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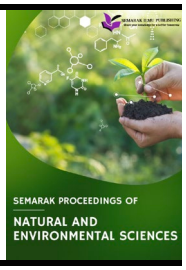

A Review on Conservation Approaches of Timber Heritage Buildings

Suhaida@Suhana Kamarudin[1,2,*], Noor Hayati Ismail[1], Suhana Johar[3]

[1] Faculty of Engineering and Built Environment, Universiti Sains Islam Malaysia, Negeri Sembilan, Malaysia
[2] Faculty of Engineering and Quantity Surveying, INTI International University, Negeri Sembilan, Malaysia
[3] Fakulti Kejuruteraan dan Alam Bina Universiti Kebangsaan Malaysia, Selangor, Malaysia

ABSTRACT

Timber heritage structures represent a significant aspect of cultural heritage, encompassing architectural, historical, and social dimensions. This category of timber heritage includes traditional Malay houses, palaces, and mosques. These timber heritage structures are crucial for maintaining cultural identity and showcasing distinctive architectural methods; however, they encounter numerous preservation challenges, including deterioration, pest infestations, and exposure to environmental factors. Conservation approaches are employed to safeguard these structures, allowing future generations to admire their aesthetic appeal, craftsmanship, and historical importance. The conservation of heritage buildings plays a significant role in furthering Sustainable Development Goals (SDGs), particularly in fostering sustainable urban environments and encouraging responsible consumption. These efforts also support education, community enhancement, and economic development, in alignment with the 11th SDG. Subsequently, it is crucial to implement suitable measures for the preservation of historic buildings to prevent their neglect. An efficient conservation approach is crucial for the sustained preservation of these structures. This research explores the diverse conservation approaches employed to maintain timber heritage buildings, emphasizing both traditional and contemporary techniques. The findings illustrate the specific conservation approach applied to each timber heritage building, considering its historical context, present condition, and geographical setting. Among the conservation approaches detailed in the guidelines provided by the National Heritage Department, relocation emerges as the most implemented approach. Traditional Malay timber buildings are built using methods that enable the buildings to be disassembled and reinstalled, and relocation is used as a conservation approach for these structures to a more suitable area.

Keywords: *Conservation; Timber heritage; Heritage buildings; Conservation approach*

1. Introduction

Heritage buildings in Malaysia, often shabby but of historical, cultural, architectural, or social significance, showcase the country's rich architectural and aesthetic heritage [1-3]. Furthermore, Azizan *et al.,* [4] stated that heritage, as a conserved aspect of history, plays an essential role in social, political, and cultural frameworks. It embodies a nation's historical narrative, sense of pride, and cultural identity, which are passed down to subsequent generations. They are crucial for a nation's cultural identity, representing its history, race, religion, and state during its circulation era [5]. Historical structures serve as a concrete connection to a region's past by embodying traditional building methods, design principles, and lifestyles. The importance of these buildings frequently arises from their links to prominent figures or key events, as well as the advancements in innovation,

* *Corresponding author.*
E-mail address: suhaidask11@gmail.com

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science, or architecture that they symbolize. According to Murtza *et al.,* [6] without clear understanding, the significance and artistry of historic buildings will continue to fade, generating the interest of a more progressive community in modern structures that are historically significant. Thus, the conservation of these heritage structures serves to protect the physical appearance of history while simultaneously nurturing a sense of identity and belonging within communities. This practice encourages cultural continuity and facilitates educational opportunities for future generations.

Malaysia's heritage buildings showcase a diverse architectural tapestry that weaves together historical stories and a variety of cultural influences, primarily employing materials like wood, bamboo, stone, clay, and lime plaster [8]. Furthermore, Hasan *et al.,* [7] added that colonialization led to advancements in building materials, resulting in a variety of architectural styles and materials used in heritage buildings. Hence, Malaysia's architectural heritage is a blend of traditional and colonial styles, serving as visual landmarks and dynamic representative opportunities for future generations.

Conservation works aim to protect these structures, ensuring their continued existence for future generations [4]. The conservation of heritage buildings is crucial for preserving cultural and historical legacies. These buildings embody aesthetic, architectural, and societal values that are often irreplaceable [9]. As time progresses, heritage buildings face natural deterioration due to environmental factors, human activity, and aging materials. Regrettably, it is unavoidable that numerous historic structures will yield to the pressures of contemporary development and be dismantled to accommodate municipal needs and commercial objectives [10]. Therefore, conservation initiatives should be tailored to the building's condition, historical significance and community needs, using specific goals and methodologies. This review outlines the conservation practices that had being used on historic structures, particularly those made of timber.

1.1 Literature Review

1.1.1 Timber heritage

Timber heritage refers to historic structures built using timber for thousands of years, including traditional timber homes, barns, temples, and bridges in regions like Scandinavia, Japan, and parts of North America, showcasing craftmanship, cultural identity, and historical context [11-14]. Timber traditional houses are vital to Malaysia's architectural heritage, requiring preservation for future generations and global appreciation. Property owners and professionals must ensure the safety and well-being of inhabitants [15]. The preservation of timber heritage safeguards not only physical structures but also the traditional knowledge and craftmanship, preserving these skills and cultural narratives for future generations.

