

Malaysian Sustainable Housing: The Study of Traditional Terengganu Architecture on Spatial Characteristics in Terrapuri Heritage Village Towards The Development of Sustainable Spatial Layout in Malaysian Home

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Abstract

Terengganu's architectural identity has developed through long-standing cultural and commercial exchanges with regions such as Siam, Cambodia, and Indonesia. These ties have contributed to a notable architectural tradition, ranked as an early expression of Malay civilisation. However, this architectural tradition has been affected by rapid globalization, as modern and contemporary design have significantly neglected the identity of traditional architectural values. Contemporary interpretations of modern housing are often seen as lacking authenticity and failing to reflect the region's traditional character. This study aimed to identify and investigate the distinctive spatial characteristics of traditional Terengganu architecture, focusing on their role in defining the region's cultural identity along the east coast of Peninsular Malaysia. The research employed a qualitative approach involving document review, interviews with a resort owner, and field observations. Three traditional buildings at Terrapuri Heritage Village in Setiu were selected as case studies, supported by detailed spatial mapping. The findings indicate that, while the original spatial design of the houses remains intact, they have undergone several transformations over time. These include modifying traditional space usage, such as converting the kitchen into a bathing area and reconstructing aging structural components using modern materials and construction techniques. These forms of adaptation demonstrate how traditional spatial arrangements can remain functional in contemporary contexts. The study highlighted the relevance of Terengganu's traditional spatial characteristics in the contemporary design context, indicating that its principles offer valuable insights for

the development of future Malaysian housing models that integrate sustainability aspects with cultural integrity.

1. Introduction

Prior to the emergence of the oil industry in the 1970s, Terengganu was among the least developed states on Malaysia's East Coast. Annually, Terengganu is in a state of isolation during the monsoon season, due to the fact that the only means of transportation is boats on the coastal sea route. This scenario is benefiting the preservation of Terengganu cultural traditions, as well as maintaining its Architectural style. Along with the rapid economic development, from the perspective of the built environment, the modernization of Terengganu neglects the traditional Terengganu architectural values. Road expansion, commercial developments, and new housing estates have increasingly disrupted the traditional way of life, as well as the values associated with traditional Terengganu architecture. Despite the decrease in the numbers over time, the traditional Terengganu buildings continue to be visible and exist due to the slower pace of Terengganu's development compared to other regions in Malaysia [1].

Architecture identity is a long-debated issue in Malaysian Architectural discourse, due to the nature of multiculturalism in Malaysia [2], [3], [4], [5], [6]. Traditional Malay Architecture is one of the architectural styles strongly associated with the development of Malaysian Architectural identity. As one of the prominent Malay architectural styles, traditional Terengganu architecture is characterized by its richness and unique design style among other Malay architectural styles. It results from the assimilation, adaptation, and influence of design styles from the surrounding Terengganu neighbourhood, including Siam, Cambodia, and Indonesia. One of the significant buildings that represent traditional Terengganu architecture is the traditional Terengganu Malay house. It is classified as one of the earliest Malay vernacular house typologies. This study specifically identified and investigated the spatial features and characteristics of the traditional Terengganu Malay house, conducted by reviewing existing documents, conducting interviews, making observations, and conducting a field survey. The spatial features of Terengganu's traditional Malay houses are examined through their exterior and interior spaces, along with the cultural influences that shaped the design of these spaces. In the context of this study, the selected buildings are the coastal resort buildings located on the east coast of Peninsular Malaysia.

2. Literature Review

2.1 Historical Background and Development of Traditional Malay Architecture

Malay traditional architecture generally reflects a synthesis of environmental factors, encompassing climatic conditions, indigenous construction methodologies, material selection, and contextual considerations. Primarily, these structures are predominantly crafted from timber [7], [8]. In Malaysia, several factors have influenced the classification of traditional Malay houses, particularly the shape of the roofs, the internal layout, and the location where the houses were constructed. These factors were, and still are, used to distinguish the traditional houses of each state. Each region can easily be identified by their distinctive house type. The traditional houses of each state still reflect the medieval Malay Archipelago region in their pattern and craftsmanship in the architecture, and the houses still preserve the patterns and elements of the culture of the region [9]. The location of traditional Malay houses in a settlement also had to respond to practical needs and amalgamated needs of the settlement to ensure that the clusters of houses also dealt with the social and cultural needs of the environment [10], [11]. Architecturally, the traditional Malay house is a manifestation of how Malay cultural life is reflected in liveable buildings [12]. As a result, it is a liveable space where the Malay people feel connected and comfortable, as the design of the house itself is a reflection of their way of life. Studies on traditional Malay houses [13], [14] indicate that the layout of these houses matches the fundamental requirements of Malay daily living. The practical design and space structure of the Malay house carefully incorporate aspects of culture, belief systems, social interactions, and desired living practices. Upon the advent of Islam in the Malay Archipelago, its practices were harmonized with the indigenous Malay lifestyle, representing a modernization of traditional Malay ideologies (*akliah*) imbued with Islamic principles. [15].

Before settling along the east coast of the Malay Peninsula, historical study indicates that the early Malay ancestors came from the ancient civilisations of Cambodia and Champa in Indochina. These regions' cultural impacts became increasingly more noticeable as regional trade increased. The Malay Kingdom of Langkasuka included parts of southern Thailand, including Kelantan, Terengganu, and Patani, between the second and sixteenth centuries. This early cultural centre is the origin of several traditional Malay performing and decorative arts, including *Wayang Kulit* (shadow puppetry), *Mak Yong* and *Menora* (dance traditions), and *Sobek* (intricate woodcarving). Malay houses serve as visible expressions of this Islamic influence on the traditional Malay way of life. Long-standing Thai and Cambodian influences are largely responsible for the distinct cultural and architectural distinctions between Peninsular Malaysia's east and west coasts. The East Coast, which is thought to have one of the strongest legacy traditions among the Malay republics, developed its cultural identity over

centuries as a result of these external connections. Local house types and building practices were greatly influenced by the region's extensive trading networks with Indonesia to the south and Thailand and Cambodia to the north [16]. Furthermore, it is believed that the traditional Terengganu house is the earliest example of Malay traditional architecture in its vernacular form [1]. Traditional Terengganu houses are distinguished by their distinctly traditional design. It is a wooden home with bamboo or wood walls that are situated on elevated terraces which are roughly two meters above the ground [17]. In addition to providing for the social, cultural, and financial needs of its residents, the Terengganu traditional home showcases Malaysian culture's artistic and creative abilities. Furthermore, the ways in which occupants utilise the different areas of a traditional Malay house transmit meanings influenced by their beliefs and way of life in addition to being connected to cultural customs [18].

