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Reflections on Identity, Positionality and Power in Community-Based Participatory Flood Research

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Abstract
The paper explores the integration of Community-Based Participatory Research (CBPR) with hydrological modeling in flood risk management, focusing on positionality, identity, and power dynamics. Employing autoethnography as the primary research method, this study draws on personal experiences and reflections of researchers to deeply engage with and understand the cultural and social dynamics of flood-affected communities. By shifting from traditional authoritative research roles to more collaborative and facilitative engagements, the study promotes equitable and inclusive practices that align scientific rigor with the complexities of the communities involved. The broader application of CBPR principles ensures sustainable, community-driven approaches in flood risk management.

Keywords: CBPR, Autoethnography, Flood Management, Inclusivity

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1.0 Introduction
Community-Based Participatory Research (CBPR) has developed significantly over the past 20 years, proving effective in addressing specific community challenges such as flooding through collaborative partnerships with affected communities. These partnerships strive to ensure that research mirrors the priorities, insights, and realities of communities grappling with frequent or severe flooding, adhering to established CBPR principles like recognizing community identity and strengths, and translating research findings into practical solutions and policy actions.

CBPR approach has faced challenges in potentially reproducing socio-economic inequalities and power differentials within the environmental and disaster management research process. Academic researchers, often positioned as centers of power and privilege within their institutions and the broader knowledge production landscape, may bring biases from their backgrounds or positions that could perpetuate systemic inequalities and disadvantage community partners. The impact of positionality, identity, and power dynamics is crucial to consider, as these factors influence interactions between researchers and community members, potentially affecting

research design and outcomes. Rose (1997) notes that "positionality profoundly shapes the research process," while Alcoff (2005) emphasizes identity's role in research authority. Bourdieu (1991) highlights how power dynamics affect knowledge production.

Flood risk management requires a multifaceted approach due to the complex interplay of environmental, social, and economic factors. Hydrological modeling, using digital tools such as rainfall-runoff models, flood inundation models, and GIS-based mapping, simulates water flow and predicts flooding scenarios. Integrating these models with CBPR enhances the precision and relevance of flood management strategies, ensuring they are informed by local knowledge and tailored to community needs. According to Pahl-Wostl et al. (2007), integrating stakeholder knowledge and scientific models significantly improves the adaptive capacity of flood management systems.

The paper objectives were to explore the integration of Community-Based Participatory Research (CBPR) with hydrological modeling and digital tools for managing flood risk, with a specific emphasis on understanding the impact of positionality, identity, and power dynamics on the research design and process. Specifically, the study aimed to:
1. Examine how positionality, identity, and power dynamics influence research design and process within a CBPR framework.
2. Promote inclusive design by incorporating diverse community perspectives in CBPR-driven flood management solutions, aligning with participatory approach
3. Address power imbalances by mitigating the influence of researchers' positionality within CBPR to achieve more beneficial community outcomes.

This exploration will include case studies from both rural and urban settings, specifically focusing on one in rural Pahang Temerloh and another in urban Selangor

2.0 Literature Review
Recent advancements in Community-Based Participatory Research (CBPR) have effectively addressed flooding by engaging communities. Two case studies illustrate CBPR's application in different settings: Mason and Neumann (2024) explore flood impacts on British Columbia's tourism and land use, emphasizing stakeholder involvement in resilience strategies. Muse (2024) addresses urban flood challenges in Hargeisa, Somaliland, showcasing CBPR's role in developing culturally appropriate flood responses. Both cases highlight CBPR's ability to build resilient communities through active participation.

Additionally, initiatives like the Total Disaster Risk Management (TDRM) approach and Hulu Langat's Resilience Living Lab by MERCY Malaysia highlight long-term resilience and co-learning. Similarly, the "Smart Flood" program at UiTM Shah Alam and the Community-led Disaster Risk Reduction (CLDRR) program (UTM, 2023) involves substantial community collaboration, aiming to empower local responses to disasters and align with global risk reduction goals. These cases collectively underscore the capacity of CBPR to build resilient communities through active participation and tailored approaches. These initiatives emphasize the importance of community involvement in research, addressing power imbalances, and enhancing research relevance and integrity. The rationale behind integrating community involvement in CBPR for flooding includes ethical reasons—asserting individuals' rights to partake in impactful research, efficiency reasons - leveraging local knowledge for more effective outcomes, and political/practical reasons - enhancing accountability and transparency.

