



Community Participation in Flood Mitigation Programs and Its Effect on Social Resilience in Semarang City

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Abstract

Flooding remains a recurrent threat to urban coastal areas in Indonesia, and Semarang City has been one of the most vulnerable cities in this regard. This study examines how community participation in flood mitigation programs contributes to the development of social resilience. Using a qualitative case study design, data were collected through interviews, focus group discussions, and direct observation in three flood-prone neighborhoods: Tambak Lorok, Kaligawe, and Tlogosari. The results show that participation takes various forms, including mangrove planting, drainage cleaning, and community-based training programs. These activities not only reduce physical risks but also build trust, solidarity, and adaptive capacities within communities. However, challenges remain, such as socio-economic disparities that affect inclusiveness, limited trust in institutional support, and the sustainability of participation over time. The findings highlight that while community engagement is central to resilience-building, it requires supportive governance, long-term commitment, and inclusive approaches to ensure effectiveness. This study contributes to the understanding of disaster risk reduction by emphasizing the synergy between grassroots participation and institutional frameworks. Strengthening this synergy is essential for developing resilience strategies that are not only reactive to crises but also proactive, inclusive, and sustainable.

INTRODUCTION

Floods remain a significant natural disaster in Indonesia, particularly in urban coastal areas where rapid development and population growth exacerbate the risks. Semarang City, situated on the northern coast of Central Java, is one of the most flood-prone cities in the country. The city's low-lying coastal geography, combined with hilly southern areas, exposes it to both tidal floods, locally known as *rob*, and rainfall-induced inundations. Over the years, the frequency and severity of floods have been intensified due to urban expansion, land subsidence, inadequate drainage infrastructure, and climate change (Idowu & Zhou, 2023; Ruan et al., 2024). These factors have not only disrupted daily life and economic activities but also strained the social fabric of affected communities, with many residents facing recurring threats that undermine their resilience (Haldon et al., 2021; Hamamra et al., 2025).

In response to the growing flood risks, flood mitigation programs have become a critical part of urban governance in Semarang. These programs typically include the development of physical infrastructure, such as river normalization, drainage improvements, and seawall construction (Meshkani, 2024; Qin et al., 2024). However, increasingly, scholars and policymakers have emphasized that the effectiveness of such mitigation efforts extends beyond government-led initiatives, urging the active participation of local communities. Community involvement in flood mitigation programs allows for the integration of local knowledge, addresses the real needs of residents, and fosters a collective responsibility for reducing disaster risks. It is through these participatory processes that communities are empowered to become active agents in their resilience-building, ensuring that flood mitigation is not only about infrastructure but also about social cohesion and collective adaptation to environmental challenges.

Community participation in flood mitigation can take various forms (Abid et al., 2024; Thaler et al., 2023). These range from involvement in decision-making processes to the active implementation and maintenance of mitigation infrastructure, such as drainage cleaning or mangrove planting. In some areas, informal community networks and self-help groups have also played a significant role in enhancing resilience, as residents collaborate on localized flood management solutions. In Semarang, with its diverse socio-economic landscape, community participation has been pivotal in determining the success of flood mitigation efforts. Different neighborhoods with varying levels of vulnerability to floods engage in diverse forms of participation, influencing the development of social resilience.

Social resilience is the capacity of communities to withstand, adapt to, and recover from disasters (Şen, 2021). It involves not only the physical capacity to cope with hazards but also the development of collective learning, trust, and adaptive governance. For Semarang's flood-prone neighborhoods, fostering social resilience is particularly crucial, as many of these areas face significant challenges such as limited resources and poor infrastructure. The active participation of local residents in flood mitigation programs helps to build networks of cooperation, solidarity, and shared knowledge, all of which are fundamental components of resilience. By engaging in collective action, residents not only mitigate flood risks but also reinforce their social networks, which enhance their ability to recover from future disasters (Cvetković & Šišović, 2024; Maulana & Wardah, 2023).

