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Does Disaster Knowledge Matter? Examining Community-Based Flood Mitigation in a Developing Country Context

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Abstract:
Floods remain one of the most recurrent and damaging hazards in developing countries, where structural limitations and governance challenges often constrain disaster risk reduction efforts. While disaster knowledge is frequently promoted as a key component of community-based disaster risk reduction, empirical evidence on how different forms of knowledge influence flood mitigation practices remains limited. This study examines the role of disaster knowledge in shaping community-based flood mitigation in a developing country context.
Using a descriptive qualitative approach, data were collected through semi-structured interviews and non-participant observations in a flood-prone community in Indonesia. The analysis was guided by the Revised Bloom's Taxonomy, which conceptualizes disaster knowledge into factual, conceptual, procedural, and metacognitive dimensions. Thematic analysis was employed to identify patterns linking knowledge dimensions to mitigation practices.
The findings reveal that disaster knowledge matters, but its influence varies across cognitive dimensions. Factual knowledge primarily increases awareness but has limited impact on sustained mitigation actions. Conceptual knowledge enhances collective understanding of flood risk and encourages community engagement, while procedural knowledge directly enables practical mitigation measures. Metacognitive knowledge, although less prevalent, supports adaptive learning and reflective decision-making. However, the translation of knowledge into mitigation practices is constrained by economic and governance-related factors.
This study contributes to disaster risk reduction literature by applying a multidimensional cognitive framework to flood mitigation and highlights the need for capacity-building strategies that move beyond awareness toward actionable and reflective knowledge.

Keywords: Disaster knowledge; Flood mitigation; Community-based disaster risk reduction; Revised Bloom's Taxonomy; Developing countries

1. Introduction

Floods remain one of the most recurrent and destructive hydrometeorological hazards globally, particularly in developing countries where rapid land-use change, environmental degradation, and limited adaptive capacity intensify disaster impacts. Beyond immediate physical damage, floods disrupt livelihoods, undermine local development, and impose long-term social and economic costs on affected communities (UNDRR, 2019; IPCC, 2022). These recurring impacts underscore the importance of shifting disaster management approaches from reactive emergency response toward proactive disaster risk reduction (DRR), with mitigation as a central pillar.

Within contemporary disaster governance, community-based disaster risk reduction (CBDRR) has emerged as a critical strategy for enhancing local resilience. Communities are not merely passive victims of disasters but active agents whose knowledge, perceptions, and behaviors significantly shape the effectiveness of mitigation efforts (Twigg, 2015). Flood mitigation, encompassing both structural and non-structural measures, aims to reduce vulnerability and exposure before disasters occur. While governments are responsible for infrastructure provision and regulatory frameworks, community engagement and informed

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action are essential for ensuring that mitigation measures function effectively at the local level (Coppola, 2015).

A growing body of literature highlights disaster knowledge as a key determinant of disaster-related behavior. Studies have demonstrated that individuals with higher levels of disaster knowledge tend to exhibit better preparedness, awareness, and adaptive capacity (Paton & Johnston, 2017; Shaw et al., 2014). In flood-prone contexts, knowledge has been linked to evacuation readiness, risk perception, and emergency response behavior (Yatnikasari et al., 2020; Jahirin et al., 2021). However, most existing studies concentrate primarily on preparedness or response phases, with relatively limited attention to mitigation behaviors that aim to reduce risk in the long term.

Moreover, disaster knowledge is frequently operationalized as a single, undifferentiated construct, measured through general awareness or basic understanding of hazards. This approach neglects the cognitive complexity of knowledge and its differentiated influence on behavior. Drawing on the Revised Bloom's Taxonomy, knowledge can be conceptualized into multiple dimensions—factual, conceptual, procedural, and metacognitive—each representing distinct cognitive processes that may shape how individuals interpret risks, evaluate mitigation options, and translate understanding into action (Anderson & Krathwohl, 2001). Despite its strong theoretical foundation, this multidimensional framework has rarely been applied empirically in disaster mitigation research, particularly in community-based flood studies.

