

Integrating Inclusive Early Warning Technologies and Social Participation for Flood Resilience in Urban Communities

Anggun Puspitasari^{1*}, Arin Fithriana¹, Taqwa Putra Budi Purnomo², Rezvia Sharla Azzahra¹, Jeremy Putra Pratama²

¹Department of International Relations, Universitas Budi Luhur, Jl. Ciledug Raya, South Jakarta, Jakarta 12260, Indonesia

²Department of Disaster Management, Universitas Budi Luhur, Jl. Ciledug Raya, South Jakarta, Jakarta 12260, Indonesia

Article Information

Article history

Received: December 1, 2025

Revised: February 7, 2026

Accepted: May 13, 2026

Keywords: Flood Resilience; Inclusive Early Warning; Social Participation; Urban Communities

Abstract

Flooding in urban communities unintentionally reduces resilience, as seen in the partner area of RT 13 Pondok Betung, South Tangerang. Flooding disrupts residents' activities, impacting the economy, health, and environment. This community service activity aimed to raise awareness of the importance of early warning and inclusive community participation in flood disaster management. The activities were implemented in three stages: preparation, implementation, and evaluation, which involved the team and partners. The implementation activities focused on education on disaster mitigation, the implementation of inclusive early warning technology and a flood information system, and community capacity building through the formation of a Disaster Resilience Task Force. The program integrates early warning technology and social participation through the implementation of the Flood Information System (SIBAR). This demonstrates significant effectiveness in enhancing community-level disaster preparedness capacity. Evaluation findings through discussions and questionnaires indicated an increase in community awareness and response to flood risks following the intervention. Prior to SIBAR's implementation, residents largely relied on informal information. Following the introduction of the inclusive early warning system, 83.3% of the respondents reported receiving real-time warnings via digital messages. Awareness of evacuation routes and emergency response procedures increased by 98%, indicating a significant shift from traditional alert patterns to technology-based preparedness. SIBAR also successfully expanded inclusivity by engaging women and senior citizens who were previously less involved in disaster management discussions, thus strengthening social cohesion by 91.6%. Adapting technology accessible to users with varying levels of digital literacy through the use of color-coding and simple text messaging contributed to a 100% user understanding rate. In addition to showcasing the principles of appropriate technology that is affordable, adaptive, and based on community ownership, this model has also proven viable for replication in other urban areas as a sustainable solution.

*Corresponding Author

© 2026 Some rights reserved

Anggun Puspitasari

E-mail: anggun.puspitasari@budiluhur.ac.id

INTRODUCTION

Urban flooding is a critical challenge for developing cities, particularly in Indonesia, where rapid urbanization and insufficient drainage increase the risk of disasters. Flooding disrupts social cohesion and weakens resilience, necessitating a multifaceted approach. This requires the integration of technology and social aspects. The relationship between the two is often described as Socio-Technical Systems (STS) the idea that technical infrastructure and social behavior are closely linked and must evolve together

to be effective. Social Participation is a moderating variable that determines whether technology investments actually produce resilience (Maskrey, 2011). Urban resilience is the capacity of urban systems and their subsystems to absorb shocks, recover from disturbances, and adapt while maintaining socio-economic functions (Bozza et al., 2015; Duy et al., 2018; Tate et al., 2015; Wang et al., 2024). It is crucial for addressing flooding largely triggered by extreme weather (Salami et al., 2017; Xu et al., 2023). Effective and inclusive disaster resilience

demands both technological innovation and active participation, especially from marginalized groups such as women, the elderly, and people with disabilities. Several studies emphasize the importance of cities shifting from traditional flood-control measures to comprehensive flood-resilience strategies that combine structural and nonstructural approaches. This paradigm shift is necessary due to the increasing frequency and intensity of flood events related to climate change, which render previous mitigation strategies inadequate (Chen & Leandro, 2019; Hegger et al., 2016). For example, Hegger et al. outlined five fundamental flood risk management strategies: prevention, defense, mitigation, preparedness, and recovery that can be diversified and coordinated to enhance urban resilience (Hegger et al., 2016).

