



EVALUATION OF DISASTER MANAGEMENT POLICIES FOR COMMUNITY FLOOD RESILIENCE IN MALAYSIA

Mariani Ariffin¹ and Nurul Fatin Harissha Zulhari²

*^{1,2} Department of Environmental Management,
FACULTY OF FORESTRY AND ENVIRONMENT
UNIVERSITI PUTRA MALAYSIA*

Abstract

The risk of floods is expected to increase as the frequency of extreme weather events driven by climate change increases. Strengthening community flood resilience requires an effective governance framework. This study uses a qualitative approach to examine the extent to which existing disaster management and other relevant policies in Malaysia support community resilience to floods amid climate change. National policy documents related to disasters, floods, and climate change were analysed using the multidimensional Flood Resilience Measurement for Communities framework, complemented by semi-structured interviews with key informants from government agencies. The study found that Malaysia's existing policy framework provides a foundation for community flood resilience, although important gaps remain across financial, human, social, physical, and natural capitals. Financial capital remains largely reactive, while physical capital focuses on large-scale infrastructure. Human capital development is uneven, social capital remains constrained by limited community participation, and natural capital is weakly integrated at the community level. Addressing these gaps is essential to enhance community-level preparedness, adaptive capacity, and long-term flood resilience in Malaysia.

Keywords: Community resilience, flood, disaster risk reduction, institutional governance, policy.

¹ Corresponding author. Email: marianiho@upm.edu.my

INTRODUCTION

Climate change increases the vulnerability and severity of flood hazards globally through multiple pathways. These include increased atmospheric moisture, sea-level rise, altered weather patterns, urbanisation, land-use changes and deforestation. Consequently, floods now affect more people globally than any other natural disaster. The risk levels are exacerbated by both climatic changes and the rapid expansion of socioeconomic activities (Mehryar & Surminski, 2021). In response, many countries have begun integrating climate change considerations into disaster-related policies to strengthen resilience to emerging risks.

In Malaysia, flood risks have been exacerbated by local factors, including rapid urbanisation, ineffective drainage systems, deforestation and logging, and climate change. Traditional flood management strategies that focus solely on structural defences are insufficient to mitigate these risks (Abid et al., 2024; Chan et al., 2012). Therefore, community flood resilience must be strengthened. Yet critical gaps remain in understanding how existing policies and governance mechanisms contribute to improving community-level resilience. Currently, Malaysia has no national legislation specifically on flood management. The government uses an executive route to govern the matter through disaster- and climate change-related policies.

This study aims to assess the extent to which Malaysia's disaster management and related policy frameworks support community flood resilience through the five-capital framework. Specifically, the study first examines how existing national policies address financial, human, social, physical, and natural capital to strengthen community resilience to floods. Secondly, it identifies gaps and limitations in the current policy framework. Finally, the study explores institutional perspectives on implementing community flood resilience strategies in Malaysia.

LITERATURE REVIEW

Flood and Its Impacts

Floods are the most frequent natural disaster in Malaysia and have significant impacts on both human and environmental systems. Between 2021 and 2023 alone, the country incurred RM 7.9 billion in flood-related losses (DID, 2022). The highest losses were recorded in public assets and infrastructure, followed by residential areas and agriculture (Norizan et al., 2021).

Floods may increase the spread of waterborne and vector-borne diseases due to contaminated water supplies and poor sanitation systems. In Malaysia, post-flood conditions have been associated with diseases such as leptospirosis, dengue, and gastrointestinal infections (Chan, 2012). Flood events may also introduce emerging pollutants, including pharmaceutical contaminants,

into water sources, although Malaysian legislation provides limited regulatory attention to this issue (Othman & Ariffin, 2019). In addition, recurring floods may contribute to mental health problems and social isolation among affected communities, particularly older adults (Song et al., 2025). Flooding also affects ecosystems through soil erosion and vegetation damage, which may increase future flood risks. Floods are complex socio-environmental challenges that undermine community resilience, particularly under intensifying climate change.