Although several studies have examined the spatial characteristics and architectural elements of traditional Malay houses, research specifically focusing on the transformation of sustainable spatial layout in Terengganu traditional houses within a heritage tourism context remains limited. Previous studies have documented the design principles, spatial hierarchy, and cultural symbolism of Malay vernacular architecture; however, they have not thoroughly examined the adaptation, modification, or preservation of these spatial elements within the frameworks of heritage tourism and sustainable development. This study aims to address the gap by analysing the evolution of spatial layouts in traditional Terengganu houses, specifically within Terrapuri Heritage Village, to explore how their architectural identity can be preserved while accommodating the functional requirements of sustainable spatial layout facilities. [19] explored the spatial hierarchy of traditional Malay houses in Terengganu, emphasizing their cultural significance. However, their study did not examine the adaptation of these structures for sustainable-related purposes, nor did it analyse their architectural identity within the coastal building setting. These studies highlighted variations in spatial organization and structural design but lacked a comparative analysis with Terengganu's *Rumah Tiang Enam* and *Rumah Tiang Dua Belas*, particularly in the context of their preservation and adaptation within heritage buildings. While these studies discussed the blending of modern and traditional elements, they did not provide a comprehensive framework for preserving Terengganu's architectural identity in heritage buildings. Given these gaps, this study aims to fill the void by analysing the way that traditional Terengganu houses in Terrapuri Heritage Village have been transformed spatially.

Unlike previous studies, which focused primarily on cultural heritage or sustainable tourism separately, this research integrates architectural analysis with sustainable tourism perspectives, offering a new framework for sustainable conservation and identity formation towards the development of sustainable spatial layout in Malaysian home.

2.2 Overview of Traditional Terengganu Architecture

The earliest form of traditional Malay dwelling in Terengganu has a single-ridged roof that is high and steeply sloping, with a ridge along the length of the house [20], [21]. Terengganu's architectural history is characterised by a dignified and polished aspect that is evident in its proportions, craftsmanship, construction methods, and cultural significance. The earliest and most common types of heritage houses in the region are *rumah bujang berselasar* (single-terraced house) and *rumah tiang dua belas* (twelve-post house) [22], [23]. The *rumah bujang berselasar* is characterised by its attached *verandah* and extended roof profile, as described in [23]. The *serambi*, a distinguishing feature that functions as a porch next to the *rumah ibu* (main house), complements the long, narrow volume of this form of home. Usually, the *serambi*, also known as the *selasar*, is an additional roofed platform that runs along one or both of the house's longer sides. Traditional Terengganu houses appeared across many historical eras, each with distinctive architectural features, as seen in Figure 1. The architectural identity of Terengganu's vernacular buildings is shaped by their elongated roof forms, which are particularly important structural and visual components [23].

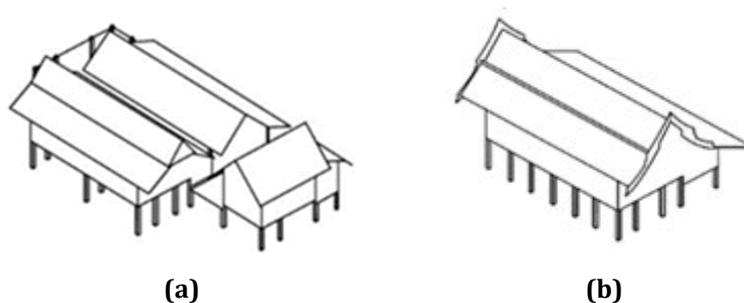


Fig. 1 (a) *Rumah Tiang Dua Belas* (twelve-pillared house); (b) *Rumah Bujang Berselasar* (single terraced house berselasar) [22]

According to [20], traditional Terengganu wooden houses are valued for two key characteristics. First, they employ wood as the main building material, and their architectural styles are ideally suited to the local environment. Second, ornamental features are a crucial aspect of its architectural identity, especially the intricate carvings on different wall and door panels. Now recognised as important examples of Malay architectural history, these traditional forms were abandoned after World War II [24]. In Terengganu, a house's size is often determined by the number of main pillars that support the roof. Since these structural pillars serve as the main load-bearing system, the Malay community frequently uses them to identify a house. *Rumah Tiang Enam* (six-pillared house) refers to a home with six pillars, whereas *Rumah Tiang Dua Belas* (twelve-pillared house) is a larger variant with twelve pillars. The typical Terengganu house has two main variations. The *Rumah Tiang Enam* form is equivalent to the smaller variant, *Rumah Bujang Selasar*. The *Rumah Tiang Dua Belas*, also known as *Rumah Serambi*, is the larger and more ornate counterpart, distinguished by its greater footprint and more extensive decoration. Additional ancillary structures are frequently seen on one or both of the main house's long sides, or occasionally at its ends. This expansion is referred to as the *Selasar* when it is roofed and extends the entire length of the structure. The addition is referred to as the *Lambor* if it is an open platform with a side entrance and a short set of steps leading to it. In order to differentiate it from the simpler version of the house, a *Rumah Bujang* equipped with a *Selasar* is called *Rumah Bujang Selasar*. The building type is more accurately classified when the term "*Selasar*" is included in the description. These housing changes are shown schematically in Figures 2 and 3 below.

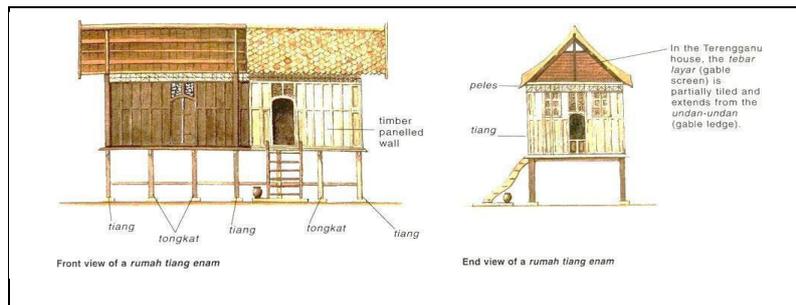


Fig. 2 Side view and end view of a *Rumah Tiang Enam* [16]