Pondok Betung area of South Tangerang is an urban area with a high flood risk. Population density and poor drainage exacerbate community conditions and impact community resilience. Based on Sipitung data (2025), the population of RT 13 is approximately 33,372, creating demographic pressure for rapid evacuation, especially given the infrastructure constraints. Most residents are informal workers and small traders (e.g., stall owners); therefore, flooding poses not only a risk to property but also an economic sensitivity, resulting in the loss of daily income. Floods hinder community activities even after receding, leaving suboptimal conditions. Data from the South Tangerang Regional Disaster Management Agency (BPBD) indicates a high flooding potential (BNPB, 2025). Site surveys and community interviews indicated that their neighborhoods are prone to flooding and that they have become accustomed to such conditions. This perception influences community resilience, emphasizing that disasters must be avoided and addressed.

Part of South Tangerang, situated in Banten Province, Indonesia, represents one of the urban areas that is most susceptible to flooding. Encompassing approximately 147.19 km², the city is intersected by several major rivers, notably the Cisadane and Cidodol Rivers (BNPB, 2022; Yin & Mostafavi, 2024). Administratively, it comprises subdistricts such as Ciputat, Cilandak, and Pamulang, where dense residential settlements, commercial centers, and extensive infrastructure development dominate the landscape of South Tangerang. Such rapid urbanization poses significant challenges for effective flood risk management in the area (Tu & Nitivattananon, 2011). The city's topographical characteristics relatively flat terrain with an average elevation of approximately 14 meters above sea level further contribute to the accumulation of surface runoff during periods of intense rainfall (Ourloglou et al., 2020). In addition, several artificial

lakes serve as water retention basins; however, their capacity has been increasingly compromised by sedimentation, pollution, and waste accumulation (Wu et al., 2021). As land-use transformation continues through the expansion of residential and commercial developments, cities face growing hydrological pressures. Therefore, strategic attention toward the identification of flood-prone zones and the implementation of integrated mitigation and adaptive measures is imperative to strengthen urban flood resilience in South Tangerang (Ajjur & Ghamdi, 2022).

The use of technology is necessary to support communities in disaster mitigation efforts. Here, 'technological developments' refers to advances in both hardware (such as sensors and alarms) and software (like digital messaging systems) that can provide timely information related to disasters. Social technologies refer to methods, platforms, and structures that promote interaction and cooperation among community members. In the context of urban flood resilience, the relationship between hardware and social technologies is symbiotic. Hardware provides the signal, but Social Technology provides meaning and movement (Maskrey, 2011). Without one, the other will fail: hardware becomes a "deaf" alarm, and Social Technology remains a "blind" reaction. Strengthening these social networks and community collaborations is essential for building resilience. Interactions between individuals and the use of technology are crucial in dealing with crisis situations and mobilizing community resources (Aldrich & Meyer, 2015; Macose, 2022). Strengthening social networks and community collaboration is important for building strong resilience. Interaction between individuals and the use of technology are crucial for managing crises and mobilizing community resources (Moulds et al., 2021).

Referring to Feng et al. (2017) thinking, informal disaster education defined as learning that takes place outside formal classrooms, through community activities and shared experience promotes a community-based educational approach to building resilience. This approach is a compilation of disaster risk reduction (DRR) principles as a framework for building collective community resilience, particularly in disaster-prone areas. Feng offers four implementation strategies with corresponding implications: cultivating a social environment for conversation, discussion, reflection, and learning; designing social activities to promote and encourage informal learning; appropriate interventions by informal educators in social activities; and transparent resources and channels for information and social support. This perspective can be applied to community service activities.

Based on these realities, the community service team recognized the need to integrate the

application of inclusive early warning technology with the importance of community involvement in community resilience. The establishment of the Inclusive Early Warning System (IEWS) and Flood Information System (SIBAR) in RT 13, Pondok Betung, South Tangerang, provides a practical model for integrating community-based participation with simple yet adaptive digital technology. This initiative aims to strengthen local disaster preparedness, encourage inclusive communication, and create a responsive and accessible flood information mechanism for all the residents. This choice was based on the realities of the area and the community's weak flood resilience.