Governance of Disaster Management

In the absence of specific flood legislation, Malaysia's flood risk management (FRM) is governed through the national disaster management policy and institutional framework (Mabahwi et al., 2020b). Since 1997, disaster management has been guided by the National Security Council (NSC) Directive No. 20, which was updated in 2012 to align with the international disaster management framework (Khairilmizal et al., 2016). The revised directive strengthened multi-agency coordination and incorporated preparedness, response, and recovery processes (Khairilmizal et al., 2016). In December 2015, the National Disaster Management Agency (NADMA) was established to coordinate disaster management nationwide.

Despite these developments, studies continue to identify poor inter-agency coordination and communication as major barriers to effective FRM (Mabahwi & Nakamura, 2020; Mah Hashim et al., 2023). Agencies often operate in silos (Zakaria et al., 2018), while limited enforcement capacity, manpower, logistics, information sharing, and resource alignment remain significant challenges (Mabahwi & Nakamura, 2020; Mah Hashim et al., 2023). Consequently, NSC Directive No. 20 was criticised as outdated and inadequate for addressing contemporary community resilience needs (Sulaiman et al., 2019).

To address these challenges, Malaysia introduced NADMA Directive No. 1 in August 2024 to replace NSC Directive No. 20. Unlike its predecessor, which focused primarily on disaster response and command structures, NADMA Directive No. 1 adopts a more comprehensive approach by emphasising disaster risk reduction, prevention, preparedness, response, and recovery. Reflecting Malaysia's federal system, the directive establishes Disaster Management Committees at the federal, state, and district levels (Figure 1), strengthening coordinated and continuous disaster risk management.

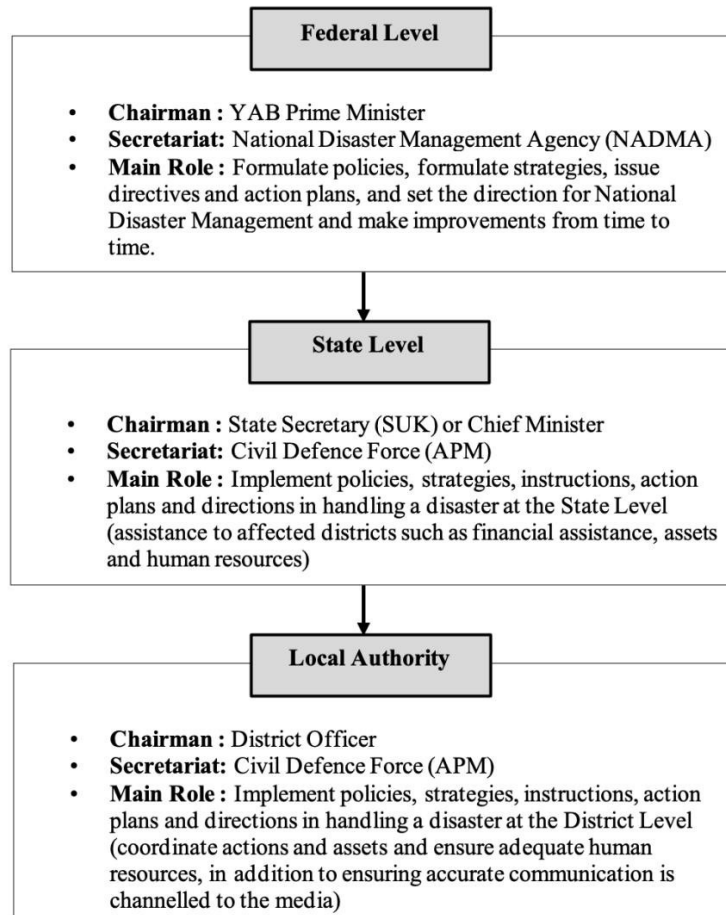


Figure 1: Disaster Management Committees
 Source: NADMA Directive No. 1

Community Flood Resilience

There is a growing recognition of the need for community-level flood resilience. This encompasses not only physical infrastructure but also social, economic, institutional, and ecological capacities to anticipate, adapt to, and recover from floods (Xu et al., 2023). Community resilience is shaped by a complex interplay of factors, requiring multidimensional and context-sensitive indicators for effective assessment (Rana et al., 2021). Similarly, Xu et al. (2023) argued that resilience depends on interconnected financial and physical capacities rather than isolated interventions.