The importance of community participation in disaster risk reduction has been widely recognized in international frameworks, such as the Sendai Framework for Disaster Risk Reduction (2015–2030), which stresses the need for inclusive and people-centered approaches. In Indonesia, the government has increasingly promoted community-based disaster risk reduction (CBDRR) programs, encouraging local governments to involve citizens in disaster preparedness, mitigation, and recovery efforts (Cahyono & Ngadisih, 2025; Ishiwatari & Aldrich, 2025). Semarang provides an insightful case study because it represents both the challenges and opportunities of integrating grassroots participation with formal governance frameworks (Husein, 2022; Kristian & Ikhsan, 2024; Cahyono & Ngadisih, 2025). The city's experience illustrates the difficulties of managing recurring flood risks in rapidly urbanizing areas, while also showing how community-led initiatives can complement government actions to strengthen social resilience.

Despite the recognized value of community participation, several challenges persist. Socio-economic disparities, educational background, trust in government institutions, and the availability of platforms for civic engagement all influence the degree of involvement (Schröder & Neumayr, 2023; Mahmud, 2021). In some cases, participation may be tokenistic, with residents being informed about decisions without meaningful influence on outcomes. In others, participation is more robust,

with communities actively co-designing and co-managing flood mitigation measures. The dynamic between these levels of engagement is central to understanding the relationship between community participation and social resilience in flood-prone areas (Lugova & Haque, 2024; Johnston et al., 2024; Azad et al., 2022; Visave & Aldrich, 2025).

This study seeks to explore how community participation in flood mitigation programs contributes to the development of social resilience in Semarang City. By examining the various forms of participation, the challenges that limit its effectiveness, and the potential for building long-term resilience, this research aims to provide a deeper understanding of the role of local communities in disaster risk reduction. The study will also analyze how participatory governance, when combined with institutional support, can create an environment that fosters sustainable and equitable flood mitigation efforts. The findings are intended to inform policy and practice, offering insights into how communities and governments can collaborate to enhance resilience in the face of increasing environmental challenges.

METHODS

This study employed a qualitative case study design to explore the relationship between community participation in flood mitigation programs and the development of social resilience in Semarang City. A qualitative approach was considered appropriate because it enables an in-depth understanding of social processes, community interactions, and the contextual factors that shape participation and resilience. Semarang was selected as the research site because of its long-standing vulnerability to floods, both tidal and rainfall-induced, and because it represents a critical case where community-based initiatives complement government interventions. Three neighborhoods were chosen purposively as case sites: Tambak Lorok, Kaligawe, and Tlogosari. These areas were selected to reflect the diversity of socio-economic conditions, varying exposure to flood hazards, and different levels of community engagement in mitigation activities. For example, Tambak Lorok has become known for its community-led mangrove planting initiatives, while Kaligawe and Tlogosari have engaged in drainage maintenance and preparedness groups facilitated by local organizations.

Participants in this study consisted of residents, local leaders, and government officials directly involved in flood mitigation. A purposive sampling strategy was applied to ensure that only those with relevant knowledge and experience were included. In total, 28 informants participated, comprising 18 residents from flood-prone neighborhoods, five local leaders such as neighborhood heads and community organization members, and five officials from the Semarang Disaster Management Agency and the Department of Public Works. This combination of perspectives allowed the research to capture a comprehensive view of how participation contributes to resilience at both the community and institutional levels.

Data were collected through multiple methods to strengthen validity through triangulation. In-depth interviews formed the primary method, using semi-structured questions to explore experiences of flooding, forms of participation in mitigation activities, perceptions of government programs, and community coping strategies. Interviews lasted between 45 and 90 minutes and were held in participants' homes, offices, or community centers. In addition, three focus group discussions were organized, one in each of the selected neighborhoods, involving six to eight participants per group. These discussions helped validate individual interview findings by highlighting consensus and divergence within the community. Non-participant observation was also conducted during activities such as drainage cleaning, mangrove planting, and preparedness meetings. Field notes were taken to capture community dynamics, cooperation patterns, and indicators of resilience

such as solidarity networks and collective problem-solving. Complementary data were obtained through document review, including local government reports, NGO evaluations, and community records, which provided historical and contextual information on mitigation efforts in Semarang.