Despite these advancements, a significant research gap exists in consistently applying CBPR principles across flood research, often due to unclear engagement rationales or lack of continuous involvement. This gap is particularly evident in the inconsistent consideration of identity, power dynamics, and positionality within research settings. Without a clear understanding and continuous engagement, researchers may inadvertently reinforce existing inequalities and power imbalances, failing to fully incorporate the community's diverse identities and perspectives (Hood et al., 2022; Secules et al., 2021). The variability in how positionality influences interactions and decision-making processes further complicates the application of CBPR principles, leading to research outcomes that may not fully reflect or benefit the community's needs.

Vilá et al. (2023) highlight the role of community specialists and local expertise in ethical CBPR practices through an autoethnographic account post-Hurricane Matthew, underscoring the importance of integrating CBPR and autoethnography to address community needs. Ritzenthaler (2023) uses autoethnography to explore how personal and academic experiences with climate change shape environmental identity. Similarly, Haeffner et al. (2022) apply collaborative autoethnography in natural sciences, demonstrating its effectiveness in addressing climate change and promoting interdisciplinary collaboration for transformative change.

2.1 Identity
Identity in the context of CBPR for flood research extends beyond professional identity to include personal and communal aspects. It encompasses how individuals and groups perceive themselves and their roles within their community, particularly in the context of flood risk and resilience. Identity in this sense involves the lived experiences, cultural backgrounds, and social roles of community members, which influence their engagement and communication with the research process. This broader understanding of identity considers the multi-layered aspects of how people relate to their environment and the challenges posed by flooding, reflecting their unique vulnerabilities and capacities (Lie et al., 2023).

2.2 Positionality
Positionality in CBPR for flood research refers to the specific stance or perspective that researchers adopt with the community involved in the study. This includes recognizing background, biases, privileges, and limitations and understanding how these factors influence interactions with the study population and the interpretation of data. Positionality requires researchers to be aware of their roles and

potential impacts on the research and community, ensuring that their approach is respectful, ethical, and aligned with the needs and values of the community. It is about being critically aware of the dynamics of power and privilege that play out within the research process and striving to minimize any negative impacts (Valez, 2019).

2.3 Power
Power in CBPR for flood research refers to the ability to influence both the process and outcomes of the research based on one's social, economic, or institutional position. Power dynamics are critical to understanding and addressing the research process because they affect how knowledge is created, shared, and applied. Researchers must critically examine how power structures within the research setting can affect participation and lead to unequal benefits or burdens among community members. This involves analyzing how power operates within the community, between researchers and community members, and within the research team itself. Emphasizing power helps ensure that the research process promotes empowerment rather than reinforcement of existing inequalities, actively engaging with the community to co-create knowledge that is truly reflective and beneficial to their needs (Springgate et.al, 2021).

3.0 Methodology
In our method section, we employed autoethnography to provide a rich, in-depth analysis of flood risk management strategies. This approach combines autobiographical and ethnographic elements, enabling us to draw on personal experiences and reflect critically on them within the broader context of societal and organizational practices. Autoethnography offers unique insights into the subtleties of how flood management policies impact individual and community identities, as well as how these identities interact with institutional actions. This method allows for a nuanced exploration of power dynamics, highlighting how decisions are made and who benefits from these decisions in flood risk management. By integrating personal narratives with systematic analysis, autoethnography deepens our understanding of the subject and enhances the applicability of our findings, bridging the gap between technical expertise and community experiences (Pillay, 2019).

To complement the autoethnographic approach, we integrated Community-Based Participatory Research (CBPR) methods to actively involve community members in the research process. This included developing and deploying digital tools, such as the Fulcrum app, to enhance real-time data collection and improve community engagement in disaster response and flood management. The use of hydrological modelling provided a scientific basis for our interventions, ensuring that technical solutions were informed by local knowledge and tailored to specific community needs.

