

Flood Resilience of Housing Development Through Land Governance: A Thematic Review

Nur Khairiyah Mohammad, Maryanti Mohd Raid, Robiah Suratman, Norshafadila Ngadiman

Faculty Built Environment and Surveying Universiti Teknologi Malaysia Johore, Malaysia
Corresponding Author Email: mhnurkhairiyah@gmail.com

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v13-i8/17767> DOI:10.6007/IJARBSS/v13-i8/17767

Published Date: 14 August 2023

Abstract

Global climate change has brought about significant modifications in weather patterns, impacting the interaction between weather and water-related elements. As a result, there has been an increase in hydrometeorological disasters, which rank as the second most severe natural catastrophe. Nevertheless, over half of the world population lives in flood-prone areas. This has led global and local actors to develop more comprehensive and multidiscipline flood resilience and mitigation. Despite the existing awareness, there is a void of past research discussing the utilisation of land governance as a tool to enhance flood resilience in housing development. This thematic review synthesised research conducted between 2019 and 2023 on flood-resilient housing development through land governance. ATLAS.ti 8 was employed. A keyword search on SCOPUS, Science Direct, and Emerald Insight databases identified 175 peer-reviewed journal articles. After inclusion and exclusion, a total of 109 articles were reviewed. The comprehensive examination of these articles on flood resilience revealed that the articles explored four pillars: institutional and governance concerns, socio-economic concerns, disaster management concerns, and environmental concerns. The findings from these articles will form the basis for future extensive studies to strengthen flood resilience in Malaysian housing development through effective land governance strategies.

Keyword: Land Governance, Climate Change, Flood Resilient, Housing Development

Introduction

Rapid urbanisation, climate change, and the growth of the world population are the key worldwide forces that increase the vulnerability of urban people in developing countries (Shiiba et al., 2023; Mitchell et al., 2015). As urban growth grows into hazard-prone locations, much of the climatic impact is focused in metropolitan and coastal areas. This development is frequently characterised by low-quality dwellings in informal settlements or slums on unlawfully occupied or subdivided land. Also, UNDESA (2019) projects that by the year 2050, 68 per cent of the world population will reside in urban regions, which is an increase of 55 per cent from the present percentage.

According to a report by the World Bank (2021), more than 90 per cent of the world population are vulnerable to flood disasters between the years 2035 and 2044. In Malaysia, at least 5 million people live in flood-prone areas (Maznieda et al., 2022), which cover 29,800 square kilometres in size and account for 9 per cent of Malaysia's total landmass. The areas receive high-volume rainfall, causing their vulnerability to flood-related disasters (Castillo et al., 2023; Hasan et al., 2019). This hydrometeorological disasters have caused diverse impacts, notably a substantial financial shortfall within the nation. The initial significant flood occurrence in Malaysia dated back to 1926, which had a widespread impact on the entire state (Williamson, 2016). For instance, in 1971, a flood of significant magnitude transpired and nearly submerged the entirety of Kuala Lumpur, the capital city, and multiple other states. This event resulted in a financial loss of MYR 177 million (Chan et al., 2022). These calamities frequently transpire, particularly in metropolitan regions and regions situated at lower elevations.

This phenomenon can be attributed to the fact that a significant number of major urban centres in the nation are situated within floodplains and along riverbanks (Kumar et al., 2021). This is the result of the eagerness to carry out developmental initiatives in the conversion of once lush and fertile land into an area dominated by concrete (Chan, 2012). The rapid pace of land development often results in the paving of land surfaces, impeding the infiltration of rainfall into the soil and increasing the likelihood of flood-related calamities (Bindal et al., 2023; Bohurquez et al., 2023).

The Malaysian government has implemented a variety of flood disaster mitigation measures, but they are still insufficient. This is a result of inadequate flood disaster management exists in this nation and how effective legal frameworks are not integrated into flood management mechanisms (Ridzuan et al., 2022; Elias et al., 2013). Thus, law enforcement must undertake a plan that is anticipated to have a more significant impact (Hussain et al., 2023; Sukairi et al., 2023; Yusoff et al., 2018; Sobian, 2016). Nevertheless, no laws currently in existence have defined procedures for handling flood disasters (Hawa et al., 2023; Sobian, 2016, Saifulsyahira et al., 2016).

Previous scholars have not conducted many academic studies on flood disaster management from the perspective of housing development. Aspects of flood management through organised procedures were the focus of previous research. For instance, Munpa et al (2022) studied the relationship between hydrological and climate change components in flood disasters. To strengthen resilience to flood disasters, green building structures were researched by (Junqueira et al., 2021). The inclusion of local plans to regulate the planning processes for development was researched by Norizan et al (2021), while the influence of housing infrastructure as a flood catastrophe resistance measure was researched by (Sen et al., 2021).

Therefore, the underpinning of this paper was to study flood resilience in housing development through land governance from the year 2019 to 2023 by answering the following research question: What are the current trends on flood resilience in housing development through land governance discussed in literature from 2019 to 2023?

Research Methodology

The thematic review was employed in the current study. According to Clarke and Braun (2013), thematic analysis is the process of identifying patterns and constructing themes

through extensive reading on the subject. ATLAS.ti 8 was then employed to facilitate the thematic analysis procedure of a literature review, as outlined by (Zairul, 2020).

