CONSERVATION OF HERITAGE BUILDING FAÇADE; THE CASE STUDY OF TRADITIONAL TOWER HOUSES IN OLD SANA'A, YEMEN

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CONSERVATION OF HERITAGE BUILDING FAÇADE; THE CASE STUDY OF TRADITIONAL TOWER HOUSES IN OLD SANA'A, YEMEN

by

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LIST OF ABBREVIATIONS

UNESCO	The United Nations Educational, Scientific and Cultural Organization.
GOPHCY	General Organization for the Preservation of Historic Cities in Yemen
ICOMOS	The International Council on Monuments and Sites
OUV	Outstanding Universal Value
UNDP	United Nations Development Programme
USM	Universiti Sains Malaysia
WHC	World Heritage Convention
WHS	World Heritage Site
NGO	Non-Governmental Organization

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Appendix A Interview questions

PEMULIHARAAN FASAD BANGUNAN WARISAN: KAJIAN KES RUMAH MENARA TRADISIONAL DI BANDAR LAMA SANA'A, YAMAN.

ABSTRAK

Rumah menara tradisional di Sana'a Lama yang terletak dalam Tapak Warisan Dunia UNESCO, Yaman kini diancam arus permodenan akibat perubahan yang tidak terkawal. Perubahan ini, seringkali didorong oleh kurangnya garis panduan yang jelas dan keupayaan instiusi berkaitan, menjejaskan keaslian dan nilai budaya bangunan tersebut. Kajian ini menyiasat hubungan kait antara keaslian dan perubahan dalam konteks pemuliharaan fakad bangunan rumah menara. Melalui metodologi kualitatif, kajian ini menggunakan tiga kajian kes rumah menara yang telah menjalankan proses pemuliharaan serta dilengkapi dengan temubual bersama pakar pemuliharaan warisan. Kajian memberi fokus kepada nilai ketulenan yang terdapat pada fakad bangunan, seperti bahan binaan, elemen reka bentuk, dan hubungannya dengan fabrik bandar. Kesemuanya dikenal pasti dan dianalisis. Kajian ini mendedahkan walaupun potensi pemuliharaan untuk pengukuhan semula bangunan, namun mempunyai risiko keatas keaslian jika tidak diurus dengan baik. Cabaran seperti ketiadaan garis panduan yang jelas, keupayaan institusi yang terhad, dan kurangnya kesedaran awam ditekankan dalam kajian ini. Berdasarkan penemuan, kajian ini mencadangkan garis panduan pemuliharaan yang komprehensif perlu memberi penekanan kepada beberapa kriteria penting iaitu keaslian, penggunaan bahan, teknik tradisional, keserasian fungsi dengan penggunaan baharu dan penglibatan masyarakat. Kajian ini seterusnya menyarankan kepada pihak pembangun polisi untuk membimbing amalan pemuliharaan yang baik termasuk meningkatkan kesedaran dalam kalangan masyarakat, akhirnya menyumbang kepada pemeliharaan lestari warisan seni bina unik Sana'a Lama.

CONSERVATION OF HERITAGE BUILDING FAÇADE; THE CASE STUDY OF TRADITIONAL TOWER HOUSES IN OLD SANA'A, YEMEN

ABSTRACT

Old Sana'a's traditional tower houses, a UNESCO World Heritage Site, face ongoing threats from unregulated alterations and modern construction practices. These changes have compromised the buildings' authenticity and cultural significance, highlighting the need for a comprehensive approach to heritage conservation. This study investigates the relationship between authenticity and conservation interventions in the context of tower house façade preservation. Employing a qualitative methodology, this research delves into three case studies of tower houses that have undergone recent alterations, supplemented by interviews with heritage conservation experts. Fundamental authentic values embedded in the façades, such as material choices, design elements, and their relationship to the urban fabric, are identified and analysed. The study examines the extent to which conservation interventions have impacted these authentic values and evaluates their effectiveness in preserving the cultural heritage of Old Sana'a. Challenges such as the absence of clear guidelines, limited institutional capacity, and a lack of public awareness are underscored. Based on these findings, the research proposes a comprehensive conservation guideline that prioritises the preservation of authenticity. This guideline emphasises using traditional materials and techniques, carefully assessing proposed interventions, and robust community engagement. These recommendations aim to inform policy development, guide conservation practice, and raise public awareness, ultimately contributing to the long-term safeguarding of Old Sana'a's unique architectural heritage.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The preservation of traditional tower houses in Old Sana'a, Yemen, is a critical endeavour, primarily focusing on conserving their main façades. However, these structures face increasing threats from pressures of modernisation and unregulated alterations. Poorly planned and unauthorized changes have damaged these tower houses significantly. These changes often involve disregarding the historical significance of these structures and neglecting their structural stability. The introduction of incompatible modern materials, changes to the original spatial layout, and a lack of consideration for traditional practices and environmental factors have further compounded the issue (Haidar & Talib, 2015). This compromises the authenticity and architectural integrity of these structures and erodes the cultural heritage they represent.