In Malaysia, there remains limited understanding of how the existing policy and governance framework supports community resilience. For instance, Omar Chong and Kamarudin (2018) found that the lack of a bottom-up approach and long-term post-disaster recovery planning hampers community resilience. Assessing gaps in the current policy framework is therefore essential to identify opportunities for improvement and strengthen community resilience (Mehryar & Surminski, 2021).

Existing Malaysian studies primarily focus on institutional coordination, disaster response mechanisms, infrastructure, or community participation in isolation (Mabahwi & Nakamura, 2020; Sulaiman et al., 2019). Limited attention has been given to evaluating disaster management policies through an integrated resilience framework encompassing financial, human, social, physical, and natural capitals. This study addresses that gap by applying the Flood Resilience Measurement for Communities (FRMC) framework to assess how Malaysia's disaster and climate-related policies support community flood resilience, thereby providing a more holistic and policy-oriented understanding of flood resilience governance.

RESEARCH METHODOLOGY

This study adopts a qualitative policy-analysis approach to assess how Malaysia's flood- and climate change-related policies support community flood resilience. Secondary data comprised national disaster directives, development plans, and climate policies (Table 1). Policy documents were selected purposively based on three criteria: (i) relevance to disaster management, flood risk reduction, climate adaptation, or national development planning; (ii) national-level applicability; and (iii) availability during the study period. These documents represent the principal policy instruments guiding disaster governance and climate resilience in Malaysia.

Table 1: National Policy Documents Relevant to Flood Risk Management

Policy Documents	Description
NADMA Directive No.1	Current principal operational directive outlining disaster risk reduction, preparedness, response, and recovery mechanisms.
NSC Directive No. 20 (1997 - 2024)	Established the structural command-and-control architecture that underpins current disaster governance practices.
13th Malaysia Plan (2026-2030)	Primary socio-economic development blueprints that allocate resources, set priorities, and integrate flood mitigation and

Policy Documents	Description
12th Malaysia Plan (2021-2025)	climate adaptation. They provide insight into financial, physical, and governance investments at the macro level.
National Climate Change Policy 2.0	Integrating climate risks into disaster risk reduction and resilience strategies.

In addition, primary data were collected through semi-structured interviews with representatives from relevant government agencies selected purposively based on their expertise in Malaysia's flood management policy framework. A snowball sampling technique was used to identify potential informants. Despite efforts to recruit participants from a wider range of agencies, only representatives from NADMA (Key Informant 1 - KI1), the Department of Irrigation and Drainage (Key Informant 2 - KI2), and the Department of Social Welfare (Key Informant 3 - KI3) were available during the study period. These agencies were selected because they represent the key institutional functions of national disaster coordination, flood mitigation, and disaster relief, providing complementary perspectives relevant to the five-capital framework. Interviews were conducted between November 2024 and January 2025, lasting approximately 40–60 minutes each. An interview guide based on the five-capital framework ensured consistency while allowing participants to elaborate on emerging issues. Prior informed consent was obtained from all participants before the interviews.