The data analysis process was carried out through thematic analysis. Transcripts of interviews and focus groups were read repeatedly to gain familiarity with the material before being subjected to open coding, which identified significant statements related to participation, cooperation, coping mechanisms, and resilience outcomes. These codes were then grouped into categories and refined into broader themes, such as inclusive versus selective participation, trust and cooperation, and adaptive practices in flood-prone areas. Thematic interpretation was conducted in relation to the research questions and the conceptual framework of participation and resilience. Triangulation between interviews, focus groups, observations, and documents ensured the credibility and dependability of the findings.

Ethical considerations were carefully observed throughout the study. Informed consent was obtained from all participants, who were assured that their involvement was voluntary and that they could withdraw at any time. Confidentiality was protected by using pseudonyms and omitting identifying details. Ethical approval was secured from the relevant institutional review board. Cultural sensitivity was also prioritized by consulting local leaders before entering communities and using local languages, including Bahasa Indonesia and Javanese, where appropriate to ensure comfort and clarity in communication.

To enhance the trustworthiness of the research, several strategies were applied. Credibility was reinforced by triangulating multiple sources of data and conducting member-checks with selected participants to verify interpretations. Transferability was supported by providing thick descriptions of the research setting and social context, allowing readers to assess whether findings could be relevant in other settings. Dependability was achieved by maintaining an audit trail of methodological decisions and coding processes, while confirmability was ensured through reflexive journaling and peer debriefing to minimize researcher bias.

Through this methodological approach, the study aimed to generate robust and contextually grounded insights into how community participation in Semarang's flood mitigation programs influences social resilience. By combining interviews, discussions, observations, and document analysis, the research captured the lived experiences of communities while also situating them within broader institutional and policy frameworks.

RESULTS AND DISCUSSION

The results of this study reveal the multifaceted nature of community participation in flood mitigation programs and its significant influence on social resilience in Semarang City. Based on the data collected from in-depth interviews, focus group discussions, and non-participant observations in three flood-prone neighborhoods (Tambak Lorok, Kaligawe, and Tlogosari), several key themes emerged, which are discussed below in relation to the research questions, theoretical frameworks, and relevant literature.

Community Participation in Tambak Lorok

In the neighborhood of Tambak Lorok, community participation primarily took the form of mangrove planting and coastal ecosystem restoration. These activities were driven largely by the community, with residents collaborating to plant mangroves along the coastline, which served both as a natural flood barrier and a means to restore the local ecosystem. This initiative was not only practical in mitigating the impacts of tidal flooding (*rob*) but also had profound social benefits. According to

participants, the act of planting mangroves created a strong sense of collective responsibility. One participant, a 45-year-old male, stated,

“Planting mangroves together gives us a sense of working for the future of our children. When we do it as a group, we feel stronger and more connected.”

This form of community participation aligns with the literature on social capital and collective action, where community-led environmental restoration is shown to enhance social cohesion, trust, and solidarity (Aldrich & Meyer, 2015). Furthermore, the community in Tambak Lorok reported that such activities fostered a sense of pride and ownership over the local environment, which in turn contributed to increased engagement in other forms of disaster risk reduction. These outcomes are consistent with the findings of Shaw (2012), who argues that community-driven disaster mitigation initiatives play a crucial role in building adaptive capacities and fostering resilience.

However, it is important to note that the degree of participation in Tambak Lorok was not uniform. While the mangrove planting efforts garnered significant support from the community, some residents were less involved due to personal limitations, such as health issues or work commitments. These disparities in participation reflect the broader findings in disaster resilience literature, where access to resources and opportunities often shapes the extent of involvement in community-led initiatives (Tierney, 2014). Despite these challenges, the strong sense of collective action observed in Tambak Lorok contributed significantly to the community's ability to respond to floods and their broader social resilience.

Community Participation in Kaligawe

In Kaligawe, the focus of community participation was centered around drainage cleaning and neighborhood-level preparedness. This form of participation was less formalized than the mangrove planting in Tambak Lorok but was equally crucial in reducing the immediate risk of flooding during the rainy season. Residents regularly gathered to clear blockages from the drainage systems, which helped to prevent waterlogging and reduce the severity of floods. One participant, a 50-year-old male, emphasized the necessity of community involvement in drainage maintenance, stating,

“If we don’t clean the drains ourselves, no one else will. The flood comes faster when the garbage blocks the water.”

