

Article

Urban Heritage in Saudi Arabia: Comparison and Assessment of Sustainable Reuses

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Abstract: Saudi Arabia witnessed unprecedented urban development starting from the 1930s due to oil discovery, leading to the construction of new contemporary cities and high-tech buildings. Recently, starting from the late 1990s, an increasing feeling of esteem toward vernacular architecture and local traditions has promoted several heritage rehabilitation projects. This paper aims to assess selected urban heritage interventions to highlight the importance of sustainable approaches in heritage reuse. An assessment of sustainable reuse was conducted by adopting sustainability criteria and principles in compliance with Saudi Arabia's national vision for 2030 (Saudi Vision 2030), which targets sustainable growth in the post-oil era. Analyses and data collection make it possible to compare four selected case studies based on materials and techniques for preservation, governmental institutions involved, the assessed methodologies of intervention, and relevant parameters (legibility, reversibility, overshadowing, alteration, replacement, and anastylosis). Results show how different institutions have adopted diverse approaches in conservative methodologies based on heritage values to provide flexibility in the reuse of buildings and adaptation to contemporary needs. Assessing the sustainable reuses of Saudi heritage can lead to a strategic change in national growth targeting social, economic, environmental, and ecologic results.

Keywords: conservation; restoration; governmental institution; adaptive reuse; heritage; Ushaiger village; At-Turaif district; Rawdat Sudair village; Rughabah village; Saudi Arabia; sustainable economy



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1. Introduction: Historical Background

In recent years, Saudi Arabia has embraced the adoption of new strategies as a pioneer in affording a sustainable approach in the post-oil era [1–4]. In the last few decades, the country has seen massive economic growth involving many aspects of society, including new businesses and international investments in culture and tourism. To enhance local values, the government has recently completed many projects to rehabilitate national heritage sites in order to improve local and international tourism and business. The aim is to lead a national transformation based on valorizing local culture, values, heritage, and resources to promote sustainable future growth as part of the Kingdom of Saudi Arabia's national vision for 2030 [1]. In the literature, it is noted that the history of the country is mainly based on oil discovery and exportation; several scholars [5–7] present urban development in the Arabian Peninsula as a sequence of three periods: the pre-oil architecture period up to the 1930s; the oil architecture period from the 1930s to the 1990s, characterized by the discovery and intensive exploitation of oil wells; and the post-oil architecture period based on the development of new economic sustainable strategies and a post-oil economy. During the oil period, the Arabian Peninsula's main cities shifted from vernacular settlements into modern planned cities.

The Arabian states aspired to fill the gap to modernity and cut ties with the traditions associated with a primitive and humble civilization. For the Kingdom of Saudi Arabia, governmental policies have led to an increase in urbanization from 10% to 75% in just forty years (around 1950–1992). The abandonment of traditional models has characterized

this growth at the architectural, constructive, and urban levels through the adoption of “imported” models since the 1970s.

It was only from the 1990s onwards that the topic of identity became crucial in the architectural debate of the Arab world. When describing the search for architectural identity, Salama [5] identifies two approaches: on one side, an intervention in the conservation and reconstruction of heritage sites or buildings, while on the other hand, new projects developed on the stream of historical revivalism. Many traditional buildings and villages, abandoned and neglected for many years, were affected by demolitions and consequent loss of the local culture linked with them in Saudi Arabia and the entire Gulf region [8]. In past years, no regulations were in place to preserve heritage from the risk of demolition; however, recently, the rising interest in local identity and cultural values has raised the amount of attention given to preserving the vernacular architecture, their traditional materials, and techniques for construction, especially in the vision of new sustainable country growth.

Saudi Arabia Legislation in Preserving National Heritage

During the oil period in Saudi Arabia, administrations and governmental institutions gave very little attention to heritage buildings due to the absence of specific regulations on safeguarding national heritage until as late as 1972. Since then, the fast and uncontrolled demolition of numerous historic buildings has raised interest in safeguarding and preserving architectural heritage in the Kingdom of Saudi Arabia.

The first attempt to provide a legislative framework to Saudi heritage came with the Antiquities Law in 1972 [9]. However, it was only in 2014 that the definition of heritage reappeared in the Law of Antiquities, Museums, and Urban Heritage. The Saudi Council of Ministers established the Supreme Commission for Tourism (SCT), which was developed in 2008 into the Saudi Commission for Tourism and Antiquities (SCTA) and later became the Saudi Commission for Tourism and National Heritage (SCTNH) in 2014 [10]. Before 2015, a cabinet decision was made to give authority to the SCTNH to take necessary measures to protect citizen-owned heritage buildings and sites. The Saudi Commission of Tourism and National Heritage [11] proposed a program to support, rehabilitate, and invest in privately owned urban heritage buildings. Following this decision, the SCTNH began to assess, classify, and preserve urban heritage sites in agreement with the owners. After that, the agency provided an electronic platform enabling archeological sites, heritage sites, heritage buildings, and lands adjacent to antiquity to be recorded in the National Heritage Register and benefit from technical and supervisory support. The program aimed to maintain the historical value of urban heritage buildings owned by citizens and worked to employ them according to standards that maintain their architectural and historical authenticity and achieve financial and spiritual satisfaction for their owners. The commission submitted several solutions that serve the primary goal of protecting urban heritage buildings of critical urban nature. The solutions suggested participatory frameworks where agreements between the owner and the investor were guided by specific criteria related to organizing such activities.

In 2018, the SCTNH was replaced by two separate entities: the Ministry of Culture and the Ministry of Tourism. In alignment with Saudi Vision 2030, the Ministry of Culture (MOC) has stated the significance of traditional artifacts in which Saudi-built heritage is categorized as a single building or an entire urban tissue. The Ministry of Culture has initiated several commissions to cover different aspects of cultural production, and the Heritage Commission is the one in charge of Saudi heritage. The Heritage Commission categorizes heritage as antiquities, urban heritage, handicrafts, and intangible heritage. Determann [12] argues that, for most of the twentieth century, the architectural heritage in Saudi Arabia was synonymous with the monuments linked to the Saudi ruling dynasty, the Al Saud. Sqour [13] lists some heritage sites that have been restored under the sponsorship of the Saudi government. The author highlights that public authority is usually keen to preserve places related to the nation’s history and religion. However, local communities have often been the engine of conservation, renovation, adaptive reuse, and cultural