Data from the policy documents were analysed using thematic analysis, supplemented by insights from key informants. The analysis was conducted through a community flood resilience lens adapted from the internationally applied Flood Resilience Measurement for Communities (FRMC) framework (Keating et al., 2017; Keating et al., 2025). As shown in Table 2, the analysis focused on five types of capital: financial, human, social, physical, and natural. Policy documents were coded manually according to the five capital dimensions of the FRMC framework through iterative reading. Within each dimension, policy provisions were assessed against predefined coding categories, while interview data were used to corroborate and contextualise the findings. Emergent themes relating to governance gaps, implementation barriers, and community participation were subsequently identified through iterative analysis.

Triangulation was undertaken by comparing themes identified from the policy documents with the perspectives of key informants. Areas of convergence were treated as corroborated findings, while discrepancies were analysed to identify implementation gaps and contextual insights beyond the policy documents. This study is limited by the small number of available key informants

and its focus on national-level policy documents. Future studies should incorporate wider stakeholder participation and comparative local-level analysis to provide a more comprehensive understanding of community flood resilience in Malaysia.

Under the FRMC framework, financial capital reflects both the level of fiscal commitment and the accessibility of financial resources. Human capital emphasises a comprehensive approach to ensure communities are informed and prepared for any eventuality, with a focus on actions that enhance their knowledge of FRM. Meanwhile, social capital evaluates whether flood resilience is supported by strong social networks, inclusive participation, and effective multi-level coordination. Physical capital considers how Malaysia's policies and governance promote infrastructure and essential services that can withstand flood impacts and support rapid community recovery. Finally, natural capital assesses the extent to which the framework integrates ecosystem-based approaches and recognises natural systems as vital components of flood resilience.

Table 2: Coding Framework Used for Policy Document Analysis

Five-Capital Dimension	Assessment Focus	Illustrative Coding Categories
Financial Capital	Policy provisions that support financial preparedness, response, and recovery	Disaster relief funds, insurance, business continuity, flood risk reduction investment, disaster response budget
Human Capital	Policy measures that strengthen community knowledge, awareness, and preparedness	Evacuation planning, flood-risk awareness, first aid, environmental awareness, governance awareness
Social Capital	Policy provisions promoting community participation and institutional coordination	Community participation, local disaster planning, mutual assistance, inter-agency coordination, social inclusiveness
Physical Capital	Policy measures supporting resilient infrastructure and essential services	Flood protection infrastructure, early warning systems, evacuation centres, transport, water, communication, emergency services
Natural Capital	Policy provisions supporting ecosystem-based flood resilience	Watershed protection, ecosystem conservation, natural flood protection, habitat restoration

ANALYSIS AND DISCUSSION

While resilience can be measured at different scales, the study focuses on the community level in Malaysia, where the effects of floods are felt most acutely and where many actions are undertaken to enhance resilience. This study reveals that Malaysia's disaster policies provide a reactive rather than proactive approach to community flood resilience, with gaps in financial, human, social, physical, and natural capital as explained below (Table 3).

Table 3: Assessment of Community Flood Resilience Policies
 Using the Five-Capital Framework

Capital	Key Policy Strengths	Key Gaps Identified
Financial	Relief funds, infrastructure allocation	Reactive financing, low insurance uptake
Human	Awareness programmes, training	Weak localisation, limited environmental awareness
Social	Inter-agency coordination	Limited participatory governance
Physical	FEW systems, drainage projects	Reactive infrastructure planning
Natural	Watershed conservation	Weak ecosystem-based FRM

Financial Capital

Financial capital encompasses the economic resources that support household asset recovery, business continuity, community disaster response, and risk-reduction investments, including grants, funds, compensation, and insurance provided by the government or the private sector. NADMA Directive No. 1 explicitly establishes NADMA's role in managing the National Disaster Relief Trust Fund, which provides financial assistance to disaster victims. It is funded through both public donations and government allocations to enable rapid assistance to affected communities. Despite these provisions, the study found that government support remains limited and largely ad hoc. For example, compassionate aid for flood-affected household heads or heirs of deceased victims, as well as compensation for crop damage, is minimal and triggered by specific disaster events. These measures may provide essential recovery support and reflect recognition of community vulnerability. However, they are primarily reactive with less emphasis on preventive measures or long-term resilience. Malaysia's financial capital should shift from reactive aid to proactive investment. This aligns with Xu et al. (2023), who pointed out that investment in disaster prevention is a primary determinant of community flood resilience. This

highlights the importance of proactive financial allocation rather than reactive post-disaster assistance.

