

A Comparative Analysis Between Experts and Local People's Perspective on Challenges in Creating Flood Resilient Housing in Malaysia

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Abstract: *Malaysia is susceptible to natural disasters, including landslides and floods. According to the present scenario, floods are the most frequent natural disasters that result in substantial harm and fatalities in Malaysia. The Northeast Monsoon season lasts from November to March every year when flood commonly happens in Malaysia. Climate change, however, has altered the pattern of flood occurrences, either amplifying them or causing them to occur in unexpected places. Housing is one of the most essential aspects of life since it offers warmth, protection, shelter, and a place to relax. However, most residents in Malaysia are forced to flee and seek safety elsewhere during a flood, particularly those living in single-story houses. Sometimes evacuation centres are already overcrowded during the floods. The victims' mental and emotional well-being has been severely affected by the major floods in December 2021, which killed individuals, forced many people to leave their homes, and ruined properties in Malaysia. Semi-structured in-depth interviews with seventeen respondents, including experts from authoritative, professional, and academic backgrounds and local people in Malaysia, are undertaken to comprehend the current challenges in creating flood-resilient housing and gather information on interventions and best practices. In addition, interviews were conducted using open-ended questions. According to the findings, the opinions of locals and experts on building flood-resistant housing in Malaysia share significant similarities. Inefficient utilization of funding, inadequate effort from the responsible authorities, and untimely and deficient information dissemination of flood hazards are the main three barriers to creating flood-resilient housing in flood-prone locations. The outcome of this study distills the key barriers by comparing the expert's and local people's perspectives to obtain a wholesome understanding of the challenges to offer the best possible recommendations in the Malaysian context. Content analysis and observation can be incorporated as data collection strategies to further this research.*

Keywords: Flood Resilient Housing, Local Perspective, Expert Opinion, Comparative Analysis, Malaysian Context

1. Introduction

As a tropical climate country, Malaysia is subject to catastrophic climate change disasters, notably floods. These regular floods devastate one or more regions of the country (Kamarudin et al., 2022). A place may be more vulnerable to flooding than others due to its location. Houses

near the river, swamp, and lowland regions are subject to flooding. These places are prone to flooding when rivers overflow due to severe rainfall and runoff from higher ground (Safiah Yusmah et al., 2020). Flood risk and resilience vary among communities because of geography, topography, and socioeconomic factors. A disastrous flood's enormous losses and devastation exemplify how certain areas lack resilience (Parvin et al., 2021). Resilience is a system's capacity to manage disturbances while retaining efficiency across social, economic, physical, and environmental domains. It is human nature to become susceptible when their typical daily activities, facilities, and consumption are disrupted due to a calamity (Balica & Wright, 2010). The impact of flooding might be weakened by applying suitable strategies before and after the flood (Hamid et al., 2015). Strategies include prevention, protection, preparedness, emergency response, recovery, and lessons learned. Flood damage can be prevented by avoiding the establishment of houses in current and future flood-prone locations, adjusting future development to the risk of flooding, and encouraging suitable land use (H. A. Hussaini, 2007). According to Norizan et al. 2021, although most risk-avoidance and vulnerability-reduction strategies were included in all local plans in Malaysia, the measures for disaster preparedness were insufficient. In Malaysia, disaster resilience has recently risen to the top of the development priority list due to catastrophe risks, particularly floods, since the nation is quite vulnerable to such hazards. As a result, the main components of Malaysia's development plans at all levels should include flood mitigation measures, which are statutory development plans that direct planning control decisions and enable local communities to participate in local development agendas. Incorporating disaster-resilient features through comprehensive flood risk reduction strategies in development plans is required owing to the rising flood risks brought on by climate change and development pressures. Therefore, optimizing flood resilience in development plans serves not only to reduce susceptibility and risk but also to increase readiness for disasters and risk reduction (Norizan et al., 2021).