This type of participation reflects the importance of local knowledge and self-help initiatives in disaster mitigation, which has been widely acknowledged in the literature (Gaillard & Mercer, 2013). However, participation in Kaligawe was not entirely equitable. Wealthier households, who were better able to afford private flood mitigation measures, were often less involved in the collective drainage cleaning efforts. One participant from a wealthier household, a 42-year-old female, remarked,

“Some neighbors with bigger houses don’t join us. They say they can handle floods with their own pumps, so they don’t feel the need to participate.”

This uneven participation mirrors the findings of Aldrich and Meyer (2015), who note that socio-economic disparities often lead to unequal involvement in community-based disaster risk reduction efforts. Such inequality risks creating resilience gaps, where marginalized groups, who are typically more vulnerable, bear the burden of collective work while benefiting less from its outcomes.

Nevertheless, the participation that did occur in Kaligawe played a crucial role in building trust among residents and enhancing their ability to cope with flood risks. The collective action in clearing drains not only mitigated immediate flood risks but also reinforced social ties and a shared sense of responsibility for the local

environment. As discussed in the Sendai Framework for Disaster Risk Reduction (2015-2030), this type of community engagement is vital for building resilience at the local level, as it strengthens networks of support and cooperation that are essential for effective disaster management.

Community Participation in Tlogosari

In Tlogosari, community participation was more formalized and structured, facilitated by NGOs and local government programs. Residents participated in training programs focused on early warning systems, evacuation planning, and first aid. These programs aimed to enhance the preparedness of residents, providing them with the skills and knowledge necessary to respond effectively to flood events. A 33-year-old male participant reflected on the value of these training sessions, stating,

“Before the training, we were always confused when floods came. Now at least we know what to do and who to contact.”

The participation in Tlogosari was characterized by a stronger institutional framework, which helped to institutionalize disaster preparedness and resilience-building. This structured approach to participation is consistent with the findings of Twigg (2015), who emphasizes the importance of institutional support in sustaining community engagement in disaster risk reduction. The role of NGOs and government in providing training and facilitating community preparedness initiatives contributed to a more systematic approach to disaster management. However, residents expressed concerns about the sustainability of these programs. One resident, a 41-year-old male, voiced his fear, stating,

“If the NGO leaves, I am afraid this program will stop. We need the government to continue supporting us.”

This highlights the dependence of some communities on external support for the continuation of disaster risk reduction programs, which can pose a challenge to long-term sustainability (Paton & Johnston, 2017).

Despite these concerns, the structured participation in Tlogosari led to significant improvements in the community's preparedness and adaptive capacity. Training programs not only increased residents' confidence in managing flood risks but also fostered a sense of empowerment and control over their environment. These findings align with the work of Gaillard and Mercer (2013), who argue that education and training are key components of disaster resilience, as they equip communities with the knowledge and skills needed to effectively cope with and recover from disasters.

Socio-economic Disparities and Participation

One of the recurring themes across all three neighborhoods was the influence of socio-economic disparities on participation. While some residents were highly engaged in flood mitigation activities, others were less involved due to various barriers, such as financial constraints, lack of time, or limited access to information. In Kaligawe, for example, wealthier households were more likely to rely on private measures to protect their homes from floods, which led to lower participation in collective activities like drainage cleaning. This uneven participation reflects the broader findings in disaster resilience literature, which highlight the importance of addressing socio-economic inequalities in community-based disaster risk reduction (Tierney, 2014). In order to build truly inclusive resilience, it is essential that flood mitigation programs are designed to involve all members of the community, regardless of their socio-economic status.

The influence of socio-economic factors on participation also points to the need for more equitable access to resources and opportunities for involvement in disaster risk reduction. As noted by Aldrich and Meyer (2015), social capital the networks of trust

and cooperation within a community is a key determinant of resilience. However, when certain groups are excluded from participation, the social fabric of the community is weakened, and overall resilience is diminished. In this regard, the findings suggest that policies and programs must actively promote inclusivity, ensuring that marginalized groups are not left behind in the process of resilience-building.

