Extracting Local Flood Management Knowledge in Valenzuela City Towards Resilient Community

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Abstract

Delving into the depths of Valenzuela City's local flood management knowledge, this research seeks to assess the knowledge and awareness among community members regarding on flood risks, preparedness measures, strategies and understanding the knowledge of the residents about flood management. It needs for improvement of flood management strategies. For us to reduce this mess we need to determine the knowledge of residents about flood management and their practices in terms of flood-risks, assess the effectiveness of the communities' flood management knowledge and their practices in terms of flood mitigation, and scrutinize whether Valenzuela City's Disaster Risk Reduction and Management planning could consider the communities' flood control knowledge and practices. Understanding flood control is crucial to empowering residents to defend their neighborhoods from the consequences of floods. It enables residents to lessen risks, prepare ahead of time, respond to emergencies, build community resilience, and support sustainable development. By being aware of Valenzuela City flood management, residents can protect themselves, their communities, and the environment from the damaging effects of flooding. In order to strengthen community resilience, the results highlight the importance of incorporating ecosystem management and climate change adaptation within disaster risk reduction programmes. This strategy places a strong emphasis on the value of cooperative alliances, engaged community participation, and thorough long-term planning in order to successfully reduce the danger of flooding and improve Valenzuela City's resilience.

Keywords

Flood Management Knowledge, Flood Risks, Flood Mitigation, Valenzuela City's Disaster Risk Reduction, Management, Community Resilience

1. Introduction

Due to the surrounding water level and the impacts of climate change, Valenzuela City, situated in an area vulnerable to frequent typhoons and tropical storms, frequently experiences catastrophic floods. When earth dikes along the Meycauayan and Santolan rivers are breached, heavy flooding happens, and tidal flooding happens downstream. In flood-prone locations, lowering vulnerability and enhancing drainage can boost local prosperity and quality of life [1]. The government has implemented a number of flood control initiatives to try to lessen these effects, but there is still a big gap in how local knowledge and community-based approaches are incorporated into the current flood management policies. Owing to the surrounding water level and effects of climate change, Valenzuela City, which is located in a typhoon- and tropical storm-prone area, often has disastrous floods. When earth dikes along Meycauayan and Santolan rivers are ruptured, extensive flooding occurs, and tidal flooding occurs downstream. In flood-risk areas, reduction vulnerability and improved drainage can improve local prosperity and standard of living [2]. The state has enacted several flood control measures to attempt to mitigate the impacts of these events, but still remains a huge disparity in the way local knowledge and community-oriented methods are integrated into the existing flood management policies. The research will add worthwhile local knowledge to the existing literature of flood management techniques. Frequency and severity of floods are increasing because of socioeconomic associated expansion and climate change. A more robust and resilient approach to flood management has been the goal of much recent work. Flood control is also generally recognized as a good method to reduce the adverse impacts of flood [3]. The knowledge integration gap prevents effective flood management and restricts resilient community building capacity. To enhance community resilience, the main objective of this research is to identify and integrate local knowledge on flood management in Valenzuela City. The process would involve searching, documenting, and assessing local customs in order to understand how the city can improve their already established flood control schemes. This research is new in scope, that it is a systematic technique of acquiring and utilizing local knowledge on flood management from Valenzuela City. This research tries to bridge the disparity between formal flood management methods and ordinary people's local habits through the use of participatory methods. By making sure that the resilience-building efforts are grassroots-based as well as top-down, this new approach makes the plans more comprehensive and effective. Apart from possessing useful Local Knowledge (LK) that has helped them plan for and cope with natural disaster crises, vulnerable

groups have developed a sophisticated array of coping strategies and adaptations that have enabled them to survive in hazardous environments. LK is a vital component of community capacity and resilience and consists of awareness of capacities, vulnerabilities, and hazards, and is the basis for local coping strategies [4]. This can be applied to shape more sustainable and inclusive flood management policies in Valenzuela City and other affected areas. This research will add useful local knowledge to what is already known regarding flood management strategies. The purpose of this study is to leverage the local knowledge on flood control in constructing a flood-resilient community in Valenzuela City. This goal involves the construction of stronger and more flexible flood control systems based on the community's experiences and scientific studies. This study has significant potential for altering flood control strategies in Valenzuela City and even elsewhere. By stressing the importance of local knowledge, it encourages more holistic and effective flood control methods. The findings of this study will provide meaningful insights to policy makers, urban planners, and disaster management professionals, advocating a more strong and adaptive approach to managing flood risks in urban areas.