2. Literature Review

A house is an enclosure that conveys the impression of a serene and protective environment. It is designed as a place/enclosure that suits living and working notions. Caves in prehistoric times provided the need for dwelling space while also sheltering the user from adverse environmental conditions. The concept of shelter in the modern-day has evolved with the passage of time and the development of technology (Chohan et al., 2010). The term "house" refers to various buildings, from the simple huts used by nomadic tribes to the intricate complexes of several systems. (Ramlan & Zahari, 2016).

Even though many laws and norms govern housing provisions in Malaysia, these only apply to official housing developments. Numerous housing units in several states, mainly villages built without following these laws and standards, have been classified as informal housing. It is, therefore, not unexpected that many of the flood-affected houses were wiped away. Additionally, several initiatives and programs overseen by responsible organizations fall short of safeguarding the rights of disaster victims (Roosli & Collins, 2016). Planning for the future is typically not very extensive. Besides, rapid growth processes produce "facts on the ground" (such as the settlement in flood plains) that are challenging to change, especially in expanding metropolitan areas with poor governance. Malaysia and other developing nations are starting to recognize the necessity of creating inexpensive and sustainable housing. Most people want a cozy, secure, and affordable house. However, finding housing that fits their requirements and budget can be challenging for households in the low-to-middle income range. Sadly, the majority of housing projects prioritize affordability above sustainable factors.

Additionally, developers ignore sustainability considerations in favor of profit (Syed et al., 2018). Flood risk management spans several of the Sustainable Development Goals (SDGs) related to water management, resilient infrastructure, climate change, sustainable cities and communities, and sustainable use of terrestrial ecosystems, despite not directly falling under any one of the 17 SDGs from the United Nations' 2030 Agenda for Sustainable Development (Desa, 2016). Prior study shows that families in the Ganges Basin invest heavily to raise plinth levels and conduct other flood risk mitigation measures (Moench & Dixit, 2004). This also happened during the September 2013 floods in Boulder, Colorado (MacClune et al., 2014) and is prevalent in most places after significant disasters. In recent years, approaches to managing flood risk have changed to emphasize integrated strategies that include resilience and more sustainable approaches. It accepts that flooding will unavoidably occur and implements methods that help to lessen its effects while enhancing resilience and accelerating recovery procedures. Terms like "build back better" and "bounce-back ability" reflects the belief (mdpi, n.d.).

The study's primary purpose is to close the gap in researching flood-resilient housing in Malaysia. This paper focuses on acknowledging the perspectives of experts and local people regarding the challenges in creating flood-resilient housing in Malaysia. Limited research is carried out on flood-resilient housing; therefore, interviews with experts and local people are conducted to obtain practical and concealed information. It is then followed by comparing the perspectives of the experts and local people on the challenges of creating a flood-resilient housing design in Malaysia. A qualitative approach is adopted to acquire information by conducting semi-structured interviews. The results showed that inefficient allocation of funds, insufficient commitment from relevant authorities, and the late and insufficient transmission of information about flood hazards are the main three barriers to creating flood-resilient housing in flood-prone locations.

3. Methodology

This section provides an analysis of the research methods used in this study. This study aims to examine and comprehend the concerns related to the challenges in creating flood-resilient housing in Malaysia. This part will outline the methodology used for data collecting and provide the evidence supporting the proposed answers to the research questions previously stated. Purposive sampling was used, with respondents chosen based on their experience and involvement in flood disasters. Interviews were conducted in Selangor, Pahang, Melaka, Terengganu, Johor, and Kuala Lumpur. Based on the narrative of the experiences of experts and local people participating in flood resiliency and management, a qualitative technique is used to determine the many discourses of challenges in creating a flood resilient housing in Malaysia. The study technique is divided into five steps, beginning with Stage 1 - respondent selection for interviews; Stage 2 - interview; Stage 3 - data transcribing; Stage 4 - data coding; and Stage 5 - data analysis. Furthermore, the study has included interviews that use open-ended questions. Concerning the study's ethical considerations, the respondents' identities are kept confidential. The results obtained from the first interview were examined to enhance the quality of the open-ended questions for the subsequent interview. After completing interviews, a descriptive analysis was conducted to provide comparisons based on the obtained findings. Ultimately, the results of the interviews are grouped and categorized into several sub-sections inside the discussion section. The scope of the study is limited to examining feedback only from the experts and local people's views. It is recommended to do further research subsequent to the study's completion to analyze contents as well as site visits on the topic being investigated.