The literature selection process of the current study was conducted according to three criteria: (i) publication from 2019 to 2023, (ii) consisted of the keyword(s) “flood resilience,” “housing development,” and “land governance”, and (iii) the discussion focused on flood resilience in housing development through land governance in Malaysia. The decision to limit to the three criteria was to help define the trends in the discussion on flood resilience in housing development through land governance, as discussed in literature published from 2019 to 2023.

Table 1

Search string from Science Direct, Emerald Insight and Scopus database

Database	Keyword	Results	After Exclusion
Science Direct	flood resilience AND housing development AND land governance Year(s): 2019 to 2023	77 results	45
Emerald Insight	flood resilience AND housing development AND land governance Date range: from 2019 to 2023	52 results	33
SCOPUS	Title-ABS-KEY (“flood resilience” AND “housing development” AND PUBYEAR 2019-2023	46 results	31
TOTAL		175	109

A literature search was conducted in the Science Direct, Emerald Insight, and SCOPUS databases. The search yielded a total of 77 peer-reviewed articles from Science Direct, 52 from Emerald Insight, and 46 from SCOPUS). However, 66 articles were removed due to their lack of relevance to the topic of flood resilience in terms of housing development, as well as instances of duplication and inaccessibility. Next, the remaining 109 articles were uploaded into Mendeley and saved as metadata.

In the current study, a total of 109 metadata were imported to ATLAS.ti 8 as primary documents. The use of ATLAS.ti 8 helped sort the data. Each article was grouped based on six parameters, namely author, issue number, periodical, publisher, volume, and year of publication. This approach allowed for a systematic and organised analysis of the data, enabling the elicitation of meaningful data.

In the first round of coding, 52 codes were generated based on the country and year of publication (refer to Figure 1 and Table 2). The second round of coding was conducted to establish themes that address the research question on the current trends in flood resilience of housing development through land governance, as discussed in the literature from 2019 to 2023.

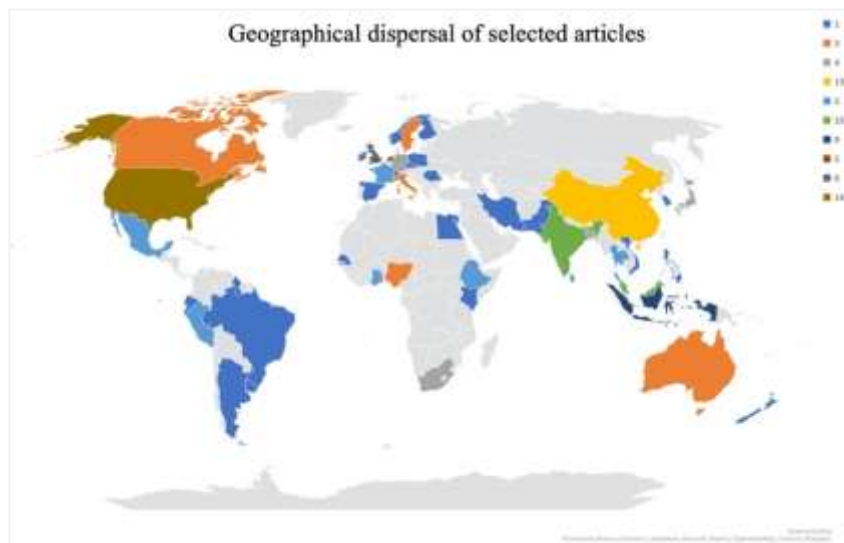


Figure 1: Geographical dispersal of selected articles

Figure 1 depicts a geographical dispersal of the 109 articles. The articles in the present study were published in 47 countries, which include Argentina, Australia, Bangladesh, Brazil, Canada, China, Czechia, Ecuador, Egypt, Ethiopia, Finland, France, Germany, Ghana, Guyana, Hong Kong, India, Indonesia, Iran, Ireland, Italy, Japan, Kenya, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Peru, Philippines, Poland, Romania, Senegal, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Togo, United Kingdom, United States, Uruguay, and Vietnam. The United States and China had the highest number of published articles, with a total of 14. India and Malaysia published 10 articles, Indonesia published 9 articles, and the rest of the countries published less than 6 articles.

Table 2

Paper reviewed according to the year of publication

YEAR	NUMBER OF ARTICLES
2019	25
2020	20
2021	28
2022	40
2023	23

Analysis and Discussion

This review examined the patterns and trends of the relationship between flood resilience and land governance in housing development. After a comprehensive review of 109 articles, a total of 52 codes emerged. Following several rounds of re-coding and code merging on ATLAS.ti 8, the final trends and patterns produced four main themes. The four themes were aligned with the United Nations Resilience Agendas, namely institutional and governance concerns, disaster management concerns, socio-economic concerns, and environmental concerns.

The network representation of the codes pertaining to the four primary patterns is depicted in Figure 2. A total of 43 codes that encompassed the various concerns related to disaster management were developed. These codes covered institutional and governance

concerns with a total of 43 codes, socio-economic concerns were represented by 33 codes, and environmental concerns are encompassed by 19 codes.