1.2 UNESCO's Recognition of Old Sana'a's Outstanding Universal Value

Old Sana'a, a Yemeni city in a mountain valley, boasts a unique architectural landscape dominated by towering stone and burnt brick structures adorned with intricate geometric patterns (Soltanzadeh & Moghaddam, 2015). This distinctive cityscape, a testament to centuries of cultural evolution and architectural ingenuity, led to its inscription as a UNESCO World Heritage Site in 1986.

UNESCO's recognition is not solely based on aesthetic appeal but on the city's fulfilment of three critical criteria (Al-Ahnomi, 2021):

1. Criterion (iv): Outstanding Example of an Architectural Ensemble: Sana'a's architectural ensemble, particularly within its partially

preserved walls, exemplifies the spatial organisation characteristic of early Islam. The city's layout, with its narrow streets, bustling markets, and towering houses, reflects a harmonious blend of functionality and aesthetic sensibility. This architectural homogeneity, maintained over centuries, underscores a deep-rooted cultural continuity and respect for tradition.

2. Criterion (v): Traditional Human Settlement: Sana'a's traditional tower houses, while vulnerable to modernization, are more than just dwellings. They are cultural artefacts that embody the city's rich heritage and showcase the exceptional mastery of Islamic architecture and urban planning. These multi-storied structures, built primarily from rammed earth and brick, are functional living spaces and expressions of artistic creativity and ingenuity.
3. Criterion (vi): Association with the Spread of Islam: Sana'a holds a significant place in Islamic history due to its direct association with the early spread of Islam. The Great Mosque of Sana'a, reputedly built during the lifetime of the Prophet Muhammad, stands as a testament to the city's pivotal role in the propagation of the faith. This historical connection, along with other religious and cultural landmarks, underscores Sana'a's importance in the spiritual and intellectual life of the Islamic world.

1.3 Historical and Cultural Significance of Old Sana’a, Yemen

Old Sana'a, nestled within the modern capital of Yemen, is a living testament to a rich and layered history that stretches back over two millennia (Figure 1.1). While

its origins are shrouded in legend, archaeological evidence points to human activity in the area as early as 1.6 million years ago, during the Old Stone Age (Lamprakos, 2016). Regardless of its precise founding, Sana'a's strategic location, nestled in a mountain valley at an elevation of 2,350 meters above sea level, played a pivotal role in its development as a significant centre of trade and political power (Al-Warafi, 2019). As depicted in Figure 1.1, this location allowed for control of crucial trade routes between the kingdom of Sheba in Marib and the Red Sea port of Tihama, fostering economic prosperity and cultural exchange in the second millennium BC.

Figure 1.1 Map of Sana'a, Yemen. Adapted from Yemen Presentation Map, by Netmaps, n.d. (https://www.netmaps.net/digital-maps/yemen-presentation-map/)

The historical evolution of the city can be broadly divided into three phases (Soltanzadeh & Moghaddam, 2015):

1. Pre-Islamic Period (910 BC - 525 AD): This Era saw the construction of the Ghamdan Palace, a monumental structure that catalysed the city's

growth and expansion. The city was fortified with a clay wall, and four main gates (Bab al-Yemen, Bab Shaoub, Bab al-Sabah, and Bab Satran, as seen in Figure 1.2), and the Al-Qalis Church was established, marking a period of Christian influence.

2. Islamic Era (627 AD - 1229 AD): Sana'a continued to expand and prosper during the Umayyad and Abbasid periods, with the construction of the Great Mosque in 627 AD. The city's borders expanded significantly, reaching a population of 70,000 houses during the reign of Caliph Haroun al-Rashid. The Sulayhid dynasty further strengthened the city's infrastructure by restoring the city walls and adding seven new entryways.
3. Ottoman Era (1547 AD - 1629 AD): The Ottomans, who ruled Yemen briefly, built a new neighbourhood, Bir al-Azab, expanding the city to the west. They also fortified this new area with a wall and towers, mirroring the original Old City's defences. The Ottomans expanded the palace-fortress and constructed the Al-Bukayriyah Mosque, adding to the city's architectural diversity.

The tower houses of Old Sana'a, as illustrated in Figure 1.2, with their distinctive architectural style and construction techniques, are a defining feature of the city's cultural landscape. These multi-story structures, built primarily of rammed earth and burnt brick, are adorned with intricate geometric patterns and decorative elements, showcasing the ingenuity and artistry of Yemeni builders. They are not merely dwellings; but a testament to the city's rich history, cultural traditions, and unique way of life (Attia, 2022). Figure 1.3 highlights the significant percentage of tower houses

(73%) in Old Sana'a, reflecting their cultural and historical importance in the city's landscape.