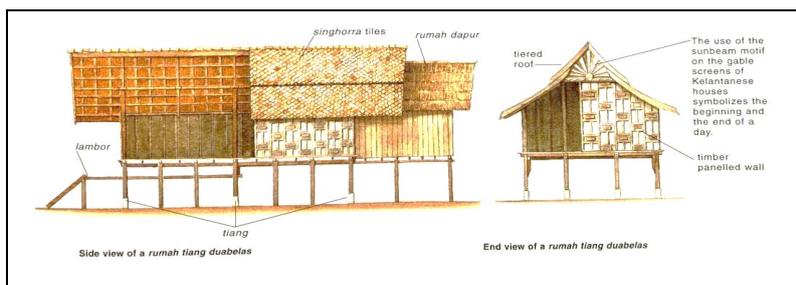


Fig. 3 Side view and end view of a *Rumah Tiang Enam* [16]

2.3 Spatial Features of Traditional Architecture in Terengganu

Most of the research addresses how traditional Malay houses are arranged spatially in terms of activity zones, daily usage patterns, and privacy levels based on occupant interactions, gender, and age. In general, the spatial arrangement is divided between interior and outdoor spaces, each of which fulfils different purposes and demands for privacy. The utilisation of these spaces in a traditional Terengganu house is shown in Table 1. The house can be divided into four primary zones: the front part, the kitchen zone, the central or main area, and the back section, as mentioned in [25] and cited by [26]. The interior is categorised by other research based on functional functions or public and private areas [18]. Eight spatial components—*Anjung*, *Serambi*, *Kelek Anak*, *Rumah Ibu*, *Pelantar*, *Selang*, *Rumah Dapur*, and *Jemuran*—are also frequently seen in traditional Malay houses, according to research by [27], [28]. Five main spatial components are identified for the Terengganu context in particular: *Anjung*, *Serambi*, *Rumah Ibu*, *Kalong*, and *Rumah Dapur* [29], [30], [31], and [32]. In this context, "*rumah*" refers to a small building unit, as those seen in *Rumah Ibu* and *Rumah Dapur*. An open passageway or *Selasar* connects these units, resulting in a connected layout. The *Rumah Tiang Dua Belas*, a compound-like layout typical of traditional Terengganu architecture, is created when multiple similar *Rumah* units are combined [27].

Table 1 Purposes and level of privacy of the interior and exterior areas of traditional Terengganu dwellings [18]

Spatial Elements	Activities	Privacy level
<i>Serambi / Anjung</i> (Verandah / Porch)	Male arrival, unwinding, keeping an eye on the kids, greeting, and treating	Public space
<i>Rumah ibu</i> (The main / core of the house)	Gathering, reading or reciting, praying, and sleeping (at night)	Semi private space
<i>Rumah Dapur</i> (The kitchen of the house)	Washing, dining, cooking, and food preparation	Private space
<i>Kolong</i> (The space beneath the floor)	Clothes drying, fixing, storing, and working	Public space
<i>Kelek Anak</i> (Area for casual activities with daughters and sons)	Discussion, kite-making, fishing net maintenance, and other	Public space

The serambi, located at the front of the house, is dedicated to male guests, while the kitchen, located at the back of the house, is reserved for female guests, who are often associated with cooking activities. [30], [29]. The sociocultural aspect plays a significant role in influencing the design of the Serambi, as it will determine the location of the main entrance of the house. In front of the serambi's main door, an open space used to greet the male visitors is called a verandah [30], [31].

In Malaysia's East Coast states, connections to new areas of house are typically formed by adding an unroofed transitional space, akin to the *jemuran* or *selang* (a gap, connector, or corridor), according to [33]. The majority of houses also have two entrances. Usually on the front façade, but sometimes on the side of the house, the main entrance is situated at the *serambi*. Traditionally, the main staircase's steps are numbered oddly. Either the kitchen wall or the areas between the kitchen and the *rumah ibu* serve as alternative entrances. Ornaments and decorative features are sometimes incorporated into the *rumah ibu* and frequently affixed to the *serambi*. In Malay culture, achieving environmental harmony is the primary goal of the construction of homes. In order to ensure physical, mental, and emotional comfort, this harmony necessitates compatibility between the object (the house) and the subject (the occupants). The concept of *rasi* or *serasi*, which includes *padan* (fit), *sepadan* (well-fitted), *sesuai* (suitable), and *selesa* (comfortable), embodies the fundamental ideas of traditional Malay house construction. Three interrelated elements of the ancient Malay architectural tradition—*adab*, *adat*, and *tertib*—are used to accomplish *rasi*. The values (*adab*) ingrained in traditional building methods (*adat*) must essentially be followed and carried out in the correct order (*tertib*) in order to achieve *rasi*.

As a result, traditional architecture represents the national identity and legacy and is considered a cultural treasure [6]. One such priceless architectural legacy is Terengganu's traditional Malay house architecture. It represents the identity and way of life of the Malay people, who have always been closely connected to their surroundings. However, as modern civilisation progressively erodes this architectural legacy, it has changed throughout time and is now in threat of being extinct.

Although extensive study exists on traditional Malay architecture, there is a paucity of studies focusing on the spatial attributes and conservation initiatives of traditional Terengganu dwellings, especially in relation to Malaysian sustainable housing. This work seeks to address this deficiency by offering a thorough visual and spatial analysis, which has been predominantly neglected in the current literature. Hence, the existing literature on architectural conservation in Malaysia primarily highlights urban heritage buildings, with insufficient attention given to rural coastal buildings that amalgamate traditional architecture with sustainable housing requirements. This study examines Terrapuri Heritage Village, offering new insights into the adaptability and sustainability of traditional Terengganu dwellings within a sustainable housing context.

3. Methodology

This study aims to analyse and record the spatial attributes of traditional Terengganu architecture as exemplified in the Terrapuri Heritage Village in Setiu, Terengganu. This study utilizes a qualitative technique comprising of historical document analysis, visual observation, and semi-structured interviews to examine the spatial attributes of traditional Terengganu dwellings at Terrapuri Heritage Village, specifically the *Rumah Tiang Enam* and *Rumah Tiang Dua Belas*. The analysis is on discerning their visual attributes, including the arrangement of spaces and the alignment of house structures. A qualitative methodology is chosen for its efficacy in delivering profound insights

into intricate social phenomena, facilitating a comprehensive examination of architectural designs and cultural surroundings [34]. This study provides insights into the adaptation of traditional architecture for contemporary use while maintaining historical integrity, thus connecting conservation theory with practical applications in sustainable housing.

