Community Preparedness and coping Strategies in facing Recurrent Flood Disasters in Kota Tinggi District, Malaysia

Kamarudin Khairul Hisyam[1,2]*, Goh Jet Yang[1], Razak Khamarrul Azahari[2], Hosen Nadzirah[1] and Rashid Mohamad Fadhli[1]

1. Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia (UTM) Johor Bahru, 81300, MALAYSIA
2. Disaster Preparedness and Prevention Centre (DPPC), Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia (UTM) Kuala Lumpur, Jalan Sultan Yahya Petra, Kuala Lumpur 54100, MALAYSIA
*khisyam.kl@utm.my

Abstract

Recurrent flooding frequently causes property damage and loss of life in both urban and rural settlements. In Kota Tinggi district, Johor, communities experience persistent flood disruptions, yet limited preparedness hinders their ability to mitigate risks and minimize losses. This study assesses the level of flood preparedness among vulnerable communities in Kota Tinggi and explores coping strategies to enhance resilience. A quantitative methodology was employed with structured questionnaires administered to 63 randomly selected households. The survey questions were formulated based on 20 indicators under three main themes i.e. current knowledge (8 indicators), past experience (5) and personal/communal skills (7). Data were analysed using SPSS (version 20.0), employing descriptive statistics, mean score and standard deviation to evaluate community awareness and preparedness levels. The study finds that the community has strong flood awareness and response skills, gaps in disaster education, information access and communication hinder preparedness.

Despite well-established evacuation plans, minimal local authority involvement and inconsistent community training weaken emergency responses. Limited access to emergency supplies further exacerbates vulnerability. Additionally, weaknesses in protective behaviours and early warning systems highlight the need for improved multi-hazard planning and policy support. Strengthening early warning systems, enhancing local government engagement and promoting community-based initiatives are crucial in improving flood resilience and response capacity. The study highlights key community coping strategies, including maintaining flood warning systems, integrating local knowledge with modern preparedness mechanisms, organizing community clean-ups, strengthening disaster education and advocating for long-term flood prevention policies.

Keywords: Monsoon flood, community preparedness, adaptation, resilience, local knowledge.

**** Author for Correspondence***

Introduction

Climate change and urbanisation have been identified as primary factors contributing to the increased frequency and severity of urban flooding events[17]. Human activities and infrastructure development have diminished natural vegetation, resulting in increased impervious areas and reduced infiltration capacity during rainfall. This leads to heightened surface runoff and more severe flooding[3]. Changes in land use and land cover manually induce cyclical impacts on hydrological processes, altering water stream flows, precipitation patterns and flood intensity and volume[7]. These changes significantly affect urban infrastructure, ecosystems and human populations, increasing the risks of infrastructure failure, property damage and potential fatalities. Combined with increased runoff and waterlogging, these factors can result in severe flooding.

The increasing frequency of intense rainstorms and storm surges has heightened vulnerability to various types of floods, particularly in Asia and Southeast Asia[10]. The results of a study conducted using Data Envelopment Analysis (DEA) from 2001 to 2018 revealed a high level of vulnerability to flood disasters in Southeast Asia[14]. Malaysia, Laos and Cambodia were identified as the most vulnerable countries while Thailand, Myanmar, Indonesia and the Philippines were classified as having medium-high vulnerability, indicating significant susceptibility to flood risks[25].

Malaysia, as a developing country in Southeast Asia, experiences seasonal Monsoon floods that result in significant losses and exacerbate poverty and vulnerability. These floods are driven by Monsoon winds, maritime weather conditions in East Malaysia and the consistent cycle of rainfall along the East Coast of Peninsular Malaysia[15]. Annual flooding has severe socioeconomic impacts, including permanent mental health effects, loss of life and economic losses in urban centres in Malaysia, including Kuala Lumpur and Penang as well as in other regions such as Johor State[9,14,16].

In Johor State, uneven rainfall distribution and extreme weather events like floods and droughts have resulted in severe social, economic and environmental consequences[16].

The State's low-lying topography, combined with rapid urbanisation and inadequate drainage systems, has made its cities particularly vulnerable to Monsoon floods. Within Johor, the Kota Tinggi district is most affected by recurrent floods. The region has experienced significant flooding events in recent years, such as in January 2024, when heavy rainfall and high tides displaced 4,397 residents and inundated the city centre[23]. Similar incidents in 2023 and 2022 saw flash floods impacting town centres, rural areas and plantation settlements during the northeast Monsoon season. In 2021, floodwaters submerged shophouses under two meters, disrupting traffic and closing major roads near the Johor River[6,22,23].

