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NATURAL DISASTER EFFECT ON RESIDENTIAL BUILDINGS: A STUDY ON THE PATTERN OF DEFECTS IN BUILDINGS AFFECTED BY FLOOD

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ABSTRACT

This study investigates the effects of natural disasters on residential buildings, specifically due to floods. This research also focuses on the pattern of defects that emerge as the consequences of these catastrophic events. The quantitative method is used for collecting and analyzing the data. The research aim is to aims to study the common defects present in different clusters of residential that are affected by floods. It is determined through a comprehensive approach by combining and comparing the previous research findings and on-site inspections. The findings reveal there is a commonness of defects that can be found in houses that have been affected by floods. The study offers valuable information on the common defects that are presented in different types of affected houses.

Keywords: *Flood, defect, pattern, residential*

INTRODUCTION

Natural disasters include any tragic event that results from the influence of natural phenomena rather than human-caused events and results in significant human casualties or the devastation of the environment, private property, or public infrastructure. A natural disaster can be brought on by changes in the weather and temperature, as well as by earthquakes, landslides, and other phenomena that start on Earth's surface or deep beneath the globe. Natural disasters can strike anywhere on Earth. However, some disasters are typically restricted to or happen more frequently in particular geographical areas (Michele Metych, 2023).

Overview of Natural Disasters in Malaysia

A literature review is a research method related to the identification and evaluation that may be referred to those responsible by researchers, academics, and practitioners who have Malaysia is frequently impacted by mild environmental disasters, but seldom by catastrophic calamities. The frequency and severity of environmental disasters have increased in Malaysia. The country has experienced environmental calamities like landslides, floods, and tsunamis. Malaysians are familiar with landslides and floods. Due to human activities, these tragedies have recently become more frequent in some locations. With its fast-growing economy, Malaysia cannot allow environmental disasters to spread greatly because they weaken and endanger the development of the country. (Rahman, 2014).

Flood

A flood is acknowledged when there is an excessive amount of water, and it covers a normally dry area. The science of hydrology is the study of floods. They are the most frequent and pervasive type of severe weather in nature. For the reason that Flooding can cover anything from a few inches of water to many feet and they have a variety of appearances. Moreover, they may start out slowly but then pick up their speed. (Earth Networks, 2023)

Flood in Malaysia

In Malaysia, flood is becoming a more and more common issue and is worsening as time passes by. In December 2021, approximately 400,000 people had been evacuated attributable to floods in Malaysia. It was a great devastation as the financial losses were estimated at about RM6.1 billion. The areas on the west coast of Peninsular Malaysia have been affected by unprecedented amounts of rain which were about four meters underwater, that transformed its roadways into rivers (Serina

Rahman, 2022). The damages of the residents faced by the flood victims were up to millions of ringgits (FMT Reporters, 2022).

For the East Coast of Malaysia including Terengganu, Kelantan, and Pahang, flood is the most frequent type of environmental disaster in these states. In fact, they experienced the year-ending monsoon floods on a yearly basis as a natural consequence of the cyclical monsoons that occur during the region's tropical wet season, which lasts roughly from October to March and is marked by heavy and frequent rainfall (Rahman, 2014).