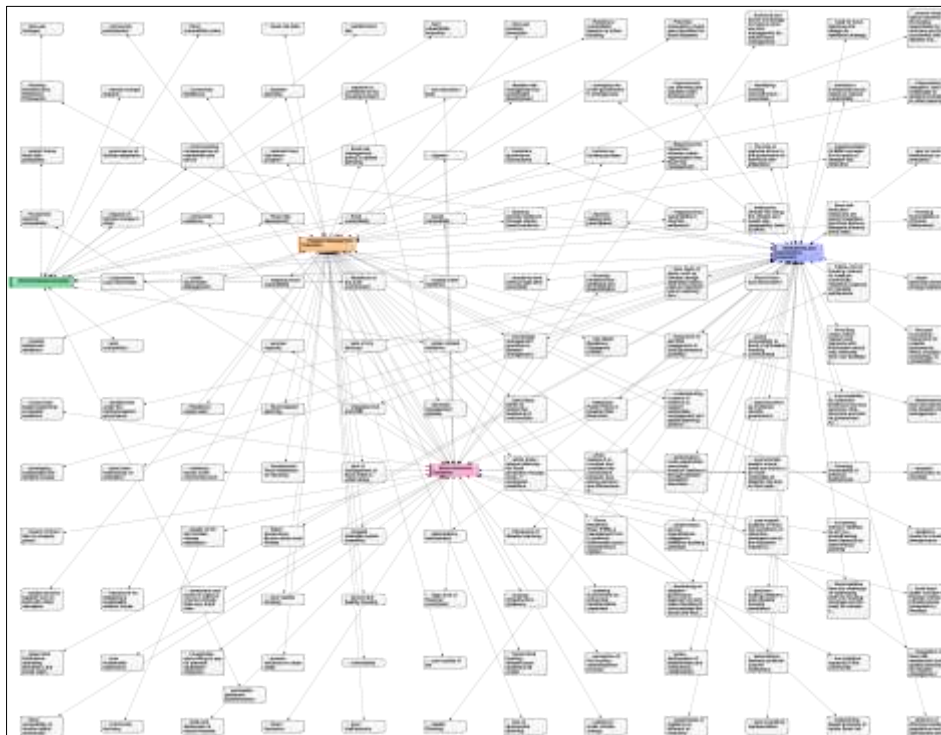


Figure 2: Network view of all the codes of the four main patterns.

Disaster Management Concerns

The concerns related to disaster management have been extensively discussed by previous authors. Most authors have highlighted urban planning management, including aspects of stormwater management, housing infrastructure, engineering solution to tackle flood risks, spatial planning, resilience masterplan, and flood vulnerability (Kiran., 2022; Meng., 2019; Handayani et al., 2019; Szpak Agnieszka et al., 2022; Zhang et al., 2021; Sen et al., 2021). Besides that, Maru et al (2021) discussed the issues and problems of disaster management including the lack of appropriate planning, highlighting the inconsistencies in integrating and conforming principles into policy documents. Moreover, Hassan et al. (2020) found that despite the optimistic visions of plans to address hazards and population growth-induced development pressures, their practical implementation has been hampered by the dominance of residential and manufacturing land uses, haphazard block arrangements, and the municipality's limited ability to implement the proposals.

The shift from a low to a high urbanisation pattern has resulted in increased flood risk (Waghwal and Agnihotri, 2019), demonstrating a failure to manage floodwater within urban areas. Thus, several authors have previously discussed strategies to address the impact of the shift related to climate-disaster resilience. These strategies include the implementation of the Build Back Better concept, the development of climate resilience through nature-based solutions such as the creation of additional urban green spaces for flood protection, the mapping of flood vulnerability, the integration of flood risk assessment and spatial planning for disaster management, the creation of resilience master plans, and the use of flood risk data (Afriyane et al., 2020; Calliari et al., 2022; Membele et al., 2022; Esmail et al., 2022).

Other strategies have also been employed including the utilisation of land use scenario simulation to augment spatial decision support with urban managers, which has been identified as a viable strategy by scholars such as Zhao et al. (2023) and Heinzlef et al. (2019).

Environment Concerns

Environmental concerns have emerged as a popular theme for flood resilience in housing development. Bottazzi et al (2019) addressed that land competition, especially in urban areas, increases the risk of flooding. According to Ioanos et al (2019), insufficient management of risk and an overly reactive approach to flood disasters can result in unanticipated alterations to land use and the possibility of conflicts at the local level. It is because of the lack of emphasis on prioritising environmental concerns in urban planning (Meng et al., 2022).

There are also agencies that specialise in climate science, meteorology, environmental science, and hydrology which are at the forefront of flood resilience initiatives due to their considerable expertise in monitoring, weather prediction, and climatic evaluation. These agents bear the primary responsibility for monitoring, analysing, and predicting the impacts of climate change and the resulting incidents of flooding. Thus, it is time for the agencies to improve urban planning by assessing the impacts of climate change on cities and enhancing their adaptive capacity (Woodruff et al., 2021; Leal Filho et al., 2019). In addition, Castaño-Rosa et al (2022) suggests the implementation of transformative approaches to assist urban planners and other stakeholders in their endeavours to invest in the built environment. For instance, Asadzadeh et al (2022) suggest a planning system to deal with urbanisation, migration, and the challenges of resilience in Germany and Iran. Previous studies conducted by Oktari et al (2020); Waghwalwa et al (2019); Karki et al (2020); Sarker et al (2022); Zhao et al (2023); Zhang et al (2021); Wardekker (2021) have also addressed that the assessment for flood risk due to rainfall and the permeable pavement transformation in urban areas as crucial aspects in mitigating flood vulnerability, particularly in coastal cities. Turner (2022) also posits that an improved comprehension of urban land systems is imperative, given the current global scenario where cities are facing environmental transformations.

