

**Proceedings
Simpora XV**

The 15th Regional
Symposium of
The Malay Archipelago

A black and white photograph of a traditional wooden building, likely a historical structure in the Malay Archipelago. The building features a steep, ornate roof with intricate carvings and a balcony with decorative railings. The image is positioned in the lower right corner of the page, set against a solid yellow background.

Resilience of Culture & Symbolism in Built Environment

**PROCEEDINGS OF THE 15TH REGIONAL
SYMPOSIUM OF THE MALAY ARCHIPELAGO**
SIMPORA XV: 2024

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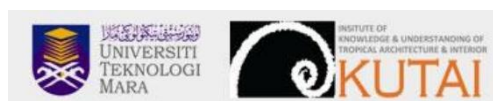
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TIMBER DEFECTS IN TRADITIONAL MALAY HOUSE: A CASE STUDY OF RUMAH KUTAI KAMPUNG SELAT

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Abstract: Timber traditional houses can bring a significant image of Malaysian built environment heritage. Indeed, it is one of the most valuable treasures that must be sustained for future global reference thus, the building owner and the professional must undertake the responsibility to ensure that these assets are in good condition and safe for its occupants. This paper aims to identify the nature of timber defects that occurred in Rumah Kutai Kampung Selat. Two research objectives had been established (i) to identify the types of timber defects and (ii) to determine the causes of the occurrence of the defects. A mixed-method approach was adopted. The building inspection was carried out from the external to the internal of the building. All timber defects for each building element were recorded in the conditional survey form. The data were analysed using frequency analysis to measure the frequency of the defects manifested. The findings suggest that with a proper methodology in place, there is much that can be learned from studying the cause of the defects. It will provide some insights to the owner/caretaker in planning to repair for replacement work to sustain the house.

Keywords: Timber traditional house, rumah kutai, timber defects, causes, learned

INTRODUCTION

There are many traditional Malay houses scattered around Malaysia. Although it had been built from decades to centuries, these houses created significant images of Malaysian built environment heritage. According to Nurfaizal et al (2020), a traditional Malay house portrays the uniqueness of Malay architecture and cultural value to the society. Indeed, it is one of the

most valuable treasures which are sustained for future reference universally. Societies worldwide have recognized the need to preserve their valuable cultural heritage (Mustafa et al., 2020), and decision makers have emphasized heritage preservation as represented by the Sustainable Development Goals (SDGs) 2030. SDG 11 addresses sustainable cities and communities, with the aim to “make cities inclusive, safe, resilient, and sustainable”. It provides a comprehensive framework for heritage buildings, particularly Target 11.4, that seeks “to strengthen efforts to protect and safeguard the world’s cultural and natural heritage”. Heritage preservation also helps to reduce landfill waste, demolition energy use, and resource consumption for new constructions. This is consistent with SDG 12, Target 12.5: “by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse”.

Nevertheless, Seo et al (2009) reported recently, the traditional Malay house has been affected by the rapid modern development and faces the threat of being demolished or transformed into a brick house. Nor Haniza et al., (2007) added that due to Malaysia's climate and location in the tropics is classified as tropical with high temperatures, high humidity and heavy rainfall. This will lead to timber defects and deterioration. Thus, the house owner and the professional must ensure that these assets are in good condition and safe for their occupants (C. Ani et al., 2009). One of the methods is by conducting building condition survey to identify the type of defects, location of the defects and causes of the defects so that an appropriate solution can be made.

This paper aims to identify the nature of timber defects that occurred in one of the traditional Malay house in Perak i.e Rumah Kutai Kampung Selat. In line with this aim, two research objectives had been established (i) to identify the types of timber defects and (ii) to determine the causes of the defect’s occurrence.

LITERATURE REVIEW

2.1 Defects and Deterioration of Timber Buildings

Defects are common phenomena which occur on any structure or building (Kartina et al, 2018) and (Mydin, 2016). Defects can be defined as a failure or shortcoming in the building’s function, performance, statutory or user requirements, and this may occur in its structure, fabric, services or other facilities (Carillo, 2006; Peng & Wee, 2001).). It occurs not only in the building operational phase but also before and during the construction stage (Lateef et al, 2010; Kian, 2001). Failure to address defects would most likely contribute to additional rectification costs, hamper the smooth operation of the building, and reduce its service life. In extreme cases, defects may even lead to accidents and disasters (Groblier & Pretorius, 2002).