4. Findings and Discussion

4.1 Interview with Experts

Access to Flood Hazard Maps: Designing flood-resilient housing requires an in-depth understanding of flood levels and risk assessments unique to the site, which is why a flood hazard map is essential. Designers must consider the depth, velocity, and duration of flood to determine the appropriate elevation and flood protection measures.

“Only DID (Department of Irrigation and Drainage) has the maps to identify the high-risk, medium-risk, and low-risk flood areas in Malaysia, however it is not accessible to the public and not published. The information is kept confidential. Because if published, it will affect the property market. There will be less demand for properties that locate in flood-prone areas. Nevertheless, recently there has been a policy that the public can view the high-risk, medium-risk, and low-risk areas for flood.” [Interviewee 1]

Flood hazard maps offer developers crucial data regarding the probability and magnitude of flood events within a specific geographical region. By examining flood hazard maps, developers can evaluate the extent of flood vulnerability and make well informed determinations regarding the viability of pursuing a development endeavour within a particular area.

“The local government generates revenue and income from development charges. Government commitment is necessary to resolve the problem. If the relevant information is released, it is easier to determine the flood-prone areas. We know where we should go for investment. Now, we do not know. I go there for development, and another developer also goes there for development. Everyone goes there. So, there is overdevelopment resulting in frequent flooding.” [Interviewee 5]

By integrating flood hazard mapping into decision-making processes, stakeholders can improve the resilience and sustainability of their projects while mitigating the potential adverse effects of flooding.

Land Ownership: Vulnerable communities must be provided with essential resources such as financial support, land resources, and affordable building materials to allow them to construct houses that are resilient to flooding.

“Our neighbour’s house is nearby the river, so her house is quite affected as it is a single-story house, and the floodwater enters the house. My neighbour doesn’t own the land, so she cannot reconstruct the house and built it on stilt or make it double story”. [Interviewee 15]

Implementing flood-resilient housing in Malaysia is hindered by complexities arising from land ownership issues. Effective resolution of land ownership issues necessitates close collaboration among government agencies, landowners, local communities, and relevant stakeholders. Legal reforms, streamlining land acquisition procedures, and establishing stakeholder engagement mechanisms can address land ownership challenges and facilitate the successful implementation of flood-resistant housing initiatives in Malaysia.

“Regarding land ownership, nobody can do anything except the government. Sometimes you want to do a project; the land belongs to three different authorities. Two authorities agree the number three does not agree. So, this one, of course, is a higher authority like the government

to direct them. To address such issues, we have to start with the universities. They come up with those initiatives to enrich the government's perspectives. The researchers have to come up with those reports.” [Interviewee 2]

Appropriate Structural Design and Material Choices: When designing flood-resilient housing, it is crucial to consider the hydraulic stresses and impacts of inundation. Ensuring the integrity and stability of housing in flood events necessitates implementing an appropriate structural design and the appropriate material selection.

“You are using whatever is around you to survive the threats. So obviously, you look for the answer around you. In a country like Malaysia, we have abundant forests. The problem is that they are selling the forest to the world. The world is chewing up all the Southeast Asian forests. It is ok to soak timber in salt water because the salt will preserve the timber. There are timber species that are resistant to water. Timber usage in my projects goes to the extent that sometimes-recycled timber needs to be used. Because the new timber, the good one, they sell overseas. It is another issue. It is not an architectural issue; it is a commercial issue.” [Interviewee 3]

Infrastructure, foundation, structure, materials, construction methods, installation techniques, and building orientation are all factors that must be considered when designing a flood-resilient structures. Each of these elements contributes to the building's resilience to flooding.