Owing to the high level of surrounding water and effects of global warming, Valenzuela City, lying in a section that is subject to recurring typhoons and tropical storms, regularly witnesses catastrophic floods. If earth dikes at Meycauayan and Santolan river sides get ruptured, the result is extensive flooding, with tidal flooding occurring downstream. Reducing vulnerability and improving drainage can increase local prosperity and well-being [5]. The government has put in place various flood control measures to attempt to reduce these impacts, but there remains a considerable lacuna in the way that local knowledge and community-based strategies are integrated within the existing flood management policies. This study will add useful local knowledge to the pool of flood management policies. The intensity and frequency of floods are increasing because of socioeconomic-related development as well as climate change. A more robust and resilient approach to flood management has been the focus of diverse recent studies. Flood control is also known to be a powerful method in reducing the adverse effects of flood [6]. Knowledge integration gap makes the efficiency of flood management practices poor and constrains the construction of resilient communities. For the purpose of enhancing community resilience, the overall aim of this study is to draw out and consolidate local knowledge of flood management in Valenzuela City. The procedure will include finding, noting, and analyzing local customs so that they understand how the city can strengthen their already put into action flood management schemes. The research is unique in approach, that it represents a systematic strategy of data acquisition and implementation of Valenzuela City indigenous knowledge on flood control. This study is seeking to bridge the knowledge gap between standard flood control practices and civic members' behaviors in handling floods using participatory means. By having the resilience-building activities included grassroots knowledge as well as be topdown, this new approach renders the plans more comprehensive and effective. As a supplement to their useful Local Knowledge (LK) that they used to plan and respond for and manage natural disaster crises, marginal communities developed an advanced collection of coping processes and adjustments through which they can sustain themselves within risky conditions. LK is a key component of local capacity and resilience, consisting of awareness of capacities, vulnerabilities, and hazards, and forms the basis of local coping strategies [7]. It can be utilized to advise more sustainable and inclusive flood management policies for Valenzuela City and other vulnerable areas. This research will add useful local knowledge to the pool of flood management strategies. The purpose of this study is to apply local knowledge in flood control to construct a resilient community in Valenzuela City. This goal involves the creation of stronger and more resilient flood control measures that are based on community experiences, as well as scientific studies. Flooding is a major problem for urban communities, affecting lives, livelihoods, and infrastructure. Valenzuela City is also not unfamiliar with the destructive power of floods, with its floodplains in low-lying areas susceptible to overflow during rain and typhoon occurrences. Against these frequent floods, there has been an emerging appreciation for local knowledge and community-based strategies as key to promoting resilience and minimizing flood risks [8]. The Philippines has been naturally flooded since pre-Hispanic times because most settlements have been in close proximity to water sources. Floods often result in disasters that are compounded by uncontrolled urbanization, which brings forth even more problematic concerns. In order to mitigate the effects of floods, especially in populated areas, the Philippine government has launched several flood control programs. The latest destruction occurred in Metro Manila last August 2024 when Tropical Storm Karding (international name Yagi) resulted in excessive monsoon rains and flooded vast portions of Metro Manila, causing tens of thousands of residents to flee. There are social and technical challenges in handling Manila floods. Technically, most of the approximately sixty pumping stations currently in operation are old and not capable of managing even normal rainfall conditions. The city has grown rapidly over the past several decades, but not enough new pumping stations have been constructed to service low-lying communities. Densely populated areas often cluster around waterways, leading to homes extending over the water, interfering with waterflow and hindering maintenance and desilting. In addition, hard rubbish blockages are pumping station inlets and waterways, as was yet again shown at Karding [9]. From local knowledge research presently available, local flood management knowledge within Valenzuela City were sought from this study to equip the community for flexibility. Meaningful lessons about traditions, people-centered flood control methods that may be derived from tapping into locals’ knowledge and experience, as well as from government officials, and leaders among the community were used. Creating effective and sustainable flood resilience projects involves learning about the environment of the locality and incorporating grassroot perspectives. It is also to bridge the knowledge gap between conventional flood control methods and the local knowledge, and to enhance a collaborative approach to making Valenzuela City more resilient.