The increasing vulnerability to annual flooding in Kota Tinggi district highlights the importance of improving flood preparation and coping strategies for effective response and recovery efforts within local communities. Review of literature reveals that flood preparedness is the systematic management and planning of various measures to minimize the impact of floods on lives and properties while accelerating recovery efforts[14]. Flood preparedness involves the actions and measures taken to anticipate, mitigate and respond to flood events effectively[12]. It encompasses a range of activities as stated in table 1.

As shown in table 1, the listed activities can be integrated into a cohesive flood management framework through coordination, collaboration and a focus on capacity-building at multiple levels to create more resilient communities that can better withstand and recover from the impacts of flooding. The discussion on community flood preparedness, as highlighted in table 1, also need to take into account elements of education and awareness for disaster preparedness. Keiichi et al[18] emphasized that awareness is essential for disaster preparedness and risk reduction as it enables early detection and response, risk reduction, safety and survival, community resilience, economic protection and psychological preparedness.

Other researchers such as Goh[14] and Kamarudin et al[17] have argued that awareness is a vital part of preparedness as it provides the knowledge necessary for a community to understand risks and make informed decisions.

Table 1
Community flood preparedness activities[12,14,17]

S.N.	Main Activities	Description
1	Early warning systems	• To provide timely and accurate information about potential flood events to enable individuals and communities to take protective actions. • Installation of early warning systems will allow communities to evacuate, secure property and prepare for incoming floods, reducing potential losses.
2	Emergency planning	• To develop structured plans and protocols for responding effectively (ensure coordination) during a flood event including, flood evacuation routes and shelter identification, Standard Operating Procedures (SOPs) for emergency response teams, training and drills for authorities, first responders and residents.
3	Public education and awareness	• To increase community knowledge about flood risks and preparedness strategies (empowerment). • Key programs are including awareness campaigns on flood-prone areas, distribution of informational materials to public and also school programs to educate children about flood safety.
4	Community engagement	• To involve local communities in decision-making and flood preparedness activities through participation in flood risk assessments and planning, community-based disaster management committees and volunteer programs. • To enhance local ownership of flood preparedness measures and leverages local knowledge for more effective solutions.
5	Resource allocation	• To ensure the availability of financial (through funding for flood infrastructure, relief supplies and recovery initiatives), human (deployment of trained personnel) and material resources needed to manage flood risks and recovery (stockpiling essential supplies like food, water and medical kits) for effective response and recovery operations during and after flood events.
6	Infrastructure and land-use planning	• To design and implement structural and non-structural measures to reduce flood risks. • These includes the construction of flood defense such as levees and dams, maintenance and improvement of drainage systems, green infrastructure and zoning laws to prevent construction in flood-prone areas. • Building disaster-resilient infrastructure and improving land use planning could reduce flood risks and protects vulnerable areas from severe damage.

However, awareness alone is not sufficient for building a disaster-resilient community. In the context of flood resilience, the two dimensions awareness and preparedness are interconnected and complementary. For instance, a community may be fully aware of flood risks but fail to prepare if they lack resources or lack a clear plan of action. Conversely, a community with strong preparedness measures but low awareness, may not use these measures effectively, such as ignoring early warnings or failing to follow evacuation protocols.

In this light, community awareness lays the foundation for preparedness by enabling people to recognize risks and prompting them to take action. Meanwhile, preparedness transforms this awareness into practical steps that reduce the community's vulnerability and enhance its ability to respond to and recover from flooding events[13,15].

Back to Kota Tinggi situation, the current mitigation strategies are predominantly Government-driven, emphasising response and recovery rather than proactive community preparedness, limiting local capacity to address flood risks effectively. Local plans prioritise hazard avoidance and vulnerability reduction over disaster preparedness, highlighting the need for community-based coping strategies to enhance resilience in flood-prone areas[1,17,19,21]. Despite recurrent floods in Kota Tinggi, there is limited understanding of community preparedness and perceptions, hindering the development of effective, region-specific strategies[14]. In this light, this study shall evaluate the level community preparedness and shall identify their current coping strategies for recurring floods in Kota Tinggi, aiming to inform the development of tailored, community-focused disaster risk management strategies.