Figure 1.2 Old Sana'a (South Gate). Retrieved from https://yemenat.net/?s=old+Sana%27a

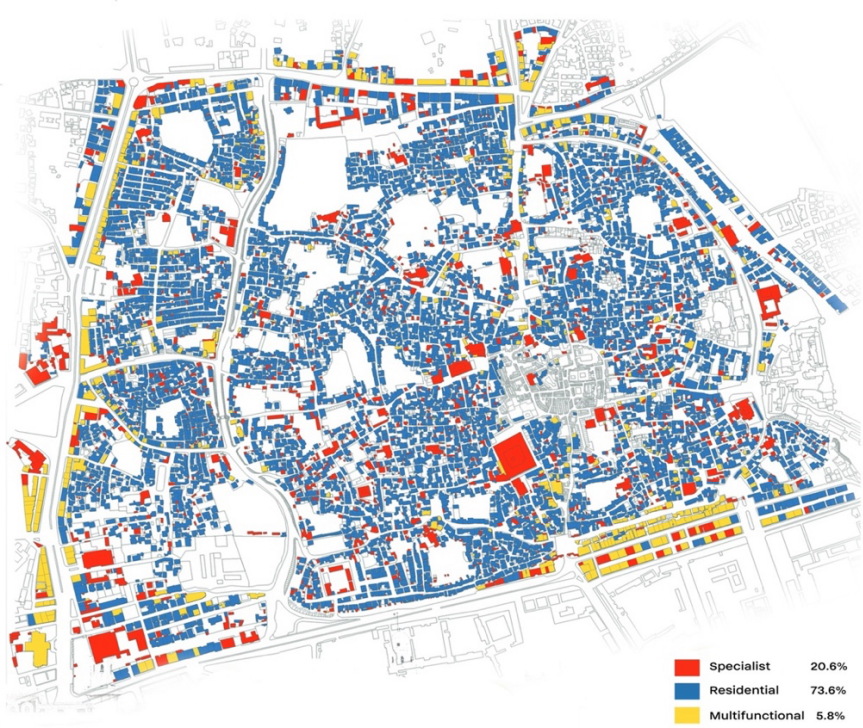

Figure 1.3 A map of Old Sana'a (land use) showing the percentage of tower houses in Old Sana'a (residential buildings). (Courtesy of Mohammed Eissa, personal communication, October 13, 2023)

Old Sana'a, a UNESCO World Heritage site, faces critical challenges in preserving its architectural heritage, particularly its iconic tower houses. Unauthorized construction, demolition, and renovations that violate preservation laws and disregard the city's unique character are a significant concern (Larsen & Logan, 2018). The General Organization for the Preservation of the Historic Cities of Yemen (GOPHCY), responsible for safeguarding the city's heritage, has been criticized for its limited capacity and effectiveness in enforcing regulations (Haidar, 2019). The ongoing conflict in Yemen has further exacerbated these challenges, damaging and neglecting historic buildings. UNESCO's 2015 decision to place Old Sana'a on the List of World Heritage in Danger and the potential threat of removal from the list altogether underscores the situation's urgency (Al-Ahnomi, 2021).

1.4 Problem Statement

Old Sana'a, a UNESCO World Heritage Site celebrated for its architectural and cultural significance, is facing a critical challenge in preserving its traditional tower houses. These iconic structures; embody centuries of Yemeni history and cultural identity with their distinctive mudbrick facades and intricate detailing. However, they are increasingly threatened by the pressures of modernization and the widespread practice of adaptive reuse. Poorly planned and unregulated conservation projects have significantly altered these tower houses. These alterations often involve disregarding the historical significance of these structures and neglecting their structural stability. The introduction of incompatible modern materials, changes to the original spatial layout, and a lack of consideration for accessibility and environmental factors have further compounded the issue (Haidar & Talib, 2015).

Institutional challenges, including a lack of clear guidelines and laws, are added to this complex issue faced by the General Organization for the Preservation of Historic Cities in Yemen (GOPHCY) (Haidar, 2019). The organization's limited enforcement capacity and the absence of a solid regulatory framework have enabled unauthorized modifications and demolitions. Furthermore, a lack of public awareness regarding the importance of preserving these structures and the limited expertise in conservation and preservation techniques within the community have exacerbated the situation. This has led to a surge in unauthorized construction activities, particularly between 2015 and 2018, fuelled by economic instability and civil unrest. The resulting damage and loss of authenticity impact individual buildings and threaten the integrity of the entire historic urban fabric (Al-Thafiri, 2022).

The scarcity of dedicated research explicitly focusing on the challenges and best practices of façade conservation in Sana'a's tower houses has further compounded this problem. While existing studies have touched upon related issues, there remains a significant gap in our understanding of how to effectively preserve these structures' authenticity and cultural significance in the face of ongoing pressures and changes while addressing the challenges highlighted in Figure 1.4. This gap necessitates a comprehensive investigation that examines the impact of interventions on authenticity, identifies the defining authentic values of tower house facades, and develops a robust conservation guideline grounded in evidence-based insights and best practices.

