

# **Building Tomorrow: A Comprehensive Guide to Flood- Resilient Housing in Malaysia**

**Sharika Tasnim, CRIT Scholar 2023-2024**



**THE AMERICAN INSTITUTE  
OF ARCHITECTURE STUDENTS**

# Contents

- 1 Introduction
- 2 Guideline – Elevations
- 3 Resilient Electrical Systems
- 4 Resilient Plumbing Systems
- 5 Resilient Materials
- 6 Summary

# 01 Introduction

# Objective of the Research

- Provide a comprehensive guideline for flood-resilient housing in Malaysia.
- Overview of the resilient electrical and plumbing systems, elevations, and materials.

## Impact of Floods Losses in Malaysia 2021 & 2022

Overall Losses	2021	2022
 <b>Public Assets and Infrastructure</b>	MYR 2.0 billion (USD 427,990,800)	MYR 232.7 million (USD 49,796,729)
 <b>Living Quarters</b>	MYR 1.6 billion (USD 342,392,640)	MYR 157.4 million (USD 33,682,875)
 <b>Vehicles</b>	MYR 1.0 billion (USD 213,995,400)	MYR 18.8 million (USD 4,023,113)
 <b>Business Premises</b>	MYR 0.5 billion (USD 106,997,700)	MYR 50.3 million (USD 10,763,968)
 <b>Agriculture</b>	MYR 90.6 million (USD 19,387,983)	MYR 154.5 million (USD 33,062,289)
 <b>Manufacturing</b>	MYR 0.9 billion (USD 192,595,860)	MYR 8.7 million (USD 1,861,759,980)
<b>MYR – Malaysian Ringgit</b>	<b>MYR 6.1 billion</b> <b>(USD 1,305,371,940.00)</b>	<b>MYR 622.4 million</b> <b>(USD 1,33,190,736.96)</b>

Source: Special Report on Impact of floods in Malaysia 2021 & 2022, Department Of Statistics Malaysia (DOSM)



**Floods in Kampung Nelayan, Port Klang, Selangor 18 Dec 2021**

Photo Source: Bernama



**Hilir Perak, 19 Dec 2021**

Photo Source: New Straits Times

**December 2021  
till  
January 2022**

- One of the worst flood events in Malaysia was in 2021.
- Recorded more than 60 thousand displaced persons.
- 430 evacuation centers in 8 states.

- Flood incidents in 2021 were 1,057 (2020: 869).
- Sarawak recorded the highest number of flood incidents.
- Selangor (120) and Perak (119).



**Jengka , Pahang, Dec 2021**

Source: Department Of Statistics Malaysia (DOSM)

Photo Source: Bomba and Penyelamat Negeri Pahang



**Cars submerged in Kuala Lumpur near KLCC on March 7, 2022**

Photo Source: Bernama



**Dungun, Terengganu, Malaysia Dec 21, 2022.**

Photo Source: Channel News Asia

### Floods in 2022

- Intense rainfall has caused floods and landslides.
- The existing drainage system is unable to support the high flow of water.



**Kampung Baru, Kuala Lumpur, March 7, 2022**

Photo Source: Taken by Firdaus Latif



**Landslide in Hulu Langat, Selangor, March 2022**

Photo Source: Government of Selangor



**Yong Peng, Johor, on March 4, 2023.**

Photo Source: The Star



**Kota Tinggi inundated by floodwaters.**

Photo Source: Mohd Rasfan

### Floods in 2023

The beginning of the Climate Crisis.



**Flood rescue in Chaah, Segamat, Johor, March 2023.**

Photo Source: Agensi Pengurusan Bencana Negara, Jabatan Perdana Menteri





Source: New Strait Times, The Star

- Urgent need for flood- resilient housing in Malaysia has never been clearer.
- In December 2022 flooding, **62 villagers resorted to boiling floodwater for daily consumption.**
- The floods claimed lives, including **a man electrocuted** on December 19, 2021.
- **Three Malaysian sisters meeting a similar fate** on December 19, 2022.