Material and Methods

This study adopted a quantitative methodology, a structured approach designed for the collection, analysis and interpretation of numerical data[11]. Data were gathered using a questionnaire divided into three primary sections: sociodemographic information, perceptions of flood awareness and preparedness and existing coping strategies for managing recurring floods. The questionnaire included items based on specific indicators (Table 2). It was distributed to 63 respondents from the Kemang area in Kota Tinggi district, Johor, with the sample size determined through the study's calculation method:

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

$$S = \frac{\frac{1.65^2 \text{ x } 0.5\ (1\text{-}0.5)}{0.1^2}}{1 + \left(\frac{1.65^2 \text{ x } 0.5\ (1\text{-}0.5)}{0.1^2\ 799}\right)} = 63 \text{ respondents}$$

where S represents the minimum sample size for this study, N is Total population size, that is, the size of the segment or population for evaluation (799 people); e is margin of error that is permissible for the sampling of a population (set at 10%); z is confidence level that the population will choose answers within a given range (1.65); and p is standard deviation (in this case, 0.5%). The data were analysed using mean score value to determine the preparedness level based on the Likert scale of 1 to 5 (indicating weak to strong levels) as well standard deviation (STD) value to explain variation level of each indicator.

As shown in table 2, the study utilizes a comprehensive framework to assess community flood preparedness, organized into three key dimensions: Current Knowledge (emphasizes the community's understanding and awareness of flood risks and their access to essential resources and information), Past Experience (reflects the historical involvement and actions of individuals and institutions during previous flood events, serving as a foundation for current preparedness) and Personal/Communal Skills (highlights individual and collective capacities to adopt proactive measures and leverage available resources for flood preparedness). These dimensions encompass a range of indicators that collectively provide insights into the readiness and resilience of communities in flood-prone areas.

Study Area of Taman Kemang, Kota Tinggi District, Johor State: The study on local community preparedness to recurrent flood disaster is focused on the State of Johor, Malaysia, with a particular emphasis on the town of Kota Tinggi. Johor. The State is among top rank for area frequently affected by recurrent Monsoon floods, contributing to significant damage and displacement of communities[8,20].

This study was conducted in Taman Kemang, Kota Tinggi, Johor, Malaysia as study area intends to evaluate the community's present state of flood preparation and identifies factors that contribute to their preparedness and gaining perception on flood coping strategies from the local community's members for improving preparedness and resilience to future flood events (Figure 1). The study uses data collected from households in flood-prone villages between October and December 2024, with the consent of the village leader.

As shown in figure 2, the dark blue boundary represents the severely flooded Kota Tinggi city core during the 2006 and 2007 flood disasters. The light blue boundary indicates areas affected by flooding from 2021 to January 2025, reflecting increased flood frequency and severity due to rising tides and intensified rainfall during the Monsoon period between October until February every year.

The worst floods in 2006 and 2007 were caused by heavy rains of 50.8mm in January, which caused the Johor River to

overflow and coupled with the reverse tide, caused the downstream areas of the river to be flooded to a depth of more than 10 meters in some areas[4,22]. The city centre of Kota Tinggi and surrounding lowland areas were almost completely flooded, including residential areas close to the Johor River.

Prior to another major flood in 2021, several residential areas near the Johor River and Kota Tinggi city centre including Taman Kemang, Taman Muhibah, Panti village and Tembioh village, have become increasingly flood-prone[5]. Notably, Taman Kemang and the Kota Tinggi city centre experienced frequent and recurrent flooding from 2020 to early January 2025, primarily caused by tides and heavy rainfall (recurrent flooding recorded in 2021, Jan 4; 2022, Nov 3; 2023, Mar 6; 2024, Nov 28; 2025, Jan 10) [14,22].