This community service project explores how the integration of inclusive early warning technology and a participatory approach can enhance community resilience in urban flood-prone areas. It also evaluates the results of community involvement and technology adoption in reducing vulnerability and enhancing the disaster response capacity.

MATERIALS AND METHODS

Community service is run under problem-based and real-world project-based learning methods as a social technology. The material related to the focus included educational materials on disaster mitigation and resilience, and equipment for making solar-powered water level detection devices. The method was implemented in three stages over six months with the active participation of the team and partners. The first stage involved preparing a problem analysis, collecting data, and obtaining permits. The second stage is implementing the core project, which involves sharing knowledge about the importance of disaster mitigation and resilience, introducing and implementing inclusive early warning technology for flood disasters, and empowering community resilience. The team prepared an inclusive early warning technology in the form of a water-level sensor that transmits information to website and WhatsApp community communication channels. All stages require active community support and collaboration with local residents and community leaders. The third stage involves reporting and evaluation. Evaluation to measure technical adoption (hardware) and social efficacy (behavior) was carried out in the form of a pre-test as an initial evaluation, a qualitative process evaluation to see participant participation and emerging challenges, a post-test as an evaluation of the results in the form of a questionnaire that assesses community understanding of SIBAR and its benefits, and finally an impact evaluation to assess sustainability and change by monitoring for 1-3 months after the activity. Additionally, digital data from the SIBAR platform (e.g., rainfall monitoring, flood height sensors, and message distribution records) were analyzed to

assess the system performance. All community service activities are carried out at partner locations to facilitate the implementation and monitoring of citizen participation in social technologies.

RESULTS AND DISCUSSION

Theoretically, the implementation of this community-based activity is based on Feng's ideas about utilizing informal education for community resilience, implemented simply with some adjustments. The steps to integrate inclusive early warning technology with social participation begin with knowledge sharing on the importance of early warning in an inclusive disaster response. The frequent intensity of disasters that hit partner areas has unwittingly made disasters commonplace and impacted the resilience of the community. Social intervention is needed to change community behavior and perspectives on disaster management. Knowledge sharing is a simple intervention that is expected to change the community's perception of the importance of disaster mitigation. Learning, discussion, and reflection were implemented in a simple manner to facilitate understanding and raise public awareness. In general, partner residents recognized that flooding occurred almost every time there was heavy rainfall, a problem that must be addressed. Previously, residents only reacted after flooding occurred before their eyes because they could not predict potential flooding events. Therefore, there was little they could do but wait for the floodwaters to recede.

This activity continues previous efforts on disaster mitigation through environmental and waste management. Therefore, this knowledge-sharing session presented several issues related to disaster mitigation to avoid losses and the importance of building community resilience through active community participation and the use of technology to reduce disaster risk. Technology in the form of an Early Warning System (EWS) in a flood information system is needed to facilitate residents in obtaining flood information for disaster anticipation. However, the EWS will not function optimally without the active participation and support of residents working together in disaster response. Therefore, it is necessary to form a Flood Disaster Task Force as a follow-up to the implementation of the technology. In addition, the Task Force monitors, evaluates, and maintains the continuity and sustainability of the integration of technology and social participation. This includes preparing evacuation routes, public kitchens, medicines, and infant and elderly needs, and other organic needs. The existence of the Task Force and active community participation serve as social capital, as is the implementation of the concept of social capital in disaster resilience, where trust and shared responsibility strengthen collective

action (Putnam, 2000). Collaboration is not only between residents but also with several related parties, such as Basarnas, the Fire Department, ambulances, nearby hospitals, stakeholders, and other related parties. Discussions and reflections through questions and answers during the knowledge-sharing session served as part of the evaluation and validation of the importance of flood resilience for urban communities (Fig. 1). Fluctuating partner participation presented a challenge to the implementation of the activity. Not all partners were able to fully participate because of time constraints, primary work commitments, or family obligations.