This gap is especially evident in developing country contexts, where flood mitigation programs often persistently underperform despite continuous policy interventions and resource allocation. In countries such as Indonesia, where floods constitute the most frequent disaster type nationwide, recurrent flood impacts suggest that structural measures alone are insufficient without corresponding improvements in community knowledge and cognitive capacity (BNPB, 2023). Empirical evidence examining whether—and how—different dimensions of disaster knowledge influence community-based flood mitigation remains scarce.

Addressing this gap, the present study aims to examine the effect of community disaster knowledge on flood mitigation practices in a flood-prone area within a developing country context. Specifically, this study investigates whether disaster knowledge—conceptualized through factual, conceptual, procedural, and metacognitive dimensions—significantly influences community-based flood mitigation behavior. By employing a quantitative approach, this research moves beyond descriptive assessments of awareness and focuses on measurable mitigation actions undertaken by communities.

This study makes several important scientific contributions. First, it extends disaster risk reduction literature by empirically examining mitigation behavior, an area that has received less scholarly attention compared to preparedness and response. Second, it introduces a multidimensional cognitive framework based on the Revised Bloom's Taxonomy into disaster studies, offering a more nuanced understanding of how different forms of knowledge shape mitigation practices. Third, by situating the analysis within a developing country context, this study provides policy-relevant insights for disaster governance, highlighting the importance of knowledge-based capacity building as a complement to structural flood mitigation strategies. Collectively, these contributions enhance theoretical understanding and offer practical implications for strengthening community-based flood risk mitigation in vulnerable regions.

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2. Literature Review

a. Disaster Knowledge and Flood Mitigation

Disaster knowledge has been widely recognized as a critical factor influencing community behavior in disaster-prone areas. Within the disaster risk reduction (DRR) literature, knowledge is commonly associated with improved risk perception, preparedness, and adaptive capacity (Paton & Johnston, 2017). In flood contexts, empirical studies have demonstrated that individuals with higher disaster knowledge are more likely to engage in preparedness actions such as evacuation planning, emergency supply storage, and response coordination (Yatnikasari et al., 2020; Jahirin et al., 2021). These findings suggest that knowledge plays an enabling role in shaping disaster-related behavior.

However, a closer examination of the literature reveals that most studies emphasize preparedness and response phases rather than mitigation practices aimed at reducing long-term flood risk. Preparedness-oriented research typically focuses on short-term behavioral adjustments prior to disaster events, while mitigation involves sustained actions such as environmental management, land-use adaptation, and participation in risk reduction programs (Coppola, 2015). As a result, the relationship between disaster knowledge and mitigation behavior remains less empirically explored, particularly at the community level.

Furthermore, inconsistencies persist in empirical findings regarding the strength of the relationship between disaster knowledge and mitigation outcomes. While some studies report a strong positive association between knowledge and disaster-related behavior (Shaw et al., 2014), others suggest that knowledge alone may be insufficient to generate meaningful action without supportive institutional and social contexts (Bubeck et al., 2012). These contrasting findings indicate the need for a more nuanced conceptualization of disaster knowledge that goes beyond general awareness.

b. Application of the Revised Bloom's Taxonomy in Disaster Studies

To address limitations in existing research, the Revised Bloom's Taxonomy offers a robust cognitive framework for conceptualizing disaster knowledge. Unlike unidimensional approaches, this taxonomy categorizes knowledge into four distinct dimensions: factual, conceptual, procedural, and metacognitive knowledge (Anderson & Krathwohl, 2001). Factual knowledge refers to basic information about hazards and risks, conceptual knowledge involves understanding relationships and principles, procedural knowledge relates to knowing how to perform specific actions, and metacognitive knowledge reflects self-awareness and regulation of one's own understanding.

In educational research, the Revised Bloom's Taxonomy has been widely used to examine how different knowledge dimensions influence learning outcomes and behavioral application. However, its application in disaster studies remains limited and fragmented. Existing disaster-related research often implicitly emphasizes factual knowledge, such as awareness of flood causes or warning signs, while giving less attention to procedural and metacognitive dimensions that are more directly linked to mitigation behavior. This narrow focus may explain why increased awareness does not always translate into sustained mitigation action.