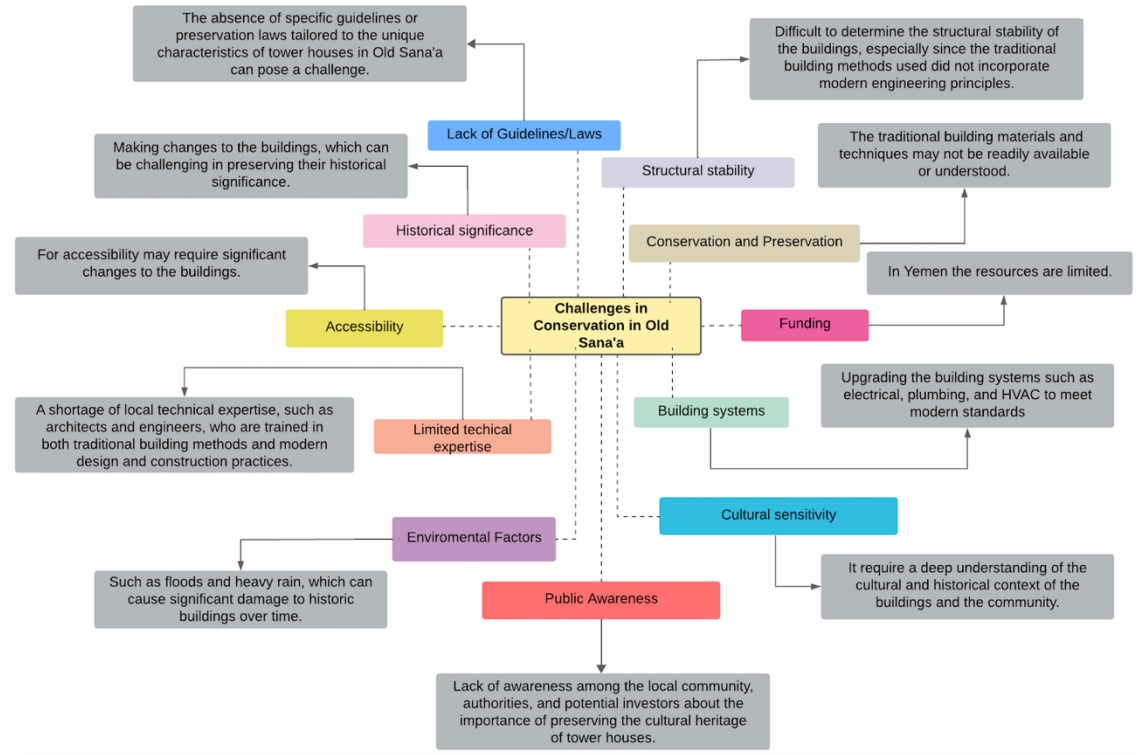

Figure 1.4 Challenges of Conservation in Old Sana'a.

Source: Researcher

1.5 Research Questions

The research questions act as a guide to understanding the complexities of preserving the authenticity of Tower House buildings in Old Sana'a:

1) What authentic values define the authenticity of heritage building façades in the tower houses of old Sana'a?
2) What is the interrelationship between the conservation and the authenticity of the tower house facades in old Sana'a?
3) How can a conservation guideline be developed to safeguard the tower house buildings' architectural and cultural integrity in old Sana'a?

1.6 Research Aim and Objectives

This research aimed to assess the impact of alterations and interventions on the authenticity of traditional tower façades in Old Sana'a, Yemen. This was achieved by comprehensively examining of the factors influencing these changes and the authentic values embedded within these unique architectural features.

Specifically, this study aims to:

1. Identify and define the authentic values that characterise the façades of Sana'a's tower houses.
2. Assess the impact of conservation on the authenticity of these façades.
3. Develop a practical conservation guideline specifically tailored to protect the architectural and cultural integrity of Sana'a's tower house façades.

1.7 Research Scope

This research focused on the main façades of traditional tower houses in Old Sana'a that have been subjected to alterations or interventions. This emphasis on façades is crucial as they are the most visible representation of the tower houses' historical and cultural significance and are often the most vulnerable to changes. This study specifically examined the external interventions made to the façades during the conservation interventions, including changes in materials, openings (such as doors and windows), and decorative elements. These interventions can range from minor modifications, like the addition of new signage, to more substantial alterations, like removing traditional elements or the introducing modern materials. By analysing these interventions, the research aims to understand their impact on the various dimensions of authenticity, including material, historical, and cultural authenticity.

In addition to examining physical changes, this research also explored how these interventions affected the overall aesthetic integrity of the façades and their contribution to the urban landscape of Old Sana'a. This involved assessing the visual impact of the alterations, their compatibility with the surrounding historical context, and their potential to disrupt the visual harmony of the cityscape. To gain a deeper understanding of the challenges and opportunities of façade conservation in Old Sana'a, the study also gathered insights from experienced professionals in Yemen's conservation field, including architects, engineers, and heritage specialists. Through semi-structured interviews, these experts provided valuable perspectives on the impact of interventions on authenticity, the challenges faced in preserving traditional façades, and potential strategies for ensuring the long-term preservation of these valuable cultural assets. Their insights informed the development of comprehensive conservation guidelines tailored to the specific needs and challenges of Old Sana'a's tower houses.