A purposive sampling technique was utilised to guarantee that the information gathered is relevant and comprehensive [35]. A semi-structured interview format was selected to provide flexibility in responses while ensuring comprehensive coverage of key topics. The interview questions were organised into four primary themes: [1] the historical context of the houses and their importance in Terengganu's cultural heritage, [2] architectural design features and spatial arrangement of *Rumah Tiang Enam* and *Rumah Tiang Dua Belas*, [3] restoration and conservation initiatives implemented at Terrapuri Heritage Village, and [4] the contemporary use and adaptation of traditional houses for tourism. In addition, oral data were collected via face-to-face interviews with the resort owner, utilising an audio recorder with the participant's consent. Each interview session had a duration of 45 minutes to 1 hour. Field notes were also recorded to document observations and contextual information. The interview recordings were transcribed into verbatim to ensure precision, followed by a thematic analysis to discern frequent themes and significant findings. Additionally, responses were validated through visual documentation and archival research to confirm the consistency and reliability of the findings.



Fig. 4 Master plan of the Terrapuri Heritage Village

The Terrapuri Heritage Village Resort in Setiu, Terengganu was selected as the case study location for this research. The selection of houses is influenced by several factors, namely: (1) their representation of Terengganu traditional architecture, originating from the eastern coastal region of Peninsular Malaysia, (2) their embellishment with distinctive regional architectural details, and (3) their provision of comprehensive spatial and physical components relevant for visual analysis purposes. It is recognized as a traditional coastal resort in Terengganu, featuring twenty-nine (29) ancient Terengganu houses, which are 100 to 250 years old. The building complex includes twenty renovated villas, a reception area, a lobby, a gallery, a reading room, a library, a souvenir shop, and a conference room. Three (3) unit houses were examined, selected based on the criteria outlined in this study. Research and observations were conducted to examine the transformation of traditional dwellings in chosen units, focusing on spatial configurations and functionalities. Additionally, interviews were conducted with the resort owners to gather information on the resort's history and the criteria used for constructing each unit.

The chosen traditional Terengganu dwellings are enumerated in Table 2. Several traditional residences were discovered to have been altered by the owner, complicating access for the study. The following reasons contribute to the study's limitations. Visual data was captured using a mobile phone camera, while oral data were obtained through semi-structured interviews with the resort owner. Both categories of data were employed to examine and ascertain the existence of spatial elements in traditional Terengganu dwellings inside Terrapuri Heritage

Village. The findings were analysed in relation to the visual tables and inventory assessment conducted for the study.

Table 2 The three chosen traditional Terengganu buildings at Terrapuri Heritage Village in Terengganu

No	Name of House	Types of Houses	Original Location of House	Remarks
1	Rumah Kedai Buluh (RKB)	<i>Rumah Tiang Enam</i>	Kg Kedai Buluh, Kuala Terengganu	Functions as a villa
2	Rumah Gelugor Raja (RGR)	<i>Rumah Tiang Enam</i>	Kg Gelugor Raja, Kuala Terengganu	Functions as a villa
3	Rumah Serada (RS)	<i>Rumah Tiang Dua Belas</i>	Kg Serada, Kuala Terengganu	Functions as reception and lobby

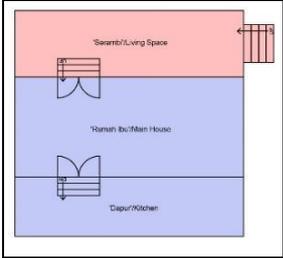
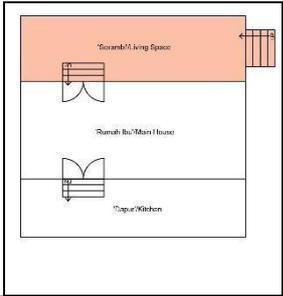
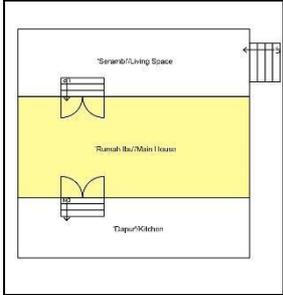
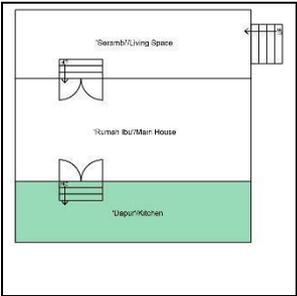
4. Findings and Discussions

The findings indicate that spatial qualities are a crucial determinant of the continuity of sustainable spatial arrangements in future Malaysian dwellings [29], [30], [31], [32]. Terengganu's traditional identity has five spatial elements: *Serambi* (veranda), *Rumah Tengah* (main house), *Kelek Anak* (intermediate space), *Rumah Dapur* (kitchen house), and *Kolong* (subterranean spaces - outside). In Terrapuri Heritage Village, it is evident that all these spatial characteristics are preserved. Moreover, the analysis results indicate that modifications have been implemented in the spatial layout in accordance with the resort's role. This includes the adaptation or repurposing of the room layout, including the conversion of the kitchen area into a bathing space, the renovation of the existing structure, and the use of new materials and building techniques into the architectural design. This study's findings indicate that the traditional architecture of Terengganu possesses significant sustainable spatial attributes that help maintain aspects of traditional Malay socio-cultural values and regional identity, while simultaneously addressing the demands of 21st-century design standards. Table 3 summarizes the spatial configuration of the studied house.

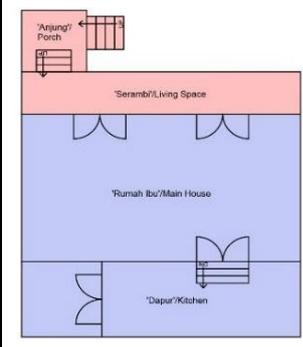
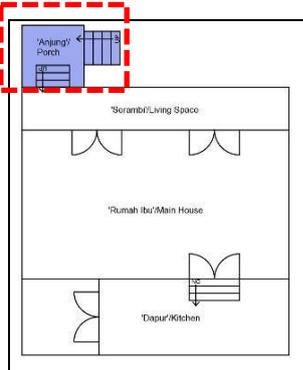
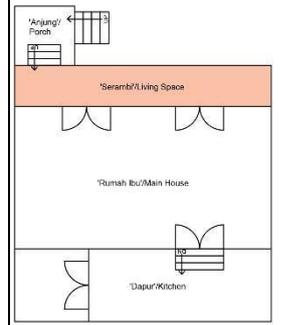
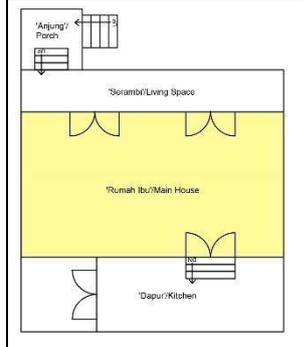
Nevertheless, few research has examined the correlation between a sustainable spatial arrangement in Malaysian residences and the incorporation of cultural identity to develop Malaysian sustainable housing. Malaysia, as a nation experiencing urbanization, exhibits a deficiency in study about the comprehensive tourism experience, particularly on the integration of cultural influences. This served as the impetus for the study, which sought to delineate the attributes of sustainable spatial design employed in the development of future Malaysian sustainable housing. Consequently, it is an opportunity to analyse the spatial planning and design elements of housing development, namely the positioning and configuration of structures, together with the incorporation of cultural identity in seaside resorts on the East Coast of Peninsular Malaysia. Moreover, the design promoted and guaranteed that all individuals acted in accordance with cultural norms and moral etiquette, as interpreted by the local community's traditions. Furthermore, by establishing separate spaces for males and females, the inter-relativity of space layout ingrained the protection of Islamic perspectives on socio cultural interaction and privacy [36].