A limited number of studies suggest that procedural knowledge—such as knowing how to implement flood mitigation measures—and metacognitive knowledge—such as the ability to evaluate personal preparedness and risk—may play a more decisive role in influencing long-term risk reduction behavior (Paton, 2019).

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Nevertheless, empirical evidence that systematically examines these dimensions within a unified framework remains scarce, particularly in developing country contexts where community capacity varies widely.

c. Comparison of Previous Studies and Research Gap

Comparative analysis of prior studies reveals three major limitations in the existing literature. First, most empirical research examines disaster knowledge as a general construct without distinguishing its cognitive dimensions, potentially oversimplifying the mechanisms through which knowledge influences behavior. Second, mitigation behavior is often treated as a secondary outcome or merged with preparedness indicators, obscuring its distinct role within the disaster management cycle. Third, studies conducted in developing countries frequently emphasize structural mitigation and institutional capacity, while underestimating the role of community cognition and agency.

In contrast to prior research, this study integrates a multidimensional knowledge framework with a specific focus on community-based flood mitigation. By applying the Revised Bloom's Taxonomy, this research moves beyond descriptive assessments of awareness and contributes a more refined understanding of how different forms of knowledge shape mitigation practices. This approach responds directly to calls in the DRR literature for more theory-driven and behavior-focused empirical studies (UNDRR, 2019).

d. Conceptual Framework

Based on the reviewed literature, this study proposes a conceptual framework in which **disaster knowledge** functions as an independent variable influencing **community-based flood mitigation behavior**. Disaster knowledge is operationalized through four dimensions derived from the Revised Bloom's Taxonomy: factual, conceptual, procedural, and metacognitive knowledge. These dimensions are hypothesized to collectively and significantly affect community engagement in flood mitigation practices.

Within this framework, flood mitigation behavior represents the dependent variable, encompassing both individual and collective actions aimed at reducing flood risk. The framework assumes that higher levels of multidimensional disaster knowledge enhance individuals' capacity to understand flood risks, evaluate mitigation options, and implement appropriate actions. This conceptual model provides the analytical basis for examining the role of cognitive knowledge in shaping mitigation behavior and guides the empirical testing conducted in this study.

3. Methodology

a. Research Design

This study adopted a **descriptive qualitative research design** to explore the role of disaster knowledge in shaping community-based flood mitigation practices. A qualitative descriptive approach was chosen to obtain an in-depth understanding of how communities perceive, interpret, and apply disaster knowledge in their everyday mitigation activities. Unlike quantitative designs that emphasize measurement and causality, this approach allows for rich, contextualized insights into social processes and community behavior within real-life flood-prone settings (Creswell & Poth, 2018).

The qualitative design is particularly appropriate for disaster risk reduction research, as mitigation practices are embedded in local knowledge systems, social interactions, and governance contexts that cannot be fully captured through numerical indicators alone.

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b.Study Area and Research Context

The study was conducted in a flood-prone region in Indonesia, a developing country frequently affected by hydrometeorological disasters. The selected area has experienced recurrent flooding events over recent years, prompting the implementation of both government-led and community-based mitigation initiatives. This context provides a suitable setting for examining how disaster knowledge is understood and operationalized at the community level.

The research focused on communities directly exposed to flood risk and actively engaged—formally or informally—in flood mitigation activities. Emphasis was placed on understanding local experiences, perceptions, and practices rather than producing statistically generalizable findings.

c. Participants and Sampling Technique

Participants were selected using **purposive sampling**, a technique commonly employed in qualitative research to identify information-rich cases relevant to the research objectives (Patton, 2015). The study involved community members who had direct experience with flood events and were familiar with local mitigation efforts, including household-level actions and collective community initiatives.

Key participants included residents, community leaders, and individuals involved in local disaster-related activities. The selection criteria emphasized lived experience with flooding, participation in mitigation practices, and willingness to articulate personal and collective perspectives on disaster knowledge.

d.Data Collection Methods

Data were collected through **in-depth semi-structured interviews** and **non-participant observation**. Semi-structured interviews allowed flexibility to explore participants' understanding of floods, mitigation strategies, and decision-making processes while maintaining consistency across interviews. Interview questions were guided by the dimensions of the Revised Bloom's Taxonomy—factual, conceptual, procedural, and metacognitive knowledge—to capture different forms of disaster-related cognition.