1.8 Significance of the Study

This research held significant importance for the academic field of heritage conservation and the practical preservation of Old Sana'a's architectural heritage. By addressing the challenges and opportunities related to façade conservation in this unique context, the study aimed to contribute to the ongoing discourse on heritage conservation and provide valuable insights that could inform future interventions.

The findings of this research were expected to have practical implications for the preservation and sustainable development of Old Sana'a. The comprehensive conservation guidelines developed through this study aimed to serve as a valuable resource for authorities, practitioners, and stakeholders involved in preserving tower

houses. By offering evidence-based recommendations and best practices, this research aimed to contribute to the long-term conservation of Old Sana'a's cultural heritage and its continued relevance in the 21st century. Moreover, the study's focus on the authenticity of façades aimed to enhance the understanding of the intricate relationship between architectural form and cultural identity. By documenting and analysing the unique features of Sana'ani tower houses, this research aimed to contribute to a broader appreciation of Yemen's architectural heritage and its contribution to global cultural diversity.

1.9 Structure of the Thesis

This thesis is structured to comprehensively investigate and address the challenges of façade conservation in Old Sana'a's tower houses. It comprises six chapters, each building upon the previous one to form a cohesive exploration of the research problem and potential solutions.

Chapter 1: INTRODUCTION

This initial chapter lays the groundwork by delineating the core issue: the urgent need to effectively conserve traditional tower houses and address the challenges posed by modern alterations and interventions. The chapter delves into the historical and cultural significance of Old Sana'a, highlighting the unique architectural characteristics of these structures and the threats they face in the modern era. It concludes with a concise overview of the research methodology, setting the stage for the following detailed investigations.

Chapter 2: LITERATURE REVIEW

This chapter examines the theoretical and practical underpinnings of heritage conservation, authenticity, and façade preservation, focusing on the context of Old

Sana'a's tower houses. It traces the evolution of international conservation principles, delves into the multifaceted concept of authenticity, and explores the complex factors contributing to heritage buildings' cultural value. The chapter also scrutinizes the challenges and opportunities inherent in conserving the tower houses of Old Sana'a, with a particular focus on their iconic façades.

Chapter 3: RESEARCH METHODOLOGY

A meticulous account of the research design and methodology is presented in this chapter. It elucidates the rationale for adopting a case study approach, emphasizing its suitability for investigating the multifaceted nature of façade conservation in real-world contexts. The chapter outlines the selection criteria employed to identify three representative case studies of tower houses that have undergone alterations or interventions. Additionally, it details the diverse data collection methods, including interviews with experts, meticulous documentation of building conditions, and archival research. The chapter also elucidates the analytical techniques employed, such as thematic and comparative case study analysis, ensuring a transparent and rigorous research framework.

Chapter 4: CASE STUDY

This chapter delves into the three distinct case studies identified in the previous chapter. Each case study provides a comprehensive portrait of the building's historical context, architectural features, the conservation interventions it has undergone, and the outcomes of these interventions. The analysis centres on the impact of conservation interventions on the authenticity and integrity of the façades, highlighting both successful preservation efforts and instances where challenges have arisen. These real-world examples offer invaluable insights into the diverse approaches to conserving these historic structures.

Chapter 5: ANALYSIS AND FINDINGS

This chapter synthesizes the findings from the literature review and the in-depth case studies. It identifies key themes, patterns, and trends related to authenticity and façade conservation in Old Sana'a. The analysis probes the impact of various interventions on the authenticity of tower house façades, examining how different approaches can either support or hinder the preservation of their cultural and historical value. The chapter also critically evaluates challenges, such as the loss of traditional practice, the use of incompatible materials, and the inadequacy of existing regulations. It also identifies opportunities for improvement through community engagement, capacity building, and the adoption of conservation solutions.

Chapter 6: CONCLUSION

The final chapter summarizes the key findings, implications, and recommendations from the research. It discusses the study’s broader contributions to heritage conservation, highlighting its potential to inform and influence future conservation efforts in Old Sana'a and beyond. The chapter acknowledges the limitations of the research and suggests avenues for further investigation. It concludes by offering practical recommendations and guidelines for conserving tower house façades, addressing the specific challenges and opportunities identified throughout the research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Architectural heritage conservation is a complex endeavour to safeguard the cultural, historical, and aesthetic values inherent in historic buildings (Gao & Jones, 2021). This study focuses on preserving heritage building façades, specifically the traditional tower houses of Old Sana'a, Yemen. These distinctive structures, celebrated for their intricate designs and unique construction techniques, are a testament to Yemen's rich cultural legacy.