Traditional Malay houses in Malaysia, famous for their uniqueness in design and aesthetic value, are mainly constructed with timber materials. There is a pressing need to conserve this valuable heritage, as these timber building structures and elements are subjected to decay and deterioration caused by environmental factors. Civil laws and other protective measures

are necessary to save these heritage buildings and important timber structures from destruction. Nevertheless, preventive treatment alone does not promise to restore the timber buildings and structure to their former condition but will at least stop further deterioration. Under proper conditions, timber provides excellent, lasting performance. However, it also faces several potential threats to service life, including fungal activity and insect damage which can be avoided in numerous ways. Mydin (2016) explained that timber buildings are also exposed to several potential threats to service life, including fungus, insect damage and wear and tear process. In addition, M. Nurfaizal et al, 2020 highlighted other typical timber defects such as timber shakes, twisted, cup, bow, split, peeling off paint and unwanted plant growth.

According to Ridout (2000), S. Johar et al (2013) and Mydin (2016), these defects can be divided into four main wood deterioration agents such as:-

- a. Biological agents are well known for their catastrophic attacks. This deterioration agent can be classified into two namely fungi and insects/ small animals. Soft, brown and white rot are typically grouped into fungi. Meanwhile, beetles, termites, ants, bees and birds are an example of insects/small animals
- b. Physical agents are imperfections and aesthetical defects in the wood itself. It was naturally born, known for its hollow, knots and cracked features before being consumed by users
- c. Chemical agents are acids that make the wood brittle and wood fibers become separated resulting in a mass of sharpened filaments detectable on the surface. These defects can usually be found in industrial areas with high pollution
- d. Mechanical agents are commonly due to mechanical friction during handling and processing, such as cutting and drying. The combined effects of light, wind and water movement produce stresses resulting in small surface checks and cracks

Some of the agents are significantly less damaging and usually affected only the aesthetic value. However, biological agents and moisture problems are the two most common defects that occurred and caused serious wood deterioration (S. Johar et al, 2013). Visual inspection is the easiest and the most fundamental method to use to inspect the existing structure. However, this method may not be applicable on the defects that do not appear on the surface. Hence, a non-destructive test will be used to assess the properties of material, component or system.

Since most of the traditional timber houses use famous local hardwood with fine carpentry skills that are rarely seen today, thus, conserving timber houses are as important as conserving other heritage buildings. According to S. Johar et al (2013), Siti (2011), Fielden (2000), conservation is a practice that highlights the importance of preserving cultural properties and

safeguards the object from destruction, decay and unintentional changes to prolong the life span of the existing cultural and natural importance.

Although building defects cannot be avoided, argued that it needs to be learned in providing valuable insights to the industry (Haryati (2016); Wardhana & Hadipriono, 2003; Ilozor et al. 2004; Samuel and Isaac, 2018). Findings from the survey will provide some insights to the owner/caretaker in planning the repair for replacement work to be undertaken to sustain the building. By systematically recording and tracking defects, the types, causes and categories of each defect can be identified. Moreover, recurring defects can also be traced.

RESEARCH METHODOLOGY

A qualitative research approach was adopted. The crucial stage in this research is to assess the existing condition of the building through a building condition survey. A pro-forma survey was established as a checklist and being used to identify the types of timber building defects, the possible causes and the location of defects. The inspection was carried out in early November 2023 using visual inspection to diagnose building defects for the traditional malay house and evaluated using Building Assessment Rating System (BARIS) score. At the time of the survey, the weather condition was a sunny day.

A few observations and procedures needed to be followed such as a top to down approach, which starts the inspection from the highest level of the house i.e roof space. Then, the survey will be moved from the internal building to the external façade with reasonable care. Several significant information on the building background was taken into consideration. Various tools and equipment's such as spirit level, digital caliper, moisture meter, laser distance, measuring tape, tapping rod and L square were used during the condition survey.