Results and Discussion

Assessment of community flood preparedness: We investigated current level of respondent's preparedness, experiences and lessons learned from recurrent flood disaster in study area based on survey questionnaire responses

Table 2

List of indicators for community flood preparedness assessment[14,15,17,21]

Dimensions and Indicators
Current knowledge
1. Awareness and knowledge of flood risks 2. Availability of disaster education and resources 3. Community access to flood information 4. Effectiveness of flood information sharing 5. Feedback loops for community input on warnings and readiness 6. Knowledge of warnings, access to shelters and skills 7. Flood awareness among the local community 8. Local knowledge and experience in flood adaptation
Past experience
1. Local authorities' involvement in emergency planning 2. Access to emergency supplies 3. Training for community disaster response teams 4. Actions taken by individuals and communities during floods 5. Clear evacuation plans and shelter availability
Personal/Communal skills
1. Adoption of protective behaviours 2. Community empowerment in preparedness 3. Public awareness and participation in campaigns 4. Community involvement and response capacity 5. Policy supports availability 6. Effective early warning systems 7. Local multi-hazard plans and rating system

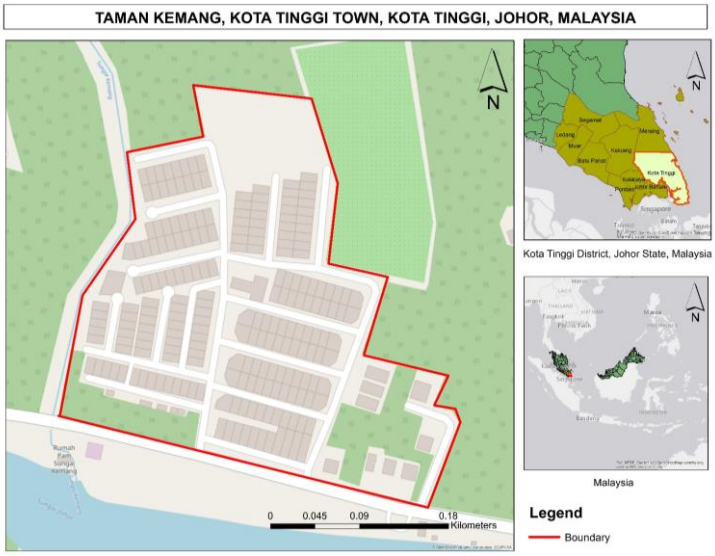

Fig. 1: Location of the study area of the Taman Kemang in Johor State.

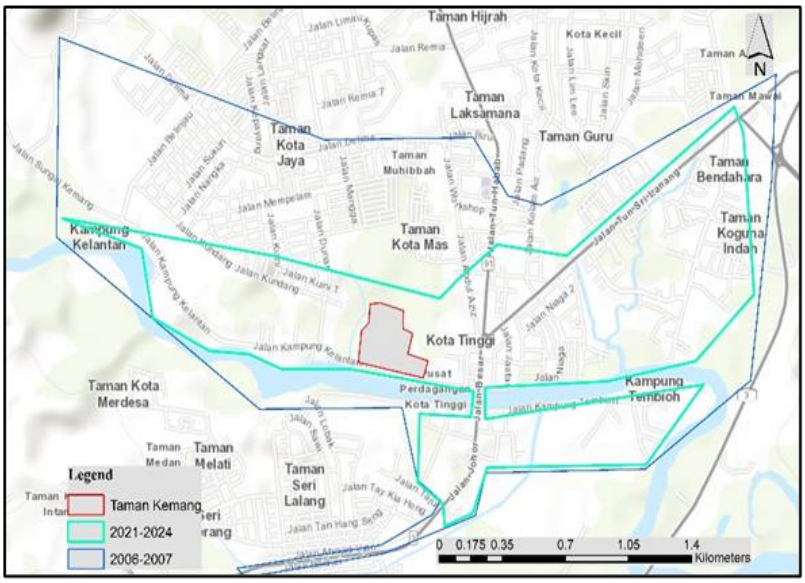

Fig. 2: Recurrent flood events from 2006 to 2024 and boundaries in Kota Tinggi city centre near the Johor River.