Flood Resistant Construction Techniques: Timber construction has the potential to exhibit efficiency and cost-effectiveness, particularly in the context of modular or prefabricated systems. The enhanced efficiency can accelerate the construction process and lessen the overall expenses associated with the project.

“The old traditional houses have been surviving the flood using timber. Even in Sarawak and, in Sabah, they are also experiencing worse floods, and their timber can withstand it. People who say timber is costly need to ask one logical question. If I want to build a reinforced concrete column, how many steps are needed? First, we bend the reinforcement. Then we put up the reinforcement. And then, we have to put a formwork. Step two, then step three, we pour in the concrete. In step four, we remove the formwork. In step five, we plaster them and paint. Now you got a column, so you got five steps. You compare, you can make a timber column. So, from the log, I cut it into a timber column. Then I bring it to the side. I got a timber column, so I got two steps. The third step is to put some oil finish. If you do not put oil, it is okay. So, the issue is that we got 3000 species of timber. It is a matter of choosing the right species, which will last long, which is the minor, durable resistance.” [Interviewee 3]

Flood-resistant construction techniques, such as raised foundation systems, reduce flood risks. Proper construction techniques, such as waterproofing and flood-resistant materials, can increase the housing's resilience.

Drainage Systems: During intense and continuous rainfall in urban areas, onsite stormwater detention (OSD) is necessary to reduce the rate of runoff entering the drainage system or other properties by momentarily holding stormwater runoff. In addition, it regulates water flow and reduces the likelihood of flooding downstream.

“The most important part of development is the drainage system—because we are experiencing heavy rain in Malaysia. The Street and Drainage Act in Malaysia is an act to amend and

consolidate the laws relating to streets, drainage, and building in local authority areas in Peninsular Malaysia, so the stakeholders must comply with this act.

On-site detention tank is also compulsory. During heavy rain the on-site detention tank will be filled with stormwater before they enter the main drain. But in Putrajaya, we have a big lake. This big lake act as an on-site detention tank.” [Interviewee 7]

“According to the guideline, onsite detention — underground storage and rainwater harvesting — must be included in any construction built on land less than 5ha. On the other hand, development of 5 to 10ha is advised to incorporate a dry pond. As for development greater than 10ha, a wet pond is recommended for storage. Another significant issue is preparing the construction sector's erosion and sediment control (ESCP) plan”. [Interviewee 12]

The integration of flood-resilient housing with existing drainage systems is crucial for the efficient management of floodwater. Collaboration between local authorities and drainage agencies is crucial so that housing projects do not adversely impact pre-existing drainage systems. Additionally, appropriate measures should be taken to accommodate water collection, retention, or diversion, as required.

Evaluation and Retrofitting Techniques: In order to retrofit existing structures to improve their flood resilience, a comprehensive assessment of their vulnerabilities and customized retrofitting strategies are required.

“When there is a flood, what are the most important spaces? Kitchen and a place to sleep. Does that mean we have to review the location of the kitchen or whether there is a second kitchen or storage space? Where do we get fresh and clean water during flood? We have to provide storage space. Moreover, we raise the kitchen on the first floor because that is the most important part of the house, and food is kept there. We could reverse the situation where the family area is on the first floor and the guest area is on the ground floor. During a crisis, what kind of space will give a feeling of safety? We should have a family area where we can see everybody and everybody can sit together, feeling secure. The first level, can be waterproof, the concrete wall is waterproof, we do not have to go for special materials.” [Interviewee 3]

Accessibility And Universal Design:

“This is the mentality that I challenge many people today. We must not design for disability. However, when there are residents with a disability, and if the house is raised, we must create a ramp.” [Interviewee 3]

Accessibility and universal design principles in flood-resilient housing promote the safety and well-being of all residents, including those with disabilities, senior citizens, and children.

Site Condition: The site's topography is a major factor in determining flood risks. Low-lying or flood-prone areas may necessitate unique design considerations and flood protection measures. The type of soil influences water infiltration rates and foundational stability. The soil conditions should be evaluated to ensure proper site preparation and foundation design. The water table level can influence the viability of certain flood resilience measures, including foundation construction and groundwater management.

