

5.12. Environmental Sustainability Potential

1. Does the structure naturally support energy efficiency through ventilation and lighting?
2. Can water management systems (e.g., rainwater harvesting) be added without disrupting the site?
3. Can renewable energy systems like solar panels or wind turbines be integrated into the structure?
4. Is there potential for sustainable landscaping, such as native planting, to enhance the site?

5.13. Placemaking and Identity Revival

1. Can public art or installations be added to enhance the site's cultural significance?
2. Can spaces be designated for local artisans or vendors to promote community involvement?
3. Can the structure become a social or cultural anchor, fostering a strong sense of place?

5.14. Long-Term Viability

1. Are minimal interventions required to make the site functional?
2. Does the structure's current reuse align with government heritage conservation policies?

5.15. Proximity to Transportation and Nearby Heritage Sites

1. Are public transport hubs (e.g., bus stops, metro/train stations) located within 1 km of the site?
2. Are pedestrian-friendly pathways or walking trails available in the vicinity?
3. Are parking lots or spaces available within 1 km for visitor convenience?
4. Are there other heritage structures or monuments within a 1 km radius?
5. Do nearby heritage sites share a historical or cultural connection to the structure?

The four thematic areas- Urban Regeneration, Urban Conservation, Built Heritage Conservation, and Built Urban Catalysts-are strongly interrelated and together constitute the basis of the prioritization framework established in this research. Each theme brings forth unique yet complementary views and criteria that, when combined, facilitate a comprehensive assessment of heritage buildings as potential urban regeneration catalysts.

Urban Regeneration sets the overall context, with a view to revitalizing cities by confronting economic, social, and

environmental issues. It prioritizes long-term sustainability, community participation, and the consolidation of various urban functions. Urban Conservation highlights the conservation and adaptive reuse of old urban fabrics so that heritage properties are made meaningful and useful within modern city life. Built Heritage Conservation builds on this and adds an element of technical sophistication, focusing on the structural stability, integrity, and management of individual heritage buildings and the broad cultural and historical contributions that they make to the city as a whole. Built Urban Catalysts emphasize the catalytic role that certain heritage places or interventions can play to spur broader urban regeneration, attracting investment, placemaking, and community action around them.

Within the framework, criteria under each theme are not addressed independently; instead, they are logically cross-referenced, defined, and brought together. For instance, the stress on mixed-use development and adaptive reuse (from Urban Conservation and Urban Regeneration) is merged with Built Heritage Conservation technical standards, and the catalytic value of a site (from Built Urban Catalysts) is determined both physically and in its ability to mobilize social and economic networks. Such a holistic methodology is assured of retaining the entire spectrum of considerations from policy and planning to technical conservation and people impact so as to allow a solid, three-dimensional evaluation of heritage buildings.

The framework ultimately harnesses the synergy among the four themes to determine and classify the heritage assets that will best lead urban regeneration in ways that are sustainable and inclusive. To provide an example of the practical use of the prioritization checklist, the following case studies illustrate how heritage buildings have successfully served as urban catalysts for regeneration in Indian and global contexts. Each case points to certain criteria from the checklist- adaptive reuse, community involvement, sustainability, and urban integration- that exhibit the transformational effect of heritage-led interventions.

5.16. Humayun's Tomb and Nizamuddin Area (Delhi)

Humayun's Tomb, a World Heritage Site, is an iconic site of historical and architectural importance. The Aga Khan Trust for Culture's restoration, with collaboration from public agencies, brought tenfold the number of visitors and renewed life to the Nizamuddin neighborhood. The Nizamuddin Urban Renewal Initiative combined conservation with socio-economic development, enhancing local quality of life and promoting cultural assets for community benefit [38]. Such a holistic strategy demonstrates the potential of heritage conservation to trigger wider social and economic renewal, consistent with checklist requirements such as community involvement, adaptive reuse, and sustainability.