tourism processes. The valuable Saudi national heritage is deeply rooted in the country's history and is spread over a large territory including many ancient and diverse traditional cultures that have suffered numerous losses in the past years due to administrations' and owners' lack of heritage preservation and protection legislation. The value of tradition has recently been brought to new light to rediscover heritage value as a fundamental component for future country development. The search for cultural identity guides the country's progress and sustainable growth. Saudi Arabia is currently working on detailed heritage classification projects, promoting many conservation and recovery plans at urban and architectural levels. Saudi Vision 2030 and the National Transformation Program (NTP2020) aim to involve the population so as to increase the awareness of inhabitants regarding the value of their heritage and promote local and international investments in the discovery of culture, tourism, hospitality, and enhancements to the peculiarities of national historic sites. Many similar case studies have been documented by researchers in relation to various heritage conservation projects located in Croatia, Poland, Costa Rica, the United Kingdom, Italy, Albania, the Netherlands, Ecuador, Sweden, Belgium, Romania, Iran, the Czech Republic, Jordan, and Canada [14–18]. These case studies located in diverse geographical contexts prove that local communities play a significant role in the success of adaptive reuse projects [19,20]. Additionally, many innovative technologies nowadays support conservative heritage interventions founded on interdisciplinary and collaborative approaches to sustainability, as suggested by Levy. Analyzing integrated responses in cultural and environmental fields is an opportunity to link to the contemporary cultural heritage needs of the public, including maritime and coastal heritage.

The research problem is based on an initial understanding of the methodologies used to preserve urban heritage in Saudi Arabia and the assessment of sustainable strategies that have been adopted to target the country's future growth in the post-oil phase while following sustainable criteria and principles. UNESCO recommends [21] a holistic and multidisciplinary approach to fully understand the historic urban landscape. Integrating more disciplines is crucial in any environment with tangible or intangible cultural heritage elements [22,23].

In doing so, the paper analyzes some selected case studies to define the best practices in the field for assessment of sustainable urban heritage reuse. The study highlights the main features of the reuse methodologies adopted in each case and how leading governmental institutions and community involvement have addressed the sustainable principles in Saudi heritage reuse.

The research's main aim is to provide some guidelines for assessing urban heritage reuses to further develop urban heritage rehabilitation and reuse under the horizon of Saudi Vision 2030.

2. Materials: A Literature Review on Saudi Heritage

A literature review on sustainable heritage reuse and adaptive reuse in Saudi Arabia is presented in the following section.

Urban heritage is considered one of the main components of evidence of human development throughout history. It expresses the capabilities reached by communities of people in connecting to their environment and displays a tangible example of previous generations' cultural, social, and religious values [23,24]. In Saudi Arabia, many ancient villages were inhabited and populated for thousands of years before the pre-oil period and were later abandoned and neglected for centuries. Many represent an extraordinary example of human adaptation and survival in extreme desert conditions. Recently, the Saudi Commission for Tourism and Antiquities (2014) [25] classified urban heritage into the following categories: Category A, buildings and sites of high significance; Category B, buildings and sites of moderate significance; and Category C, buildings and sites of low significance. Although there is diversity in urban heritage between historical cities and old villages, there is a close relationship between the national approaches to conservation adopted by Saudi Arabia and the general framework of the Gulf region [26].

There is a large body of research addressing heritage conservation in Saudi Arabia [26–35] and the Gulf regions [2–4,6,18,36–42] with particular reference to urban heritage [43–47]. In contrast, the notion of sustainable heritage reuse is newly targeted. Only a few investigations have analyzed sustainable conservation in the Gulf regions and Saudi Arabia [3,29,34,42,48].

Models for Promoting Sustainable Reuses of Heritage

The concept of adaptive reuse is relatively recent in Saudi Arabia, whether applied to a historical urban heritage site or the built environment [7,43,49].

Recent studies have emerged on the sustainability of conservation and adaptive reuse projects limited to the western region of the Saudi Kingdom, which deal, in particular, with the old city of Jeddah. Badawy and Shehata [29] discuss the assessment of conservation projects in terms of sustainable results and approaches. The authors evaluated the applied urban conservation strategies and policies in terms of their success in achieving sustainable results through the historic Jeddah districts case study. El-Belkasy [50] highlighted the social dimension of sustainability by discussing the relocation of local communities residing in heritage sites and its impact on the sustainable conservation and reuse of the historic center of Jeddah.

More projects are going in this direction under Saudi Vision 2030, which aims to enhance the value of national heritage conservation according to the Sustainable Development Goals (SDGs) framework promoted by the United Nations since 2015 [51]. Bay et al. [7] used a sustainable development approach to analyze the heritage practices adopted at Diriyah, a World Heritage Site (WHS) close to the city center of Riyadh.

Recently, Alhojaly [52] proposed a model for assessing the adaptive reuse of heritage buildings in historical sections of Jeddah. The model articulates the data into axes, elements, evaluation items, illustrations, and notes. Therefore, the method provided by the author is effective in the aftermath of any intervention as a mapping tool rather than as an evaluation system or guidelines to control the design phase.

Tam and Hao [53] listed four typologies of adaptive reuse interventions: new exterior–old interior; new interior–old exterior; additions and incisions; and integrated infill. According to the authors, the most successful adaptive reuse projects have used the last method, which preserves most of the existing building while giving a more integrated appearance in case of alterations demanded by the users' needs. Bianco [54] proposed a set of parameters to further detail the intervention, such as legibility, reversibility, overshadowing, alterations, the replacement of original elements, anastylosis, and ruins.

Several scholars [4,40,48] argue that the sustainability of a heritage conservation and reuse plan should be assessed and evaluated on three levels of impact: physical, social, and economic. Other scholars advocate for adopting a scientific approach in the assessment and conservation phases that is based on collecting forensic evidence rather than sustainable achievements. Mahmoud [55] conducted an integrated diagnosis and used a mineralogical, chemical, petrographical, and morphological characterization methodology when assessing the historical Al-Shafi'i mosque walls in Jeddah. The author suggests that any conservation action should consolidate the existing artifact using compatible materials and the most appropriate techniques. Moussa [56] argues that heritage deterioration should be estimated based on petrographic findings, wind erosion, salt weathering, temperature, and humidity.

Additionally, mineralogical, chemical, petrographical, and morphological characterization methodologies for investigation and analysis techniques that complement each other should also include visual inspection, optical microscopy (OM), polarizing microscopy (PM), scanning electron microscopy (SEM) using an attached EDX unit, and X-Ray Diffraction (XRD) techniques that are usually applied to architectural buildings to guide conservation interventions. Additionally, Bednarik [57] advocates for adopting a scientific approach in the assessment and conservation phases based on collecting forensic evidence and chemical analyses that date the origin of Saudi Arabian rock art. Usually, scientific analyses

that provide characterizations of materials are conducted in buildings with recognized value to preserve the originality of materials. For buildings of limited value (for example, residential units) and the extended urban fabric of residential villages, the Saudi Arabian government initially promoted a campaign of community involvement to raise inhabitants' awareness of national heritage value as a participatory plan targeting an initial sustainable approach to heritage conservation. Additionally, 3D laser scanning tools, surveys, and analyses are currently under development in many ancient urban villages. Nowadays, Saudi legislation [25] requires that "The building or site shall be maintained, restored and operated in a manner consistent with its nature without altering any of its components except to the extent necessary for the operation" (art. 50), allowing for certain flexibility in their reuses.