“It is up to the developer to conduct a proper study on how to develop the land. They need to identify if the area is prone to flooding. So, if the developer does not propose a proper construction method or design to tackle the flood, it will affect the development.

If the developer can justify or propose a good solution to develop in a flood-prone area, they should develop in that area. Strategies include cutting and filling the land and then making the topography higher. And then provide proper drainage. They can include a drain or a small river to discharge the water. So why not develop the area even though that is flood-prone? The most important thing is the overall study of the site. Proper drainage and site planning will minimize flood risks. If you are a developer, consultant, or architect; you are designing a high residential housing. You should design the ground floor for facilities or podium parking. Therefore, the housing unit will be on the first floor and above. [Interviewee 7]

Costs And Time Associated with Implementation:

“We are killing our effort with the construction cost issues. This is the mentality of the consumerist world, which is why the architect must be bold to put the construction cost aside.” [Interviewee 3]

“If you want your project to be flood-free, you must invest money and time to build structures and implement solutions that prevent future flooding. Most clients try to avoid spending money on these kinds of projects because it is considered a single base. And then they will just say provide the channel, and let the water go. However, where does the water go? Everybody wants to let the water go. At the end of it, there should be a lake. Somebody has to spend money to create this lake and provide the vegetation. Nevertheless, when we change it to a recreation area like a park, it becomes a public hub for people to gather. So, if we do not use this, we must create another water feature. Instead of creating a water feature for every project, we can share a nice lake with many projects.” [Interviewee 2]

“There is no solution for the increasing construction cost. Construction costs include material costs, the supplier and their raw materials, and buying land resources. Sometimes I don't have the land, and I have to buy the land. We need to engage all these 24 contractors, engineers, and architects to design and build the house, which adds to the construction costs. However, you ask to sell the properties at a cheaper price. I cannot do it. The problem is that the buyers will pay all the costs. If you say the government should help you reduce the construction cost, they will make the regulations stricter and increase business costs.” [Interviewee 5]

“We must educate people to build on stilts; the problem is accepting these ideas. However, when it is necessary, we need to do it. We need to convince our community and authority. The main issue is when we talk about the economic aspects of the stilt house; it is always about the increasing cost”. [Interviewee 9]

The overall expense of implementing flood-resilient measures, such as elevation, construction materials, and retrofitting, can be a challenging aspect for stakeholders, especially because of the expenses.

Financial Incentives and Subsidies:

The government might consider providing additional subsidies and incentives to lessen expenses and promote flood-resilient housing.

“There is a map where we can determine which is a high-risk, a medium-risk, and a low-risk area for a flood in Malaysia. However, it is yet to get approval from the government to release it for public viewing. Because when the flood map is released, it can have negative and positive impacts. It can hurt the existing development. It is contested that the developer only thinks about the economic benefits. For example, if the residential buildings are on stilts, there is more protection but the extra cost is a barrier. Then the government may give more subsidies and offer more incentives to reduce costs when flood-resilient strategies are widely used; the cost could be reduced normally”. [Interviewee 13]

Offering homeowners financial incentives and subsidies can encourage them to invest in flood-resistant measures. These incentives may be tax rebates, low-interest loans, grants, or subsidies tailored to flood resilience enhancements.

Government Support: The government can facilitate the provision of support and funding to flood victims. Implementation can be facilitated by allocating budgetary resources to flood resilience initiatives, establishing funding mechanisms, and supporting research and development in flood resilience.