The results showed that local customs encode the design of spatial layout, which is subsequently influenced by socio-cultural and cultural values. From the perspective of Terengganu Malay design, "Cultural Values" are therefore determined to be the enhanced regional identity of Terengganu, accommodating their code of conduct and refined moral etiquette as indicated by custom in every facet of design, based on the literature reviews. Thus, including cultural values in home design is a Malay socio-cultural perspective on quality of living. Therefore, in this context, "home" rather than "house" denotes a person's surroundings that are consistent with their cultural beliefs.

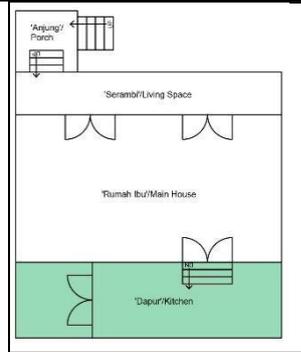
Table 3 Space planning for selected traditional Terengganu dwellings at Terrapuri Heritage Village, Setiu

Rumah Kedai Buluh		
Photo	Spatial planning	Remarks
	<p>Space zoning</p> 	<p>External area (Public space)</p> <p>The area is built for guests, proprietors, and family members.</p> <hr/> <p>Internal area (Semi-public/Semi-private space)</p> <p>The area is designated for the owners and their family members, while visitors are occasionally permitted.</p>
<p>'Serambi'/Living space</p> 	<p>Division of spaces</p> 	<p>'Serambi' is an open area located on the side of the home that faces the street. This area was formerly designated as the reception for guests, particularly male visitors. The <i>serambi</i> serves as the venue for all social and religious activities within the village. However, as the home has now been transformed into a rental villa, the 'Serambi' functions solely as a resting area.</p>
<p>'Rumah ibu'/Main house</p> 		<p>The principal element of a traditional house's architecture is the 'Rumah ibu' (main house). It is regarded as the central component of the house and the location of the 'Tiang seri'. The central region of Rumah Kedai Buluh, previously known as 'Rumah ibu', has been modified and divided into two halves. The room is spacious, with a section designated as a bedroom with a queen-sized bed, while the remainder functions as a dressing area.</p>
<p>'Dapur'/Kitchen</p> 		<p>The 'Dapur' is situated at the rear of the house and is positioned at a lower elevation than the 'Rumah ibu'. The 'Dapur' functions largely as a kitchen. Furthermore, whenever female visitors arrive, they are hosted in the 'Dapur' area. The area has been transformed into an expansive bathing space. The bathroom comprises of bathtub, sink, toilet, and shower area.</p>

Rumah Gelugor Raja

Photo	Spatial planning	Remarks
	<p>Space zoning</p> 	<p>External area (Public space) The area is built for guests, proprietors, and family members.</p> <hr/> <p>Internal area (Semi-public/Semi-private space) The area is designated for the owners and their family members, while visitors are occasionally permitted.</p>
<p>'Anjung'/Porch</p>	<p>Division of spaces</p> 	<p>Rumah Gelugor Raja's layout differs slightly from other traditional Malay houses in Terengganu. A small 'Anjung' is available at the home's main entrance. This area is used as a resting area for sitting, having conversations, and observing passers-by. Sewing and net-making are also done here. The 'Anjung' is the domain area for men to carry out their activities. To differentiate between the two levels of privacy, 'Anjung' is constructed to be lower than the 'Serambi' area.</p>
<p>'Serambi'/Living space</p>		<p>The 'Serambi' area for Rumah Gelugor Raja is designed to be on the same level as <i>Rumah ibu</i>. The 'Serambi', however, continues to be regarded as a public area where male visitors are entertained. 'Serambi' in the Rumah Gelugor Raja is smaller than the other typical Terengganu Malay houses in size. As a result, there is not much activity in the 'Serambi' area because it is solely used as a place to rest.</p>
<p>'Rumah ibu'/Main house</p>		<p>The principal element of traditional house architecture is the '<i>Rumah ibu</i>' (main house). It is regarded as the central component of the house and the location of the '<i>Tiang seri</i>'. The primary region of Rumah Gelugor Raja, previously known as '<i>Rumah ibu</i>', has been modified and divided into two halves. The spacious room includes a designated area as a bedroom featuring a queen-sized bed, while the remainder functions as a changing area.</p>

'Dapur' / Kitchen



The *'Dapur'* is situated at the rear of the house and is positioned at a lower elevation than the *'Rumah ibu'*. The *'Dapur'* functions largely as a kitchen. Furthermore, whenever female visitors arrive, they are hosted in the *'Dapur'* area. Rumah Gelugor Raja's *'Dapur'* was originally divided into two sections, where the dry and wet areas are. As a result, this villa's bathroom is similarly divided into two halves, which includes the relaxing space and the restroom.

Rumah Serada (Reception & Lobby)

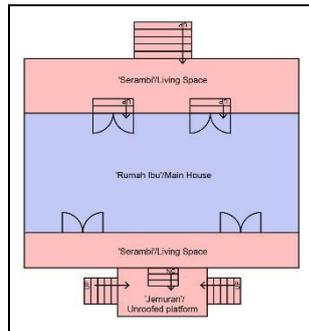
Photo

Spatial planning

Remarks



Space zoning



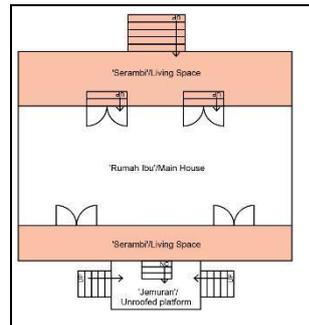
External area (Public space) The area is specifically intended for guests, owners, and staff members.