Table 3
Respondents' current knowledge on recurrent flood (n=63)

Dimension: Current knowledge on recurrent flood				
Indicators	**Min**	**Max**	**Mean**	**STD**
1. Awareness and knowledge of flood risks	2	5	4.36	0.598
2. Availability of disaster education and resources	1	4	1.09	0.518
3. Community access to flood information	1	2	1.58	0.498
4. Effectiveness of flood information sharing	1	4	1.52	0.949
5. Feedback loops for community input on warnings and readiness	1	4	1.06	0.387
6. Knowledge of warnings, access to shelters and skills	1	5	4.94	0.498
7. Flood awareness among the local community	1	5	4.11	0.806
8. Local knowledge and experience in flood adaptation	2	5	4.32	0.559

Current knowledge of recurrent flood: Table 3 represents the assessment of the community's current knowledge on recurrent floods based on eight key indicators. The findings in table 3 indicate that the community possesses a strong awareness of flood risks (Mean = 4.36, STD = 0.598) and high knowledge of flood warnings, shelter locations and response skills (Mean = 4.94, STD = 0.498). Additionally, local knowledge and experience in flood adaptation are well established (Mean = 4.32, STD = 0.559), suggesting that past experiences have contributed to community resilience. Similarly, flood awareness among the local population is relatively high (Mean = 4.11, STD = 0.806), though some variability exists among respondents. The low standard deviation for most of these indicators implies a generally consistent level of knowledge across the community.

Despite this strong awareness, the study reveals significant gaps in disaster education and preparedness resources (Mean = 1.09, STD = 0.518), as well as limited access to flood-related information (Mean = 1.58, STD = 0.498). Flood information sharing is also perceived as ineffective (Mean = 1.52, STD = 0.949), with a high level of variability in responses, suggesting disparities in how information is distributed and received. Additionally, feedback loops for community input on warnings and readiness are almost non-existent (Mean = 1.06, STD = 0.387), indicating a lack of formal mechanisms for community participation in flood preparedness efforts. These findings highlight the need for improved disaster education, better access to information and more effective communication strategies to enhance community resilience.

Respondents past experience of recurrent flood: Table 4 shows data evaluation of the community's past experience with floods, focusing on emergency planning, preparedness and response measures. The results indicate that clear evacuation plans and shelter availability received the highest mean score (Mean = 4.94, STD = 0.492), suggesting that the community has well-established procedures for evacuation and access to shelters. The low standard deviation implies consistency in responses, meaning that most respondents are aware of these plans. However, local authorities' involvement in emergency planning is relatively low (Mean = 1.58, STD = 0.498), indicating limited engagement in proactive disaster management. Similarly, actions taken by individuals and communities during floods (Mean = 1.74, STD = 0.615) suggest that while some level of response exists, it may not be systematic or well-coordinated.

Other aspects of past experiences show moderate preparedness. Training for community disaster response teams has a mean score of 2.55, but the high standard deviation (STD = 1.205) suggests inconsistency in training opportunities, some community members may have received adequate training while others have had little to no exposure. Access to emergency supplies is also relatively low (Mean = 2.33, STD = 0.751), which could indicate challenges in resource distribution and availability. Overall, while the community benefits from clear evacuation plans, there are critical gaps in local authorities' involvement, emergency training and resource accessibility, highlighting the need for improved emergency planning and disaster response capacity.

Respondents' personal/communal skills for recurrent flood: Table 5 presents the data evaluation of the personal and communal skills related to flood preparedness, focusing on protective behaviours, community empowerment, participation and policy support. The findings suggest weak adoption of protective behaviours (Mean = 1.80, STD = 0.728) and low effectiveness of early warning systems (Mean = 1.06, STD = 0.387), indicating that the community lacks strong proactive measures and may not receive timely or effective alerts about potential flooding events. Additionally, local multi-hazard plans and rating systems scored low (Mean = 1.52, STD = 0.846), implying that structured, localized risk assessments and preparedness frameworks are either underdeveloped or not widely implemented. These results highlight a need for improving risk communication and promoting individual protective actions.

Despite these challenges, there is moderate community empowerment in preparedness (Mean = 2.41, STD = 0.992) and community involvement and response capacity (Mean = 2.55, STD = 1.205), though the relatively high standard deviations suggest variability in experiences across different groups. Public awareness and participation in campaigns (Mean = 2.15, STD = 0.916) and policy support availability (Mean = 2.27, STD = 0.969) remain limited, indicating that while some efforts exist, they may not be reaching the entire community effectively. These findings emphasize the need for stronger policy enforcement, community-based capacity building and more accessible early warning mechanisms to enhance overall flood resilience.