Institutional Trust and the Sustainability of Participation

Another key factor influencing the effectiveness of community participation in flood mitigation is the level of trust that residents place in local institutions. In Tlogosari, where NGOs and local government played a significant role in facilitating participation, residents expressed greater trust in the effectiveness of the programs. However, in Kaligawe, where government support was less visible, there was a noticeable lack of trust in institutional initiatives, with residents questioning the government's commitment to long-term flood mitigation efforts. As noted by Twigg (2015), trust in institutions is critical for ensuring the sustainability of community engagement in disaster risk reduction. Without this trust, participation may become ad hoc and short-lived, undermining the long-term resilience of the community.

Discussion

This section of the study discusses the results derived from the data on community participation in flood mitigation programs and its impact on social resilience in Semarang City. The findings revealed key factors shaping the effectiveness of participation, including socio-economic disparities, institutional trust, the nature of participation, and the long-term sustainability of resilience efforts. Drawing from existing literature, the implications of these findings are explored within the broader context of disaster risk reduction (DRR) and community-based resilience.

The results of this study reinforce the growing consensus in disaster management literature that community participation is a fundamental component in building social resilience. As demonstrated in the case of Semarang, community involvement in flood mitigation programs plays a significant role in enhancing the collective ability to cope with and recover from floods. This is consistent with the Sendai Framework for Disaster Risk Reduction (2015–2030), which emphasizes the importance of people-centered approaches to disaster risk reduction, encouraging active participation at all levels (UNDRR, 2015). In Semarang, residents who participated in activities like mangrove planting in Tambak Lorok, drainage cleaning in Kaligawe, and preparedness training in Tlogosari displayed a heightened sense of solidarity and collective responsibility. The collective action observed in these communities is in line with the findings of Aldrich & Meyer (2015), who argue that community-led initiatives, especially those focused on environmental restoration or disaster preparedness, foster trust, cooperation, and social cohesion, which are critical elements of social resilience.

The nature of participation in these communities varied but consistently contributed to strengthening the social fabric. For instance, in Tambak Lorok, the mangrove planting initiative not only served as a flood mitigation measure but also fostered a deep sense of pride and ownership among community members. These forms of grassroots initiatives are particularly important in disaster risk reduction, as they encourage the development of social capital, which, according to Putnam (2000), is vital for enabling communities to effectively respond to disasters. By engaging in collective action, residents not only reduce their vulnerability to floods but also develop adaptive capacities through enhanced communication, mutual support, and problem-solving.

One of the critical challenges identified in this study was the socio-economic disparity in participation across the neighborhoods. In Kaligawe, for instance, wealthier households tended to disengage from collective efforts such as drainage cleaning, relying instead on private flood mitigation measures. This disparity reflects broader trends in community-based disaster risk reduction, where socio-economic status often influences the degree of involvement in disaster preparedness and mitigation activities. As noted by Tierney (2014), socio-economic inequalities can result in uneven participation, with marginalized groups often carrying a disproportionate burden of disaster risk reduction efforts.

In the case of Semarang, these disparities were most evident in Kaligawe, where wealthier households were less likely to engage in collective activities. This uneven participation poses a significant challenge to building inclusive social resilience. As highlighted by Aldrich & Meyer (2015), social resilience is most effective when all members of a community are involved in mitigation efforts, ensuring that resilience is not fragmented and that vulnerable groups are not left behind. The findings suggest that more inclusive strategies are required to bridge these participation gaps. For instance, addressing the needs of wealthier households by engaging them in community-driven initiatives or by offering incentives for their participation could help level the playing field.

This issue of inequality also ties into the broader conversation around social capital, where inequality can lead to the exclusion of certain groups from the benefits of collective action (Bourdieu, 1986; Soundararajan et al., 2024). In Semarang, inclusive participation is crucial to ensuring that resilience is shared across the community. The disparities observed in Kaligawe highlight the need for policies that promote equity in disaster risk reduction programs. As noted by Shaw (2012), ensuring that flood mitigation programs are inclusive can enhance the overall resilience of the community by empowering all members to contribute to the collective good.