FINDINGS

Based on the analysis of building defects obtained from the conditional survey, it was found that Rumah Kutai Kampung Selat involved several defective works. The types and causes of the defect's occurrence are illustrated below.

4.1 Defects Analysis by Matrix and Element

4.1.1 Defects Analysis by Matrix

Figure 3 depicts the percentage of defects for Rumah Kampung Selat according to the matrix classifications as mentioned in CPBS 101: Code of Practice for Building Inspection Report/BARIS.

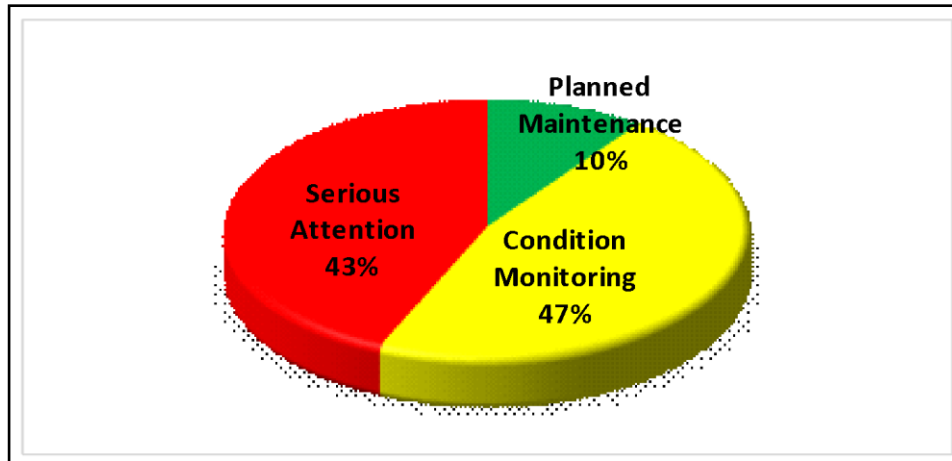


Figure 3: Defects Analysis by Matrix

Majority of the defects occurred falls under condition monitoring (47%). These defects need to be constantly monitored before it became a major defect. The second highest is defects categorised in serious attention and need urgent actions (43%). Defects under planned maintenance classification is the least defects matrix (10%) and it did not harm the occupants.

4.1.2 Defects Analysis by Element

Figure 4 represents the percentage of defects according to 10 elements involved in Rumah Kutai Kampung Selat.