Fig 1. Community resilience knowledge sharing activities to reduce disaster risk

The next intervention was the installation of a flood information system (SIBAR) early warning system in flood-prone locations within the partner areas. This tool integrates the NodeMCU ESP8266 and Arduino modules with a floating switch detection approach (Fig. 2). SIBAR detects water levels using a floating switch-based buoy. When the water level exceeds a predetermined height limit, the buoy is submerged so that the floating switch is connected, triggering the system to automatically send information through real-time notifications. This tool was developed using a switch buoy system placed in the river flow that crosses the partner area. By controlling and monitoring ultrasonic sensors to the water level distance, for a warning alarm, if the water overflows beyond the set height limit, the ultrasonic sensor will send a signal to the controller, and then the controller will sound an alarm as a warning.

This system is powered by solar energy through solar panels to charge the battery that serves as the main power source. Thus, the system can operate independently without relying on an electrical energy supply. This energy utilization is based on the assumption that power outages often occur during flooding to prevent unwanted and life-threatening events, such as electrocution, short circuits, chemical contamination, and even fires. Therefore, this technology provides a reliable early warning of high

water levels, is environmentally friendly, and reduces dependence on external power sources.



Fig 2. Installation of flood detection devices

The device's activity is recorded on the Early Warning System (EWS) flood information system website, <https://pondokbetungsiaga.com/> (Fig. 3). This platform focuses on flood information, specifically the Early Warning System (EWS) for the neighbourhood of RT. 13 RW. 03 Pondok Betung, Pondok Aren, South Tangerang. This platform provides information on the water levels in small rivers that flow through partner locations. The controller also periodically sends data so that the public can monitor water levels via the provided website. The website reports water-level data every second. The website records water levels daily and provides graphical information for the past seven days. The website also displays the location of the water-level detection sensor and provides information on water-level conditions, from normal to alert levels 1, 2, 3, and 4. The website is also connected to the WhatsApp application, which can be accessed via a smartphone. Registered residents receive notifications about water level conditions as an early warning. The website <https://pondokbetungsiaga.com/> is a comprehensive resource for the community to improve disaster mitigation and flood preparedness (Fig. 4). This website is a knowledge management system that uses JavaScript, PHP, HTML, and jQuery. The framework is Bootstrap, with a cPanel Control Panel (phpmyadmin) server and hosting with a 6GHz CPU and 6GB of RAM.

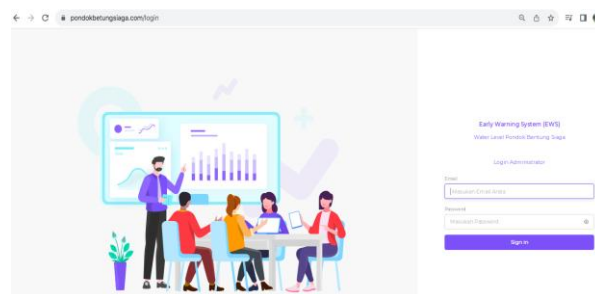


Fig. 3 Admin website appearance

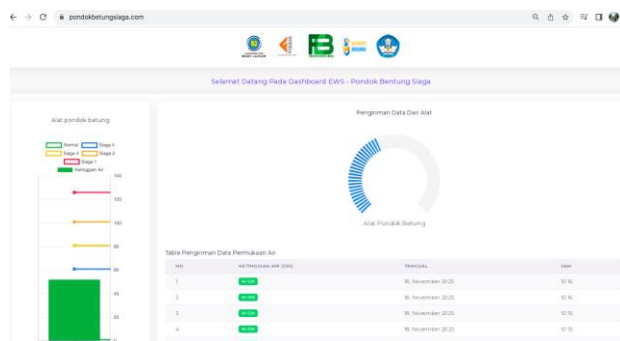


Fig 4. Public website appearance

Real-time information is essential for early warning systems. The task force is responsible for communicating real-time conditions, especially in the event of heavy rain and changes in water levels. The task force acts as an administrator, managing flood information to be disseminated to residents in anticipation of floods. The administrator delivered information to the residents via WhatsApp. The use of WhatsApp as an EWS SIBAR information medium is based on previous studies showing that social media platforms serve as vital communication tools during emergencies. Previous studies have shown that crisis responses conducted through social media can accelerate information processing and facilitate social interactions among community members. Therefore, this activity also provided separate training to the task force on the use of the EWS SIBAR system, including website management, as a technology handed over to the community (Fig. 5).