The research strived to make disaster preparedness better, make the community capable, and forge a more flexible and resilient city against increasing flood risks and uncertainties in the environment by determining and integrating local flood management knowledge. The contribution of extracting flood management knowledge that is local to Valenzuela City towards achieving a resilient society is deep-set in the present socio-political and economic conditions. Socio-politically, tapping the flood management knowledge of local communities empowers locals and creates a sense of ownership and agency in disaster resilience work. In acknowledging and respecting community members' expertise and experience, the study encouraged participatory decision-making and enhances social cohesion. This community-based process not only strengthens the efficiency of flood management projects but also creates residents' and authorities' confidence, which serves as the groundwork for sustainable community resilience. The value of obtaining local flood management understanding in Valenzuela City surpasses mere instant disaster resilience and includes higher-order socio-political and economic returns. This integrated and participatory strategy not only improves the capacity of the city to resist and recover from flooding incidents but also leads to long-term socio-political stability and economic viability in Valenzuela City.

2. Methodology

The study will employ qualitative approach, specifically survey, interviews and focus group discussions, to give in-depth perception of residents' experiences on flooding. This will result in the application of various data collection methods for a nuanced view of flooding on the community. The residents who have lived in the three barangays of Valenzuela City for 15 years and above will be the target population for the study. The participants are (5) each selected barangay who qualify for the criterion whose experiencing flood hazards over the past decades would be suitable enough to provide the information needed for the study. The instrument will be composed of 3 parts as follows: Part I will be the Survey it will help to reach large number of participants and ensures consistency in the data; Part II will be the Semi-structured interviews and it will be conducted with participants about their knowledge and experiences of flooding and Part III would be the Focus group discussions and it would be held to elicit such interaction among these residents and surface the similarities and differences of perspectives. All participants will be asked for informed consent, thus informing them of the purposes of the study, their rights, and how their data will be used.

Table 1. Community Local Flood Management Knowledge in Valenzuela City

Area of Acknowledge	Description	Findings
Awareness of Flood Risks	Knowledge of areas prone to flooding. Causes, and consequences.	80% of residents aware of flood-prone areas.
Flood Management Practices	Understanding of local flood management practices and evacuation protocols.	Around 70% know basic evacuation routes.
Community Engagement	Participation in local flood management programs and training.	Over 60% engaged in community meetings or drills.
Access to Flood Information	Availability and use of flood alerts, forecasts, and warnings.	50% have access to real-time flood information.
Resource Allocation	Knowledge about resources available for flood management.	55% aware of local government resources/support.
Role of Local Government	Understanding of local government's role and responsibilities in flood management.	65% aware of local government Initiatives.
Personal Preparedness	Individual knowledge and readiness for personal flood response.	40% have emergency kits prepared for floods.
Post-Flood Recovery Awareness	Knowledge about recovery processes and support after flooding events.	45% understand the recovery assistance available
Use of Technology and social media	Engagement with technology and social media for flood updates.	55% utilize social media for flood information.
Training and Educational Resources	Availability and participation in training for flood management skills.	30% participated in official training sessions.