Private insurance offers potential for more effective asset recovery, yet uptake among Malaysians remains low. Even motor insurance policies rarely include flood coverage. According to KI2, insurance uptake remains low due to the public's reliance on government assistance and limited awareness of disaster-risk financing. Similarly, KI1 highlighted that business continuity support is similarly constrained. Business interruption insurance is available, but it depends on sector participation and institutional support. In the meantime, government-subsidised insurance models face implementation challenges due to insurers' risk concerns. The situation leaves disaster insurance largely voluntary.

The findings showed that policy-driven investments in flood risk reduction focus on large-scale infrastructure projects that aim to mitigate climate-induced floods and develop flood-resilient cities. These initiatives strengthen preventive and mitigation capacities at the system level. They may also enhance communities' ability to prepare for, respond to, and recover from flood impacts. NCCP 2.0, for example, proposes sustainable drainage and tidal gate systems at the local level, although limited financial resources may hinder implementation.

The policy analysis and interviews suggest that while financial mechanisms exist, structural and behavioural barriers may limit their effectiveness in fostering community-level financial resilience. Malaysia needs a greater allocation of resources to local disaster response and risk-reduction investments. Mehryar & Surminski (2020) emphasise that national policy and legislation can enhance financial capital by regulating or promoting the creation and distribution of economic resources that support recovery and risk-reduction measures. Complementary strategies, including public education, wider insurance penetration, and robust mitigation planning, are critical to achieving a balanced and sustainable disaster management system.

Human Capital

The study found that human capital provisions are partially addressed in existing policies, but remain uneven and largely general. For example, RMK13 prioritises strengthening disaster preparedness through community awareness and capacity-building programmes. Similarly, the policies include preparedness initiatives such as training sessions and evacuation simulations. However, there is no explicit requirement for community-specific evacuation plans, indicating limited localisation of preparedness measures. Efforts to raise flood-risk awareness are evident through the dissemination of disaster information (Kamarudin et al., 2022). For example, communities can access daily disaster reports, maps of affected areas, weather updates, river water levels, and impact assessments via the NADMA website. Nevertheless, communication on future flood risks,

including climate change impacts, remains general, with limited mechanisms for effective community-level risk communication. Although disaster management training incorporates safety and health components, first-aid knowledge is not explicitly operationalised as a distinct community capacity. Likewise, there are no clear provisions to ensure continuity of education during floods, revealing a gap in safeguarding essential social services.

The policies also address asset protection and sanitation awareness during response and recovery phases. However, these measures remain general rather than community-targeted. There is also limited emphasis on environmental and governance awareness, constraining community understanding of broader risk drivers and institutional responsibilities. KI1 and KI3 highlighted waste management and sanitation challenges in evacuation centres during prolonged flood events. Particularly, they pointed to the extensive use of disposable food packaging and utensils, which generate solid waste and may contribute to health risks, odour pollution, and environmental degradation. Greater environmental awareness could enhance preparedness and reduce flood impacts, but this aspect remains underemphasised within the current framework.

KI2 observed that disaster management is increasingly framed beyond post-disaster response by drawing on sectoral laws to promote a more holistic and preventive approach. Nevertheless, the policy analysis and interview findings suggest that this emphasis remains largely institutional, with limited translation into community-level understanding or capacity-building, thereby constraining the development of comprehensive human capital for flood resilience. Similarly, Mehryar and Surminski (2020) note that plans, SOPs, and risk maps are often designed primarily for government and disaster management agencies rather than for public awareness. Consequently, government information should be communicated in more accessible, user-friendly formats for all age groups, alongside greater community involvement in decision-making to support locally relevant and inclusive resilience-building strategies.