“Everyone likes to buy the houses on stilt as it is higher on the ground, however because of the stilt, the construction cost is higher, therefore the house on stilt is expensive than the house on the ground. Our program is designed by the government. We are the implementer. So, the price and all other factors are decided by the government. We implement it based on the government instruction”. [Interviewee 14]

Knowledge And Perception of Flood Risks:

“We shouldn’t agree to the client’s wishes, because they are probably not educated. Instead, we focus on architectural solutions and how to be more flood resilient. We look at the examples. Most of the houses previously were made of timber and the timber floor is steeper. Because the floor is timber, they have to raise the floor, so that is by default, in the older days, there was no drainage. When it floods, it floods. Therefore, they have to raise the house. And then, beneath their houses, they need to park their boats. Just like in China, their houses are raised, they park their boats underneath the house. And then their columns are large strong columns since the flood is intense. The most obvious strategy is raising the house.” [Interviewee 3]

“A home buyer should go to the site and look at the site. Otherwise, the buyer will regret it. There are lots of issues in the new development. Nobody knew initially that this area should not have any problem with floods. However, suddenly there are flood occurrences because of overdevelopment. So, the public has to be smart when they want to buy a house.” [Interviewee 5]

Limited awareness and comprehension of the risks associated with flooding may reduce demand for flood-resistant housing measures.

Education, Training and Hand-On Experience:

“When you choose the right approaches for a project, you could make two, three mistakes, or four mistakes. Then after one year or two years you will make zero mistakes, and the quality will be better than the previous one. So, for the next project, you can also make it cheaper.” [Interviewee 3]

“I had asked some carpenters from Indonesia to train our local people. Now I have five carpenters working for me in my office. It is a simple thing. It is something you do, and then it will happen.” [Interviewee 2]

“We must educate the developer, the architects, and all the stakeholders in the construction phase, such as the developer, contractor, and consultants. They need to have this awareness they need to have awareness towards flood resiliency.” [Interviewee 7]

Training programs and seminars on flood resilience, construction methods, and maintenance can equip the stakeholders with the knowledge and skills to implement and maintain flood-resilient measures.

Showcasing Housing That Has Survived Floods Well: The significance of the contribution of ordinary people to self-housing in Malaysia cannot be overstated, for which Mr. Bakar is an excellent example.

“Vulnerable communities should have access to resources like finance, land and building materials so that they may construct their own houses. These represent the most critical conditions for building flood-resilient houses. I inherited the land, received financial support from my family, and had access to building materials which made “Rumahku, Rakitku”, a reality. It is indispensable to have access to land and land tenure security as well as funds and building materials.

During the flood, the house was not completed. Electricity and water supply was connected from the old house (the house next door). The cost at that time was estimated at RM 55 thousand. After the flood, there were improvements (installation of additional barrels, connection of electricity and water supply and iron poles). After improvements, the total cost was RM 65 thousand. The estimated construction period was more than 3 months. And this house was built by Mr. A. Bakar Ahmad, alone.

This floating house is suitable for older people, people with wheelchairs because the indoor surface is even. This means that there are no height/levels to get to the kitchen and bathrooms”. [Interviewee 17]

The benefits and effectiveness of flood-resilient strategies can be visualized by displaying examples of successful flood-resilient housing developments within the community.

Partnering With Stakeholders

“Another thing is about the engagement between agencies. Because we know different agencies govern the land, they have regulations and laws. There should be a mutual understanding between different agencies regarding the flooding issue, which is one of the major areas for improvement.” [Interviewee 6]

“Developers share conflicting opinions regarding flood mitigation, which is their last priority. The developer's primary objective is to maximize profits. Therefore, in the team, among the engineer, architect, and developer, except for the architect, none of them are concerned about people or users. If the architect raised the matter in the meeting, they avoid listening as it is costly. Because those houses are faceless, they do not belong to anybody. So, the architect, in that case, is just responding to the client to create some faceless products to be sold. Thus, when you are working for the developer, the human issue suddenly goes down the priority list.

They are okay if they can sell their product within five years from zero to completion.” [Interviewee 3]

There is a lack of effort from commercial developers to integrate flood-resilient housing design strategies despite being aware of the consequences.