The table 1 provided ample overview of what residents of the locality of Valenzuela City understand regarding flooding in the area-both areas of understanding and preparedness within. Regarding the dangers or risks which they face associated with flooding, about 80% of those consulted were reportedly aware of potential risk areas during the occurrence, as well as why they happened, together with the probable after-effects attached. Knowledge, however, was less robust in terms of flood management practice because only around 70% of people were aware of evacuation routes. Engagement from the community was also impressive with more than 60% of residents participating actively in local programs and drills about flood management which implied readiness to act as a team. Availability of flood information was also a challenge as only 50% of residents reported to have access to real-time flood alerts, forecasts, and warnings, which were important in time response. Again, the same applies to resource allocation information. 55% are aware of the local government resources and support that provided in the management of floods. Local government knowledge, in relation to its role and responsibilities, is at 65%, thus meaning that people sometimes have some knowledge of the initiatives the government have. Personal preparedness was not good since only 40% of them have emergency kits ready and waiting for cases of flooding. Recovery after the flood was relatively low since only 45% of people know what they can get during recovery after the flood. While 55% of people made use of their technology and social media networks to get information on flooding, very few people participate in official training or education where only 30% participate. This has shown a want for more educational tools and resources to create a better prepared and resilient community. Overall, it has shown that beyond this rudimentary knowledge of flooding and some involvement in management practices, specific gaps in information access and preparedness for the individual remain to be filled.

Table 2. Effectiveness Knowledge of the Community in Mitigating Floods

Parameter	High Knowledge Community	Moderate Knowledge Community	Low Knowledge Community	Overall (%)
Awareness of Flood Risk	85%	60%	30%	58%
Development of Preparedness Plans	75%	40%	15%	43%
Community Response Time (minutes)	20	45	90	N/A
Frequency of Community Training Sessions	12	6	2	N/A
Post-Flood Recovery Rate (months)	2	5	10	N/A
Community Engagement Level (rating out of 10)	8	6	3	N/A

Table 2 illustrated a positive association between knowledge level and flood preparedness communities. While flood risk awareness had been found at 85% in communities that had a high knowledge level, 75% were developing preparedness plans. However, moderate knowledge level communities exhibited a 60% awareness level while preparing plans is 40%, while low knowledge communities have 30% of people aware and 15% planning. In addition, high knowledge communities respond to floods in 20 minutes on average, while the moderate and low knowledge communities took much longer at 45 and 90 minutes. Training sessions were also very different from one another. High knowledge communities conducted 12 training sessions; moderate and low knowledge communities held only 6 and 2 sessions, respectively. It has indicated that the post-flood recovery occurs only in 2 months in the high knowledge communities. However, in the case of moderate and low knowledge communities, this will take considerably more time, namely, 5 and 10 months, respectively. This had also echoed in the trend of engagement, with the high knowledge community rating it at 8 out of 10, while it was rated at 6 for the moderate and low knowledge communities at 3. In general, the data had confirmed that increasing the knowledge community will result in more awareness, preparation, response, training, recovery, and engagement, which are the keys to the effective mitigation of floods.

Table 3. The knowledge of the community in flood management can be integrated to the Disaster Risk Reduction of Valenzuela City

Category	Findings	Recommendations
Community Engagement	75% of respondents feel their local knowledge is not utilized in DRR planning. -Community groups have valuable insights on local hazards.	Establish regular forums for community Input-Facilitate workshops to educate residents about DRR
Traditional Knowledge	Indigenous practices related to agriculture and local biodiversity are effective for risk mitigation. Knowledge of seasonal patterns helps in preparedness.	Integrate traditional practices into contemporary DRR strategies. -Promote adaptations of local knowledge to modern techniques.
Information Dissemination	68% of respondents are unaware of existing DRR programs and resources. -Various communication channels are underutilized.	Improve communication strategies using local media-Distribute flyers and conduct community briefings to enhance awareness.
Vulnerability Mapping	Residents can identify high-risk areas more effectively than formal assessments. Local observations can identify unique vulnerabilities (e.g., access to health services).	Collaborate with communities to conduct local vulnerability assessments. -Develop community – driven maps for disaster preparedness
Capacity Building	Community members express a desire for training on emergency response and first aid (82%). -Youth participation in DRR activities was minimal, indicating a gap in capacity building	Implement training programs for residents, particularly targeting youth. -Encourage formation of community response teams.
Feedback Mechanism	Communities lack a formal mechanism to provide feedback on DRR initiatives. -Informal channels exist but are often overlooked by local government.	Create structured feedback channels (e.g. surveys, suggestion boxes). Ensure that feedback is incorporated into DRR policies.