Social Capital

Social capital fosters an environment in which communities can act collectively and engage with broader governance systems (Visave & Aldrich, 2025). Community networks are strengthened through local flood response and recovery plans that coordinate activities and improve safety in flood-prone areas. The study found that existing policies mandate continuous public awareness programmes to enhance preparedness and resilience, coordinated by the Disaster Management Committee and centralised through the National Disaster Command Centre (NDCC) to ensure inter-agency cooperation.

In addition, the policy framework supports community flood resilience primarily through institutional preparedness and coordination. For example, pre-

monsoon meetings conducted by NADMA review past events, assess resources, plan for worst-case scenarios, and coordinate multi-level assistance across local, national, and international actors. While these mechanisms strengthen operational readiness and inter-agency collaboration, they remain largely state-centric, focusing on logistics, asset mobilisation, and response planning, with limited integration of local knowledge or direct community involvement. Consistent with earlier reviews (Sulaiman et al., 2019), the findings show that Malaysia's disaster governance remains policy-driven but lacks an integrated community resilience framework linking planning, risk-reduction initiatives, and community empowerment.

Community-based disaster management also remains underdeveloped. Abid et al. (2024) note that Malaysian communities often rely on external assistance rather than actively participating in flood risk management (FRM). Empowering communities through planning and preparedness training is therefore essential, as it enables them to identify effective local solutions based on their flood experience (Kamarudin et al., 2022). However, the participating agencies indicated that community engagement remains concentrated during emergency response phases, with limited involvement in preparedness and recovery. KII similarly observed that community participation is rarely integrated into preparedness planning. Structured awareness and participation programmes also remain underdeveloped in Malaysia's resilience framework (Sulaiman et al., 2019). Communities actively involved in mitigation efforts, such as early warning systems and nature-based solutions, demonstrate stronger resilience (Abid et al., 2024).

Enhancing community awareness and participation can strengthen social capital and collective action. Akhir et al. (2021) highlight that fostering community spirit and self-efficacy reduces reliance on external resources and improves coping strategies. Similarly, Vázquez et al. (2024) emphasise that interactive communication through social media or interpersonal discussions enhances risk awareness, collective action, and resilience, particularly among older adults and marginalised groups. In general, while Malaysia's existing policy framework supports institutional coordination, greater emphasis on community engagement, participatory planning, and proactive preparedness is needed to fully leverage social capital for community resilience to floods.

Physical Capital

The study found that existing policies support physical capital primarily through large-scale infrastructure projects designed to reduce flood risks, as reflected in earlier findings on financial capital. These infrastructures include flood-protection structures, drainage improvements, and flood early warning (FEW) systems. Such projects are manifested clearly under RMK12 and RMK13.

Consistent with Xu et al. (2023), flood control and drainage capacity, together with disaster relief capability, are critical structural determinants of community resilience. This reinforces the importance of strengthening physical capital. However, most infrastructural interventions in Malaysia remain reactive, constructed within already developed or urbanised areas prone to flooding. Although NCCP 2.0 proposes integrating climate-change risk-based planning into land use and building regulations, this strategy has yet to be fully implemented. This integration is important because, as climate change intensifies, early integration of flood and climate considerations into physical development is essential to enhance resilience.

The existing framework also provides community services during flood events, including temporary shelters for evacuees and logistical support. Necessities such as food, clothing, blankets, and mats are also distributed to affected families. All key informants stressed the importance of maintaining evacuation facilities and essential services during flood events. In addition, emergency services and critical infrastructure protection are primarily addressed in the water supply sector. Beyond this, the current framework lacks provisions for other essential services, including the identification of structural hazards and the restoration of electricity and gas by professional services. The findings suggest that physical capital is strengthened through large-scale infrastructure and emergency services, but existing policies remain reactive and sector-specific. This highlights the need for more comprehensive, proactive, and multi-sectoral approaches to flood resilience in Malaysia.