Central to heritage conservation is the concept of authenticity, which encompasses both the tangible (materials, design) and intangible (cultural practices, social values) aspects of a building (Silverman, 2015). Preserving authenticity is vital to maintaining the integrity and significance of these structures, as it ensures that their historical and cultural values are respected even when interventions are necessary for their continued use and relevance (Man, 2023). This balance is remarkably delicate regarding façades, which serve as the public face of a building and embody significant architectural and cultural values.

Old Sana'a, a UNESCO World Heritage Site, faces unique challenges in conserving its traditional tower houses (Lamprakos, 2016). These buildings, with their characteristic architectural features, are vulnerable to urbanization, neglect, and the pressures of modernization (Ali & Al-Hashimi, 2018). Developing effective conservation strategies that respect authenticity while allowing for necessary interventions is vital for safeguarding this invaluable cultural heritage.

This literature review examined scholarly works and theoretical foundations related to heritage conservation, authenticity, façade preservation, and interventions in historic buildings. It explored diverse interpretations of authenticity, the challenges and approaches to façade conservation, and the principles and impacts of various interventions. The goal is to establish a comprehensive understanding of these concepts and their relevance to the research objectives, culminating in developing a tailored façade conservation guideline for the traditional tower houses of Old Sana'a. Ultimately, this review aims to contribute to the ongoing discourse on heritage conservation, offering insights that can inform sustainable preservation strategies and ensure the continued relevance of these iconic structures.

2.2 Heritage Conservation and Theoretical Concepts

Heritage conservation is a multifaceted discipline with deep theoretical roots, aiming to preserve, protect, and maintain the cultural and historical significance of structures, sites, and artefacts (Tyler et al., 2018). This field is guided by a rich tapestry of international charters and conventions, such as the Venice Charter (1964), the Nara Document on Authenticity (1994), the Burra Charter (1979), and the UNESCO Operational Guidelines for the Implementation of the World Heritage Convention (2013). These documents establish a framework of ethical and practical principles for preserving both cultural and natural heritage (Jokilehto, 2017). These charters and guidelines, while providing valuable guidance, are not static or prescriptive; rather, they form a foundation for the dynamic and evolving field of heritage conservation. The discipline necessitates the adoption of diverse approaches carefully tailored to specific contexts, community values, and the unique attributes of each heritage asset (Smith, 2020). The active participation of local communities is paramount in this

process, fostering a sense of ownership, and empowerment and ensuring the long-term sustainability and relevance of heritage preservation efforts (Labadi et al., 2021).

2.2.1 International Charters and Guidelines

Heritage conservation is guided by a rich tapestry of international charters and guidelines, each contributing to a deeper understanding and more effective practice of preserving our shared cultural legacy. These documents, developed by organizations like UNESCO and ICOMOS, provide a framework for ethical and practical decision-making in the field.

2.2.1(a) The Venice Charter (1964)

The Venice Charter marked a pivotal moment in heritage conservation, solidifying a shift from mere restoration to comprehensive conservation (Biase, 2014). This entailed preserving the physical fabric of monuments and sites and safeguarding their historical context and cultural significance. Though not explicitly defined the Charter's emphasis on authenticity hinted at the importance of preserving the original form, materials, and setting of a heritage asset. This departed from earlier practices that often prioritized aesthetic restoration over historical accuracy.

A vital contribution of the Charter was its clear distinction between the concepts of restoration and conservation. Conservation was framed as the ongoing maintenance and protection of a monument or site, emphasizing preserving of its historical integrity and existing state (Ureche-Trifu, 2013). On the other hand, restoration was considered an exceptional measure to be undertaken only when necessary and based on meticulous research and respect for original materials and authentic documentation.

The Venice Charter advocates for several critical principles that guide conservation practices:

1. Minimal intervention: Prioritize the preservation of existing elements over extensive reconstruction.
2. Reversibility: Any changes made should be reversible, allowing for future adjustments based on new knowledge or understanding
3. Use of traditional materials and techniques: Employ materials and techniques compatible with the original construction to maintain the historical fabric

This distinction and the emphasis on these principles reflected a growing recognition that excessive intervention could irreparably alter a heritage asset's historical and cultural value (Jokilehto, 2017). The Charter encouraged a more conservative approach, prioritizing preserving existing elements over conjectural reconstruction. This preference for conservation aligned with a broader shift in heritage philosophy towards respecting the patina of age and the traces of history embedded within a building or site (Jones & Leech, 2015).

The Venice Charter's influence was profound, establishing a global framework for conservation practice and influencing the creation of ICOMOS in 1965. Moreover, the Venice Charter recognized that interventions in historic buildings might be necessary to ensure their continued use and relevance, provided that such interventions respected the original form and did not distort the building's historical character (Wong, 2016). This concept opened new avenues for revitalizing heritage buildings and ensuring their continued relevance in contemporary society.