Institutional and Governance Concerns

The literature on flood resilience studies that pertain to institutional and governance matters is a diverse collection of work that encompasses various fields of study, including policy studies, social science, and political science. Hampton and Curtis (2022) addressed the topic of governance climate adaptation, particularly on the implementation of flood insurance implementation that aims to deliver risk reduction and affordability to cover land-use planning, housing, consumer, and community representatives. Most previous studies also stressed the development of necessary capacity-building activities to improve the spatial plan implementation capacities of local governments such as by transforming governance mechanisms, developing governance approach to peri-urban flooding to acknowledge the social and ecological complexities of climate change, and integrating Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) (Wen et al., 2023; Govindarajulu et al., 2020; Winter and Karvonen, 2022; Asibey et al., 2022; Hewawasam and Matsui, 2020; Van Assche et al., 2022). These will lead to the active participation of stakeholders and foster institutional collaboration to garner further attention from all tiers of government (Maru and Worku., 2022; Singh et al., 2021; Dunning et al., 2020; Ardaya et al., 2019).

According to Oktari et al (2020), knowledge management in disaster practises for mitigating disaster impacts is significant to improve disaster resilience. The reason is that floods have a disproportionately severe effect on informal settlements and low-cost housing. Despite the joint efforts of government stakeholders to manage knowledge of disaster practices, the coordination of flood management is hindered by the distribution of competencies among multiple ministries and their lack of cooperation. This has resulted in a vertically-divided authority, which is characterised by overlapping mandates and competition between state and non-state agencies (Dash et al., 2019; Aguilar et al., 2019; Borbor-Cordova et al., 2020). Nevertheless, Mason (2021); Hewawasam et al (2020) have highlighted the importance of involving stakeholders and communities in the decision-making process to mitigate flood risk, while Lamb et al (2022) have examined the potential of cooperative land ownership as a means of facilitating transformative climate adaptation.

Moreover, the inclination towards network closure is a crucial governance characteristic for the successful implementation of resilience measures (Oktari et al., 2020). This information might assist urban policymakers and planners in comprehending the reasons behind the formation of networks, thereby enabling the effective implementation of blue-green infrastructure in this region that is experiencing rapid growth and the impacts of climate change, as well as in other areas. Therefore, the utilisation of a network paradigm offers valuable perspectives for establishing comprehensive resilience strategies that facilitate adaptation and transformation within metropolitan systems.

Socio-Economic Concerns

The final theme is socio-economic concerns. The amalgamation of social and economic perspectives is evident due to their interdependent adverse effects of floods. For instance, limited access to secure shelter is an issue of inequity that affects the financially disadvantaged, thereby highlighting the intersectionality of the problem. Previous studies have highlighted community vulnerability and its adaptation to tackle flood disasters. For example, Nurdini et al (2021) examined the housing preferences of individuals residing in flood-prone regions with a focus on enhancing community resilience. She employed three key indicators, namely survival capacity, perception of the housing redevelopment process, and the capacity to contribute to the housing products in order to analyse the housing choices of the participants. Meanwhile, Chongwilalkasaem and Chalermyanont (2022) conducted a study on the cost-benefit analysis of flood risk avoidance or reduction as a strategy for the housing market. This could be due that enhancing citizens' capacity for autonomous actions, such as fortifying their ability to act, can be more efficiently achieved by furnishing them with comprehensive action plans and detailed scripts in the context of flood risk (Ro and Garfin, 2023).

Moreover, the integration of climate change adaptation and quality of life can potentially augment flood resilience (Friedman et al., 2023). Several scholars have examined the challenges and difficulties faced by communities that are susceptible to flood disasters. Factors such as limited education, skills, awareness, and sense of urgency regarding climate risks, inadequate community involvement, low adaptive capacity, and significant financial constraints have been identified (Borbor-Cordova et al., 2020; Marschutz et al., 2020; Hewawasam et al., 2020; Ehsan et al., 2022; Mason et al., 2021; Okunola and Olawuni, 2022). Previous scholars also agree that both community and individual actions are crucial for improving flood resilience, rather than dependency on government intervention, such as

relocation to alternative regions (Yamashita, 2022). According to the study, most residents residing in the western coastal regions of Peninsular Malaysia possessed the ability to relocate to regions that share similar characteristics with their initial place of abode. Furthermore, their choice to migrate to one of these areas is not contingent upon their evaluation of the area's resilience. In addition, Hampton (2022) emphasises the influence of flood risk on real estate values. Therefore, it can be argued that community-based leadership, knowledge, and skills play a vital part in improving the flood resilience of housing development.