Natural Capital

The study found that while the current disaster management policy framework provides only limited explicit recognition of natural capital in the context of flood resilience, RMK13 strengthens ecosystem-based adaptation by promoting watershed protection, riparian forest conservation, and improved water resource management. Together with RMK12's emphasis on the transition to a low-carbon economy, these initiatives indirectly contribute to flood risk reduction by mitigating the impacts of climate change. The development plans also promote the conservation of wetland habitats to reduce disaster risk, including flooding.

Despite these measures, the existing framework lacks explicit provisions for implementing natural flood-protection measures at the community level, thereby limiting the integration of natural systems as a core component of flood resilience. KI2 similarly observed that ecosystem-based approaches, such as river reserve protection and wetland conservation, are recognised at the policy level but remain inadequately translated into local implementation and community-based initiatives. Although the current policy framework demonstrates a broader commitment to environmental sustainability and climate

mitigation, greater emphasis on community-level natural capital and ecosystem-based flood management is still needed to strengthen resilience to flood risk in Malaysia.

CONCLUSION

Malaysia should strengthen community flood resilience through more targeted and actionable reforms that enhance community preparedness before flood events rather than relying primarily on post-disaster response. These include expanding subsidised flood insurance, integrating flood-risk zoning into land-use planning, improving evacuation-centre planning and strengthening participatory disaster governance. In addition, greater emphasis should be placed on ecosystem-based flood mitigation through watershed protection, riparian forest conservation, wetland conservation, and improved water resource management. More importantly, the country's disaster management should move beyond reactive response approaches towards preventive and adaptive strategies that empower communities as active resilience actors.

This study demonstrates that Malaysia's existing disaster management and related policy framework provides a foundation for community flood resilience across financial, human, social, physical, and natural capitals. However, important gaps remain. Financial and physical capital continue to rely heavily on reactive measures, while human and social capital are constrained by limited community participation and localised preparedness planning. Although natural capital is recognised through environmental sustainability initiatives, ecosystem-based flood management remains weakly integrated at the community level. The findings highlight the need for a more balanced, integrated, and community-centred resilience framework in Malaysia. Priority should be given to integrating flood-risk zoning into spatial planning, improving evacuation-centre planning, strengthening participatory governance, expanding community preparedness programmes, and adopting ecosystem-based flood mitigation strategies.

REFERENCES

- Abid, S. K., Sulaiman, N., Al-Wathinani, A., & Goniewicz, K. (2024). Community-based flood mitigation in Malaysia: Enhancing public participation and policy effectiveness for sustainable resilience. *Journal of Global Health, 14*, 04290. <https://doi.org/10.7189/jogh.14.04290>
- Akhir, N. M., Aun, N. S. M., Selamat, M. N., & Amin, A. S. (2021). Exploring factors influencing resilience among flood victims in Malaysia. *International Journal of Academic Research in Business and Social Sciences, 11*(6), 969–981.
- Chan, N. W. (2012). Impacts of disasters and disaster risk management in Malaysia: The case of floods. In Y. Sawada & S. Oum (Eds.), *Economic and welfare impacts of*