Coping strategies in facing recurrent flood: As illustrated in figure 3, the most commonly reported coping strategy was "maintaining emergency flood warning systems and real-time monitoring stations." The second most frequently cited approach involved "utilizing local knowledge and integrating traditional and modern mechanisms for flood preparedness, response and recovery." The third most common strategy emphasized "regular community clean-up activities, flood protection measures and strengthening community empowerment through education, training and participation in decision-making." This was followed by "advocating for long-term flood prevention policies and governance control," ensuring that essential information is effectively disseminated to communities in flood-prone areas.

In addition, some respondents also stressed on their ability to "maintain communication with relevant authorities" for accurate information that will assist their disaster preparation, followed by "upgrading and cleaning local infrastructure" particularly drainage system and "local volunteers that shared their four-wheel-drive vehicles for emergency transportation".

Table 4
Respondents past experience of recurrent flood (n=63)

Dimension: Past experience				
Indicators	**Min**	**Max**	**Mean**	**STD**
1. Local authorities' involvement in emergency planning	1	2	1.58	0.498
2. Access to emergency supplies	2	4	2.33	0.751
3. Training for community disaster response teams	1	5	2.55	1.205
4. Actions taken by individuals and communities during floods	1	4	1.74	0.615
5. Clear evacuation plans and shelter availability	1	5	4.94	0.492

Table 5
Respondents' personal/communal skills for recurrent flood (n=63)

Dimension: Personal/Communal skills				
Indicators	**Min**	**Max**	**Mean**	**STD**
1. Adoption of protective behaviours	1	4	1.80	0.728
2. Community empowerment in preparedness	1	4	2.41	0.992
3. Public awareness and participation in campaigns	1	4	2.15	0.916
4. Community involvement and response capacity	1	5	2.55	1.205
5. Policy supports availability	1	5	2.27	0.969
6. Effective early warning systems	1	4	1.06	0.387
7. Local multi-hazard plans and rating system	1	5	1.52	0.846

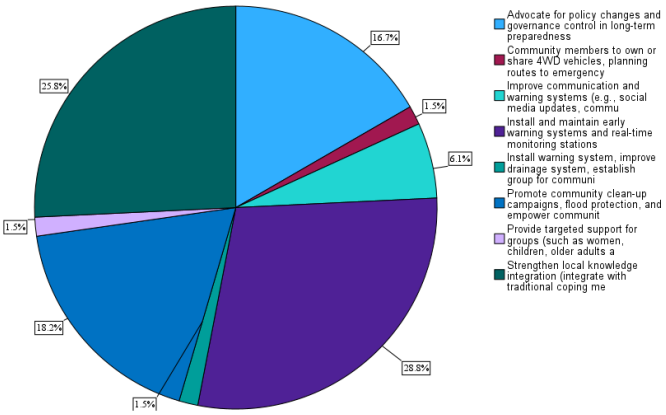

Fig. 3: Community's coping strategies for facing recurrent floods.

A small number of respondents did highlight the role of "planning evacuation routes and emergency supplies early preparation" for flood preparedness as their coping strategies for facing the recurrent floods.

The study indicates that the community has a strong awareness of flood risks and significant knowledge regarding flood warnings, shelter locations and response skills. The high mean scores for these indicators suggest that past flood experiences have contributed to local resilience. Furthermore, the community demonstrates substantial local knowledge and experience in flood adaptation, reinforcing the importance of lived experiences in shaping preparedness strategies. However, despite this awareness, there are critical gaps in disaster education and preparedness resources. The findings highlight limited access to flood-related information, ineffective communication mechanisms and a lack of formal feedback loops for community input.

These deficiencies indicate that while residents may understand flood risks, they lack the structured support needed to translate this knowledge into more effective preparedness and response measures. Addressing these gaps through targeted disaster education programs, improved information dissemination and enhanced community engagement could significantly improve flood resilience. In terms of respondents past flood experience and preparedness measures, the results suggest that the community has well-established evacuation plans and access to shelters, which are crucial for minimizing flood-related risks. However, there is minimal involvement of local authorities in emergency planning, pointing to a gap in institutional support.

Additionally, individual and community actions during floods appear to be inconsistent and training for community disaster response teams varies significantly among respondents. This suggests that preparedness measures are not systematically implemented across the community, leading to disparities in response capacity. Limited access to emergency supplies further exacerbates the situation, indicating that many residents may struggle to meet basic needs during flood events. Enhancing local government engagement, ensuring consistent community training and improving access to emergency supplies are essential steps to strengthen flood preparedness and response efforts.