The scope of the study includes both rural and urban communities affected by flooding. The units of analysis are the individuals and communities engaged in flood risk management activities. This approach allows for a comprehensive understanding of the diverse experiences and perspectives within different socio-economic and geographical contexts.

4.0 Findings

4.1 Case Study 1: Enhancing Disaster Response with the Fulcrum App: A Community-Based Participatory Research Initiative
In a Community-Based Participatory Research (CBPR) initiative following a severe storm in a rural village, our focus was not just on technological intervention but also on meaningful community engagement. In the aftermath of a severe storm that devastated a rural village, a local mother's response highlighted the community's struggle with insufficient support and ineffective leadership: "When the storm hit and our home was severely damaged, the first thing on my mind was the safety of my children. The village head seemed indifferent to our plight, which only added to our vulnerability. We received a mere RM500 as official help, which was far from enough. Thankfully, my brother was able to provide financial support for significant repairs."

Responding to slow official actions, CBPR researchers developed the Fulcrum app to improve disaster responses. This app includes real-time damage recording, and community interfaces, enhancing assessment accuracy and aid effectiveness. Though broader deployment and training are forthcoming, the app is set to empower users, improve resilience, and ensure that disaster support aligns more closely with community needs. This initiative lays the groundwork for broader applications in global disaster management. Positionality affects how researchers, as external agents, are perceived within APM, which could see the app as increasing workload rather than aiding disaster response. Similarly, conflicts between the innovative stance of researchers and the technophobic tendencies of some staff can affect how new interventions are received. Moreover, while researchers introduce new technologies, APM holds the practical authority over their implementation. Enhancing my Malay language skills has also improved trust and communication, allowing me to work as a collaborator, thereby facilitating the technology's acceptance and effective use by empowering APM personnel and community members.

4.1.1 Impact on CBPR Design and Processes
The integration of positionality, identity, and power significantly influences the design and processes of Community-Based Participatory Research (CBPR), as evidenced in our Fulcrum app (Fulcrum, 2024) project following a severe storm in a rural village. This case study illustrates how these dynamics shape CBPR, especially in disaster response. Initially viewed as outsiders, our researchers emphasized understanding the community's needs and past experiences with insufficient support. This perspective shaped the app's development to meet local needs and concerns, with a focus on transparency to build trust. The identity of the researchers shifted from traditional

authoritative roles to facilitators, promoting a collaborative approach. This transition helped reduce resistance to the app and improved its acceptance. Power dynamics were intentionally altered to empower community members with tools for real-time damage recording and direct involvement in data processes. This shift promoted a more democratic resource distribution, addressing gaps left by traditional leadership. Community members actively participated in data collection and decision-making, enhancing the cultural relevance and acceptance of the research. These contributions ensured the project was technically effective and aligned with actual community needs, vital for the sustainability of CBPR initiatives. Looking ahead, there is a need to maintain community engagement, optimize resource use, and develop impact measurement metrics to improve CBPR adaptability and effectiveness in various settings. This study showcases the transformative potential of CBPR in redefining traditional research approaches through a respectful and inclusive method.

4.2 Case study 2 - Integrative Flood Risk Management: A Community-Based Participatory Approach in the Langat Watershed, Malaysia
Our Case Study 2 explores flood risk management strategies, integrating the application of advanced hydrological tools for comprehensive urban flooding analysis in Malaysia, specifically within the Langat watershed. This strategy employs a methodical assessment of flood-prone areas using hotspot data publicly provided by the Jabatan Pengairan dan Saliran (JPS) Selangor. JPS which translate to Drainage and Irrigation Department is a local government agency in Malaysia responsible for managing water resources, including drainage and irrigation systems, flood control, and river basin management. The use of these advanced tools enhances our understanding of flood dynamics through hydrological modeling, allowing for precise resource allocation and mitigation planning based on identified hotspots. These software tools model hydrological and hydraulic processes in urban areas to support flood risk mapping, each offering unique features from rainfall-runoff simulation to comprehensive urban drainage and flood management. This data-driven approach not only improves transparency and intervention efficiency but also bolsters public communication regarding the decisions being made, ensuring that efforts are strategically aligned with the areas of greatest need.