In conclusion, there is still a need for a more specific description of the characteristics and possible limitations of adaptive reuse projects concerning heritage sites, particularly in reference to various intervention typologies, especially for urban heritage. Several scholars have recommended the establishment of protocols and a framework of collaboration between ministries and governmental institutions to overcome the gap in legislation relating to built heritage [4,7,49]. A review of the literature highlights a practical knowledge gap [19,24,29,48,50,53] in assessing interventions in urban heritage reuse and evaluating the sustainable strategies adopted by private and governmental institutions. This study aims to fill the gap by providing a practical method for assessing urban heritage interventions and sustainable reuse, which can be adopted by owners, local stakeholders, and professionals in situations where the legislative framework needs to provide further guidance. Through Saudi Vision 2030, the country is trying to achieve a leadership position in sustainable growth in the post-oil era. For this reason, the paper presents a possible methodology for assessing the sustainable criteria and principles adopted in recently completed urban rehabilitation to provide a methodological tool that can be adopted for future research highlighting the importance of a holistic view in the adopted sustainable strategies.

3. Methodology: Comparing and Assessing Sustainable Urban Heritage Reuses in Saudi Arabia

Research into primary and secondary sources—documents, maps, articles, photographs, educational materials, and advertisements—relied on governmental or private institution archives accessible online. This study adopts a mixed methodology based on the review of relevant literature, site visits, and the analysis of documents, maps, images, photographs, databases, and surveys. For selection of the cases studies, we set the following requirements to highlight fundamental similitudes between the urban heritage sites:

- Location: Najd region.
- Adopted construction materials: mud, palm, stone.
- Recent interventions carried out by governmental institutions: partially or entirely preserved or restored.
- Periods of construction and abandonment: established several centuries ago and inhabited until the end of the 1970s.
- Heritage category: urban heritage (including the entire village or a district).

The four selected case studies are the only villages that satisfy all the requested criteria:

- Ushaiger Heritage Village;
- At-Turaif District (Riyadh);
- Rawdat Sudair Village;
- Rughabah Village.

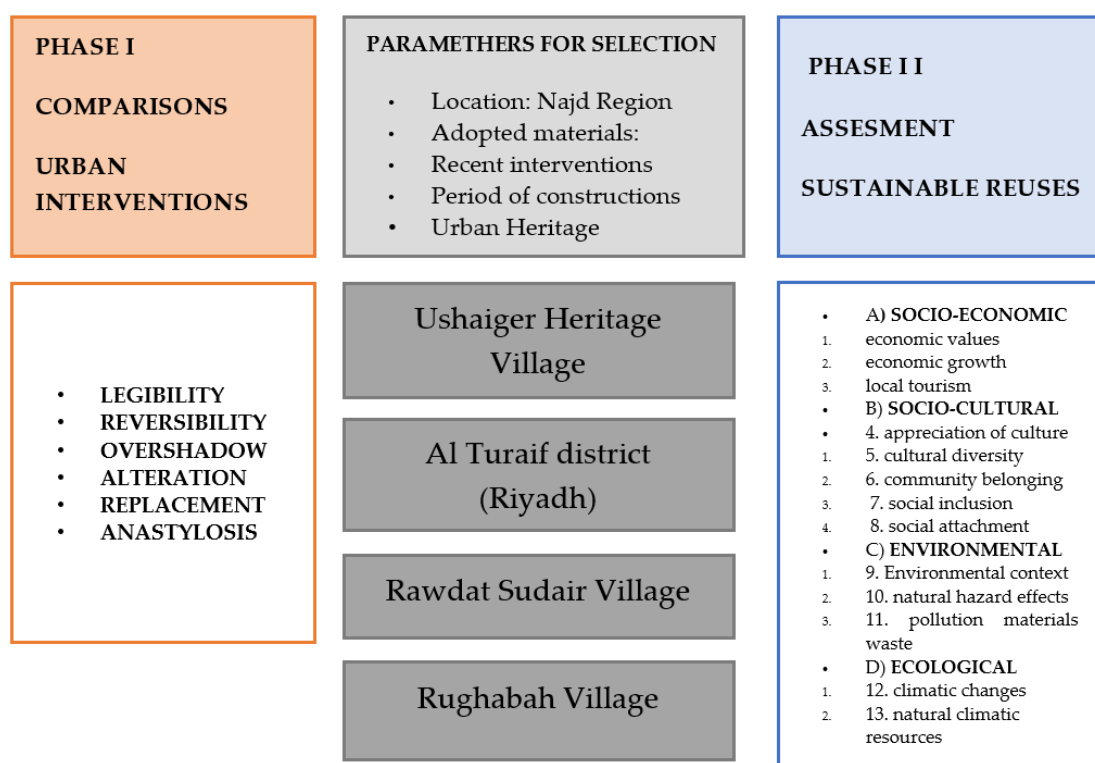
Ushaiger Village is included in the Heritage Commission's list for urban heritage and won the Prince Sultan bin Salman Award for Urban Heritage in 2017. The district of At-Turaif (Riyadh) was included as a UNESCO World Heritage Site in 2010 and is also included in the Heritage Commission's list for urban heritage, while the other two villages, Rawdat Sudair and Rughabah, are known as important touristic heritage sites among locals and international tourists. The condition of rehabilitated urban heritage case studies was

documented during fieldwork through a survey on materials, techniques for intervention typologies, the state of preservation, the state of alteration, and sustainable reuses, which contained information in the following order:

- Name and location of the urban heritage case study;
- History and description, including the urban fabric, the main buildings, and the old techniques and materials adopted for the original construction;
- Date of intervention and the governmental institutions responsible for supervising the work, including community involvement and participation;
- Methodologies adopted for urban heritage interventions;
- Old and new use: analyses and comparisons.