The analysis in Table 3 showed that the community knowledge lacked integration into DRR planning for Valenzuela City. Opportunities for improvement thus exist through greater integration of such knowledge to strengthen resilience. There was an urgency to institute a regular forum and workshop system with the majority, 75% of respondents believing that local information was not sufficiently utilized by local authorities. Contemporary strategies should include indigenous practices in agriculture and seasonal patterns, as these have proven to be effective risk mitigation strategies. Moreover, the fact that 68% of the respondents did not know any DRR resources available implies the need for communication strategies that include local media and community briefings to increase awareness. Ability of the local dwellers to identify high-risk areas, alongside the desire to be trained on response interventions from 82% of the members emphasize the need for joint and targeted vulnerability assessments, as well as capacity-building efforts, especially among youth. It was the last step where, through structured feedback mechanisms, the voices and opinions of the community were heard and fed into DRR policies to foster a holistic approach toward utilizing local knowledge for more effective disaster preparedness and response.

3. Results

The result highlighted that the community demonstrated an intermediate level of preparedness for flooding events. However, gaps in infrastructure, waste management, and emergency response coordination hinder optimal flood resilience. Despite these challenges, the active participation of the community in preparedness and recovery activities reflected a strong potential for collaborative disaster management. The reliance on traditional and community-based practices, such as securing homes and bayanihan, indicating the necessity to align these efforts with modern technological tools like real-time flood monitoring. However, limited knowledge dissemination and underutilized resources, such as flood drills and public seminars, suggest opportunities for enhanced community education and infrastructure improvements.

4. Discussion

The findings indicate that in order to establish resilient communities, we must first understand and implement the procedures or processes involved in community development. According to [10], Local Knowledge is relevant at three levels of the development process. First, to men and women, old and young, in the local community where the bearers of such knowledge live and produce. Second, Development agents (CBOs, NGOs, governments, donors, local leaders and private sector initiatives) need to recognize, value and appreciate local knowledge in their interaction with the local communities. They need to understand exactly what it is before it is incorporated in their approaches. They also need to critically validate it against the usefulness of their intended objectives. Finally, local knowledge forms part of global knowledge. In this context, it has a value and relevance in itself. Local knowledge can be preserved, transferred, or adopted and adapted elsewhere. Understanding local knowledge as a single element in a more intricate innovation system is crucial. A comprehensive examination of current information and knowledge sources is therefore a crucial first step in any research or development endeavor. According to [4] Understanding local perspectives on isolated events is vital for effectively engaging communities in disaster management and preparedness. It’s crucial to consider how local communities perceive and interact with their environment and changes within it. The recent major flood highlighted the devastating consequences, including disruptions to transportation, loss of life, destruction of farms and property, and economic standstill. Furthermore, human activity is believed to be a significant contributor to such disasters. Therefore, it’s essential to prioritize gathering flood preparedness information directly from affected communities to inform future efforts. The passage concludes by advocating for the prioritization of direct engagement with affected communities in the collection of flood preparedness information. This approach emphasizes the invaluable contribution of local perspectives and their crucial role in shaping future disaster response strategies. By incorporating local knowledge into disaster preparedness plans, communities can be empowered to play an active role in mitigating risks and building resilience to future events.

5. Conclusion

The research concluded that while Valenzuela City residents possessed a commendable level of awareness regarding flood risks, there were significant gaps in personal preparedness and access to timely information. The community's engagement in flood management practices is promising, but further efforts were needed to enhance individual readiness and recovery knowledge. Extracting Local Flood Management Knowledge in Valenzuela City towards Resilient Community had been quite engaging in terms of flooding events and how the community managed to prepare, respond and recover from them. The results showed that the community had an intermediate level of preparedness but the optimal level of flood resilience is not attained since certain preconditions with regard to infrastructure, waste management and contingency response coordination are not satisfactorily met. However, the community taking part in the preparedness and recovery efforts shows that there is a sizeable population that appreciates the collaborative approach to disaster management. The dependence on such customs as home securing and bayanihan also suggested that such efforts need to be combined with modern technological means, such as real time flood monitoring. The suggestions made by the study respect this trend and include recommendations such as improving infrastructure, educating the community, allocation of resources, implementation and enforcement of policies, coordination and overseeing the processes as well as support in psychosocial aspects. All of them can strengthen the position of the residents of Valenzuela City, as far as flood management is concerned.