Integrating inclusive early warning technology and social participation is expected to strengthen community resilience. This includes creating efficient communication channels for sharing information and emotional support, helping individuals cope with the anxieties they experience due to crises (Balakrishnan et al., 2023; Bukar et al., 2022; Wang et al., 2021), and strengthening social bonds within the community

(Aldrich & Meyer, 2015). Information and communication technology (ICT) plays a crucial role in supporting local governments in enhancing community resilience. Local governments, as the frontline in disaster management, can utilize technology to obtain information. Table 1 presents the results and discussion.



Fig 5. EWS SIBAR broadcast display on the WhatsApp platform

The questionnaire results generally indicated an increase in participants' understanding of the importance of integrating inclusive early warning technology using existing communication platforms. Furthermore, the participants recognized the importance of community participation in flood management. Interestingly, despite an increase in understanding evacuation upon receiving a warning, only 75% expressed interest in joining the task force (Table 2). This result is assumed to be due to a combination of structural, cultural, and psychological factors, including the responsibilities to be assumed, time allocation, expertise, and lack of incentives due to the voluntary nature of the task force.

Table 1. Condition before and after intervention

Initial Condition	Intervention	Condition Change
Familiarity with flood disasters	Sharing knowledge	Changes in perspectives on disaster resilience based on questionnaire results, which indicate
Lack of inclusive technology implementation	Creation of flood detection tools	Utilization of inclusive early warning technology integrated with websites and the WhatsApp communication platform
Lack of a disaster information system at partner locations	Creation of a website and use of communication media	Utilization of the pondokbetungsiga.com website and WhatsApp, which provide real-time flood information, into a Flood Information System
Low community participation in disasters	Encouragement for the formation of a disaster task force	Establishment of a disaster resilience task force and increased participation of women and the elderly, which supports community resilience in the face of flood disasters

Table 2. Evaluation via pre-test and post-test

No	Question N=48	Pre-test		Post-test	
		Yes	Pre-%	Yes	Post-%
1	Do you know about flood early warning systems (e.g., SMS, sirens, apps)?	10	20,8%	48	100%
2	Will the information from the early warning system be accurate and important?	14	29,2%	40	83,3%
3	Do you know how to take (evacuation/rescue) when receiving a warning?	21	43,7%	47	98%
4	Do you have a shared plan in case of a flood?	23	48%	45	94%
5	Have you ever received training or information on the use of early warning technology?	4	8,3%	48	100%
6	Do you think information on the use of early warning technology is important?	20	41,6%	48	100%
7	Will you help your neighbours when receiving a flood warning (e.g., help with evacuation, food/drinks, health care)?	30	62,5%	44	91,6%
8	Do you know about Disaster Resilience Task Force?	18	37,5%	45	94%
9	Are you willing to participate in the Disaster Resilience Task Force?	22	46%	36	75%
10	Are flood early warnings received through communication media appropriately? (WhatsApp group/RT head)	20	41,6%	40	83,3%

CONCLUSION

This activity received a positive response and enthusiasm from residents. The questions and answers and the results of the questionnaire as an evaluation indicated an increase in flood awareness and preparedness among residents. Prior to the implementation of SIBAR, most residents relied on informal signals, such as rising water levels or word-of-mouth communication. After introducing an inclusive early warning system, 83,3% of respondents reported receiving timely alerts via digital messaging. The awareness of the importance of evacuation routes and flood response procedures increased by 98% compared to that in the pre-intervention phase. Increased inclusivity and citizen participation were also evident, with women and elderly residents, previously excluded from disaster management discussions, becoming active contributors. Participation in neighborhood communication groups via WhatsApp and discussions with the internal Task Force increased social cohesion by 91,6%. Another outcome was the adoption of local (inclusive) technologies and innovations. The SIBAR system utilizes open-source technology with low-cost sensors, designed with color-coded alerts and simplified text to ensure accessibility for users with limited digital literacy. This is demonstrated by the