# A semi-structured interview with 50 diverse respondents

- Developers,
- Homeowners,
- Architects,
- Urban planners,
- Engineers,
- Landscape architects,
- Policymakers,
- Community leaders,
- NGOs (Non-government organizations)
- Offers a portrayal of the current state of flood-resilient housing initiatives in Malaysia.
- **A noteworthy finding was gained from the interviews.**
- **Lack of guideline for flood-resilient housing in Malaysia.**

## Challenges in Flood-Resilient Housing Implementation

• Inadequate Regulations	• Issues with Engaging the Private Sector	• Lack of Guideline
• Policy Gaps	• Lack of Expertise	• Lack of Appropriate Site Preparation
• Bureaucracy	• Land ownership Issues	• Lack of Financial Incentives and Subsidies
• Cost and Affordability Issues	• Resource Availability Issues	• Inappropriate Perception of Flood Risks
• Low Community Knowledge and Awareness	• Drainage Issues	• Lack of Training and Hand-On Experience
• Lack of Flood Data	• Issues with Implementation of Evaluation and Retrofitting Techniques	• Implementation Challenges for Designers and Architects
• Absence of Interagency Coordination	• Accessibility Issues	• Limited Budget

## Significance of Guideline

- Malaysia's expenditure on flooding damage has reached MYR 15 billion ( USD 3,218,539,500)
- Living quarters in Malaysia recorded the second highest losses due to flooding.
- Decision-makers, such as architects, developers, and local authorities, perceive flood-resilient design as less critical since the design is not featured in the guidelines.
- This influences their decisions to prioritise other aspects over flood resilience.
- Lack of guideline can affect cost considerations.
- Stakeholders prioritise cost-effective design elements over flood resilience.
- Lack of guideline eventually affect public awareness.
- Homebuyers and residents in Malaysia are unaware of the importance of flood resilience in housing design, assuming it's not a priority due to its absence in guidelines.

# Scale

- A comprehensive guideline tailored to the Malaysian context has been developed.
- Encompassing crucial aspects such as building levels, plumbing systems, electrical systems, and material selection.
- Incorporating urban, neighbourhood and building scale.
- Urban Scale – High impervious surfaces, stormwater management and land use changes.
- Neighbourhood Scale – Local drainage issues, proximity to water bodies, infrastructure vulnerability.
- Building Scale – Elevation and design, material selection.

## Advantages of Guideline

- The guide aims to provide detailed insights and recommendations in each of these areas.
- The guideline serves as a valuable resource for industry professionals.
- Offer clear directives and best practices for achieving optimal outcomes in minimizing flooding damage.

# **02** Guideline – Elevations

## Low-Risk Areas

- House elevation may be minimal.
- This could involve raising the foundation slightly above the ground.
- A small part of the railing in the residential building can be converted into a gate for flexible evacuation.



Image credit: Sharika

## 02 Flood-Resilient Housing in Low-Risk Areas



## Low-Risk Areas

- Space underneath elevated buildings can serve as parking areas, storage and children's play areas, recreational spaces, and small businesses, etc.
- Enclosures in spaces underneath elevated buildings are customized to suit various needs.
- Container gardens or vertical gardening can be incorporated to provide emergency food supplies.



## 02 Flood-Resilient Housing in Low-Risk Areas

## Medium-Risk Areas

- Houses may be elevated to a higher level compared to low-risk areas.
- Walkways might be designed to accommodate occasional flooding.
- Maximizing car parking and space utilization involves clustering elevated houses.



Image credit: Sharika

## 02 Flood-Resilient Housing in Medium-Risk Areas

# Medium-Risk Areas

- Parking area at the back of the building can be utilized.
- Requires ramp.
- Facilitate shared elevated car parking.
- Garage floors are sloped in order to facilitate the drainage of flood water.



## 02 Flood-Resilient Housing in Medium-Risk Areas

# High-Risk Areas

- High-risk flood areas demand more substantial house elevation.
- However, it is an impractical approach, and it is not recommended to build houses in high-risk areas prone to flooding.
- It is recommended to move existing occupants away from high-risk areas.