Observational data complemented interview findings by documenting visible mitigation practices, community interactions, and environmental conditions related to flood risk. Field notes were systematically recorded to provide contextual detail and to support data triangulation.

e. Data Analysis

Data analysis followed a **thematic analysis** procedure, consistent with qualitative descriptive research. Interview transcripts and observational notes were analyzed through an iterative process involving data familiarization, coding, theme development, and interpretation (Braun & Clarke, 2006). Initial codes were derived both deductively from the theoretical framework of disaster knowledge and inductively from emerging patterns in the data.

The analysis focused on identifying how different dimensions of disaster knowledge influenced community mitigation practices, as well as the contextual factors that facilitated or constrained the translation of knowledge into action. To enhance analytical rigor, themes were continuously refined through comparison across participants and data sources.

f. Trustworthiness of the Study

To ensure the trustworthiness of the findings, this study applied established qualitative research criteria, including credibility, dependability, and confirmability (Lincoln & Guba, 1985). Credibility was enhanced

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through prolonged engagement in the field and data triangulation between interviews and observations. Dependability was addressed by maintaining a clear audit trail of data collection and analysis procedures, while confirmability was supported through reflexive notes and systematic documentation of analytical decisions.

g. Ethical Considerations

Ethical considerations were carefully observed throughout the research process. Participation was voluntary, and informed consent was obtained from all participants prior to data collection. Participants were assured of confidentiality and anonymity, and pseudonyms were used to protect personal identities. All data were collected and analyzed solely for academic research purposes.

4. Results

The findings of this study are organized into thematic categories derived from the analysis of interview data and field observations. These themes reflect how different dimensions of disaster knowledge influence community-based flood mitigation practices. The results demonstrate that disaster knowledge does matter; however, its influence varies across cognitive dimensions and is strongly shaped by contextual and governance-related factors.

a. Factual Knowledge: Awareness Without Structural Change

Most participants demonstrated adequate **factual knowledge** regarding floods. Community members were generally aware of the causes of flooding, such as high rainfall intensity, river overflow, clogged drainage systems, and land-use change. Participants were also familiar with flood warning signs and seasonal flood patterns based on prior experiences.

Despite this awareness, factual knowledge alone was insufficient to drive meaningful mitigation behavior. While participants could accurately describe flood risks, this understanding often remained at the level of recognition rather than action. Observational data confirmed that although residents were aware of flood-prone zones, settlements and daily activities frequently continued in high-risk areas without significant preventive modification. This finding suggests that factual knowledge contributes to awareness but does not automatically translate into long-term risk reduction.

b. Conceptual Knowledge: Understanding Risk Relationships and Collective Responsibility

Participants who demonstrated **conceptual knowledge** exhibited a deeper understanding of the relationship between environmental conditions, human behavior, and flood risk. These individuals were more likely to recognize how waste management, land conversion, and river maintenance collectively influence flooding.
Conceptual knowledge was particularly evident among community leaders and individuals actively involved in local organizations. These participants articulated floods not merely as natural events but as outcomes shaped by governance decisions and collective behavior. As a result, they were more inclined to support community-based mitigation initiatives such as river clean-up programs and neighborhood-level drainage maintenance. This finding indicates that conceptual knowledge plays a critical role in fostering collective responsibility and shared mitigation efforts.

c. Procedural Knowledge: Translating Understanding into Mitigation Action

Procedural knowledge emerged as a key determinant of practical mitigation behavior. Participants who possessed clear knowledge of *how* to implement mitigation measures—such as elevating house foundations,

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managing household drainage, or organizing community work activities—were more actively engaged in flood risk reduction practices.