Timber heritage structures, architectural assets showcasing historical and cultural epochs, are protected through various conservation methods like restoration, preservation, reconstruction, rehabilitation, and adaptation to ensure their historical relevance and structural integrity [13]. The conservation of historically significant structures, particularly those constructed from timber, ensures the continuation of cultural practices, the retention of historical knowledge, and the promotion of sustainable building methods [13,16]. Despite the material's challenging acquisition, it seemed to be in favor of replacing damaged wood with the original material, underscoring the significance of preservation [17].

From studies by Jing *et al.,* [12] Terlikowski *et al.,* [18] Walsh-Korb *et al.,* [19] and Tomaszek *et al.,* [20], timber heritage buildings are considered as crucial for maintaining cultural identity and unique architectural methods but face significant preservation challenges due to wood's natural vulnerability to decay, insects, and weathering. Safeguarding heritage buildings, particularly those constructed

from wood, plays a crucial role in preserving historical knowledge, cultural identity, and promoting sustainable architectural practices. Hence, specialized conservation methods are implemented to guarantee the longevity of these timber structures, enabling future generations to recognize and value their aesthetic appeal, skilled craftsmanship, and historical significance.

1.1.2 Conservation approaches

The conservation practice entails the elimination of indicators of erosion and sedimentation through various strategies aimed at safeguarding and revitalizing the fundamental historic and architectural significance of heritage sites, while simultaneously creating an urban landscape that harmonizes with modernist features [21]. The practice is based on the values offered by the architectural heritage resources for different individuals, groups, societies, and governments [22]. In addition, by maintaining the architectural features and structural soundness of these sites, such initiatives not only avert additional deterioration but also enable future generations to engage with the historical stories these buildings represent and facilitating their integration into modern urban landscape.

Conservation approaches for buildings necessitate a multidisciplinary strategy aimed at safeguarding the historical, cultural, and architectural importance of heritage structures. This approach addresses issues of deterioration, damage, or modification, while simultaneously ensuring the ongoing functionality and preservation of these edifices [9,23]. Based on Hao *et al.,* [24], conservation initiatives prioritize the principles of minimal disruption and reverence for the historical integrity of the structure. These efforts frequently employ methods such as structural stabilization, material restoration, environmental management, and careful modifications to accommodate contemporary functions. Moreover, conservation involves collaboration among architects, historians, engineers and environmental specialists to preserve heritage buildings' aesthetics and structural aspects while incorporating modern technologies and materials.

The conservation of our architectural necessitates a careful integration practical consideration. According to National Heritage Department (NHD) [25] through the National Heritage Act 2005 (Act 645) Part 1, Section 2, the conservation approaches consist of preservation, prevention, consolidation, restoration, rehabilitation, reproduction, reconstruction, adaptation (adaptive reuse), and maintenance. Table 1 shows the definition of each approach justified by NHD.

Table 1
Definitions of conservation approach [25]

Conservation Approach	Definition
Preservation	The works carried out to maintain the building, structure or monument in its original form, and needs to be implemented where necessary in the effort to prevent damage or deterioration in future.
Prevention	The effort to protect a historic entity or monument through controlling its environment, which directly or indirectly prevents damaging agents or conditions from becoming active and causing adverse effects.
Consolidation	Any addition whether in physical form or application using a supportive method especially to the original structure of a historic building in order to strengthen its structure and integrity, in the effort to prevent structural damage while maintaining its original form and material(s).
Restoration	The action to restore or bring back the authentic condition or also reinstate or revitalize an original concept of a historic building.
Rehabilitation	The process of rehabilitation or re-energizing a historic building or property to a condition of usability, usefulness and functionality through restoration, improvement and even renovation that will help allow efficient contemporary usage while maintaining authentic characteristics, parts and aspects that are important to its original architecture and history.
Reproduction	The copying or re-making of especially an artefact or element, which is normally to replace a component or part that is lost, damaged or rotted away, so that the aesthetic value and/or the original artistic/architectural design as a whole is preserved.
Reconstruction	The process of rebuilding or constructing back a structure, meaning a new construction of its form and all details of the structure that is lost or damaged beyond repair, or else part(s) of such structure, as determined at a point in time.
Adaptation / Adaptive Reuse	Involve works to change the function and usage of an old building into something else but preserving or maintaining the same form and characteristics of the original structure.
Maintenance	The carrying out of monitoring and maintenance works to prevent damage and/or repair wear and tear to a historical structure or building in a continuous manner, including to be done after conservation or reconstruction works are completed and to a satisfactory level as part of continuing efforts to prevent deterioration.