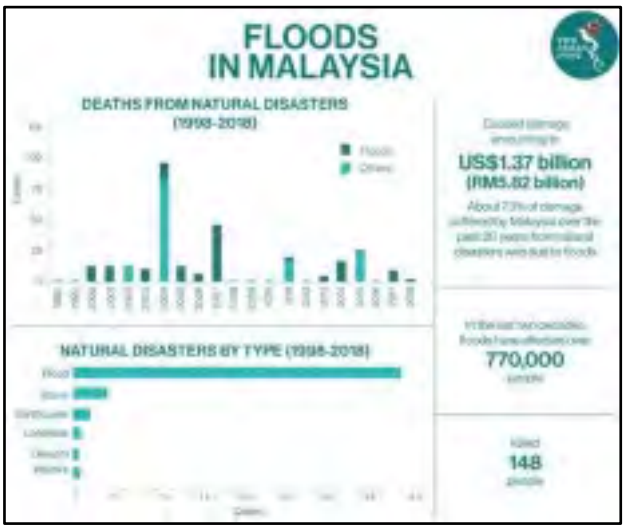


Figure 1: Flood Data

Even though Malaysia does not seem to be overwhelmed by the most severe weather conditions such as earthquakes, hurricanes, and forest fires. Nevertheless, risky of floods, landslides, haze, and water pollution. In the twenty years prior to August 2018, there have been 51 natural catastrophe incidents in Malaysia, which has caused 281 fatalities, three million people are affected, and the damages are approximately up to US$2 billion (Mohtar & Yeo, 2021). With the combination of geographic, climatic, topographical, hydrological, and human systems, floods are the natural disasters that cause the most vital concerns in Malaysia. Despite the fact that floods are a natural occurrence owing to inorganized development, overlogging, and other human activities which worsen the floods' peak discharge and concentration times. On all occasions floods occur, and the news about the victims, fatalities, monetary losses and other issues may be heard, seen, and read every quarter of the year. These effects of floods show the severity, frequency, and impacts of this catastrophic natural tragedy in this nation (Rahman, 2014).

There are 189 river basins in Malaysia, including Sabah and Sarawak which are 89 in Peninsula Malaysia, 78 in Sabah, and 22 in Sarawak. The majority of 85 river

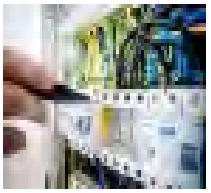
basins drain directly into the South China Sea. Nearly 4.82 million people, or about 22% of the nation's total population, live in the projected 29,800 km2 area that is vulnerable to a flood disaster. It can be concluded that 9% of the overall area of Malaysia is susceptible to flood disasters (Garba Abdullahi, 2014). A defect is a structural weakness or a design error that lowers the building's value and creates a hazardous situation. Poor craftsmanship or the use of subpar materials are two examples of the various causes of construction defects. Recent improvements in construction technologies do not seem to have reduced the amount of building defects. The common flaws are more frequently affect the residentials building are climate conditions, poor workmanship, the use of subpar materials, and air pollution. (Jaspal Singh & Kamaldeep Kaur, 2023).

Types of Building Defects

It is becoming more and more common for owners to complain about construction flaws, whether they own a high-rise structure or a landed property. The state of the structure has deteriorated by several basic construction flaws. The following are a few examples of typical flaws:

Table 1: Types of Defects

No.	Defect Type	Figure
1	Roof Leakage	
2	Cracks	
3	Dampness	

4	Plumbing Leakage	
5	Foundation Problem	
6	Electrical Wiring	
7	Mold	
8	Peeling Paint	
9	Timber Defect	

METHODOLOGY

The aim of this research is to identify the pattern of defects that are present in different types of houses that are commonly affected by floods. The study will use a quantitative method for collecting and analyzing the data. This is because both procedures are critical to raising the general degree of knowledge and comprehensive understanding of the research in order to establish the facts.

Research Design and Strategy

For this research, it will be conducted by using the quantitative method for the data collection. Since the main purpose of this study is to identify the pattern of defects that are present in different types of houses that are commonly affected by floods, this is the best method to answer the research questions and support the study. Quantitative research entails measurement and implies the information that has been studied which can be quantified. In order to analyze the data for patterns and correlations as well as to validate the findings, the researcher has used SPSS as a tool. It also fulfills the research objectives which are to study the common defects present in different clusters of residential that are affected by flood and to verify the pattern of defect that occurs in houses that are commonly pretentious by flood in the case study. This research also involves secondary data analysis. It is done by referring to previous research to identify the patterns of defects that can be seen in residential buildings that are affected by floods.

Sampling / Case Study

The area that has been chosen for this study to be conducted is Temerloh, Pahang since this area is commonly exposed to flood. Specifically, the parameters that has been determined for the study is Kampung Berhala Gantang. This area stretches along the Pahang River This area is chosen because thus, every time flood season comes, this area is usually affected by the flood since it is located very close to this river.

Research Instruments

This research use direct observation as a form of data collection. This method is done simultaneously with the checklist inspection. To investigate and observe the circumstances in the study region, which is Kampung Berhala Gantang, Temerloh, Pahang. Observations were made by going to the study's location in the case study region. Using this strategy, the researcher can comprehend the precise circumstance that each building inspected will show. This is done to fulfil the first objective of this research which is to study the common defects present in different clusters of residential that are affected by flood.