2.2.1(b) The Nara Document on Authenticity (1994)

The Nara Document on Authenticity represents a pivotal shift in the global understanding of heritage conservation. It significantly expanded the concept of authenticity beyond its traditional emphasis on material integrity (Boccardi, 2018;

Kono, 2014), recognizing that authenticity encompasses a broader spectrum of cultural values and contexts, including spiritual, social, and aesthetic dimensions. The Nara Document's expanded definition of authenticity has significant implications for conservation decisions. It calls for a more nuanced and culturally sensitive approach to assessing heritage value and determining appropriate interventions (Luxen & Magar, 2019). Conservationists are now encouraged to consider a broader range of factors, such as the cultural significance of a site to its community, the traditional knowledge and skills associated with its construction and maintenance, and its role in shaping cultural identity (Boccardi, 2018). This shift promotes a more holistic appreciation of the multifaceted nature of cultural heritage and encourages greater collaboration between conservation professionals and local communities. (Jones & Leech, 2015).

2.2.1(c) The Burra Charter (1979)

The Burra Charter distinguishes itself by emphasising community involvement and cultural diversity. It recognizes that heritage is not solely defined by material attributes but also encompasses social, spiritual, and historical values held by various communities (Hanna, 2015). The Charter's definition of "cultural significance" explicitly includes aesthetic, historical, scientific, social, and spiritual values for past, present, and future generations (Johnston, 2015; Mackay, 2019). This broader perspective allows for a more inclusive understanding of heritage and encourages greater participation of diverse stakeholders in conservation decision-making.

Furthermore, the Burra Charter advocates for a balanced approach to conservation and adaptation. While it acknowledges the importance of preserving the physical fabric of a heritage place, it also recognizes the need for change and adaptation to ensure the continued use and relevance of historic structures (Lesh,

2020). The Charter outlines a clear hierarchy of intervention levels, ranging from maintenance and preservation to restoration and reconstruction, emphasizing that any intervention should aim to retain the cultural significance of the place (Zhang & Dong, 2021)

2.2.1(d) UNESCO Operational Guidelines (2013)

The UNESCO Operational Guidelines for implementing the World Heritage Convention (2013) are a cornerstone of contemporary heritage conservation practice. These guidelines provide detailed instructions and recommendations for applying the World Heritage Convention, serving as a reference for States Parties, the World Heritage Committee, and all those involved in the identification, protection, conservation, presentation, and transmission of World Heritage properties (Ringbeck, 2018).

The UNESCO Operational Guidelines define authenticity as the truthful and credible expression of a property's cultural values, assessed through its form, materials, use, traditions, and setting (Silverman, 2015b). This concept is dynamic, adapting to cultural context and evolving values. Integrity is defined as the wholeness and completeness of a property, ensuring it includes all elements necessary to express its Outstanding Universal Value and remains free from adverse effects (García-Esparza, 2018). Unless exceptional circumstances exist, the guidelines caution against reconstruction, requiring complete documentation and clear differentiation from the original fabric (Aygen, 2013).

The UNESCO guidelines offer crucial guidance for conserving Old Sana'a's tower houses. By emphasizing a holistic evaluation of authenticity based on multiple attributes and the importance of community engagement, the guidelines provide a framework for ensuring that interventions respect and enhance the authenticity of these

unique structures while maintaining the integrity of the urban fabric (McCafferty, 2023). This approach ensures that the Outstanding Universal Value (OUV) of Old Sana'a, a UNESCO World Heritage Site, is preserved for future generations.

2.2.2 Approaches to Conservation

The conservation of cultural heritage encompasses various approaches, each with distinct principles and objectives, adapted to the specific context and desired outcomes. These approaches, often combined, guide the preservation of Sana'a's tower houses.

1. Preservation: This approach prioritizes maintaining the existing state of a heritage asset with minimal intervention (Trifu, 2013). It focuses on preventive measures, such as regular cleaning, monitoring, and minor repairs using compatible materials, to slow deterioration and protect the historical fabric (D'Alpaos & Valluzzi, 2020). Preservation aims to retain the façade's authenticity and integrity, recognizing its historical and cultural significance (Kyriazi, 2019). This approach is particularly suitable for façades that are well-preserved or where there is limited historical evidence to guide extensive restoration (Pedersen et al., 2024).
2. Restoration: Restoration seeks to return a façade to a known earlier state by removing later additions or alterations that are not considered historically significant (Plevoets & Cleempoel, 2019). This might involve replacing missing elements, such as decorative plasterwork or carved wooden details, based on accurate documentation and evidence. Restoration aims to reveal the original design and character of the façade while acknowledging its historical evolution (Yildizlar et al.,

2020). This approach requires meticulous research and a thorough understanding of the building's history and construction techniques. It is often employed when a façade has undergone substantial changes, and sufficient evidence exists to guide the restoration process to a specific period.