The study was divided into two phases to assess the sustainable reuse of urban heritage. The first step of the study, as shown in Scheme 1, was to understand the completed urban regeneration projects by collecting data to understand and compare the status of preservation of the selected cases studied. Initial evaluation of the urban heritage interventions was based on Bianco's [54] proposed parameters to understand the differences and similitudes between interventions in terms of the following:

- Legibility, which is when the interventions between old and new materials and techniques have the quality of being legible;
- Reversibility, which is the intervention's ability to restore a building and return to its previous condition;
- Overshadowing, which is when the new interventions are more significant when compared to the old structures;
- Alteration, which is any change, modification, or adjustment;
- Replacement, which is when old materials are substituted with new ones;
- Anastylosis and ruins, which occur when interventions on a ruined building reassemble fallen parts and, where necessary, incorporate new materials.



Scheme 1. Methodological framework representing the various phases of the conducted research to assess the sustainable reuses of urban heritage in selected case studies.

The second step of the research was to assess the sustainable reuse of the selected urban case study. During fieldwork, a small area survey was conducted with various participants (instructors, students) and local stakeholders (local community members, visitors, tour guides, and governmental representatives). The sustainable urban heritage reuse assessment methodology was based on the literature review [3,4,7,40,50,58]. One important definition of conservation is protection from the risk of loss that extends heritage value from the past to the future [29,59,60]. The sustainability concept was first adopted in conservation in 1970 [59–61]. Since then, it has held importance in the sustainable agenda promoted by the United Nations [62] and the definition of sustainable reuse in world heritage [51,62]. Sustainability has a broad meaning that incorporates conservation. However, its main aim is to preserve particular resources that mainly relate to four specific areas, called the four pillars of sustainability: social, cultural, economic, and environmental sustainability.

A questionnaire (Scheme 2) was designed for a small area survey to assess the sustainable reuse of urban heritage. The questions were based on the main pillars of social, cultural, environmental, and economic criteria promoted by the United Nations General Assembly [51] and the United Nations Educational, Scientific and Cultural Organization (UNESCO-ICOMOS) [63,64] to compare the selected cases studies and assess how the urban heritage intervention reached different levels of sustainable reuse. The small area survey was conducted by involving different participants into an open access questionnaire (Scheme 2) that was approved by Prince Sultan University's Institutional Review Board (IRB, Approval Letter of Authorization on Research Ethics: PSU IRB-2022-09-0123, dated 1 October 2022).

The survey has adopted the following criteria and principles for assessing sustainable reuses in urban heritage cases studies:

- (A) Socio-economic criterion:
 1. To improve economic values.
 2. To enhance economic growth.
 3. To support local tourism.
- (B) Socio-cultural criterion:
 4. To improve appreciation of culture.
 5. To promote cultural diversity.
 6. To discover community belonging.
 7. To enhance social inclusion.
 8. To enhance social attachment.
- (C) Environmental criterion:
 9. To respect the environmental context.
 10. To reduce the effect of natural hazards.
 11. To reduce pollution and material waste.
- (D) Ecological criterion:
 12. To minimize climatic changes.
 13. For the benefit of natural and climatic resources.

Participant information sheet**Seed Project 112 2022-23 Urban Heritage assessment for sustainable reuses**

Provided in the participant information sheet:

To participate in the study, you must fulfil the following:

- I am aged 18 or older.
- I have visited urban heritage sites in Saudi Arabia.

☐ I consent for my answers to be used in determining research output and all my questions have been answered

☐ I do not consent and would like to end the survey

GENDER

What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

AGE

What is your age group?

NATIONALITY

What is your nationality?

- ☐ Saudi
- ☐ Non-Saudi

EDUCATION STATUS

What is your completed highest level of education?

- ☐ High school or less
- ☐ High school diploma
- ☐ College/Associate or technical degree
- ☐ Bachelor's degree
- ☐ Graduate or professional degree (MA, MS, MBA, Ph.D., JD, MD, DDS, etc.)

EMPLOYMENT STATUS

What is your employment status over the last three months?

- ☐ Employed
- ☐ Unemployed
- ☐ A homemaker or a stay-at-home parent
- ☐ Student
- ☐ Retired

RESIDENCY STATUS

Do you live in a heritage site?

- ☐ I live in a heritage site
- ☐ I don't live in a heritage site

QUESTIONNAIRE

How would you rate the following sustainable criteria and principles in the reuse of urban heritage villages?

☐ 1 very low ☐ 2 low ☐ 3 neither low nor high ☐ 4 high ☐ 5 very high

5= Very high/ 4=High/ 3= Neither low nor high / 2= Low/1=Very low		Reuse of heritage Villages																			
Criterion of sustainability	Principles of sustainability	Ushaiger					At-Turaif					Rawdat					Rughabah				
SOCIO-ECONOMIC CRITERION	Improve economic values	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Enhance economic growth	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Support local tourism	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
SOCIO-CULTURAL CRITERION	Appreciation of culture	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Promote cultural diversity	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Discover community belonging	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Enhance the social inclusion	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
ENVIRONMENTAL CRITERION	Improve social attachment	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Respect environmental context	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Reduce natural hazard	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Reduce pollution and waste	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
ECOLOGIC CRITERION	Minimize the climatic changes	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	The Benefit of Nature and Climate	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

Scheme 2. Questionnaire designed for a small area survey that includes a participant information sheet with the requirements for participation and some demographic data. The second part includes the assessment criteria and principles for sustainable urban heritage reuses. The scale spans between 5 and 1; 5 = very high, 4 = high, 3 = neither low nor high, 2 = low, and 1 = very low. The questionnaire was mainly provided to heritage village residents in order to collect feedback from the users.

3.1. Assessing Sustainable Heritage Reuse Intervention in Saudi Arabia

3.1.1. Ushaiger Village

Name and location: Ushaiger Heritage Village is located in the heart of the Najd region near Shaqra, about two hundred kilometers northwest of Riyadh, the capital of Saudi Arabia. Ushaiger's name refers to Mount Ushaige, located north of the village.

History and description: The history of Ushaiger dates back about 1500 years; it was a pilgrims' resting place on their pilgrimage route to Mecca. The village was a well-known destination due to its richness, both in terms of natural resources and water springs. The urban fabric of Ushaiger (Heritage Commission, 2021) consists of buildings surrounding a main rectangular square; to its west is the Aljamia Mosque, and to its east is a group of shops and public services, including lofts, animal shelters, visitors' accommodation, and schools. Residential areas are connected to the central square by arterial roads (Figure 1). The village is surrounded on all sides by a wall with a circumference of more than four kilometers. The walls have many towers to protect the city, as well as four main gates and several wells to serve houses and irrigate agricultural lands, which are mostly planted with palm trees. The dense urban tissue contains the main family dwelling, while the family farms are in agricultural areas. In the city center is a Souq called Majlis, which nowadays has several shops selling local crafts and one museum house.