Internal area (Semi-public/Semi-private space) This area is designated for owners and staff; however, visitors are permitted to enter during visiting hours or by reservation.

'Serambi' / Living space

Division of spaces

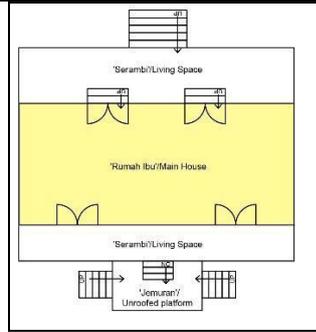
Among all the Traditional Terengganu Malay Houses preserved in Terrapuri, Rumah Serada exhibits the most distinctive design. The house is created with two *'Serambi'* to delineate the men's and women's quarters. The front *'Serambi'*, however, continues to be regarded as a public area where male visitors are entertained and used by the fishermen to place and distribute their catch.



Another *'Serambi'*, which is only intended for women, is also added to the back of the house. It is situated next to the *'Dapur'* and is intended for women to congregate and be entertained. The back *'Serambi'* is smaller than the other typical Terengganu Malay Houses in size. As a result, there is not much activity in the *'Serambi'* area because it is solely used as a place for the women to rest.

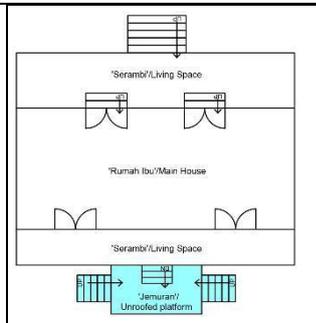


'Rumah ibu'/Main house



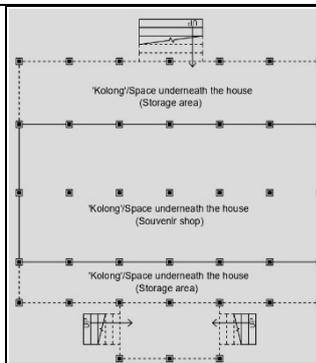
The principal element of a traditional house's architecture is the 'Rumah ibu' (main house). It is the central component of the house, where the 'Tiang seri' is situated. Due to Rumah Serada's size, the house has been altered to serve as a reception area and lobby for visitors arriving at Terrapuri Heritage Village.

'Jemuran'/Unroofed platform



'Jemuran' is created without a roof or shade, it is situated next to the 'Dapur' and intended for women to congregate and being entertained. In addition, the space is also used as a place to wash and dry clothes, as well as a place to collect rainwater. However, the 'Jemuran' space is now used as a rest area for the public, as it is attached to the lobby and reception area and facing the sesayap courtyard.

'Kolong'/ The space beneath the floor



Below the house's floor lies an area known as a 'Kolong', which is reinforced by pillars to mitigate the effects of the damp earth. It is considered a semi-private location commonly utilized for work, relaxation, and occasionally as a storage area. The presence of 'Kolong' alleviates the burdens associated with flooding and ensures the safety and protection of homeowners from animal attacks, like snakes and insects, in the vicinity.

However, the purpose of 'Kolong' under Rumah Serada is no longer the same now that Terrapuri is being preserved and well maintained. The house's 'Kolong' has been converted into a souvenir shop since Rumah Serada receives the most visitors because of its modification as a reception and lobby. The area is now enclosed by glass walls and is no longer an open area.

Table 4 shows the overview of the spatial characteristics of the studied houses at Terrapuri Heritage Village. There are slight variations in the space arrangement and layout of Rumah Gelugor Raja compared to the other traditional Terengganu Houses. Overall, the design of Terrapuri Heritage Village preserves the significant elements in the traditional Malay house layout. It includes Kolong (exterior spaces below), Serambi (selasar), Rumah Tengah (rumah ibu), Kelek Anak (selang), and Rumah Dapur.

The findings, as outlined in Table 4, indicate notable spatial characteristics in *Rumah Tiang Enam* and *Rumah Tiang Dua Belas*, namely regarding their orientation, structural composition, and functional adaptability. These findings establish a fundamental comprehension for the ensuing discourse on the incorporation of traditional Terengganu architecture into modern heritage tourist initiatives. In addition, the study of spatial arrangements in the chosen traditional Terengganu houses reveals a hierarchical structure of spaces, distinctly differentiating between public and private areas. *The Rumah Tiang Enam* features a more compact configuration, whereas the *Rumah Tiang Dua Belas* permits wider spatial growth. The results indicate that the architectural typologies in Terrapuri Heritage Village are shaped by socio-cultural influences and environmental conditions, underscoring the significance of spatial flexibility in traditional Malay architecture.

Moreover, this research diverges from prior studies that mainly emphasised on the symbolic and aesthetic dimensions of traditional Malay houses [37], [38] by employing a spatial analysis approach to investigate functional adaptability in the context of Malaysian sustainable housing. In contrast to traditional conservation frameworks that prioritise static preservation, this study illustrates that adaptive reuse strategies in Terrapuri Heritage Village improve cultural authenticity and contemporary functionality, thereby presenting a more sustainable conservation model. Furthermore, the results demonstrate that the spatial arrangement of traditional Terengganu houses facilitates climatic adaptation and socio-cultural interactions. An open *verandah* (*serambi*) and elevated floor structures indicate a significant adaptation to environmental factors, including humidity and seasonal flooding. These architectural elements facilitate passive cooling strategies, consistent with sustainable design principles.

Hence, this research builds upon the findings of [29] and [11] by presenting empirical evidence regarding the role of traditional Malay houses in the context of Malaysian sustainable housing. Previous studies have documented architectural styles and construction techniques; however, this study's findings emphasise the evolution of spatial functions to meet modern hospitality needs while maintaining historical authenticity.