Conclusion

This paper provides a review of the current trends and patterns in flood resilience pertaining to housing development, with a focus on land governance spanning from 2019 to April 2023. The results obtained through code-to-document analysis using ATLAS.ti 8 revealed that prior research has emphasised on disaster management, socio-economic, institutional and governance, and environmental concerns as having significant patterns and trends. Based on the aforementioned findings, it is evident that past authors have placed significant emphasis on the topics of disaster management and environmental concerns. The topic of disaster management, particularly in relation to urban planning and flood disaster issues, has received significant attention and discussion in academic circles. To address these challenges, the matter of environmental concerns was indirectly deliberated upon with the aim of enhancing climate adaptation capacity through the integration of data by forefront agencies. Therefore, it aligns with the prevailing challenges faced by global community, characterized by the increasing frequency of floods, even in areas previously unaffected by such occurrences. Notwithstanding the results of the present research, there remains a gap in the studies of flood resilience, particularly in the context of institutional and governance concerns especially in decision-making related to housing development or land governance policies, aimed at addressing these issues. Therefore, advancing studies on flood resilience necessitates the implementation of comprehensive mitigation and adaptation strategies, particularly in the context of housing development approval procedures. Hence, it is a prudent step to delve into decision-making approach pertaining to flood disasters, given its critically and extensive discourse in the context of climate change adaptation.

Acknowledgement

The authors would like to thank Universiti Teknologi Malaysia through UTM Encouragement Grant (UTM-ER) vot number Q.J130000.3852.31J24 for the study fund.

References

- Afriyanie, D., Julian, M. M., Riqqi, A., Akbar, R., Suroso, D. S., and Kustiwan, I. (2020). Re-framing urban green spaces planning for flood protection through socio-ecological resilience in Bandung City, Indonesia. *Cities*, 101, p.102710.
- Aguilar-Barajas, I., Sisto, N. P., Ramirez, A. I., and Magana-Rueda, V. (2019). Building urban resilience and knowledge co-production in the face of weather hazards: flash floods in the Monterrey Metropolitan Area (Mexico). *Environmental Science & Policy*, 99, pp.37-47.
- Ardaya, A. B., Evers, M., and Ribbe, L. (2019). Participatory approaches for disaster risk governance? Exploring participatory mechanisms and mapping to close the

- communication gap between population living in flood risk areas and authorities in Nova Friburgo Municipality, RJ, Brazil. *Land Use Policy*, 88, p.104103.
- Asadzadeh, A., Kotter, T., Fekete, A., Moghadas, M., Alizadeh, M., Zebardast, E., Weiss, D., Basirat, M., and Hutter, G. (2022). Urbanization, migration, and the challenges of resilience thinking in urban planning: Insights from two contrasting planning systems in Germany and Iran. *Cities*, 125, p.103642.
- Asibey, M. O., Mintah, F., Adutwum, I. O., Wireko-Gyebi, R. S., Tagnan, J. N., Yevugah, L. L., Agyeman, K. O., and Abdul-Salam, A. J. (2022). Beyond rhetoric: urban planning-climate change resilience conundrum in Accra, Ghana. *Cities*, 131, p.103950.
- Bindal, S., Samanta, S., and Gupta, A.K. (2023). Understanding Urban Floods as Extreme Events and Disaster Management: A Case Study of Bengaluru. In *Climate Change and Environmental Impacts: Past, Present and Future Perspective* (pp. 415-427). Cham: Springer International Publishing.
- Bixler, R. P., Lieberknecht, K., Atshan, S., Zutz, C. P., Richter, S. M., and Belaire, J. A. (2020). Reframing urban governance for resilience implementation: The role of network closure and other insights from a network approach. *Cities*, 103, p.102726.
- Bohorquez, P., Perez-Latorre, F. J., Gonzalez-Planet, I., Jimenez-Melero, R., and Parra, G. (2023). Nature-Based Solutions for Flood Mitigation and Soil Conservation in a Steep-Slope Olive-Orchard Catchment (Arquillos, SE Spain). *Applied Sciences*, 13(5), p.2882.
- Borbor-Cordova, M. J., Ger, G., Valdiviezo-Ajila, A. A., Arias-Hidalgo, M., Matamoros, D., Nolivos, I., Menoscal-Aldas, G., Valle, F., Pezzoli, A. and Cornejo-Rodriguez, M.D.P. (2020). An operational framework for urban vulnerability to floods in the Guayas estuary region: The Duran case study. *Sustainability*, 12(24), p.10292.
- Bottazzi, P., Winkler, M.S. and Speranza, C.I. (2019). Flood governance for resilience in cities: The historical policy transformations in Dakar's suburbs. *Environmental science & policy*, 93, pp.172-180.
- Calliari, E., Castellari, S., Davis, M., Linnerooth-Bayer, J., Martin, J., Mysiak, J., Pastor, T., Ramieri, E., Scolobig, A., Sterk, M. and Veerkamp, C. (2022). Building climate resilience through nature-based solutions in Europe: A review of enabling knowledge, finance and governance frameworks. *Climate Risk Management*, p.100450.
- Castano-Rosa, R., Pelsmakers, S., Järventausta, H., Poutanen, J., Tähtinen, L., Rashidfarokhi, A., and Toivonen, S. (2022). Resilience in the built environment: Key characteristics for solutions to multiple crises. *Sustainable Cities and Society*, 87, p.104259.
- Castillo, O. F. G., Antonucci, V., Marquez, E. M., Najera, M. J., Valdiviezo, A. C., and Castro, M. O. (2023). *Urban Resilience: Methodologies, Tools and Evaluation: Theory and Practice*. Springer Nature.
- Chan, N. W. (2012). Impacts of disasters and disaster risk management in Malaysia: the case of floods. In: Sawada, Y., Oum, S. (Eds.), *Economic and Welfare Impacts of Disasters in East Asia and Policy Responses*. ERIA., Jakarta, pp. 503–551. Chand, A.V.M., 2018. Place based approach to plan for resilient cities: a local government perspectives. *Procedia Eng.* 212, 157–164.
- Chan, S. W., Abid, S. K., Sulaiman, N., Nazir, U., & Azam, K. (2022). A systematic review of the flood vulnerability using a geographic information system. *Heliyon*, 8(3), 1-11.
- Chongwilakasaem, S., and Chalermyanont, T. (2022). Flood hazards and housing prices: a spatial regression analysis for Hat Yai, Songkhla, Thailand. *International Journal of Housing Markets and Analysis*, (ahead-of-print).