“They do not want to make any seal trap. They do not want to make any detention pond. They do not want to make a new sewerage to accommodate the water. So, the excess water just discharged to existing development. Thus, we need to develop the whole thing, not just the new development. Last time there were trees. The trees absorb the water. However, suddenly, they clear everything up. The developer is responsible for this kind of situation. They used to be my client, and I have realized the developer needs to put in much practical effort to minimize the risk associated with floods.” [Interviewee 8]

Involving householders, communities, local authorities, NGOs, and relevant organizations in decision-making and implementation efforts fosters ownership, ensures context-specific solutions, and increases the likelihood of successful implementation.

Building Codes and Regulations: The existing guidelines for flood-resilient housing in Malaysia needs to be revised.

“The guidelines we have right now do not cover much on flood resilient housing design in Malaysia. In order to build back, we need to look into improving building design. When we want an intervention for flood-proof housing, it is best to approach government housing because imposing regulations on the design and everything is easy. However, if a private developer is involved, it can be done, but usually, the cost will be higher”. [Interviewee 10]

“In the last amendment, there was no request to include flood prevention inside the uniform building by law because the original intent of it is to standardize and uniform all the bylaws or laws relating to the building. It usually focuses on the health and safety of a building.

There have been many amendments over the years, and one of the amendments in 2012 included natural disasters like earthquake prevention. Proposed Amendments to Street, Drainage and Building Act 1974 (ACT 133) does stipulate to enable the local authorities to regulate buildings and premises in sloping areas periodically. This is relevant to another frequent disaster in Malaysia which is landslides.

The ministry could consider adding flood prevention to the UBBL. It must go through the appropriate channels. The public and the ministry may engage in an extensive dialogue to determine what future amendments should include. Because the uniform building bylaw applies to all buildings, requiring specific legal requirements such as elevation and impermeable materials is unsuitable. Consequently, presuming any building is in a dry region, only a few buildings will experience flooding. Consequently, if it is made a legal requirement and even buildings that do not require it must comply, it will be expensive. Second, because flood only occurs at certain locations and periods. Consequently, this only applies to certain buildings. So instead of placing it inside the uniform building by law, we can produce a guideline to ensure people can refer to it when they need to comply with it.

Another way is to put all the requirements for flood resiliency inside the Malaysian standard. The Malaysian standard is subject to frequent review. There is a lengthy process for uniform

building by law. Sometimes it may take a few years to make any change. Furthermore, it also depends on how important it is because many people will review it. So, this flood issue can come a policy or a strategic plan. Because it is a national strategic plan or a policy, if it is included, the action will be implemented. After any amendment has been made at the federal level, the state government will have to make the amendment. Now, whatever the government has decided may not be accepted by the state. That is why every state has a different UBBL. According to the law, the state has the right to pick and choose whatever suits them.” [Interviewee 4]

The clarity, comprehensiveness, and enforcement of building codes and regulations about flood resilience can affect implementation. Clear rules and requirements provide a framework for implementing flood-resilient housing measures.

4. Conclusion

EXPERTS AND LOCAL PEOPLE'S SIMILARITIES	SHARED ADDITIONAL PERSPECTIVE FROM LOCAL PEOPLE
1. One of the major challenges in building a flood resilient housing (constructing on stilts) is the higher expenses.	1. Movement and accessibility of elderly and specially-abled people is an issue when staying in a flood-resilient house (Houses on stilts).
2. Lack of knowledge and awareness of flood resilient design strategies among the people contribute as the vital factor in creating flood resilient housing.	2. Communities should have access to resources like finance, land and low-cost building materials so that they may construct their own flood-resilient houses.
3. Inadequate effort from the responsible authorities hinder the process of implementing flood resilient design strategies.	3. It is significant to obtain relevant information from relevant agencies when constructing a house on a stilt because sometimes, flood water enters even after elevating the house.
4. Political interference play a crucial role in the planning and approval process.	4. To avoid unfavorable designs while adopting flood-resilient housing, it is essential to engage those who have lived through disastrous flooding.
5. Western-inspired design styles which disregard the climatic condition of Malaysia dominate the architectural scene.	5. The community and local administration must work together more closely throughout the planning phase.