100% understanding rating for the implementation of the SIBAR EWS. This approach reflects the principles of appropriate technology: it is affordable, adaptive, and community-owned. Quarterly monitoring provided a form of program sustainability, enabling the replication of the activity in other locations. Furthermore, the system can be replicated and scaled to other urban communities to ensure sustainability. While the results are positive, other challenges and lessons need to be addressed, such as attention to sustainability, as system maintenance is carried out in stages and requires learning and adaptation by residents. Participatory elements are essential for maintaining local ownership and trust in the system. The synergy between social participation and technological adaptation demonstrates how inclusive disaster governance bridges institutional gaps.

ACKNOWLEDGEMENTS

We would like to thank the Director of Research, Technology, and Community Service, Directorate General of Higher Education, Research, and Technology, Ministry of Education, Culture, Research, and Technology for their financial support through the 2025 National Competitive Community Service Grant under the Community Partnership Scheme. We

would also like to thank the Budi Luhur Cakti Foundation and Budi University for providing funding and support for reporting our community service activities. We would also like to thank our partner, the housewives group RT.13 RW.03, Pondok Betung Village, Pondok Aren, South Tangerang, for their permission and support in ensuring the smooth running of this program.

REFERENCES

- Ajjur, S. B., & Ghamdi, S. G. Al. (2022). Exploring urban growth – climate change – flood risk nexus in fast growing cities. *Scientific Reports*, 1–11. <https://doi.org/10.1038/s41598-022-16475-x>
- Aldrich, D. P., & Meyer, M. A. (2015). Social Capital and Community Resilience. *American Behavioral Scientist*, 59(2), 254–269. <https://doi.org/10.1177/0002764214550299>
- Balakrishnan, S., Elayan, S., Sykora, M., Solter, M., Feick, R., Hewitt, C., ... & Shankardass, K. (2023). Sustainable smart cities—Social media platforms and their role in community neighborhood resilience—A systematic review. *International Journal of Environmental Research and Public Health*, 20(18), 6720. <https://doi.org/10.3390/ijerph20186720>
- BNPB. (2022). *Dokumen Kajian Risiko Bencana Nasional Provinsi Banten 2022 - 2026*. <https://peraturan.bpk.go.id/Details/260320/pergub-prov-banten-no-59-tahun-2022>
- BNPB. (2025). *Indeks Risiko Bencana Indonesia 2025*. <https://inarisk.bnbp.go.id/irbi>
- Bozza, A., Asprone, D., & Manfredi, G. (2015). Developing an integrated framework to quantify resilience of urban systems against disasters. *Natural Hazards*, 78(3), 1729–1748. <https://doi.org/10.1007/s11069-015-1798-3>
- Bukar, U. A., Jabbar, M. A., Sidi, F., Nor, R. N. H. B., Abdullah, S., & Ishak, I. (2022). How social media crisis response and social interaction is helping people recover from Covid-19: an empirical investigation. *Journal of Computational Social Science*, 5(1), 781–809. <https://doi.org/10.1007/s42001-021-00151-7>
- Chen, K. F., & Leandro, J. (2019). A conceptual time-varying flood resilience index for urban areas: Munich city. *Water*, 11(4), 830. <https://doi.org/10.3390/w11040830>
- Duy, P. N., Chapman, L., Tight, M., Thuong, L. V., Ph.D., & Linh, P. N. (2018). Urban Resilience to Floods in Coastal Cities: Challenges and Opportunities for Ho Chi Minh City and Other Emerging Cities in Southeast Asia. *Journal of Urban Planning and Development*, 144(1), 5017018. [https://doi.org/10.1061/\(ASCE\)UP.1943-5444.0000419](https://doi.org/10.1061/(ASCE)UP.1943-5444.0000419)