Unlike factual knowledge, procedural knowledge was directly linked to observable mitigation actions. Field observations revealed that households with stronger procedural understanding were more likely to adopt preventive measures before the rainy season. However, access to procedural knowledge was uneven across the community, often depending on prior training, experience, or involvement in disaster-related programs. This disparity highlights the importance of targeted capacity-building initiatives that emphasize practical skills rather than general awareness alone.

d. Metacognitive Knowledge: Risk Reflection and Adaptive Decision-Making

Metacognitive knowledge—the ability to reflect on one's own understanding and limitations—was less commonly observed but proved highly influential in shaping adaptive mitigation behavior. Participants who demonstrated metacognitive awareness actively evaluated their preparedness, recognized gaps in their knowledge, and sought additional information or support.

These individuals were more likely to adjust mitigation strategies over time, learning from past flood experiences and modifying practices accordingly. Metacognitive knowledge also influenced decision-making related to resource allocation and participation in mitigation programs. This finding suggests that reflective capacity enhances learning and adaptation, enabling communities to refine mitigation practices in response to changing risk conditions.

e. Contextual Constraints on Knowledge Application

Although disaster knowledge influenced mitigation behavior, participants consistently emphasized contextual constraints that limited the application of knowledge. Economic limitations, lack of infrastructure support, and insufficient coordination with local authorities were frequently cited barriers. Even participants with strong procedural and metacognitive knowledge reported difficulties in sustaining mitigation efforts without institutional backing.

This finding underscores that disaster knowledge functions within broader governance and socio-economic contexts. Knowledge alone does not guarantee effective mitigation; rather, its impact depends on the availability of enabling conditions that support community action.

5. Discussion

This study set out to examine whether disaster knowledge matters in shaping community-based flood mitigation practices within a developing country context. The findings confirm that disaster knowledge does influence mitigation behavior; however, its impact is neither uniform nor automatic. Instead, the effect of knowledge varies significantly across cognitive dimensions and is mediated by contextual and governance-related factors. These results contribute to ongoing debates in disaster risk reduction (DRR) literature regarding the role of knowledge in translating awareness into sustained mitigation action.

The findings show that **factual knowledge**, while widely present among community members, has limited influence on long-term flood mitigation practices. This aligns with previous studies suggesting that awareness of hazards does not necessarily lead to behavioral change (Bubeck et al., 2012; Paton & Johnston, 2017). Similar to research conducted in other flood-prone regions, this study demonstrates that knowing

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what floods are and *why* they occur often results in passive awareness rather than proactive risk reduction. This supports the argument that disaster education programs focusing predominantly on information dissemination may be insufficient for fostering meaningful mitigation outcomes.

In contrast, **conceptual knowledge** plays a more substantive role by shaping how individuals understand the interconnectedness between environmental conditions, human activities, and flood risk. Participants who demonstrated conceptual understanding were more likely to frame floods as socially constructed risks rather than purely natural events. This finding reinforces earlier arguments in CBDRR literature that risk perception grounded in systems thinking enhances collective responsibility and community engagement (Shaw et al., 2014; Twigg, 2015). Unlike factual knowledge, conceptual knowledge appears to function as a bridge between awareness and collective mitigation initiatives, highlighting its importance in community-based governance frameworks.

The most significant influence on mitigation behavior was observed in **procedural knowledge**, which directly enabled communities to implement practical flood risk reduction measures. This finding is consistent with studies emphasizing the role of skills-based capacity building in disaster mitigation (Coppola, 2015; Paton, 2019). Participants who knew *how* to carry out mitigation actions—such as managing drainage, modifying housing structures, or organizing collective activities—were more likely to engage in sustained mitigation practices. This suggests that procedural knowledge serves as the operational core of disaster mitigation, transforming abstract understanding into concrete action.

Although less prevalent, **metacognitive knowledge** emerged as a critical factor in fostering adaptive and reflective mitigation behavior. Individuals with higher metacognitive awareness demonstrated the ability to evaluate their own preparedness, learn from past flood experiences, and adjust mitigation strategies accordingly. This finding extends prior disaster research by highlighting the importance of reflexivity and self-regulation, elements that have been underexplored in mitigation-focused studies. The presence of metacognitive knowledge enables communities not only to act but also to adapt, making mitigation practices more resilient to changing risk conditions.