5.17. City Palace (Jaipur)

The City Palace, in the heart of Jaipur, combines Rajput, Mughal, and European architectural features and continues as a cultural and administrative center [39]. Its reuse as museums and event venues, in addition to ongoing royal occupation, shows how heritage buildings can serve as a basis for urban identity and tourism. The continued function of the palace as a part of urban life reflects the checklist's emphasis on mixed-use function, cultural value, and economic sustainability.

5.18. Tate Modern (London, UK)

The redevelopment of Bankside Power Station into the Tate Modern Museum is an international best practice for adaptive reuse. The project retained industrial heritage and established a flagship cultural destination, leading to investment and rejuvenating the South Bank as a thriving district [40]. The case illustrates the effect of combining sustainability, accessibility, and placemaking-key principles of the checklist.

5.19. Gasworks Park (Seattle, USA)

The transformation of Gasworks Park from a polluted industrial area into an innovative public park entailed ecological restoration and creative reuse of industrial remains [41]. The strategy showcases factors like environmental sustainability, innovative design, and community benefit in converting a past liability into an urban icon.

6. Discussion

This research realizes better outcomes than state-of-the-art methods and earlier documented frameworks in the following ways. To begin with, the approach combines four unique but connected thematic fields-Urban Regeneration, Urban Conservation, Built Heritage Conservation, and Built Urban Catalysts-while the majority of existing methods concentrate on one or two aspects [8]. By systematically amalgamating criteria from a wider range, the suggested framework allows for a more holistic and multidimensional evaluation of heritage buildings. Second, the utilization of qualitative coding using NVivo software and an exacting color-coding system permitted the recognition and removal of overlapping or redundant criteria, producing a streamlined and highly pertinent set of parameters. This is in contrast to much previous research, which tends to use expert judgment or ad hoc choice, which may be biased or may ignore important variables. Third, the model was subjected to expert opinions to guarantee practical applicability and quantifiable parameters were established for immediate use in prioritization, a feature not always included in prior models. As illustrated in the case studies, this thorough and structured methodology resulted in more practical and context-specific prioritization of world heritage sites to better support conservation and urban regeneration goals compared to previous methodologies. Finally, the combination of varied thematic understanding and sophisticated qualitative analysis

makes this framework stand out among current literature and provides its enhanced capacity for strategic heritage intervention.

7. Conclusion

Heritage buildings in cities have tremendous potential for urban regeneration while addressing the historical alongside current existing realities. This research sets out a prototype and participatory framework for identifying and prioritizing heritage buildings that have the potential for urban regeneration while respecting their unique cultural values. It creates a systematic process for the identification of heritage buildings, which can be catalysts for sustainable renewal and tourism, informed by extensive analysis of 75 academic references and guided by systematic processes, compiling a comprehensive list of data to develop 12 core indicators and their associated parameters. The indicators reflect key themes, including cultural heritage, adaptive reuse, community engagement, accessibility, sustainability, and respect for the context of the urban landscape, each of which is important to provide a framework for addressing urban regeneration. This framework was also accompanied by an inventory with a particular focus of 60 indicators, specifically to support policymakers, urban planners, and heritage agencies in identifying and assessing buildings for intervention. Ultimately, also helps prioritize the buildings, allocate resources, and conserve in a particular budget and time. The results are complemented with visual artifacts in the form of multiple bar charts and radar charts to convey the relative importance of the parameters and more complex issues being considered while allowing practical applications in the field of urban regeneration. The study makes an important connection between conservation and urban regeneration, with heritage buildings being key socio-economic assets of sustainable cities. Instead of paving the way for new development at the expense of historic buildings, this perspective sees creative renewal as a way to meet present needs while cultivating vibrant, inclusive, and evolving communities. This framework offers valuable insights and a methodology to see the potential of heritage buildings to preserve the historical value of the place and promote sustainable urban development, which can help the government, organizations, researchers, and communities striving to build resilient cities.

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