- disasters in East Asia and policy responses* (ERIA Research Project Report 2011-8, pp. 503–551). Jakarta, Indonesia: ERIA.
- 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. <https://doi.org/10.11113/ijbes.v9.n2.922>
- Keating, A., Campbell, K., Mechler, R., Magnuszewski, P., Mochizuki, J., Liu, W., Szoenyi, M., & McQuistan, C. (2017). Disaster resilience: What it is and how it can engender a meaningful change in development policy. *Development Policy Review*, 35(1), 65–91. <https://doi.org/10.1111/dpr.12201>
- Keating, A., Hochrainer-Stigler, S., Mechler, R., Laurien, F., Rubenstein, N., Deubelli, T., Velez, S., Szoenyi, M., & Nash, D. (2025). Reflections on the large-scale application of a community resilience measurement framework across the globe. *Climate Services*, 38, 100562. <https://doi.org/10.1016/j.cliser.2025.100562>
- Khairilmizal, S., Hussin, M. F., Hussain, A. R., Jusoh, M. H., Sulaiman, A. A., & Husna, A. K. (2016). Implementation of disaster management policy in Malaysia and its compliance towards international disaster management framework. *Information*, 19(8A), 3301–3306.
- Mabahwi, N. A., & Nakamura, H. (2020a). Challenges of inter-agency coordination in flood management in Malaysia. *Environment-Behaviour Proceedings Journal*, 5(13), 243–250. <https://doi.org/10.21834/e-bpj.v5i13.2069>
- Mabahwi, N. A., Nakamura, H., & Bhattacharya, Y. (2020b). Flood risk management in Malaysia: The current hindrances for flood related agencies. *Asian Journal of Behavioural Studies*, 5(19), 11–24.
- Mah Hashim, N., Abu Bakar, N. A., Kamaruzzaman, Z. A., Shariff, S. R., & Amin Burhanuddin, S. N. Z. (2023). Flood governance: A review on allocation of flood victims using location-allocation model and disaster management in Malaysia. *Journal of Governance and Integrity*, 6(1), 493–503. <https://doi.org/10.15282/jgi.6.1.2023.9160>
- Mehryar, S., & Surminski, S. (2021). National laws for enhancing flood resilience in the context of climate change: Potential and shortcomings. *Climate Policy*, 21(2). <https://doi.org/10.1080/14693062.2020.1808439>
- Norizan, N. Z. A., 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. <https://doi.org/10.1016/j.landusepol.2020.105178>
- Omar Chong, N., & Kamarudin, K. H. (2018). Disaster risk management in Malaysia: Issues and challenges from the perspective of agencies. *Planning Malaysia*, 16(5). <https://doi.org/10.21837/pm.v16i5.415>
- Othman, A., & Ariffin, M. (2019). Source water protection from pharmaceutical contaminants: Assessment of Environmental Quality Act 1974 and its regulations. *Planning Malaysia*, 17(10). <https://doi.org/10.21837/pm.v17i10.638>
- Rana, I. A., Bhatti, S. S., Jamshed, A., & Ahmad, S. (2021). An approach to understanding the intrinsic complexity of resilience against floods: Evidences from three urban communities of Pakistan. *International Journal of Disaster Risk Reduction*, 63, 102442. <https://doi.org/10.1016/j.ijdr.2021.102442>

- Song, C., Atun, F., Blanford, J. I., & Anthonj, C. (2025). Impact of flooding on the social and mental health of older adults: A scoping review. *Water Security*, 25, 100190. <https://doi.org/10.1016/j.wasec.2025.100190>
- Sulaiman, N., She, T. W., & Fernando, T. (2019). Community resilience frameworks for building disaster resilient community in Malaysia. *Planning Malaysia*, 17(9). <https://doi.org/10.21837/pm.v17i9.589>
- Vázquez, L. P., Eshun, E. A., & Houston, J. B. (2024). Community disaster resilience and communication: Models, existing research, and next steps. In J. B. Houston (Ed.), *Routledge handbook of risk, crisis, and disaster communication* (1st ed., pp. 146–161). Routledge.
- Xu, W., Xie, Y., Yu, Q., & Proverbs, D. (2023). An evaluation of factors influencing the resilience of flood-affected communities in China. *Hydrology*, 10(2), 35. <https://doi.org/10.3390/hydrology10020035>
- Zakaria, S., Yusoff, M., & Hashim, R. (2018). Knowledge integration and coordination challenges in flood disaster management: A case study of Kemaman District. *Journal of Information and Communication Technology*, 17(3), 825–858.

Received: 4th June 2026. Accepted: 13th June 2026