- Feng, S., Hossain, L., & Paton, D. (2017). Harnessing informal education for community resilience. *Disaster Prevention and Management*, 27(1), 43–59. <https://doi.org/10.1108/DPM-07-2017-0157>
- Hegger, D. L., Driessen, P. P., Wiering, M., Van Rijswijk, H. F., Kundzewicz, Z. W., Matczak, P., ... & Ek, K. (2016). Toward more flood resilience: Is a diversification of flood risk management strategies the way forward?. *Ecology and Society*, 21(4). <https://doi.org/10.5751/ES-08854-210452>
- Macose, V. G. D. (2022). Building a resilient community with an ICT-Powered Local Government Unit (LGU): Community-based disaster solution. 27(2), 219–227. <https://doi.org/10.17977/um017v27i22022p219-227>
- Maskrey, A. (2011). Revisiting community-based disaster risk management. *Environmental Hazards*, 10(1), 42–52. <https://doi.org/10.3763/ehaz.2011.0005>
- Moulds, S., Buytaert, W., Templeton, M. R., & Kanu, I. (2021). Modeling the Impacts of Urban Flood Risk Management on Social Inequality. *Water Resources Research*, 57(6), e2020WR029024. <https://doi.org/10.1029/2020WR029024>
- Ourloglou, O., Stefanidis, K., & Dimitriou, E. (2020). Assessing nature-based and classical engineering solutions for flood-risk reduction in urban streams. *Journal of Ecological Engineering*, 21(2), 46–56. <https://doi.org/10.12911/22998993/116349>
- Putnam, R. D. (2000). Bowling alone: the collapse and revival of American community. *Proceedings of the 2000 ACM Conference on Computer Supported Cooperative Work, CSCW '00*, 357. <https://doi.org/10.1145/358916.361990>
- Salami, R., Giggins, H., & von Meding, J. (2017). Vulnerability of human settlements to flood risk in the core area of Ibadan metropolis, Nigeria. *Jàmbá: Journal of Disaster Risk Studies*, 9(1), 1–14. <https://journals.co.za/doi/abs/10.4102/jamba.v9i1.371>
- Tate, E., Strong, A., Kraus, T., & Xiong, H. (2015). Flood recovery and property acquisition in Cedar Rapids , Iowa. *Natural Hazards*, 80(3), 2055–2079. <https://doi.org/10.1007/s11069-015-2060-8>
- Tu, T. T., & Nitiwattananon, V. (2011). Adaptation to flood risks in Ho Chi Minh City , Vietnam. 3(1), 61–73. <https://doi.org/10.1108/17568691111107943>
- Wang, C., Zhang, T., Xu, W., Ruan, H., & Tang, J. (2021). Social capital, technological empowerment, and resilience in rural China. *International Journal of Environmental Research and Public Health*, 18(22), 11883. <https://doi.org/10.3390/ijerph182211883>
- Wang, W., Xu, C., He, J., Chi, Z., Bai, W., & Liu, R. (2024). Resilience-Vulnerability Balance and Obstacle Factor Analysis in Urban Flooding: A Case Study in the Qinghai-Tibetan Plateau. *Buildings*, 14(5), 1274. <https://doi.org/10.3390/buildings14051274>
- Wu, C. F., Chen, S. H., Cheng, C. W., & Trac, L. V. T. (2021). Climate justice planning in global south: Applying a Coupled Nature-human flood risk assessment framework in a case for Ho Chi Minh City, Vietnam. *Water*, 13(15), 2021. <https://doi.org/10.3390/w13152021>
- Xu, W., Yu, Q., & Proverbs, D. (2023). Evaluation of factors found to influence urban flood resilience in China. *Water*, 15(10), 1887. <https://doi.org/10.3390/w15101887>
- Yin, K., & Mostafavi, A. (2023). Unsupervised graph deep learning reveals emergent flood risk profile of urban areas. *arXiv preprint arXiv:2309.14610*. <https://arxiv.org/abs/2309.14610>