3. Reconstruction: Reconstruction, the most invasive approach, is used when a façade has been destroyed or significantly altered beyond recognition (Bravaglieri et al., 2021). It involves rebuilding the façade based on historical evidence, aiming to recreate the original appearance and function (Klimkowska et al., 2022). It is crucial to distinguish between original and reconstructed elements, ensuring transparency and avoiding any misrepresentation of historical authenticity (Earl & Saint, 2015). Reconstruction is often a last resort, typically considered when the loss of a façade is deemed a significant cultural detriment.
4. Rehabilitation: Rehabilitation focuses on adapting a heritage façade to a new or continued use while preserving its significant historical features (Prieto et al., 2019). This might involve upgrading services, improving accessibility, or modifying the façade to accommodate new functions, such as adding windows or doors. The goal is to ensure the façade remains usable and relevant while respecting its historical and cultural value. Rehabilitation is often employed when a building needs to be modernized for contemporary use while retaining its character.
5. Maintenance: Maintenance encompasses the ongoing care and repair of a heritage façade to prevent deterioration and ensure its longevity (Prieto et al., 2019). This includes regular cleaning, inspection, and

addressing minor issues promptly before they escalate into major problems. Proper maintenance is crucial for preserving the integrity and authenticity of a façade and ensuring the safety of the building and its occupants.

6. Renovation: While not explicitly defined by ICOMOS, renovation typically refers to renewing or upgrading a heritage façade to improve its appearance, functionality, or energy efficiency (Leskovar et al., 2019). This might involve using modern materials or techniques while maintaining the overall character and significant features of the façade. Renovation often aims to enhance the aesthetic appeal or usability of a historic building without compromising its heritage value.

Choosing the appropriate conservation approach requires careful consideration of various factors, including the condition of the façade, the available historical documentation, the cultural significance of different elements, the intended use of the building, and the financial and technical resources available (Forsyth, 2013). The conservation process should always be guided by a comprehensive understanding of the heritage values at stake and a commitment to preserving the authenticity and integrity of the cultural resource; Table 2.1 provides a summary of these conservation approaches, their goals, and potential advantages and disadvantages.

Table 2.1 Summary of Conservation Approaches

Approach	Goals	Advantages	Disadvantages	Potential Application to Sana'a Tower Houses
Preservation	Prevent further deterioration, maintain the existing state	Least invasive, respects historical layers, and is cost-effective.	It may not address significant damage, requires ongoing maintenance	Suitable for well-preserved façades or those with limited historical documentation.
Restoration	Return to a known earlier state	Reveals original appearance, enhances historical understanding	Costly, time-consuming, may involve removing later additions	Appropriate when significant alterations have occurred, and historical evidence is available for guidance.
Reconstruction	Rebuild a destroyed or altered building	Revives lost landmarks, educational and tourism potential	Most invasive, ethical concerns about authenticity, very costly	A last resort: is considered only when the loss of a façade is a significant cultural detriment.
Rehabilitation	Adapt to a new use while preserving significant features	Continued use, economic revitalization, sustainable	Balancing preservation and adaptation can be challenging	It is crucial to adapt tower houses to modern needs while retaining their heritage value.
Maintenance	Prevent deterioration through regular care and repair	Essential for long-term preservation, less costly than significant interventions	Requires ongoing commitment and resources	Fundamental for all tower houses, regardless of other conservation approaches.
Renovation	Renew or upgrade while maintaining overall character	Improves functionality and appearance	Risk of compromising authenticity if not carefully executed	It Can enhance the usability of tower houses while respecting their historical context.

2.3 Interventions in Heritage Buildings

Interventions in heritage buildings are an increasingly vital strategy within the field of heritage conservation. They offer a balanced approach that reconciles the preservation of historical significance with the adaptation of these structures for contemporary functions (Zhang & Dong, 2021). This practice involves a thoughtful reimagining and repurposing of heritage structures, breathing new life into them and allowing them to serve modern functions while retaining their original character and cultural value (Prieto et al., 2019). In essence, interventions in heritage buildings aim to create a symbiotic relationship between the past and the present, ensuring that historic buildings remain relevant and functional within the ever-evolving urban landscape (Tam & Hao, 2019).

2.3.1 Benefits of Interventions in Heritage Buildings

Interventions in heritage buildings are an increasingly attractive strategy for heritage conservation due to their multifaceted benefits, which span economic, social, and environmental dimensions. Economically, it often proves to be more cost-effective than new construction. By utilizing existing structures, the need for raw materials and labour is reduced, leading to substantial savings in project budgets. (Takva et al., 2023). This economic advantage makes preservation a feasible option for developers and communities alike. Furthermore, heritage intervention projects often act as catalysts for economic revitalization, attracting investment and stimulating local economies (Merlino, 2018). For example, the transformation of abandoned industrial buildings into thriving commercial spaces can generate employment opportunities and boost the local economy.

Interventions in heritage buildings also bring significant social and cultural benefits. They foster a sense of community pride and connection to heritage by