- Clarke, V., & Braun, V. (2013). Teaching thematic analysis : Overcoming challenges and developing strategies for effective learning Associate Professor in Sexuality Studies Department of Psychology Faculty of Health and Life Sciences University of the West of England Coldharbour Lane Br. University of the West of England, 26, 120–123.
- Dash, P., and Punia, M. (2019). Governance and disaster: Analysis of land use policy with reference to Uttarakhand flood 2013, India. *International Journal of Disaster Risk Reduction*, 36, p.101090.
- Dunning, K. H. (2020). Building resilience to natural hazards through coastal governance: a case study of Hurricane Harvey recovery in Gulf of Mexico communities. *Ecological Economics*, 176, p.106759.
- Ehsan, S., Begum, R. A., Maulud, K. N. A., and Mia, M. S. (2022). Assessing household perception, autonomous adaptation and economic value of adaptation benefits: Evidence from West Coast of Peninsular Malaysia. *Advances in Climate Change Research*, 13(5), pp.738-758.
- Elias, Z., Hamin, Z., & Othman, M. B. (2013). Sustainable Management of Flood Risks in Malaysia: Some lessons from the legislation in England and Wales. *Procedia - Social and Behavioral Sciences*, 105, 491 – 497.
- Esmail, A., Abdrabo, K. I., Saber, M., Sliuzas, R. V., Atun, F., Kantoush, S. A., and Sumi, T. (2022). Integration of flood risk assessment and spatial planning for disaster management in Egypt. *Progress in Disaster Science*, 15, p.100245.
- Friedman, E., Solecki, W., Troxler, T. G., and Paganini, Z. (2023). Linking quality of life and climate change adaptation through the use of the macro-adaptation resilience toolkit. *Climate Risk Management*, 39, p.100485.
- Govindarajulu, D. (2020). Strengthening institutional and financial mechanisms for building urban resilience in India. *International Journal of Disaster Risk Reduction*, 47, p.101549.
- Hampton, S., and Curtis, J. (2022). A bridge over troubled water? Flood insurance and the governance of climate change adaptation. *Geoforum*, 136, pp.80-91.
- Handayani, W., Fisher, M.R., Rudiarto, I., Setyono, J. S., and Foley, D. (2019). Operationalizing resilience: A content analysis of flood disaster planning in two coastal cities in Central Java, Indonesia. *International Journal of Disaster Risk Reduction*, 35, p.101073.
- Hasan, H. H., Razali, M. S. F., Zaki, A. Z. I., and Hamzah, M. F. (2019). Integrated hydrological-hydraulic model for flood simulation in tropical urban catchment. *Sustainability*, 11(23), p.6700.
- Hassan, M. C., Musa, S. M. S., Zainal, R., and Kasim, N. (2020). Kajian Permasalahan Pembinaan Sistem Saliran Yang Menjadi Punca Kepada Masalah Banjir Di Kawasan Perumahan. *Research in Management of Technology and Business*, 1(1), pp.588-605.
- Hawa, N. N., Zakaria, S. Z. S., Razman, M. R., Majid, N. A., Taib, A. M., and Emrizal. (2023). Element of Disaster Risk Reduction in Geography Education in Malaysia. *Sustainability*, 15(2), p.1326.
- Heinzl, C., Becue, V., and Serre, D. (2019). Operationalizing urban resilience to floods in embanked territories—Application in Avignon, Provence Alpes Côte d’azur region. *Safety science*, 118, pp.181-193.
- Hewawasam, V., and Matsui, K. (2020). Equitable resilience in flood prone urban areas in Sri Lanka: A case study in Colombo Divisional Secretariat Division. *Global Environmental Change*, 62, p.102091.