Table 4 Overview on spatial characteristics of the chosen traditional Terengganu dwellings at Terrapuri Heritage Village in Terengganu

Spatial Characteristics of Traditional Terengganu Dwellings	Rumah Kedai Buluh	Rumah Gelugor Raja	Rumah Serada
<i>Anjung (Porch)</i>		√	
<i>Serambi (Verandah)</i>	√	√	√
<i>Kelek anak or selang</i>			
<i>Rumah Tengah or Rumah ibu (Main House)</i>	√	√	√
<i>Pelantar</i>			
<i>Selang (Intermediary spaces)</i>			
<i>Ruang dapur (Kitchen)</i>	√	√	
<i>Selasar (Exposed corridor)</i>			√
<i>Jemuran or Yard (Flat, unroofed building)</i>			√
<i>Kolong (The space beneath the floor)</i>	√	√	√
<i>Jemuran or Yard (Flat unroofed building)</i>			

5. Conclusion and Recommendations

The development of Architecture, in the context of modern design schemes, impacts the authenticity of heritage and cultural identity which have become more apparent. The consideration of spatial layout reflects appropriate communication between environments and occupants, signifying the effectiveness of the design. The detailed analyses show that while effectively adapting to the local environment, the building layout of Traditional Terengganu Malay homes closely examines the East Coast influence viewpoints (an evident integration of culture and religion). Furthermore, the spatial characteristics embody culturally sensitive design principles, which significantly affect the occupants' quality of life and, consequently, the well-being of the community. As a result, the Terengganu Malays demonstrate cultural diplomacy and subtlety in their practices of receiving guests, acknowledging their status or rank within the social structure, and adhering to socio-cultural boundaries, guided by the concept of mahram (unmarriageable kin) in Islam. These socio-cultural perspectives are apparent in the space arrangement design concept. The literature demonstrates that every Malay traditional home, regardless of state or kind, has a significant spatial arrangement. Although there are some specific variations from one type of Malay traditional house to another, overall, the fundamental layout of a Malay traditional house remains the same, as do the relationships between different spaces, their assigned functions, adjacencies, hierarchy, and arrangement [18], [28], [39].

The studies on the spatial characteristics of traditional Terengganu Architecture in the context of this study, specifically at Terrapuri Heritage Village, will contribute to the development of sustainable spatial layouts for future Malaysian home designs. The characteristics of their designs, including the building placement, layout, and materials, as well as the integration of cultural identity, should be adapted for the future home layout design in Malaysia. The authenticity and the practicality of the traditional Malay house are manifestations of the wisdom of our ancestors in respecting their way of life in their inhabited space, the home. Thus, the idea of developing

modern sustainable home design that adapts traditional Malay house characteristics and values should respect the needs of the current modern lifestyle.

The future studies may incorporate digital documentation methods, including 3D laser scanning and Building Information Modelling (BIM), to improve the precision of spatial analysis and conservation strategies for traditional Terengganu houses. An interdisciplinary approach that includes cultural anthropologists and experts may yield deeper insights into the socio-economic impacts of sustainable housing. Besides, this study's limitation lies in its concentration on a single case study, potentially failing to encompass the diverse architectural adaptations present throughout Terengganu. Future research should conduct a comparative analysis of various heritage sites to formulate broader generalisations concerning spatial transformation in traditional Malay architecture.

The ideals of sustainable Malaysian home design begin by understanding how the way of life and culture should be incorporated into the design, as shown in the traditional Malay architecture. On the other side, the identity of traditional Malay architecture, based on its regional identity, should be adapted in the future home design, as a continuation of identity that we should preserve from the past, in the pressure of contemporary design influence in this era.

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Conflict of Interest

There is no conflict of interests regarding of the publication of this paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Izzati Zainal Abidin, Sumarni Ismail, Nor'Atiah Ismail, Azmal Bin Sabil, Mohd Azli Mohd Jamil; **data collection:** Izzati Zainal Abidin, Siow May Ling; **analysis and interpretation of results:** Izzati Zainal Abidin, Sumarni Ismail; **draft manuscript preparation, review and editing:** Izzati Zainal Abidin, Sumarni Ismail, Azmal Bin Sabil. All authors reviewed the results and approved the final version of the manuscript

References

- [1] Kamal, K.S., Syed Mustapa, S.A.H., Husin, H.N., (2005). The Influence of Social Interaction in the Spatial Planning and Organization of a Traditional Terengganu Malay House. *Proceedings: International Seminar Malay Architecture as Lingua Franca*, 133-142
- [2] Asif, N., Zuki, M. Z. M., Hussain, M. H., Fouzi, M. A. Z. M., & Ardiansyah, R. (2020). Reflection on the National Architectural Identity of Malaysia: A Qualitative Study Based On the Thoughts of Achmad Moerdijat. *Journal of Architecture, Planning and Construction Management*, 10(2). 44-54.
- [3] Ismail, A., S. (2021). *What Is Malaysian Architecture?* [Radio broadcast]. <https://www.bfm.my/podcast/night-shift/i-love-kl/i-love-kl-what-is-malaysian-architecture>
- [4] Abidin, I. Z., Ismail, S., Ismail, N. A., & May Ling, S. (2022). In search of the architectural design characteristics of coastal resort tourism in Terengganu. In *1st International of e-Conference on Green and Safe Cities 2022*, 87-106.
- [5] Rahmat, M. H., Ismail, A. S., & Mandala, A. A. (2022). *Framework of National Architectural Identity of Public Administration Buildings: A Case Study of Majlis Bandaraya Johor Bahru (MBJB) Tower*. *International Journal of Sustainable Construction Engineering and Technology*, 13(4). 399-414. <https://doi.org/10.30880/ijscet.2022.13.04.034>
- [6] Bahari, A., Sabil, A., Yusof, H., Hamzah, M. H., & Ismail Jamail, M. (2023). The contribution of non-malay architects to the development of national architecture identity in Malaysia. *International Journal of Integrated Engineering*, 15(6). 143-151. <https://doi.org/10.30880/ijie.2023.15.06.016>