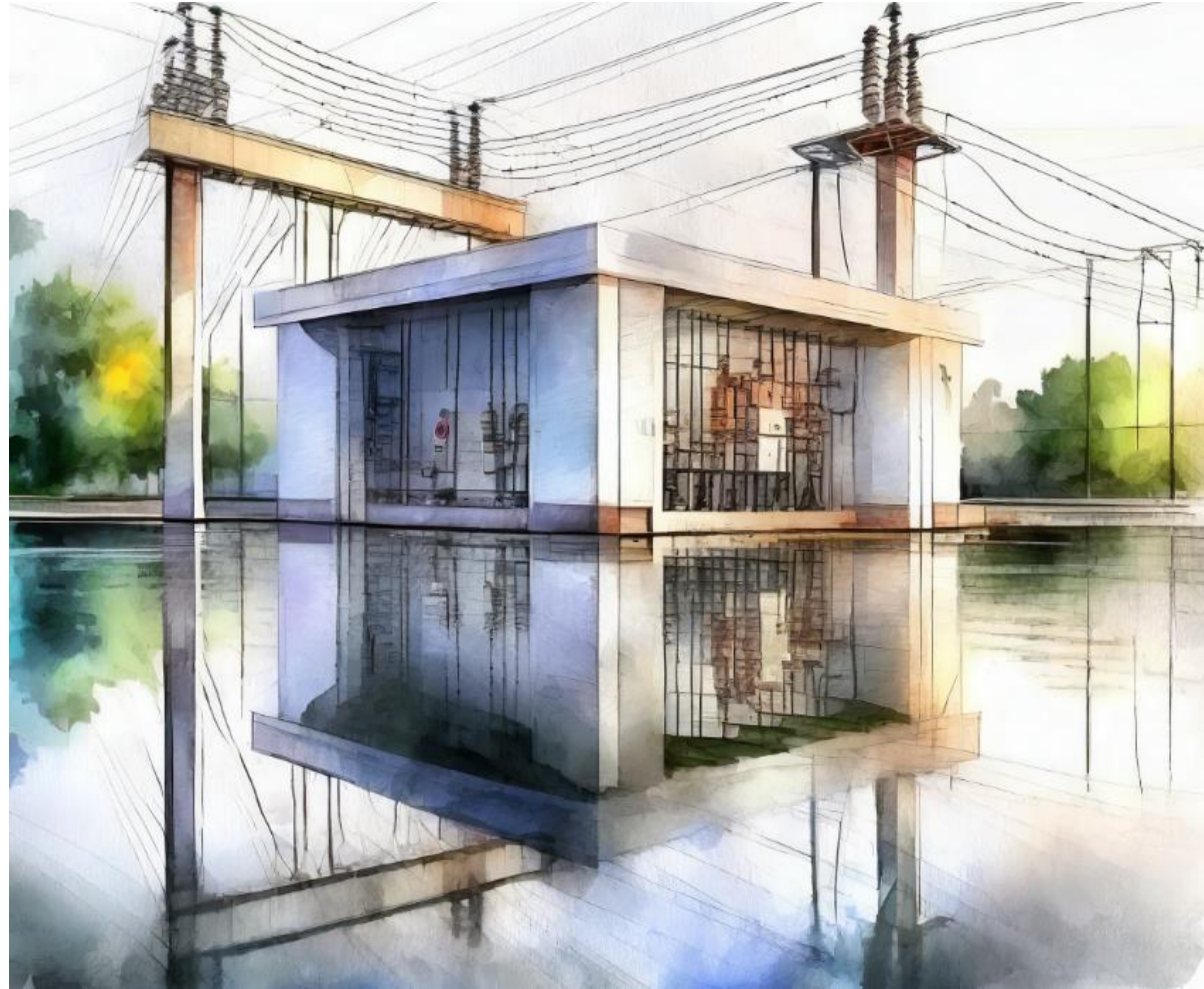


Image credit: Sharika

## 02 Flood-Resilient Housing in High-Risk Areas

# **03** Resilient Electrical Systems

## Resilient Electrical Systems



**Urban Scale :** Elevate sub-stations using elevated foundations or platforms.

## Resilient Electrical Systems



**Neighborhood Scale** : Elevate the backup generator.

## Resilient Electrical Systems



**Building Scale :** Surge protectors should be installed to prevent electrical surges during flooding.



# **04** Resilient Plumbing Systems

# Resilient Plumbing Systems



**Urban Scale:** Elevate pumps and control equipment.

# Resilient Plumbing Systems



**Neighborhood Scale:** Elevate access points to emergency service centers.

# Resilient Plumbing Systems



**Building Scale:** Install rainwater harvesting tanks to collect rainwater to ensure a consistent water supply during emergencies.