Findings from the personal and communal skills for capacity building reveal weaknesses in the adoption of protective behaviors and the effectiveness of early warning systems. The low mean scores indicate that many community members either do not take proactive protective measures or lack confidence in the early warning systems currently in place. Additionally, local multi-hazard plans and rating systems are underdeveloped, limiting the ability to assess and address risks systematically. Despite these challenges, moderate levels of community empowerment and response capacity suggest that some local initiatives exist, though their effectiveness varies across different groups.

Public awareness campaigns and policy support are present but not widespread, highlighting the need for more inclusive and participatory approaches to flood preparedness. Strengthening early warning systems, promoting community-based capacity-building initiatives and ensuring more equitable access to policy support would enhance overall resilience.

Data analysis highlighted few coping strategies for recurrent floods, whereby the most commonly reported coping strategy among respondents is the maintenance of emergency flood warning systems and real-time monitoring stations. Additionally, many respondents emphasize the importance of integrating local knowledge with modern flood preparedness and response mechanisms. Community-driven strategies, such as regular clean-up activities, flood protection measures and empowerment through education and training, also play a critical role in enhancing resilience. Some respondents also stress the need for maintaining clear communication with relevant authorities, upgrading drainage systems and utilizing local volunteers with emergency transportation capabilities.

A smaller group highlights the importance of early planning for evacuation routes and emergency supplies. These findings underscore the need for a multi-pronged approach

that combines institutional support with community-driven initiatives to create a more robust flood resilience framework.

Conclusion

This study highlights a paradox in flood preparedness while the community in Kota Tinggi district demonstrates strong awareness and local knowledge of flood risks. Significant gaps remain in institutional support, resource access and systematic preparedness measures. Strengthening disaster education, improving communication channels, enhancing early warning systems and ensuring consistent engagement from local authorities are crucial steps toward building a more resilient community.

Furthermore, supporting community-led initiatives and integrating local knowledge with modern flood management strategies can enhance both preparedness and response capacities. Future efforts should focus on policy improvements, increased investment in flood prevention infrastructure and fostering a culture of proactive disaster risk reduction at both individual and community levels. By addressing these challenges, the community can move beyond reactive coping strategies toward a more sustainable and adaptive flood resilience framework.

Acknowledgement

The authors acknowledge the UTM International Grant (External Grant), R.K130000.7343.1U053 funded by Universiti Teknologi Malaysia (UTM), Malaysia.

References

1. Adekola O., Chan F.K.S., Chen J., Griffiths J., Li P., Lu X., Nafea T., Pezzoli A. and Wang J., Selected global food preparation and response lessons: implications for more resilient Chinese cities, *Journal of Natural Hazards*, **118**, 1-30 **(2023)**

2. Ahmad A.R., Aini M.S., Fakhru I.A., Mohd Muhaimin R.W. and Noor Diyana F.A., Community preparedness to flood disaster in Johor, Malaysia, *Journal of Earth and Environmental Science*, **479**, 1-7 **(2020)**

3. Ajay K., Amrit B., Aruna S., Balbhadra T. and Rohan B., Evaluating the effectiveness of best management practices in adapting the impacts of climate change-induced urban flooding, *Journal of Atmosphere*, **15(3)**, 1-18 **(2024)**

4. Alias N.E., Arman N.Z., Hassan C.H.C., Ramli M.W.A., Ramzan M.A., Saadi Z., Tajuddin A.N.W.A. and Yusop Z., Evaluating flood early warning system and public preparedness and knowledge in urban and semi-urban areas of Johor, Malaysia: Challenges and opportunities, *International Journal of Disaster Risk Reduction*, **113**, 1-19 **(2024)**

5. Aminiril A.A.H., Cindy L.I.S., Claire W., Dominic K.S.W., Dominic K.S.W., Michaela L.G., Norlilawati S. and Yee, C.K., Comparison of WASH with flood perception among rural and urban communities in Kota Tinggi, Malaysia, Research Square, 1-21 **(2024)**

6. Arjun M., Annual floods in Kota Tinggi stir waves of frustration, The Vibes.com **(2023)**

7. Banjara M., Bhusal A., Chimire A. and Kalra A., Impact of land use and land cover change on hydrological processes in urban watersheds: analysis and forecasting for flood risk management, *Journal of Geosciences*, **14(2)**, 1-15 **(2024)**