Figure 1. Aerial view of the village showing the central square with arterial roads. Residential houses and surrounding agricultural lands where several buildings are still in need of restoration are located in the center (source <https://heritage.moc.gov.sa/en/points-of-interest/ushaiger-heritage-village>, retrieved 17 April 2023).

The village buildings are constructed with clay walls (Figure 2) over the foundations of courses of limestone (Madameek). Roofs are constructed with palms or tamarisk trunks.

Date and institutions: The urban rehabilitation project was completed in 2017 under the supervision of the Saudi Commission for Tourism and National Heritage, and the village received the Prince Sultan bin Salman Award for Urban Heritage in appreciation of the local community's success in its revival and their investment in the village. As an example of best practices in urban heritage preservation, the village became part of the Urban Heritage Training Program held by the Al-Turath Foundation between 2011 and 2017. The Saudi Commission for Tourism and National Heritage and the Custodian of the Two Holy Mosques Cultural Heritage Program presented the intervention. Accord-

ing to the document, Abdullah Bin Muhsin Al Mughaira, head of the Ushaiger Center, initiated the restoration project supported by external funding from business investors. Five entities were involved during the restoration work: the Village Restoration Committee, supervised by Al Mughaira; homeowners, responsible for restoring facades, house doors, roofs, mosques, and interiors; the Saudi Commission for Tourism and National Heritage (SCTNH), responsible for the restoration of a portion of the external wall; Ushaiger Municipality, responsible for village rainwater drainage, paving, and lighting for roads and alleys; and the Social Development Committee, responsible for providing opportunities for micro-enterprise.



Figure 2. Ushaiger Village alleys after recently completed restoration work that included the replacement of stone tiles on floors, mud plaster on external walls, and main wooden doors and windows. The interventions respect the traditional style of Najd architecture. Some areas still in need of additional interventions are visible (source: authors).

Methodologies: interventions completed before 2018 provided about one hundred restored houses equipped with furniture, water, electricity, and hospitality services.

The field survey revealed that a general restoration strategy was adopted to restore the main alleys, which changed vertical and horizontal elements to recreate the traditional atmosphere of the alley while keeping the wall's ruins hidden behind (Figure 2). The following interventions can be listed: replacement of stone tile pavement along the walking paths, recovery of vertical walls with mud plaster and stone tiles, replacement of the decorated wood doors in main entrances following the traditional typology, and replacement of roofs visible from the streets. The restored residential utilities are currently in excellent condition. The assessment of interventions reveals that the legibility of old and restored parts is not visibly remarkable on-site, showing that the reversibility of interventions is reduced to a minimum. The intervention has respected the traditional urban heritage fabric by using new materials and finishings that are very similar to the old ones, reducing the overshadowing effect to a minimum. Replacing the original parts, including facades, plasters, roofs, doors, and floor tiles, is significant. However, traditional materials and techniques for construction have been adopted. The anastylosis approach is minimal, and many original ruins still need to be preserved, which are usually hidden behind the main facades.

Old and new use: The original uses of the village, mainly residential and commercial, changed after the restoration work. Nowadays, Ushaiger Village is ready to welcome visitors and tourists with a traditional restaurant, a local market, and three private museums and is a well-known touristic attraction with sustainable economic and social reuses that promote local investment for the benefit of the local community.

Private properties are regularly maintained by owners, who promote the village's architectural heritage by inviting tourists for visits. Visitors can freely access the heritage village and explore the local museum, the restored private houses that open to the public, valleys, mosques, water systems, and agricultural fields, thus experiencing the living conditions of an ancient Najd village. There is a guest house with a few rooms and facilities such as a cafeteria, restaurant, and bathroom. The restorative approach has produced more flexible building reuse by promoting socio-cultural aspects and valorizing environmental and ecological elements while promoting economic principles and local investment.

3.1.2. At-Turaif District (Riyadh)

Name and location: The district of At-Turaif is located northwest of Riyadh and is a satellite district that has been incorporated into the modern city over the last few decades (Figure 3). The settlement was the first capital of the Al Saud dynasty founded in the 15th century. It became the political, religious, and economic heart of the Najd region and, progressively, the peninsula.

History and description: Diriyah is relevant to Saudi history for being a remarkable example of human adaptations to the desert environment within the oasis of the Wadi Hanifa Valley [65]. Morphologically, the citadel presents fortified defensive walls surrounding a packed urban tissue that contains institutional, educational, commercial, and private buildings. Salwa Palace was the heart of the First Saudi State's political, administrative, and religious power. The At-Turaif mosque is located close to it, which was the great mosque of the state; previously, it was connected to Salwa palace by a roofed bridge to facilitate mobility. There are eight more palaces: Prince Turki bin Saud Palace, Prince Thunayan bin Saud Palace, Prince Meshari bin Saud Palace, Imam Abdullah bin Saud Palace, Prince Fahad bin Saud Palace, Prince Ibrahim bin Saud Palace, Prince Saad bin Saud Palace, and Prince Omar Bin Saud Palace. Finally, six museums can also be found: the Diriyah Museum, the Arabian Horse Museum, the Military Museum, the Museum of Traditional Architecture, the Social Life Museum, the Sibat Modhi, and Bait Al Mal.



Figure 3. Aerial view of At-Turaif and Buajiri showing a pedestrian bridge connecting the two areas, pedestrian access to At-Turaif, and vehicular access to Buajiri (source: <https://dgda.gov.sa/our-destinations/at-turaif.aspx>; retrieved 17 April 2023).

Date and institution: A diachronic study on the site’s heritage conservation and development plans [58] divided its history into three periods: before 2010, between 2010 and 2017, and after 2017 until the new opening in December 2022. The settlement was abandoned and neglected until 1976, when it was defined as an antiquity and consequently protected by the “Antiquity Act” (1972) [9]. The site was under the Arriyadh Development Authority (ADA) from 1986 until 2016, and it was officially listed as a World Heritage UNESCO site in 2010. In 2017, under the Saudi Vision 2030 (2016) program, the Diriyah Gate Development Authority (DGDA) was supervised by the chair of the board, Prince Mohammed bin Salman bin Abdulaziz, the crown prince and prime minister of Saudi Arabia.