2. Methodology

A comprehensive review of the current literature was carried out to understand the conservation strategies for heritage timber buildings in Malaysia. This review involved analysis of secondary data from a range of sources, such as peer-reviewed academic journal articles, conference proceedings, textbooks, publications from regulatory bodies, and doctoral theses. Content analysis served as the methodological framework for interpreting the data.

3. Results

3.1 Result and Discussion

The selection of conservation strategy is influenced by the existing condition of the building, its historical significance, and its intended future use. The finding indicates that the predominant conservation approaches employed for timber heritage structures are relocation and adaptive reuse. Relocation is thought to be the best course of action to reintegrate the original culture and construction landscape into the buildings, which have been abandoned and neglected for a long time. This will save and restore the buildings which have interesting Malay architectural features that should be preserved for the future generation [26,27]. In addition, the adaptive reuse is employed because of the historic buildings offer a sense of place; connect people; enhance urban landscapes;

contribute sustainable development; foster historical curiosity among tourists; extend the usefulness of a building and its function, create sustainable and safe environment [29].

As well, according to Abidin *et al.,* [28] maintenance serves as a conservation strategy that demonstrates the structural soundness of a building, even following its relocation or adaptive reuse efforts.

Table 2
Conservation approach applied for Malay traditional house

Name of Building	Conservation						Sources
	Preservation	*Restoration*	*Maintenance*	*Relocation*	*Reconstruction*	*Adaptive Reuse*	
Masjid Teluk Memali				✓			[26,30]
Istana Puteri Bongsu				✓		✓	[28,31]
Rumah Haji Wan Muda Haji Hassan				✓		✓	
Rumah Perak Uda Noh b. Kanda Jaafar				✓		✓	
Rumah Kutai				✓		✓	
Rumah Dato' Raja Diwangsa				✓		✓	
Rumah Penghulu Ismail B. Khatib				✓		✓	
Rumah Warisan Hajah Kundur				✓	✓	✓	[28,32]
House of Raja Kamaruddin Raja Yaa'kob				✓	✓		[33,34]
Rumah Maimunah Yaakub				✓	✓		
Rumah Tukang Kahar				✓	✓		
Teratak Zaaba	✓						
Rumah Datuk Tan Mas Mohar	✓						
Rumah Datuk Tan Mas Mohar	✓						
Masjid Lama Kampung Laut				✓			[27,35,36]
Ampang Tinggi Palace				✓			[35]
Seri Menanti Palace, Negeri Sembilan			✓				
Kenangan Palace, Perak		✓					
Rumah Penghulu Abu Seman		✓					
Rubber Smoke House, Kedah						✓	[37]
Istana Jahar						✓	[38]
Madrasah Idrisiah			✓				[39,40]
Masjid Kampung Kuala Dal			✓				[40]
Masjid Lama Mulong			✓				[36,40]

The review reveals that restoration is one of the least commonly used approaches for conserving historic wooden structures. It remains appropriate for structures that have undergone modifications which conceal their original characteristics and may be involved in the relocation process immediately following the deconstruction of building elements [41].

Apart from that, preservation and reconstruction of timber buildings are also being retained as the conservation strategies for timber building such as Malay traditional house and palace. Preservation preserves historical authenticity, while reconstruction revives lost heritage. Preventive conservation focuses on sustainability, ensuring longevity with minimum alterations [42]. On top, reconstruction is vital for restoring cultural heritage, especially in disaster-affected regions and its authenticity is debated due to lack of historical aura in reconstructed structures [43]. While preservation maintains the integrity of historical sites, reconstruction plays a crucial role in reviving cultural identity, particularly in areas impacted by natural or human-made disasters, offering

communities a tangible link to their past despite debates surrounding the authenticity of recreated structures.

4. Conclusions

In conclusion, this study ultimately examines the most suitable conservation approach for timber heritage buildings, advocating for the relocation approach. Since the 16th century, Malay architecture has embraced the practice of repurposing wooden structures, frequently found in traditional Malay villages, transforming them into outdoor museums and resort villas [30]. However, the National Heritage Department (NHD) does not specifically advocate a 'relocation' approach within its conservation guidelines. Restoration is typically defined as the process of returning a historic building to its original state or reviving its initial concept. Consequently, the practice of dismantling and reassembling timber structures facilitates their transfer for reuse and restoration. maintaining cultural, historical, and architectural legacies requires the conservation of timber heritage structures. These buildings, which represent important historical stories and traditional craftsmanship, are under pressure from contemporary development and the environment. Minimal intervention must be balanced with the requirement to preserve historical authenticity and structural integrity in effective conservation approaches. Conservation efforts are strengthened by the fusion of cutting-edge materials and digital documentation with more conventional approaches. It is essential to employ sustainable techniques, such as using locally produced materials and eco-friendly treatments. To guarantee that these priceless historical structures continue to instruct and inspire future generations, a comprehensive strategy that considers the building's state, historical value, and community needs is required.

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