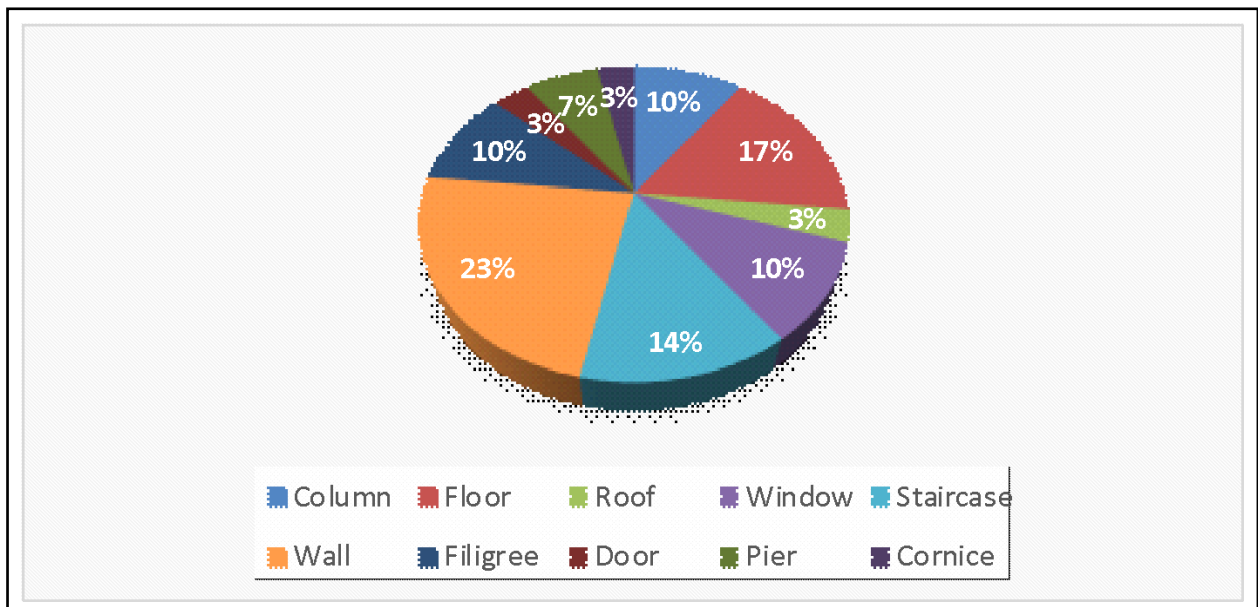


Figure 4: Defects Analysis by Elements

It is found that wall is most defective element (23%), followed with floor (17%), staircase (14%) and Others i.e window, filigree and columns (10%). The least defective elements are roof, door and cornice which represents 3% of the defects.

4.2 Type of Defects

Table 1 shows that there are 30 types of defects occurred in Rumah Kutai Kampung Selat. Broken is recorded as the most frequent type of defects and mould growth as the second most type of defects (14%). Missing, crack and decay/rotten represents 10%, followed by loose (7%) and checks (4%). Fungus attack, crooked, discoloration and knot are the five least type of defects (3%) recorded at Rumah Kutai Kampung Selat.

Table 1: Types of Defects

Type of Defects	Percentage (%)	Rank
1. Checks on column surface	4	5
2. Decay/Rotten of timber floor joist, staircase carriage and rafter	10	3
3. Crack on timber column, foundation pier and timber column surface	10	3
4. Missing of timber floor on staircase landing, timber window and window panel	10	3
5. Knot holes on wall frame	3	6
6. Broken of timber frame on internal wall, external and top filigree, timber floor joist, external timber concrete, timber staircase tread, staircase newel, external timber cornice	30	1
7. Discoloration of timber filigree	3	6
8. Loose of timber external wall panel	7	4
9. Crooked on timber internal floor	3	6
10. Mould growth on timber foundation pier, external timber wall, timber floor joist, filigree joist	14	2
11. Fungus attack on window surface	3	6

4.3 Causes of Defects

Table 2 presents the causes of defects occurred in Rumah Kutai Kampung Selat.

Table 2: Causes of Defects

Type of Defects	Causes of Defects
1. Checks on column surface	Age of material
2. Decay/Rotten of timber floor joist, staircase carriage and rafter	Termite attacks, weather condition, old material effect
3. Crack on timber column, foundation pier and timber column surface	Age of material, mould growth, checks
4. Missing of timber floor on staircase landing, timber window and window panel	Wear and tear, human activities, weather condition
5. Knot holes on wall frame	Insect attack
6. Broken of timber frame on internal wall, external and top filigree, timber floor joist, external timber concrete, timber staircase tread, staircase newel, external timber cornice	Insect attack, termite attack, weather condition, old material effect, crack
7. Discoloration of timber filigree	Weather condition
8. Loose of timber external wall panel	Old material effect, weather condition, wear and tear
9. Crooked on timber internal floor	Weather condition
10. Mould growth on timber foundation pier, external timber wall, timber floor joist, filigree joist	Weather condition
11. Fungus attack on window surface	Weather condition

Among the main causes of the defect's occurrence are due to age of material, termite attacks, weather condition, old material effect, mould growth, checks, wear and tear, human activities, insect attack and crack.

CONCLUSION

Overall, the present study achieved in addressing the mentioned objectives, namely, (i) to identify the types of timber defects and (ii) to determine the causes of the occurrence of the defects.

The main building defects that occurred at Rumah Kutai Kampung Selat is broken of timber elements resulting from insect and termite attack, weather condition, old material effect and crack. Majority of these defects are due to termite attacks, particularly the main timber structure elements, which are in critical stage, since it will adversely affect in the context of safety and health issues. Therefore, it is suggested for essential repair practice, particularly in the context of conservation of historic buildings, the restoration work should be carried out by using a 'minimal intervention' approach.