- [7] Sabil, A. and Utaberta, N. (2011). *Documentation and Analysis of Sustainable Design and Application of Tanggam System in Malay Traditional House*. *Advanced Materials Research*, 291-294, 984-987. <https://doi.org/10.4028/www.scientific.net/amr.291-294.984>
- [8] Mohamad Tajuddin Mohamad Rasdi. (2004). *Warisan Seni Bina Dunia Melayu Rumah-Rumah Tradisional*. Penerbit UTM.
- [9] Nizam, N. F. S. B. S. (2022). Keistimewaan Rumah Bujang Berserambi Selasar Di Manir, Terengganu. (Undergrad dissertation, Universiti Malaysia Kelantan). <http://discol.umk.edu.my/id/eprint/3729/>
- [10] Rasdi, M. T. H. M. (2005). *The architectural heritage of the Malay world: The traditional houses*. Penerbit UTM.
- [11] Lim, J. Y. (1987). *The Malay house: Rediscovering Malaysia's Indigenous Shelter System*. Institut Masyarakat.
- [12] Dobby, E. H. G. (1942). Settlement patterns in Malaya. *Geographical Review*, 32(2), 211-232.
- [13] Mohd Nasir, N. N. (2021). *Keistimewaan Rumah Tradisional Tiang 12 Yang Wajar Dipelihara Sebagai Warisan Nusantara Yang Berharga* (Doctoral dissertation, Universiti Malaysia Kelantan). ProQuest Dissertations and Theses Global.
- [14] Nasir, A. H., (1996). *Rumah Melayu Tradisi*, Fajar Bakti, KL.
- [15] Yusof, A. A. R., Rahman, K. A. A. A., Sabil, A., Utaberta, N., & Yusuf, N. (2021). *The Adaptation of Islamic Principles in Sarawak Traditional Malay House*. *Journal of Islamic Architecture*, 6(4), 210-216. <https://doi.org/10.18860/jia.v6i4.13044>
- [16] Chen V. F. (1998). *Architecture: The encyclopedia of Malaysia*. Singapore: Editions Didier Millef.
- [17] Marzuki, I., Salem, A., & Hisham, L. (2019). Interior design analysis of Terengganu traditional Malay house. *International Journal of Scientific Research and Engineering Development*, 2(2), 598-604.
- [18] Masri, M., Yunus, R. M., & Ahmad, S. S. (2016). The Serambi: Inculcation of socio-cultural values in Malay traditional home design. *Procedia-Social and Behavioral Sciences*, 234, 255-264.
- [19] Kamarudin, Z., & Said, I. (2011). Configuration of carved components and its layout patterns in Malay timber houses. *Archnet-IJAR: International Journal of Architectural Research*, 5(1), 7.
- [20] Shah, R. B. S. R. A. (1988). *The Terengganu timber Malay house/by Raja Bahrin Shah bin Raja Ahmad Shah*. Kuala Terengganu: Published with the assistance of Petronas by Badan Warisan Malaysia.
- [21] Sheppard, M. F. (1949). A short history of Trengganu. *Journal of the Malayan Branch of the Royal Asiatic Society*, 22(3), 1-74.
- [22] Endut, E. H. (1994). *Traditional Malaysian Built Forms: A Study of the Origins, Main Building Types, Development of Building Forms, Design Principles and the Application of Traditional Concepts in Modern Buildings* (Doctoral dissertation, University of Sheffield). ProQuest Dissertations and Theses Global.
- [23] Kamarudin, Z. (2015). Long-roofed Houses of Northeastern Peninsular Malaysia: Sustainability of Its Identity in the Built Environment. *Procedia Environmental Sciences*. 28. 698-707. DOI:10.1016/j.proenv.2015.07.082.
- [24] Nasir, A. H., & Wan Teh, W. H. (1997). *Warisan seni bina Melayu*. Penerbit Universiti Kebangsaan Malaysia.
- [25] Abidin, W. B. W. (1981). *The Malay house: Rationale and change*. (MArch). Cambridge: MIT. ProQuest Dissertations and Theses Global.
- [26] Ghaffarian Hoseini, A. H., Berardi, U., Dahlan, N. D., Hoseini, A. G. (2014). What can we learn from Malay vernacular houses? *Sustainable Cities and Society*, 13, 157-170. <https://doi.org/10.1016/j.scs.2014.04.008>
- [27] Abdullah, A., Wahid, J., Mohamad, W. S. N. W., Khairuddin, M. R., Ibrahim, I. L. H., & Hasim, A. H. (2021). Remembering the Malay Settlement: A Case of Rumah Tiang Dua Belas Kelantan. *MAJ-Malaysia Architectural Journal*, 3(2), 1-9.
- [28] Abdullah, A., Wahid, J., Mohamad, W. S. N. W., Khairuddin, M. R., Ibrahim, I. L. H., & Hasim, A. H. (2021). Remembering the Malay Settlement: A Case of Rumah Tiang Dua Belas Kelantan. *MAJ-Malaysia Architectural Journal*, 3(2), 1-9.
- [29] Md Rashid, 'A.F. and Hanafi, Z (2018). The Future of Traditional Malay House Design in Peninsular Malaysia. *Infrastructure University Kuala Lumpur Research Journal*, 6(1), 20-26
- [30] Nasir, A. H. (1985). *Pengenalan Rumah Tradisional Melayu Semenanjung Malaysia*. Loyal Press.
- [31] Idrus, Y. (1996). *Rumah Traditional Negeri Sembilan: Satu Analisis Seni Bina Melayu*. (201 Ed.). Shah Alam: Penerbit Fajar Bakti Sdn. Bhd.

- [32] Masri, M. (2012). The misconceptions of Negeri Sembilan traditional architecture. *Procedia - Social and Behavioral Sciences*, 68, 363-382. doi: <http://dx.doi.org/10.1016/j.sbspro.2012.12.234>
- [33] Masri, M. (2013). Prevalence of Negeri Sembilan Malay traditional architecture for future communities: Misconceptions. *Asian Journal of Environment-Behaviour Studies (ajE-Bs)*, 4(13), 111-132.
- [34] Ariffin, S. I. (2000). A Mathematical Explanation of the Magic Measurements Found in the "Taj-UI-Mulk" And The "Pawang's Book." *Journal of the Malaysian Branch of the Royal Asiatic Society*, 73(1), 91-105. DOI: <http://www.jstor.org/stable/41493414>
- [35] Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- [36] Kvale, S. (2012). *Doing interviews*. SAGE Publications.
- [37] Jani, H. H. M., & Hussain, M. R. M. (2014). Reclaiming the loss of the Minangkabau cultural landscape in Negeri Sembilan. *Procedia-Social and Behavioral Sciences*, 153, 317-329.
- [38] Rashid, R. A., & Ahmad, A. G. (2011). Overview of maintenance approaches of historical buildings in Kuala Lumpur—a current practice. *Procedia Engineering*, 20, 425-434.
- [39] Abidin, I. Z., Ismail, S., Ling, S. M., Hamdan, N. A. A. M., & Sazli, S. S. (2024). A Critical Discourse Analysis Physical Characteristics of Traditional Terengganu Architecture as A Tourist Attraction on The East Coast Of Peninsular Malaysia: A Case Study Of Terrapuri Heritage Village In Terengganu, *Jurnal Pengajian Melayu (JOMAS)*, 35(1), 38-54.
- [40] Awawdeh, T., Omar, M. H., Ibrahim, M., Lababneh, H., & Alqamaz, S. (2019). Space planning factors of Terengganu traditional house. *International Journal of Scientific Research and Engineering Development*, 2(2), 568-576.