- Hussain, M. A., Shuai, Z., Moawwez, M. A., Umar, T., Iqbal, M. R., Kamran, M., and Muneer, M. (2023). A Review of Spatial Variations of Multiple Natural Hazards and Risk Management Strategies in Pakistan. *Water*, 15(3), p.407.
- Ianoş, I., Ionica, C., Sîrodoev, I., Sorensen, A., Bureta, E., Merciu, G., Paraschiv, M., and Talanga, C. (2019). Inadequate risk management and excessive response to flood disaster create unexpected land use changes and potential local conflicts. *Land Use Policy*, 88, p.104081.
- Junqueira, J.R ., Serrao-Neumann, S., and White, I. (2021). Managing urban climate change risks: Prospects for using green infrastructure to increase urban resilience to floods. In *The Impacts of Climate Change* (pp. 379-396). Elsevier.
- Karki, T. K. (2020). Flood resilience in Malaysian cities: A case study of two towns in Johor state. *International journal of disaster resilience in the built environment*, 11(3), pp.329-342.
- Kumar, K., and Bindu, C. A. (2022). Resilience master plan as the pathway to actualize sustainable development goals—A case of Kozhikode, Kerala, India. *Progress in Disaster Science*, 14, p.100226.
- Kumar, N., Liu, X., Narayanasamydamodaran, S. and Pandey, K.K. (2021). A systematic review comparing urban flood management practices in India to China's sponge city program. *Sustainability*, 13(11), p.6346.
- Lamb, Z., Shi, L., Silva, S., and Spicer, J. (2022). Resident-Owned Resilience: Can Cooperative Land Ownership Enable Transformative Climate Adaptation for Manufactured Housing Communities?. *Housing Policy Debate*, pp.1-23.
- Filho, L. W., Balogun, A. L., Olayide, O. E., Azeiteiro, U. M., Ayal, D.Y., Munoz, P. D. C., Nagy, G. J., Bynoe, P., Oguge, O., Toamukum, N. Y., and Saroar, M. (2019). Assessing the impacts of climate change in cities and their adaptive capacity: towards transformative approaches to climate change adaptation and poverty reduction in urban areas in a set of developing countries. *Science of the Total Environment*, 692, pp.1175-1190.
- Marschutz, B., Bremer, S., Runhaar, H., Hegger, D., Mees, H., Vervoort, J., and Wardekker, A. (2020). Local narratives of change as an entry point for building urban climate resilience. *Climate Risk Management*, 28, p.100223.
- Maru, M., and Worku, H. (2022). Unpacking principles of resilience mainstreamed in Ethiopia's local urban spatial planning documents: practices from Kombolcha, an urbanizing secondary city. *Heliyon*, 8(3), p.e09137.
- Maru, M., Worku, H., and Birkmann, J. (2021). Factors affecting the spatial resilience of Ethiopia's secondary cities to urban uncertainties: A study of household perceptions of Kombolcha city. *Heliyon*, 7(12), p.e08472.
- Mason, K., Lindberg, K., Haenfling, C., Schori, A., Marsters, H., Read, D., and Borman, B. (2021). Social vulnerability indicators for flooding in Aotearoa New Zealand. *International Journal of Environmental Research and Public Health*, 18(8), p.3952.
- Maznieda, M., Dalila, R., Rosnah, S., Rohaida, I., Rosmanajihah, M. L., Mizanurfakhri, G., and Nurhanie, M. (2022). The soft skills emergency management that matters at the hardest time: A phenomenology study of healthcare worker's experiences during Kelantan flood 2014. *International Journal of Disaster Risk Reduction*, 75, p.102916.
- Membele, G. M., Naidu, M., and Mutanga, O. (2022). Examining flood vulnerability mapping approaches in developing countries: A scoping review. *International Journal of Disaster Risk Reduction*, 69, p.102766.

- Meng, M., Dabrowski, M., Tai, Y., Stead, D., and Chan, F. (2019). Collaborative spatial planning in the face of flood risk in delta cities: A policy framing perspective. *Environmental Science & Policy*, 96, pp.95-104.
- Meng, M., Dabrowski, M., Xiong, L., and Stead, D. (2022). Spatial planning in the face of flood risk: Between inertia and transition. *Cities*, 126, p.103702.
- Mitchell, D., Enemark, S., and Van der Molen, P. (2015). Climate resilient urban development: Why responsible land governance is important. *Land Use Policy*, 48, pp.190-198.
- Sukairi, M. S., Harun, S., Nasir, M. K. A., Jeevaragagam, P., and Salleh, M. R. (2023). Application of Geospatial and Hydrological Modeling for Runoff Estimation in Lebir River Basin, Malaysia. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 48, pp.231-235.
- Munpa, P., Kittipongvises, S., Phetrak, A., Sirichokchatchawan, W., Taneepanichskul, N., Lohwacharin, J. and Polprasert, C. (2022). Climatic and Hydrological Factors Affecting the Assessment of Flood Hazards and Resilience Using Modified UNDRR Indicators: Ayutthaya, Thailand. *Water*, 14(10), p.1603.
- Norizan, N. Z. A., Hassan, N., and Yusoff, M. M. (2021). Strengthening flood resilient development in malaysia through integration of flood risk reduction measures in local plans. *Land Use Policy*, 102, p.105178.
- Nurdini, A., Hadianto, N. F., and Suryani, S. (2021). Emerging housing choices for community resilience capacity in flood-prone areas of Bandung Regency, Indonesia. *Journal of Housing and the Built Environment*, pp.1-21.
- Oktari, R. S., Comfort, L. K., and Dwitama, P. (2020). Measuring coastal cities' resilience toward coastal hazards: Instrument development and validation. *Progress in Disaster Science*, 5, p.100057.
- Okunola, O. H., and Olawuni, P.O. (2022). Determinants of household flood resilience strategies in Kaduna Metropolis, Nigeria. *Urban Climate*, 44, p.101216.
- Ridzuan, M. R., Razali, J. R., Soon Yew, J., & Rahman, N. A. S. A. (2022). An Analysis of Malaysian Public Policy in Disaster Risk Reduction: An Endeavour of Mitigating the Impacts of Flood in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 12(7), 2006 – 2021.
- Ro, B., and Garfin, G. (2023). Building urban flood resilience through institutional adaptive capacity: A case study of Seoul, South Korea. *International Journal of Disaster Risk Reduction*, 85, p.103474.
- Saifulsyahira, J., Edre, M. A., AF, A. F., and Juni, M. H. (2016). Governance of flood disaster management: Malaysian case study. *International Journal of Public Health and Clinical Sciences*, 3(1), pp.17-30.
- Sarker, M. N. I., Alam, G. M., Firdaus, R. R., Biswas, J. C., Islam, A. R. M. T., Raihan, M. L., Hattori, T., Alam, K., Joshi, N. P., and Shaw, R. (2022). Assessment of flood vulnerability of riverine island community using a composite flood vulnerability index. *International Journal of Disaster Risk Reduction*, 82, p.103306.
- Sen, M. K., Dutta, S., and Kabir, G. (2020). November. Housing Infrastructure Resilience Framework Development for Sustainable Future. In *2020 International Conference on Decision Aid Sciences and Application (DASA)* (pp. 519-525). IEEE.
- Sen, M. K., Dutta, S., and Kabir, G. (2021). Flood Resilience of Housing Infrastructure Modeling and Quantification Using a Bayesian Belief Network. *Sustainability* 2021, 13, 1026. *Sustainable Assessment in Supply Chain and Infrastructure Management*, p.149.