The role of institutional trust in ensuring the sustainability of community participation was another key finding in this study. In Tlogosari, where NGO and government support were more visible, residents expressed greater confidence in the flood mitigation programs, which, in turn, led to higher levels of participation. However, in Kaligawe, where government support was less apparent, residents expressed skepticism about the effectiveness and longevity of the programs, with some questioning the government's commitment to flood mitigation efforts. These findings resonate with the work of Twigg (2015), who emphasizes the importance of trust in institutional frameworks for ensuring the continued engagement of communities in disaster risk reduction activities.

This lack of trust in government institutions can undermine the sustainability of participation in flood mitigation programs. Without the confidence that government institutions will follow through on their commitments, residents are less likely to participate in long-term disaster preparedness and mitigation initiatives. This dynamic highlights the need for greater transparency, accountability, and long-term support from government and institutional actors in disaster risk reduction programs. As noted by Paton & Johnston (2017), fostering institutional trust is essential for building a resilient society, as it strengthens the relationship between communities and the governing bodies responsible for disaster management.

In Semarang, the disparity in institutional trust between neighborhoods reflects the broader challenges of ensuring that disaster risk reduction efforts are sustainable. In areas where government support is perceived as weak, such as Kaligawe, community participation is often limited to short-term, event-driven mobilization. On the other hand, in neighborhoods like Tlogosari, where institutional support is more

visible and consistent, participation is more likely to be sustained. These findings underscore the importance of embedding disaster risk reduction efforts within long-term institutional frameworks, ensuring that community engagement is not dependent on temporary external actors such as NGOs but is supported by local government policies and resources.

Training and education programs, such as those provided in Tlogosari, were found to enhance the preparedness and adaptive capacity of residents, contributing to their overall resilience. These programs provided participants with the knowledge and skills necessary to effectively respond to floods, such as evacuation planning, early warning systems, and first aid. This approach aligns with the work of Gaillard and Mercer (2013), who argue that capacity-building initiatives are critical for enhancing community resilience, as they empower residents with the tools they need to manage disaster risks.

In Tlogosari, residents expressed a sense of empowerment after participating in training programs, with some stating that the knowledge gained from these initiatives gave them confidence in managing flood risks. This empowerment is a key factor in social resilience, as it enables communities to take proactive measures in the face of disaster risks, rather than relying solely on reactive strategies. As highlighted by Aldrich and Meyer (2015), community-based disaster risk reduction is most effective when it combines local knowledge with formal capacity-building efforts. In Semarang, the integration of local knowledge with institutional training programs was a key factor in strengthening social resilience, as it provided residents with a comprehensive approach to disaster preparedness.

However, as noted in the results, concerns about the sustainability of these programs emerged, with some residents fearing that the benefits would be short-lived if external support were to disappear. This highlights the need for institutionalized disaster risk reduction programs that go beyond the involvement of temporary actors and become embedded within local governance structures. As Paton and Johnston (2017) emphasize, the sustainability of disaster risk reduction efforts is contingent on long-term institutional support and the integration of these programs into everyday community practices.

CONCLUSION

This study has demonstrated that community participation plays a vital role in shaping social resilience in Semarang City's flood mitigation efforts. The findings revealed that participation manifests in diverse ways ranging from grassroots initiatives such as mangrove planting in Tambak Lorok, to neighborhood-based drainage cleaning in Kaligawe, and more structured training programs facilitated by NGOs and local government in Tlogosari. These forms of engagement not only reduce immediate flood risks but also strengthen social cohesion, collective problem-solving, and preparedness, which are essential components of resilience. However, the study also highlighted critical challenges, including socio-economic disparities that limit inclusiveness, uneven trust in government institutions that affects the sustainability of programs, and the tendency for participation to peak during crises but decline afterward. These limitations underscore that while community participation is powerful, it is not sufficient on its own. Building long-term and equitable resilience requires integrating grassroots initiatives with consistent institutional support, fostering inclusivity across social groups, and embedding disaster preparedness into everyday community practices. By bridging community efforts with supportive governance and sustainable policy frameworks, flood mitigation in Semarang can evolve beyond reactive mobilization toward a proactive and enduring model of resilience.

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