4.2.1 Impact on CBPR Design and Processes
The influence of positionality, identity, and power significantly shapes our CBPR approach to flood risk management. Positionality affects how researchers and stakeholders interact with the community, emphasizing the integration of local knowledge to create culturally relevant solutions. The identity of researchers evolves into more collaborative and facilitative roles, fostering a partnership where they work alongside the community rather than directing from above. This approach challenges the traditional top-down power dynamics, often seen in government-led, technical decision-making that may overlook valuable community input (McGowan et al., 2020). To counteract this, our CBPR methodology involves the community from the start, through initiatives like forming a community advisory board with Jawatankuasa Kemajuan dan Keselamatan Kampung (JKKK) and engaging residents in data collection and analysis. This ensures that research goals and methods are co-developed. We also plan to train community members to use flood risk map produced through hydrological models and incorporate their feedback to refine flood risk maps, transforming our approach into a truly collaborative process. Reflecting on engagement strategies, formal methods such as drafting official communications have proven necessary for maintaining professionalism and adhering to expected protocols. Conversely, informal engagement, which is more relaxed and based on personal relationships, requires careful management to maintain commitment and avoid logistical issues (Dong et al., 2022). By balancing formal professionalism with the relational depth of informal methods, we have built trust across various stakeholders, essential for fostering cooperative relationships and ensuring project success. This dual approach enhances our CBPR framework, making it more adaptive and effective in managing flood risks with community involvement.

5.0 Discussion
Promoting an inclusive design that respects diverse identities and addresses power imbalances can transform digital tools and hydrological modeling tools into empowering assets for disaster management teams and significantly enhance the sustainability of long-term partnerships while ensuring that community voices are respected and amplified. An inclusive design involves implementing a user-friendly interface, multilingual support, accessibility features, comprehensive training programs, and community-based participatory approaches, ensuring broader usability and understanding of flood risks. which makes these tools accessible and usable by the broadest range of people, including those with limited technology skills or disabilities. By reflecting the cultural, ethnic, and social identities of its users, the tool ensures cultural sensitivity and allows for customization, increasing its relevance and acceptance across different community segments. Addressing power imbalances through equitable access and empowerment via data democratizes information flow, shifts traditional power dynamics, and enhances transparency and accountability. For disaster management teams, such tools not only streamline data collection and analysis for better operational efficiency but also build trust with the community, facilitating more sustainable and cooperative relationships. The tools' capacity to allow all community members to report and access information ensures that even marginalized voices are heard, leading to more equitable community development and response strategies. This comprehensive approach not only meets functional needs but also fosters social change, creating a more inclusive, equitable, and responsive community environment.

A balanced strategy that synthesizes both formal and informal approaches can enhance stakeholder engagement in urban flood risk management. Formal methods ensure structured and respected interactions, particularly with governmental bodies, while informal methods offer adaptability and deep engagement with community stakeholders. This combined approach ensures that engineering solutions are not only technically sound but also culturally sensitive and community-oriented. The dual approaches to stakeholder

engagement also bring to light the complex power dynamics involved in urban flood risk management. This power dynamic was evident in formal engagements with local government officials, where institutional backing was crucial in establishing credibility and seriousness.

Balancing technical engineering with local knowledge is challenging but crucial for creating sustainable, community-supported solutions. This approach democratizes power by involving community members directly in data collection and decision-making, shifting traditional power from government and experts to residents, thus fostering greater community engagement and sustainable practices. Moreover, the participatory approach transforms community identities, empowering members to see themselves as proactive stakeholders in environmental stewardship and enhancing communal resilience and morale. This holistic engagement not only enriches data but also strengthens the effectiveness and support for flood management initiatives.

Having a Malay CBPR researcher is particularly beneficial for projects within Malay-speaking communities. A researcher from the same cultural and linguistic background inherently understands the local nuances, social norms, and community values, which can significantly streamline the research process. They are inherently equipped to interpret cultural expressions and local knowledge accurately, which is crucial for building genuine trust and rapport with community members. Moreover, their presence can diminish resistance and skepticism from the community, as they are seen not just as researchers but as insiders who share the same concerns and aspirations.