Methodologies: During the intervention period, the ADA [58–66] developed and enforced several conservation and protection plans (in 1988, 2000, 2012). Dr. Mahmoud Bendakir [67], who worked on the site as a heritage expert from the submission of the UNESCO nomination file through to the implementation of the ADA’s conservation, restoration, and adaptive reuse plans, argues that the conservation measures and guiding principles used in historic Diriyah between 2012 and 2015 abide by the Operational Guidelines for the Implementation of the World Heritage Convention, respecting three criteria: being non-intrusive; ensuring reversibility; and using original materials and traditional techniques (Figure 4). After the completion of conservation work, the ends of vertical walls had been sealed with plaster, showing a loss of integrity and making the intervention both legible and reversible. Any additions motivated by international standards for site circulation, security, and comfort were made so that contemporary materials are visually recognizable from originals, such as metal, glass, or textiles. Where possible, new partial additions allow for visual contact with the remaining materials, which is often achieved through the use of glass floors or perforated metallic surfaces that allow the walking path beneath to be seen, thus preventing the archeological remains from being overshadowed. Replacement of original materials and anastylosis are partially adopted to preserve ruins and integrate them with new materials.



Figure 4. At-Turaif Al Sawa Palace after the completion of the conservation project in December 2022 (source: authors).

Old and new use: Nowadays, the At-Turaif area is an open-air museum. Visitors are welcomed at the Visitor Center by a tour guide responsible for the group assigned, who are then led through the main gate along Salwa Palace and toward other relevant stations. Visitors are introduced to museum exhibitions, where signs, videos, and audio-visual installations are found at each stop. Staff members are available to provide information, and at the end of the visit, tourists can enjoy the view from At-Turaif to Bujairi and the Wadi Hanifa Valley. The adaptive reuse plan operates at an urban and architectural scale with several buildings open to the public, including the visitor center, Salwa Palace, At-Turaif Mosque, and all of the traditional palaces (Prince Turki bin Saud Palace, Prince Thunayan bin Saud Palace, Prince Meshari bin Saud Palace, Imam Abdullah bin Saud Palace, Prince Fahad bin Saud Palace, Prince Ibrahim bin Saud Palace, Prince Saad bin Saud Palace, and Prince Omar Bin Saud Palace). The site includes various museums with exhibitions that showcase the area's history, including the Diriyah Museum, the Arabian Horse Museum, the Military Museum, the Museum of Traditional Architecture, the Social Life Museum, the Sibalat Modhi, and Bait Al Mal. The Diriyah Development Program includes guidelines to regulate local community participation and thus ensure continuity in development due to community reception and engagement.

3.1.3. Rawdat Sudair Village

Name and location: Rawdat Sudair Village is approximately 150 km from Riyadh in the Sudair region, Najd province.

History and description: In the past, the settlement was significant due to its agricultural production of grains and dates (Figure 5). The inhabitants abandoned it in the middle of the 1980s when the government provided new residential units.



Figure 5. Rawdat Sudair Village. Remains of old houses still in need of preservation located close to agricultural land with palm orchards (source: authors).

The village has a museum, a well, private residences, and a mosque. Parts of the urban tissue are still in bad condition, with safety reasons preventing their use.

Date and institution: Restoration work was carried out under the supervision of the Saudi Commission for Tourism and Antiquities (SCTA) between 2005 and 2015. The local owners financed the intervention to rehabilitate their properties, which, after being subjected to abandonment for years, were badly preserved, thus jeopardizing their integrity and originality. The public initially conceived the conservation and adaptive reuse plan in collaboration with the private sector. Rawdat Sudair is an extraordinary example of collaboration between the local community and the government [13].

Methodologies: A governmental institution started work during the first phase of conservation around Al-Dakhlah Mosque (Figure 6), while inhabitants and private owners restored walls, pathways, buildings, doors, and the ceilings of the mosque, intending to reuse the abandoned structure. Many new contemporary mosques were built around this heritage area without considering the possibility of restoring the ancient existing buildings and restoring the damaged ones. Rawdat Village inhabitants aimed to reuse their old mosque to bring it new life. The interventions were carried out by Saudi companies with experience in heritage restoration, who integrated missing parts with local materials and enhanced the value of the traditional Najd architectural style. The restoration preserved the traditional characteristics of the mosque, preserving and integrating parts of ornamental stuccos, the traditional wooden roof, and the courtyard. The work was completed in recent years and lasted from 2003 to 2015. The conservation efforts were extended to private residential buildings subjected to loss and collapse (Figure 5). A few of the buildings located near the main gate to the village are now entirely renovated and accessible; unfortunately, the buildings are facing an urban void due to numerous collapses that have caused substantial changes to their original identity. The legibility of the restoration inter-

vention is minimal since differences between old and new structures are not visible, and the reversibility of the approach is consequently minimal too. Facades, roofs, doors, and pavements have been rebuilt using traditional materials and techniques to enhance past values during the restoration work. Many additions and alterations have been requested to repair collapsed buildings in bad states of preservation. The anastylosis process was minimally applied, and many ruins are still hidden behind the main facades. Nowadays, many residential buildings need urgent intervention to avoid the risk of collapse. The restored buildings in Rawdat Sudair are private property, so their preservation is linked with the daily maintenance of inhabitants.



Figure 6. The Marqab Surveillance Tower in Rughabah Village (source: authors).

Old and new use: Today, the site is a residential village with commercial activities and a museum to promote tourism. It is managed by private owners who welcome locals and foreign tourists during weekends or holidays. The visitors can enjoy the tangible and intangible heritage offered by the local community: visiting the village, exploring the spaces of the renovated Majlis, and drinking Arabic coffee or tea with locals with the aim of learning traditional values and exchanging cultures.

3.1.4. Rughabah Village

Name and site location: Rughabah Village is located northwest of Riyadh in the Najd region, about 130 km northeast of the Saudi Arabian capital.

History and description: The urban growth of Rughabah can be traced back to 1669 [68]. In the following centuries, the urban tissue developed into three districts: the Al-Bilad, Al-Hazm, and Nab'a quarters. After that phase, floods and governmental campaigns contributed to the community moving from mud vernacular houses into new contemporary buildings. As a consequence, the abandoned areas were neglected and progressively ruined. In the case of Rughabah, new development quarters and old districts are intertwined in the urban tissue. Episodes of renewal in the historic fabric are limited to major tourist

attractions such as the Al Marqab Surveillance Tower (Figure 6). The tower was used as an observation point. It is located southwest of the city. It was built in the 19th century as part of the security system of the historic town to protect the inhabitants from foreign attacks.

Date and institution responsible: The surveillance tower was restored three times: first in 1974, by the governor of the Riyadh region, second in 1996, under the sponsorship of Sheik Abdul Rahman Al Jeraisy, and finally in 2018, under the supervision of the Saudi Commission for Tourism and National Heritage. It is currently in a good state of preservation.