A specific checklist derived from secondary data analysis will also be used in this case study. The checklist are categorized into three different types which are:

- Defect Pattern Checklist (Houses with Timber Structures) ii. Defect Pattern Checklist (Houses with Concrete Structures)
- Defect Pattern Checklist (Houses with Timber and Concrete Structures)

These checklists contain the common defects that are found in the residential buildings that are affected by floods. They will be used when observing the houses in the case study area. These checklists are based on findings in the literature review which reveal the pattern of defects that are commonly found at in houses that are affected by flood. They also proclaim the common types of defects that are found in houses that are affected by flood and then will be categorized by elements such as doors, windows, walls, and others. After the information of the case study has been gathered, the checklists have also been used for every house that has been observed for the purpose of gaining data. Next, the data is analyzed will then be collected and analyzed to fulfil the second objective of the study which is to verify the pattern of defect that occurs in houses that are commonly affected by flood in the case study.

ANALYSIS AND DISCUSSION

The first stage in this stage of data analysis is to except the data from the defect checklists that have been collected and analyzed to show the demographic patterns. The second stage is to analyze the data gathered by using SPSS to extract the information on the types of houses, the background of the residents, the timeframe from the last time the houses were affected by flood, and the level of damage that affected the houses. After the data has been sorted, the findings will disclose whether the variables correlate or contradict previous researchers' findings.

- Defect Analysis by Element

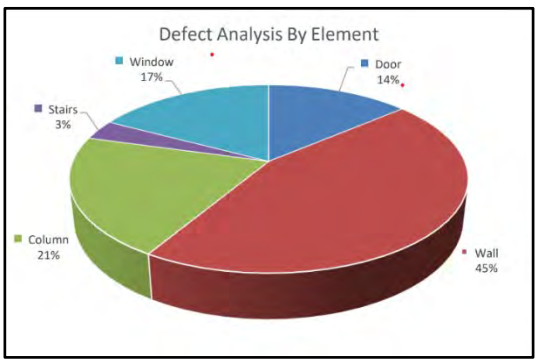


Figure 2: Defect Analysis by Element

There are 29 defects recorded in 6 houses that were inspected. The majority of defects were found on the wall element with 13 defects. The defects found on the wall such as mould growth, decay, insect infestation, cracks, broken and stain mark. The column element with a number of 6 defects. The defects that were present at the column were mold growth, stain mark, and peeling/flaking paintwork. The third majority is followed by the window element with a number of 5 defects. The types of defects found were broken, peeling/flaking paintwork, corrosion, and cracks. Next, it is followed by the door element. The types of defects found were insect infestation, mold growth, broken and stain marks. Lastly, the element with the least defect is the stair with 1 defect which was peeling/flaking paintwork.

- Analysis by Types of Defects

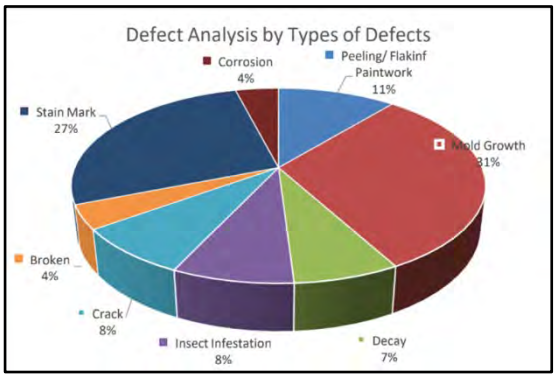


Figure 3: Analysis by Types of Defects

From the total of 29 defects recorded, most of the defects were mould growth in which it is 31% of all of the defects found. Mould growth was found in 4 of the houses inspected. The second most defects is followed closely by stain mark which is 27%. The defect which is a stain mark was found in 4 of the houses inspected. Thirdly, it is followed by peeling/flaking paintwork which has a total of 11%. The defect which is peeling/flaking paintwork was found in 2 of the houses inspected. The third most common defects is crack and insect infestation both share the same number of 8% each. The defect which is a crack was found in 1 of the houses inspected and insect infestations were found in 2 of the houses that have been inspected. The least defects were broken and corrosion which is 4% each. The defect which is broken were found in 3 of the houses inspected and corrosion was found in 1 house that have been inspected.

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CONCLUSION

It can be concluded that this research has explored the pattern of defects that can be found in residential buildings that are commonly affected by floods. From the data analysis, it can be divulged that it is true that some types and patterns of defects can indeed be found and seen in residential buildings that are affected by floods. From all the findings, it can be concluded that this research can achieve its aim which is to identify the pattern of defects that are present in different types of houses that are commonly affected by flood. The conclusions derived from the findings were made based on the findings thus, the research objectives had been achieved.

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Setuju.

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