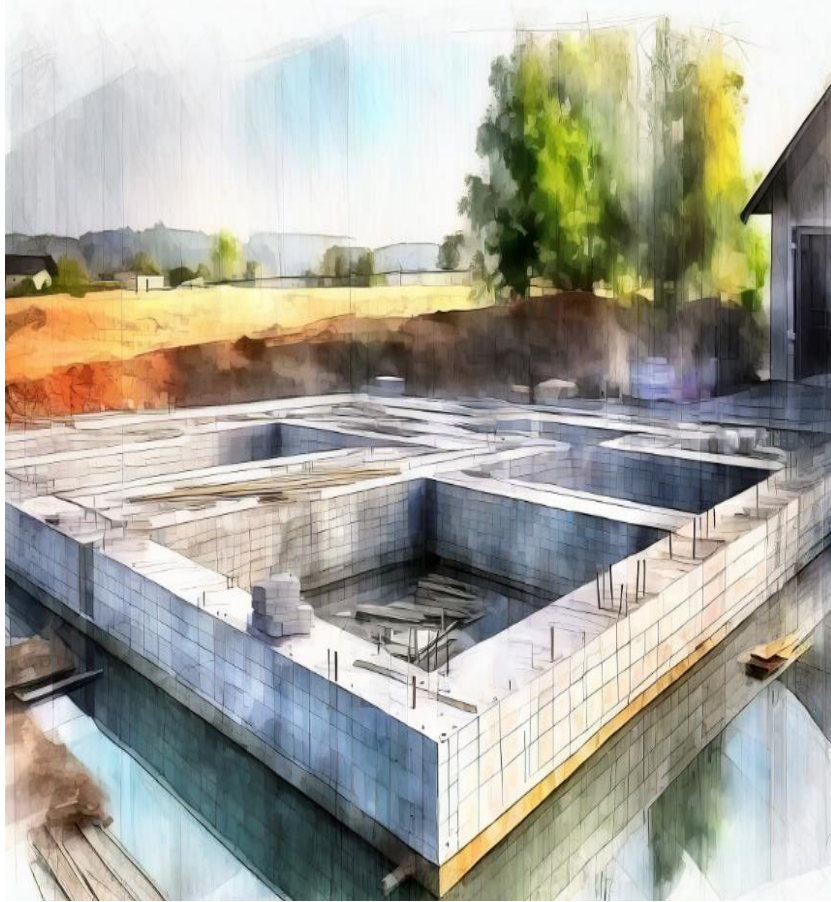
# **05** Resilient Materials

## Resilient Materials



**Urban Scale:** Use permeable surfaces as landscaping materials.

# Resilient Materials



05

**Neighborhood Scale:** Use concrete or steel for the foundation, columns, walls and floors.

## Resilient Materials



**Building Scale:** Use composite stone for kitchen cabinet tops.  
Use epoxy grout for floor finishes.



# Summary

- Malaysia faces the reality of climate change.
- It is imperative to adopt innovative strategies for constructing flood-resilient housing.
- Therefore, the recent floods in Malaysia serve as a stark reminder of the pressing need for a paradigm shift in housing design.
- It underscores the urgency of embracing flood-resilient housing practices to secure a safer and more secure future for citizens.
- To mitigate the devastating impact of floods and safeguard the well-being of communities nationwide.
- The time to act is now.
- The blueprint for a flood-resilient Malaysia begins with the flood-resilient housing guidelines for newly constructed homes today.

'Regarding flood mitigation efforts, the authorities are doing what they can, but it seems insufficient. Developers could help by incorporating flood-resilient design, but this would be an added cost. I understand their reluctance to do so. To tackle this issue, I believe laws and regulations must be considered to find a win-win situation.' - University Professor in Malaysia

Thank you