Methodologies: The surveillance tower was constructed with traditional mud bricks, as well as wooden structural elements for the helicoidal staircase that allows the highest level of the building to be reached. Restoration work adopted traditional materials and techniques to preserve the culture's values without overshadowing the existing ones. The legibility of old materials and new interventions is minimal since the new ones are very similar to the old ones, and the reversibility approach is minimal. Due to past damage, the tower structures were reinforced to allow visitors to enter, and some alterations and additions were mandatory to reach the safety conditions required for the visitors' expected level of experience. Unfortunately, the ancient village close to the tower is in a bad state of preservation. Many buildings are partially or totally collapsed and exposed to damage due to the environment and climate. The ancient construction materials and traditional techniques are visible on the abandoned buildings, including mud bricks and wooden elements used for structure and finishing (staircases, doors, windows, roofs, and porticos); these elements still need a main rehabilitation project.

Old and new uses: The village is nowadays still abandoned; however, the residential buildings are close to the restored tower and are well known as an important heritage site. Visiting the tower daily and during weekends is possible since the structures are accessible. The very important remains of Al Jeraisy Castle, located close to the tower, stand as a memory of a glorious past, showing only part of the foundation of the walls. The area is an open-air museum that attracts many local and international tourists every year.

4. Results and Discussion

This study compares the four case studies based on their urban characteristics, the recently completed interventions, the governmental institution responsible for supervising the work, the categories of intervention, and old and new uses, all of which is summarized in Table 1.

Table 1. The comparison between case studies is organized based on the date of intervention, governmental institutions responsible for the supervision of the work, the list of heritage sites, categories of interventions, and comparisons between old and new uses (source: authors).

Name	Date/Site Intervention	Institution Responsible	UNESCO WHS	Saudi Commission List	Categories Intervention	Old Use	Reuse
Ushaiger Village	2018 Ushaiger	Saudi Commission for Tourism and National Heritage (SCTNH)	Not listed	Listed heritage locations www.heritage.moc.gov.sa (Accessed on 17 April 2023)	Urban heritage Restoration	Residential	Residential Commercial Museum
At-Turaif District	2009 Diriyah (Riyadh)	Diriyah Gate Development Authority (DGDA)	Listed	Listed heritage locations www.heritage.moc.gov.sa (Accessed on 17 April 2023)	Archaeological urban heritage Conservation	Residential Government	Open-air museum
Rawdat Sudair Village	2003–2015 Rawdat	Saudi Commission for Tourism and Antiquities (SCTA)	Not listed	Not listed	Urban heritage Restoration	Residential	Residential Commercial Museum
Rughabah Village Al Marqab Surveillance Tower	2018 Rughabah	Saudi Commission for Tourism and National Heritage (SCTNH)	Not listed	Not listed	Urban/architectural heritage Restoration	Residential	Museum of the tower

The research methodology presents the subdivision of data collection in two parts, with the first focused on understanding urban heritage interventions and the following main characteristics:

- Name and location;
- History and description;
- Date of intervention and the involvement of governmental institutions or the community;
- Methodologies adopted;
- Old and new uses.

The collected qualitative data include a preliminary understanding and initial assessment of methodologies for interventions, the uses of materials, and the techniques investigated by considering the parameters of legibility, reversibility, overshadowing, alterations, the replacement of original elements, anastylosis, and ruins, thus leading to a better understanding of differences and similitudes between cases studies. For comparing the diverse interventions, we transformed the qualitative data collected during the field surveys (organized in Table 2) and then translated them into a quantitative numeric scale with values from 1 to 5, corresponding to the following:

- Value 5 = Total (100%–75%);
- Value 4 = Significant (75%–50%);
- Value 3 = Partial (50%–25%);
- Value 2 = Minimal (25%–5%);
- Value 1 = Absent (0%).

Table 2. Assessment of the parameters of urban heritage intervention case studies (legibility, reversibility, overshadowing, alteration, replacement, anastylosis) showing similitudes and differences in the adopted methodologies (source: authors).

Parameters and Values		Cases Studies		
5 = Total (100%–75%) 4 = Significant (75%–50%) 3 = Partial (50%–25%) 2 = Minimal (25%–5%) 1 = Absent (0%)		Ushaiger Village	At-Turaif District	Rawdat Village
		Rughabah Village		
Approach	Restoration	Conservation	Restoration	Conservation
Legibility	Minimal: Old and new interventions are not legible.	Total: Old fabric and new interventions are legible.	Minimal: Old and new interventions are not legible.	Minimal: Old and new interventions are not legible.
Value	2	5	2	2
Reversibility	Minimal: Not reversible.	Total: Reversible.	Minimal: Not reversible.	Minimal: Not reversible.
Value	2	5	2	2
Overshadowing	Minimal: Original values are preserved.	Minimal: Original values are preserved.	Minimal: Original values are preserved.	Minimal: Original values are preserved.
Value	2	2	2	2
Alteration	Significant: Many elements have been added and removed.	Minimal: Most of the originals have been preserved without alteration.	Significant: Many elements have been added and removed.	Significant: Many elements have been added and removed.
Value	4	2	4	4

Table 2. Cont.

Parameters and Values		Cases Studies		
5 = Total (100%–75%) 4 = Significant (75%–50%) 3 = Partial (50%–25%) 2 = Minimal (25%–5%) 1 = Absent (0%)		Ushaiger Village	At-Turaif District	Rawdat Village
				Rughabah Village
Approach	Restoration	Conservation	Restoration	Conservation
Replacement	Significant: Walls, roofs, doors, and floors are replaced using traditional materials and techniques.	Minimal: Walls, floors, and finishing have been fully preserved.	Significant: Walls, roofs, doors, and floors are replaced using traditional materials and techniques.	Partial: Al Marqab Surveillance Tower—walls, roof, doors, staircase, and floors partially replaced using traditional materials and techniques.
Value	4	2	4	3
Anastylosis and ruins	Partial: Ruins are preserved in part and, where possible, stored behind facades.	Partial: Anastylosis applied partially. The ruins are preserved and integrated into the open-air museum.	Partial: Ruins are preserved in part and, where possible, stored behind facades.	Minimal: Al Marqab Surveillance Tower—the remaining village ruins are not preserved and are exposed to environmental risks.
Value	3	3	3	2

The district of At-Turaif presents legible and reversible interventions on the old urban fabric and buildings; the original values are preserved, alteration and replacement of the original materials is minimal, anastylosis is partially applied, and the ruins are preserved and integrated into the open-air museum. Ushaiger, Rawdat, and Rughabah offer a different picture: the old and the new interventions could be more legible, although the use of new materials that are very similar to traditional ones has enhanced the value of the Najd architectural style. Most of the interventions in Ushaiger, Rawdat, and Rughabah are irreversible. The original value of the urban tissue and buildings is preserved but alterations are significant, with ruins not very well protected; these ruins are sometimes hidden behind facades and exposed to environmental risks.