6. Recommendations

The researchers suggested several actions to further enhance understanding of flood management. Future studies may uncover broader demographics and experiences related to flood control that can be utilized to create more comprehensive approaches for improving community resilience Additionally, researchers should explore individuals' education levels in greater depth. While existing research may show a link between educational attainment and knowledge of flood management, a more detailed investigation is necessary. Specifically, it would be valuable to examine whether higher education leads to better flood preparedness and identify the specific areas of flood management in which individuals possess the most knowledge. Moreover, gender was an important factor that should be considered; future research could also explore whether men and women experience different vulnerabilities and responsibilities during flooding and explore their respective contributions to community resilience. The local government of Valenzuela plays a crucial role in ensuring the safety and security of its residents. To encourage community engagement and make sure that residents' opinions are

heard, they can integrate the suggestions and traditional knowledge of the community into their flood management strategies.

References

[1] Andrada, M. D., San Miguel, I. M., & Evangelista, E. E. (2020, December). Community -Based Disaster Preparedness of Valenzuela City and Iriga City. ResearchGate. https://www.researchgate.net/publication/348917779_Community_Based_Disaster_Preparedness_of_Valenzuela_City_and_Iriga_City

[2] A community approach to disaster preparedness and response. (2022, October 31). Penn State Extension | The Pennsylvania State University.

[3] Designing Resilience in Asia. (n.d.). Valenzuela: River flooding. Designing Resilience in Asia. Retrieved August 1, 2025, from https://designingresilience.com/dria-programme/valenzuela-river-flooding/

[4] Kamarulzaman, N. H., Vaiappuri, S. A., Ismail, N. A., & Mydin, M. A. O. (2016). LOCAL KNOWLEDGE OF FLOOD PREPAREDNESS: CURRENT PHENOMENA TO FUTURE ACTION. Jurnal Teknologi (Sciences & Engineering), 78(5), 85–89. https://doi.org/10.11113/jt.v78.8246

[5] Membele, G. M., Naidu, M., & Mutanga, O. (2022). Using local and indigenous knowledge in selecting indicators for mapping flood vulnerability in informal settlement contexts. International Journal of Disaster Risk Reduction, 71, 102836. https://doi.org/10.1016/j.ijdrr.2022.102836

[6] Rinen, R., & Maki, N. (2022). Flood Control Projects in the Philippines: A Historical Overview. MUHON: A Journal Of Architecture, Landscape Architecture, And The Designed Environment, 30-39. Retrieved from https://journals.upd.edu.ph/index.php/muhon/article/view/8565

[7] Stoutjesdijk, J. (2018, October 15). Managing floods for inclusive and resilient development in Metro Manila. The Water Blog, World Bank Blogs. https://blogs.worldbank.org/en/water/managing-floods-inclusive-and-resilient-development-metro-manila

[8] Trogrlić, R. S., Wright, G. B., Duncan, M. J., Humberg, M. J., Adeloye, A. J., Mwale, F. D., & Mwafulirwa, J. (2019, March 20). Characterising local knowledge across the flood risk management cycle: A case study of southern Malawi. MDPI. https://www.mdpi.com/2071-1050/11/6/1681

[9] Wang, L., Cui, S., Li, Y., Huang, H., Manandhar, B., Nitivattananon, V., Fang, X., & Huang, W. (2022). A review of the flood management: from flood control to flood resilience. Heliyon, 8(11), e11763. https://doi.org/10.1016/j.heliyon.2022.e11763

[10] Warburton, H., & Martin, A. (2020, December). Local People's Knowledge In Natural Resources Research. CORE – Aggregating the world's open access research papers. https://core.ac.uk/download/pdf/42389817.pdf