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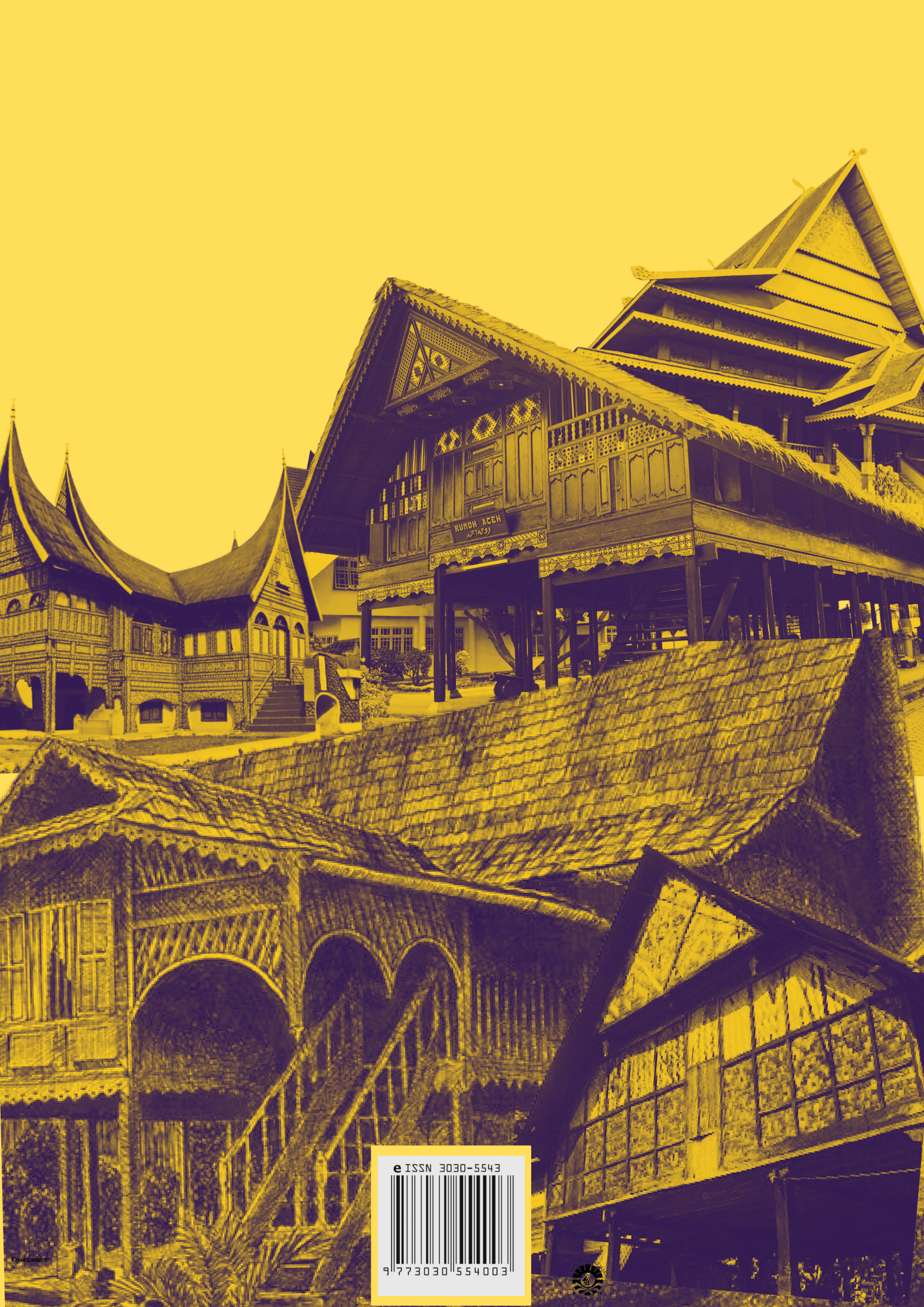
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