References

- Balica, S., & Wright, N. G. (2010). Reducing the complexity of the flood vulnerability index. *Environmental Hazards*, 9(4), 321–339. doi:10.3763/ehaz.2010.0043
- Chohan, A. H., Che-Ani, A. I., Tahir, M. M., Abdullah, N. A. G., Tawil, N. M., & Kamarruzzaman, S. N. (2010). Retrieved from <https://academicjournals.org/journal/IJPS/article-full-text-pdf/340788619571>
- Desa, U. N. (2016). Transforming our world: The 2030 agenda for sustainable development. *Sustainable Development Goals*. doi:10.5040/9781509934058.0025
- Hamid, Z. Abd., Roslan, A. F., & Dul, Mohd. N. (2015). Retrieved from https://www.researchgate.net/publication/289530317_Strategic_Framework_Toward_s_Flood_Resilience_in_Malaysia
- Kamarudin, K. H., Rashid, M. F., & Omar Chong, N. (2022). Local Community Knowledge for flood resilience: A case study from East Coast Malaysia. *International Journal of Built Environment and Sustainability*, 9(2), 21–34. doi:10.11113/ijbes.v9.n2.922
- Moench, M., Khan, F., MacClune, K., Amman, C., Tran, P., & Hawley, K. (2015). Transforming vulnerability: Shelter, adaptation, and Climate Thresholds. *Climate and*

- Development*, 9(1), 22–35. doi:10.1080/17565529.2015.1067592 (mdpi, n.d.). Retrieved from https://www.mdpi.com/journal/water/special_issues/Management_Resilience
- Moench, M., & Dixit, A. (Eds.). (2004). Adaptive capacity and livelihood resilience: Adaptive strategies for responding to floods and droughts in South Asia. Boulder, CO: Institute for Social and Environmental Transition (2) (PDF) *Transforming vulnerability: shelter, adaptation, and climate thresholds*. Available from: https://www.researchgate.net/publication/283196738_Transforming_vulnerability_s_helter_adaptation_and_climate_thresholds [accessed Jun 03 2023].
- MacClune, K., Allan, C., Venkateswaran, K., & Sabbag, L. (2014). Floods in Boulder: A study of resilience. Boulder, CO: ISET-International.
- Norizan, N. Z., Hassan, N., & Yusoff, M. M. (2021). Strengthening Flood Resilient Development in Malaysia through integration of flood risk reduction measures in local plans. *Land Use Policy*, 102, 105178. doi:10.1016/j.landusepol.2020.105178
- Parvin, G. A., Ahsan, S. M., Yusop, A. Y., Gordon, J. A., Abedin, M. A., & Ahmad, M. H. (2021). Kampung (village) flood resilience: An empirical analysis in Malaysia. *Environmental Hazards*, 20(5), 550–574. doi:10.1080/17477891.2021.1887800
- Ramlan, H., & Zahari, E. E. (2016). Review the issue of housing among urban dwellers in Malaysia with special reference towards affordability to home ownership. *Procedia Economics and Finance*, 35, 216–223. doi:10.1016/s2212-5671(16)00027-7
- Roosli, R., & Collins, A. E. (2016). Key lessons and guidelines for post-disaster permanent housing provision in Kelantan, Malaysia. *Procedia Engineering*, 145, 1209–1217. doi:10.1016/j.proeng.2016.04.156
- Safiah Yusmah, M. Y., Bracken, L. J., Sahdan, Z., Norhaslina, H., Melasutra, M. D., Ghaffarianhoseini, A., ... Shereen Farisha, A. S. (2020). Understanding urban flood vulnerability and resilience: A case study of Kuantan, Pahang, Malaysia. *Natural Hazards*, 101(2), 551–571. doi:10.1007/s11069-020-03885-1
- Syed Jamaludin, S. Z., Mahayuddin, S. A., & Hamid, S. H. (2018). Challenges of integrating affordable and sustainable housing in Malaysia. *IOP Conference Series: Earth and Environmental Science*, 140, 012001. doi:10.1088/1755-1315/140/1/012001