The results show that the most conservative approach in the case studies was used in the district of At-Turaif. The district has been entirely preserved and has the highest score regarding minimal and conservative intervention that refers strictly to the World Heritage Site guidelines; the entire district is an open-air museum. Ushaiger has adopted a more restorative approach, although some structures still need preservation. Transformations and alterations provided a good level of flexibility and adaptation to users' needs since the village offers a variety of options, such as guest houses, a cafeteria, museums, restaurants, mosques, and shops where tourists can enjoy tangible and intangible heritage. Rawdat and Rughabah adopted a similar restorative approach. However, the intervention was limited to only a few buildings, such as the mosque and residential houses in Rawdat and the surveillance tower in Rughabah. Although the restorative approaches have provided flexibility in terms of heritage reuse, the results have produced different achievements in Ushaiger, which is nowadays considered one of the main touristic attractions due to its many available functions on-site. Results of the small area survey assessing the sustainable criteria of interventions are summarized in Table 3.

Table 3. Results of the small area survey conducted to assess sustainable heritage projects in Saudi Arabia.

5 = Very High/4 = High/3 = Neither Low Nor High/2 = Low/1 = Very Low		Villages			
Areas of Sustainability	Principles of Sustainability	Ushaiger	At-Turaif	Rawdat	Rughabah
Socio-Economic Criterion	Improve economic values	5	5	4	1
	Enhance economic growth	4	5	3	1
	Support local tourism	5	5	4	3
Socio-Cultural Criterion	Appreciation of culture	5	5	4	2
	Promote cultural diversity	5	4	5	2
	Discover community belonging	5	3	4	1
	Enhance social inclusion	5	4	4	1
Environmental Criterion	Improve social attachment	5	3	5	1
	Respect environmental context	5	5	4	3
	Reduce natural hazards	5	5	3	3
	Reduce pollution and waste	4	5	3	2
Ecologic Criterion	Minimize climatic changes	5	5	3	3
	Benefits of nature and climate	5	5	3	3

Comparison among the case studies regarding the social impact of the heritage site interventions in terms of socio-cultural criteria and community belonging reveals that Ushaiger is of a very high level for all principles, enhancing the personal feeling of belonging to a community, social attachment, and the appreciation of cultural values. Every weekend, the descendants of the local families open houses, shops, mosques, restaurants, and museums to welcome visitors and tourists. The village has taken part in several editions of the Al-Turath training program on Saudi heritage. Therefore, Ushaiger has the highest score (Table 1). Assessment of the socio-cultural impact of heritage villages shows that Rawdat has a good score because the village is a live tourist attraction. However, the village buildings still need more intervention and involvement from the community, and the socio-cultural principles could also be enhanced. For At-Turaif, the collected data for socio-cultural principles indicate a high score, showing how conserving traditional buildings, materials, techniques, and cultural values can enhance social inclusion and social appreciation of culture, thus increasing the feeling of community belonging. However, social attachment can be improved. Rughabah's score is average-low due to the limited restoration work that has only been completed at the architectural level and the few socio-cultural activities that can be further developed. The economic criteria and principles assessment highlights that the district of At-Turaif has excellent economic revenue based on the huge achievements in economic growth and the support for local tourism and sustainable heritage reuses. Both Rawdat and Rughabah achieved an average score on environmental and ecologic criteria and principles since the remaining abandoned buildings still need to be taken into consideration, indicating that the principles of respect for environmental context and the benefits of natural resources could be improved in the future. The synthetic comparison between environmental, ecologic, and economic factors shows that Ushaiger and At-Turaif achieved the best results. At the same time, Rawdat and Rughabah could improve to achieve a sustainable heritage conservation and reuse model.

Rughabah in particular could revise socio-cultural and socio-economic aspects, and At-Turaif could enhance the level of social attachment to socio-cultural values. Rughabah should upgrade most of the criteria to have more interventions that are capable of enhancing sustainable strategies in reuse. Nevertheless, the data show that best practices have been adopted for the Ushaiger and At-Turaif cases due to all principles having high scores. Results show a recurrent pattern in the heritage reuse strategies adopted. The strategy used by Ushaiger and Rawdat accomplished a remarkable result in terms of socio-cultural criteria, and the strategy used in At-Turaif performs very well in terms of environmental and economic factors. More flexibility in reuses with a restorative approach can produce more social involvement. In contrast, the conservative approach, such as the limited function of a museum, attracts mainly visitors and allows for less flexible reuse.

The study's limitation to four cases does not allow us to further determine the variables of those two models of sustainable heritage reuse.

The state of preservation in urban heritage was limited to the four selected case studies and only four adopted methodologies, with the involvement of governmental institutions responsible for the supervision of the work. The variables could be implemented with additional case studies and comparisons, thus providing more combinations between case studies. This study should be extended to other heritage sites in Saudi Arabia to provide more data comparisons and case studies.

More research and assessment should be conducted on Saudi Arabia's heritage to interpret sustainable variables in heritage reuse.

5. Conclusions

This paper explores the sustainability of adaptive reuse strategies in four urban Saudi heritage sites in the same geographical area. The examination concerns four ecological, environmental, social, and economic criteria. The study argues that at least two different models of adaptive reuse can be related to the entity promoting the project. Each model has pros and cons; therefore, each model has best practices and improvable indicators. The paper concludes that the sustainable development model of any Saudi heritage site should achieve a good level for all four criteria related to the above principles to be considered sustainable.

The investigation has pointed out some open issues that could lead to new streams of research crucial in defining the new agenda for Saudi heritage under Saudi Vision 2030. Possible topics for future studies include the collection of all urban heritage sites under a unified assessment frame, surveys of local stakeholders concerning the sustainable heritage reuse of a site, the development of guidelines for interventions on historical buildings, the development of a community engagement strategy for governmental projects, the development of an economical–environmental plan for community-based projects, and the development of a monitoring system for all conservation/adaption projects in the Kingdom of Saudi Arabia. In conclusion, this research has contributed to filling a knowledge gap in the literature by providing a possible methodology for assessing the sustainable reuse of heritage villages in Saudi Arabia. The approach was based on comparing four selected case studies of urban heritage villages in terms of sustainable reuses after the completed restorative interventions. The paper aims to initiate a good practice example that can be adapted for other analyses and promote a consistent scientific methodology in urban rehabilitation projects.

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