- Shiiba, N., Singh, P., Charan, D., Raj, K., Stuart, J., Pratap, A., and Maekawa, M. (2023). Climate change and coastal resiliency of Suva, Fiji: a holistic approach for measuring climate risk using the climate and ocean risk vulnerability index (CORVI). *Mitigation and Adaptation Strategies for Global Change*, 28(2), p.9.
- Singh, P., Amekudzi-Kennedy, A., Woodall, B., and Joshi, S. (2021). Lessons from case studies of flood resilience: Institutions and built systems. *Transportation research interdisciplinary perspectives*, 9, p.100297.
- Sobian, A. (2016). An overview of the participation of community and faith-based organisations (FBO) in disaster preparedness in Malaysia. *TAFHIM: IKIM Journal of Islam and the Contemporary World*, 9.
- Szpak, A., Modrzynska, J., and Piechowiak, J. (2022). Resilience of Polish cities and their rainwater management policies. *Urban Climate*, 44, p.101228.
- Turner, V. K. (2022). The environmental consequences of residential land tenure in single family neighborhoods. *Land Use Policy*, 114, p.105959.
- UNDESA. (2019). *World Urbanization Prospects*. United Nations, Department of Economic and Social Affairs. New York.
- Van Assche, K., Birchall, J., and Gruezmacher, M. (2022). Arctic and northern community governance: The need for local planning and design as resilience strategy. *Land Use Policy*, 117, p.106062.
- Waghwal, R. K., and Agnihotri, P. G. (2019). Flood risk assessment and resilience strategies for flood risk management: A case study of Surat City. *International Journal of Disaster Risk Reduction*, 40, p.101155.
- Wardekker, A. (2021). Contrasting the framing of urban climate resilience. *Sustainable Cities and Society*, 75, p.103258.
- Wen, J., Wan, C., Ye, Q., Yan, J., and Li, W. (2023). Disaster Risk Reduction, Climate Change Adaptation and Their Linkages with Sustainable Development over the Past 30 Years: A Review. *International Journal of Disaster Risk Science*, 14(1), pp.1-13.
- Williamson, F. (2016). The " Great Flood " of 1926: environmental change and postdisaster management in British Malaya. *Ecosyst. Health Sustain.* 2 (11) <https://doi.org/10.1002/ehs2.1248>.
- Winter, A. K., and Karvonen, A. (2022). Climate governance at the fringes: Peri-urban flooding drivers and responses. *Land Use Policy*, 117, p.106124.
- Woodruff, S., Bowman, A. O. M., Hannibal, B., Sansom, G., and Portney, K. (2021). Urban resilience: Analyzing the policies of US cities. *Cities*, 115, p.103239.
- World Bank. (2021). *Climate Risk Country Profile: Malaysia*. Washington, D.C.
- Yamashita, R. (2022). Disaster risk and migration in the west bank of the Malay Peninsula: Will the urban-rural divide improve or widen?. *International Journal of Disaster Risk Reduction*, 78, p.103150.
- Yusoff, I. M., Ramli, A., Alkasirah, N. A. M., and Nasir, N. M. (2018). Exploring the managing of flood disaster: A Malaysian perspective. *Geografica*, 14(3).
- Zairul, M. (2020). A Thematic Review on Student-Centred Learning in The Studio Education. *Journal of Critical Reviews*, 7(02), 504–511. <https://doi.org/10.31838/jcr.07.02.95>
- Zhang, Y. (2021). Understanding China's dam-induced resettlement under the institutionalised governance process of policy coevolution. *Journal of Environmental Management*, 283, p.111968.

Zhang, Y., Zhao, W., Chen, X., Jun, C., Hao, J., Tang, X., and Zhai, J. (2020). Assessment on the effectiveness of urban stormwater management. *Water*, 13(1), p.4.

Zhao, H., Gu, T., Tang, J., Gong, Z., and Zhao, P. (2023). Urban flood risk differentiation under land use scenario simulation. *Iscience*, 26(4).