Importantly, this study also reveals that disaster knowledge does not operate in isolation. Contextual constraints—such as economic limitations, inadequate infrastructure, and weak coordination with local authorities—significantly shape the extent to which knowledge can be applied. This finding resonates with governance-oriented studies that argue for the integration of community knowledge with institutional support systems (UNDRR, 2019). Even participants with strong procedural and metacognitive knowledge reported difficulties in sustaining mitigation efforts without enabling policy frameworks and material resources. Thus, disaster knowledge should be understood as a necessary but insufficient condition for effective mitigation.

From a theoretical perspective, this study contributes to DRR literature by demonstrating the value of applying the **Revised Bloom's Taxonomy** beyond educational contexts. By disaggregating disaster knowledge into cognitive dimensions, this research offers a more nuanced explanation of why some forms of knowledge are more effective than others in driving mitigation behavior. This multidimensional approach addresses a key limitation in previous studies that treated knowledge as a single construct, thereby oversimplifying its role in disaster mitigation.

From a practical standpoint, the findings suggest that disaster risk reduction programs should move beyond awareness-raising initiatives and prioritize the development of procedural and metacognitive capacities.

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Training programs that emphasize practical skills, reflective learning, and community problem-solving are likely to yield more sustainable mitigation outcomes. Furthermore, aligning community-based knowledge initiatives with local governance structures is essential for maximizing the effectiveness of mitigation efforts in developing country contexts.

6. Conclusion

This study examined whether disaster knowledge matters in shaping community-based flood mitigation practices within a developing country context. Drawing on a descriptive qualitative approach and employing the Revised Bloom's Taxonomy as an analytical framework, the findings demonstrate that disaster knowledge plays a significant but differentiated role in influencing mitigation behavior. Not all forms of knowledge contribute equally to flood risk reduction, and their effectiveness depends on both cognitive depth and contextual support.

The results indicate that factual knowledge primarily enhances awareness but has limited impact on sustained mitigation practices. In contrast, conceptual knowledge strengthens collective understanding of flood risk and encourages community engagement, while procedural knowledge directly enables the implementation of practical mitigation measures. Metacognitive knowledge, although less prevalent, emerges as a critical driver of adaptive learning and reflective decision-making, allowing communities to refine mitigation strategies based on past experiences and changing risk conditions. These findings confirm that disaster knowledge matters, but only when it extends beyond basic awareness toward actionable and reflective cognitive capacities.

From a theoretical perspective, this study contributes to disaster risk reduction literature by introducing a multidimensional cognitive approach to understanding disaster knowledge. By applying the Revised Bloom's Taxonomy in a disaster mitigation context, this research moves beyond conventional unidimensional treatments of knowledge and offers a more nuanced explanation of how different knowledge dimensions influence community-based mitigation behavior. This approach helps clarify why awareness-based interventions often fail to produce long-term risk reduction outcomes.

Practically, the findings suggest that disaster risk reduction policies and programs should prioritize capacity-building strategies that emphasize procedural and metacognitive knowledge rather than focusing solely on information dissemination. Community training initiatives should be designed to develop practical mitigation skills, encourage reflective learning, and strengthen collective problem-solving capacities. Furthermore, the effectiveness of community-based mitigation efforts depends on supportive governance structures, including access to resources, institutional coordination, and policy alignment between local authorities and communities.

Despite its contributions, this study has several limitations. The qualitative and context-specific nature of the research limits the generalizability of the findings to other regions or hazard types. Additionally, the study focuses on community perspectives and does not explicitly incorporate institutional or policy actor viewpoints. Future research could address these limitations by adopting comparative designs across multiple regions, integrating quantitative or mixed-method approaches, and examining the interaction between community knowledge and institutional governance mechanisms.

In conclusion, this study underscores the importance of reconceptualizing disaster knowledge as a multidimensional and action-oriented construct. Strengthening community-based flood mitigation in

developing countries requires not only increasing awareness but also fostering the cognitive and practical capacities that enable communities to translate knowledge into sustainable risk reduction practices.

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