Promoting inclusive and empowering digital tools in disaster management must integrate critical recommendations from community-based participatory research (CBPR) to ensure these tools are effective, equitable, and sustainably integrated within the communities they serve. Here are the key recommendations:

1. **Examination of Team Diversity**: The teams developing these tools must include members whose identities intersect with those of the community partners - considering gender, race/ethnicity, sexual orientation, and class. If a cultural match isn't present, efforts should be made to diversify the team or engage a cultural broker from within the community. This diversity not only fosters trust but also enhances access to local knowledge and values epistemological diversity, crucial for crafting tools that genuinely resonate with and empower the users.
2. **Development of Collaborative Learning Environments**: Establish authentic co-learning environments that emphasize the sustainability of partnerships and the utility of research findings. Tools should facilitate matched identities and negotiate cultural nuances to ensure that community wisdom and insights shape the development and application of the technology. This alignment between research purposes and community values is essential for minimizing conflicts and maximizing cooperation.
3. **Multi-level Collaborative Mentorship**: Encourage a non-hierarchical, collaborative approach in the development and implementation phases, recognizing and utilizing the diverse levels of expertise among all partners. This approach helps build a democratic environment where contributions from different stakeholders are equally valued and integrated.
4. **Long-term Partnership Maintenance**: Focus on sustaining partnerships by respecting local knowledge, traditions, and community concerns, which are central to the integrity of the CBPR project. Awareness of positionality and power dynamics is crucial to avoid unintentionally silencing community voices and to ensure the long-term viability of the partnerships.
5. **Ensuring Researcher and Institutional Responsibility**: Develop mechanisms, such as community checklists, to hold developers and organizations accountable to the core components of CBPR. These tools should help verify that the projects align with CBPR ideals and community values and involve cultural-identity brokers to facilitate mutual respect and learning.

By incorporating these recommendations, digital and hydrological tools for disaster management can become more than just functional solutions; they can serve as catalysts for social change, fostering more inclusive, equitable, and responsive community environments. This strategic approach ensures that the technology not only meets the immediate needs but also contributes to the broader goals of community empowerment and sustainable development.

6.0 Conclusion and Recommendations

Our study confirms that integrating local insights with scientific methods through a Community-Based Participatory Research (CBPR) framework enhances the relevance, inclusivity, and effectiveness of flood risk management strategies. This approach shifts researcher roles towards more collaborative and supportive functions, promoting partnership and contrasting with traditional hierarchical research methods. This power redistribution empowers community members by involving them in data collection, scenario planning, and policy-making, crucial for crafting sustainable flood management solutions. The democratization of this process results in outcomes that are more pertinent and strengthen community engagement and resilience.

Moreover, the shift in positional dynamics and community empowerment illustrates CBPR's potential to transform traditional research paradigms into more equitable and participatory methods for managing urban flood risks. We advocate for the broader application of CBPR in environmental research to bridge the gap between scientific precision and community needs, enhancing urban resilience and promoting equitable practices that acknowledge and elevate marginalized voices. This paradigm shift redefines the researcher's role from authoritative to one focused on co-learning and mutual respect for local knowledge, balancing power distribution, and aligning research with real-world needs. However, challenges such as variable community engagement, resource demands, and the difficulty of generalizing results highlight the need for future research to refine community engagement strategies, broaden studies for wider applicability, and optimize resources while reducing biases and improving impact measurements. Addressing these challenges will

bolster CBPR's implementation in environmental management, making it more effective and adaptable across different community contexts.

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Paper Contribution to Related Field of Study

This paper enhances flood risk management by merging Community-Based Participatory Research (CBPR) with traditional scientific approaches, highlighting how local insights boost the cultural relevance and applicability of solutions in both rural and urban areas. It describes a shift in researcher roles from authoritative to collaborative, promoting equitable partnerships with community members. The study showcases how power redistribution through active community involvement in the research process leads to sustainable and resilient outcomes. By advocating CBPR principles, the work narrows the gap between scientific precision and community needs, fostering inclusive practices that elevate marginalized voices and impact both academic and practical realms in environmental management.

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