8. BPEN JOHOR (Johor State Economic Planning Department), Department of Statistics Malaysia (DOSM), Basic data on the State of Johor 2021, 1-86 **(2021)**

9. Bracken L.J., Farisha A.S.S., Ghaffarianhoseini A., Melasutra D.M., Norhaslina H., Sumiliana S. and Yusmah M.Y.S., Understanding urban flood vulnerability and resilience: a case study of Kuantan, Pahang, Malaysia, *Journal of Natural Hazards*, **101(1)**, 551-571 **(2020)**

10. Chen Y., Jin L., Lei X., Shao B., Yang Q. and Zheng X., Research progress of urban floods under climate change and urbanization: a scientometric analysis, *International Journal of Buildings*, **11(628)**, 1-25 **(2021)**

11. Cresswell J.W., Research Design: Qualitative and Quantitative Approaches, Thousand Oaks, CA, Sage Publications **(1994)**

12. Erin D., Ha T.D., Margot H. and Michaela L., Community adaptation to climate-related flooding in Saskatchewan, *International Journal of Disaster Risk Reduction*, **108**, 1-14 **(2024)**

13. Gajendran T., Jonatan K., Kim M., Matthew A., Md Nawrose F., Michael O.E., Mitchell B. and Seth A.O., Influence of personal and collective social capital on flood preparedness and community resilience: evidence from Old Fadama, Ghana, *International Journal of Disaster Risk Reduction*, **94**, 1-17 **(2023)**

14. Goh J.Y, Community preparedness for flood resilience in Kota Tinggi, Johor, Malaysia, M.Sc. dissertation, Universiti Teknologi Malaysia, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia **(2025)**

15. Hosen N., Kamarudin K.H. and Mohamad Fauzi M.H., From Risk to Readiness: ExploringCommunity Preparedness for Monsoon Floods in East Coast Malaysia, *Disaster Advances*, **18(1)**, 31-37 **(2025)**

16. Idris W.M.R., Lihan T., Neng L.J., Rasid M.Z.A. and Talib S.A.A., Irregularity and time series trend analysis of rainfall in Johor, Malaysia, *Journal of Heliyon*, **10**, 1-18 **(2024)**

17. Kamarudin K.H., Omar Chong N. and Rashid M.F., Community resilience and disaster risk reduction in changing environment, Johor Bahru, Penerbit UTM Press **(2024)**

18. Keiichi S., Ryo M. and Tsuyoshi H., Disparity between evacuation intention and actual evacuation behavior during a heavy rain induced disaster event in Japan: exploring the role of everyday awareness of disaster preparedness, *International Journal of Disaster Resilience in the Built Environment*, **92(1)**, 1-11 **(2023)**

19. Mariney M.Y., Norhaslina H. and Nur Zainul A.N., Strengthening flood resilient development in Malaysia through integration of flood risk reduction measures in local plans, *Journal of Land Use Policy*, **102**, 1-11 **(2021)**

20. MDKT (Kota Tinggi District Council), PLAN Malaysia

(Department of Town and Country Planning), Draft Local Plan for Kota Tinggi District 2030, Putrajaya, Ministry of Housing and Local Government Malaysia **(2021)**

21. Omar Chong N., Rashid M.F. and Kamarudin K.H., Local community knowledge for flood resilience: a case study from east coast Malaysia, *International Journal of Built Environment and Sustainability*, **9(2)**, 21-34 **(2022)**

22. Rhea Y.A.H., Heavy rain in Johor: Close to 4,000 victims forced into flood relief centres, Channel News Asia **(2023)**

23. Rizalman H., Kota Tinggi floods ease, but much of town still submerged, New Straits Times **(2021)**

24. Srinivasa R.D. and Babji P.C., A study on the effects of El Nino and global warming in India: Climatic changes, issues and challenges, *Disaster Advances*, **18(2)**, 52-59 **(2025)**

25. Wang X. and Yu X., Flood disaster risk assessment based on DEA model in Southeast Asia along "The Belt and Road', *Journal of Sustainability*, **14**, 1-10 **(2022)**.

(Received 18th February 2025, accepted 16th April 2025)