



Submitted : 24 April 2026

Published : 30 June 2026

\*Corresponding author:  
Ikhwan Rahmatika Latif, Department of  
Public Administration, Teuku Umar  
University, Indonesia.  
E-mail: [ikhwanrahmatikalatif@utu.ac.id](mailto:ikhwanrahmatikalatif@utu.ac.id)

DOI:

<https://doi.org/10.54144/govsci.v7i1.150>

## RESEARCH ARTICLE

# Unpacking Failures and Challenges in Flood Mitigation: An Actuating-Based Policy Implementation Analysis in West Aceh

Erlinda Sarni Sidim<sup>1</sup>, Ikhwan Rahmatika Latif<sup>1\*</sup>, Ilham Mirza Saputra<sup>1</sup>, Aulia Risky<sup>2</sup>, Karuni Humairah Arta<sup>3</sup>, Najamudin<sup>1</sup>

**Abstract:** Flood disasters are increasingly frequent in Indonesia, yet the gap between mitigation policies and their on-ground outcomes remains persistently wide, particularly in decentralized, flood-prone regions such as West Aceh Regency. While existing studies have focused on policy design, institutional arrangements, or technical infrastructure, they have largely overlooked the execution dimension—how policies are actually translated into action. This study addresses that gap by analyzing flood mitigation implementation through the lens of George R. Terry’s actuating framework, which comprises motivating, directing, communicating, and leading. A qualitative case study design was employed, drawing on in-depth interviews with ten purposively selected informants (including BPBD officials, village heads, hamlet leaders, and affected community members), field observations, and document analysis. The findings reveal that the ineffectiveness of flood mitigation in West Aceh is not primarily due to lack of policies or budgets but to systemic failures in the actuating function: low and tokenistic community participation (motivating); inconsistent translation of directives into field action (directing); one-way and inequitable communication systems that exclude remotes hamlets (communicating); and reactive, spatially concentrated leadership that cannot enforce inter-agency synergy (leading). These failures produce a reactive drift, accountability void, and systematic erosion of public trust. The study’s primary contribution is a novel conceptual framework—Actuating-Based Disaster Governance—that explicitly models how motivating, directing, communicating, and leading mediate the integration of structural (infrastructure) and nonstructural (capacity-building) approaches. This framework shift disaster governance analysis from policy design to policy execution, offering both theoretical and practical tools for diagnosing implementation failures in flood-prone, decentralized settings.

### Keywords:

Flood Mitigation, Policy Implementation, Actuating Function, Disaster Governance, Local Government, West Aceh.

### About the Author

Erlinda Sarni Sidim is an alumna of the Public Administration Study Program at the Faculty of Social and Political Sciences, Teuku Umar University, in 2025. Her research interests lie in disaster management policy in regional government, which she chose as her thesis research topic. This study is the outcome of her thesis.

### About Author

**Erlinda Sarni Sidim**, **Ikhwan Rahmatika Latif**, **Ilham Mirza Saputra**, **Najamudin**, Department of Public Administration, Teuku Umar University, Indonesia; **Aulia Risky**, Department of Communication, Teuku Umar University, Indonesia; **Karuni Humairah Arta**, Darul Hikmah of Islamic Studies (STAI Darul Hikmah), West Aceh, Indonesia;

## 1. Introduction

Indonesia's geographical position at the intersection of major tectonic plates makes it one of the world's most disaster-prone countries, facing both geological and hydrometeorological hazards (Mulki & Alhadi, 2022; Zhao et al., 2023). However, the persistence and increasing frequency of flood disasters—1,420 incidents in 2024 alone (BNPB, 2025)—reveal a fundamental problem: flood mitigation policies are repeatedly failing at implementation, not merely at planning or design. While Indonesia has established a comprehensive legal framework (Law No. 24/2007 on Disaster Management) and institutional mechanisms (BNPB at the national level and BPBD at the regional level), the gap between policy intent and on-the-ground outcomes remains wide. This study argues that the primary source of failure lies in the actuating function—the execution, coordination, and leadership dimensions of policy implementation—rather than in planning or organizing per se. Focusing on West Aceh Regency, a region that experienced recurrent flooding in 2024, affecting over 40 villages, this research uncovers why actuation-based failures occur and what specific challenges local governments face when translating flood mitigation policies into action (Irsyam et al., 2020; Zhao et al., 2023).

Globally, hydrometeorological risks are increasing due to climate change and environmental degradation, demanding comprehensive mitigation strategies across all levels of government (Hutchings & Mooney, 2024; UNDRR, 2019). National institutions such as the National Disaster Management Agency (*Badan Nasional Penanggulangan Bencana*, BNPB) and regional bodies play a crucial role in reducing risks through policy synergy, governance, and public participation, particularly by implementing targeted programs that enhance community resilience and preparedness for hydrometeorological events (Kazhimi, 2020; Lomban & Ariyani, 2023; Syugiarto et al., 2022). Yet, evidence from Indonesia shows that even well-designed flood mitigation policies often fail because of weak execution—poor inter-agency coordination, inadequate community engagement, and ineffective leadership at the field level (Fahrimal et al., 2023; Septikasari et al., 2022).

In West Aceh Regency, flood incidents in 2024 followed a recurring pattern. Table 1 (presented after this paragraph) summarizes the three major flood events that occurred in May, September, and October 2024, affecting sub-districts such as Woyla, Johan Pahlawan, Meureubo, and Arongan Lambalek, with water levels reaching 50-60 cm in September. The table is placed here to provide empirical evidence of the repeated nature of flooding, which is not merely a natural phenomenon but a symptom of systematic implementation failures. The data show that floods hit different sub-districts across different months, indicating that no single area is permanently safe, pointing to a lack of targeted, sustained mitigation efforts.

**Table 1. Information regarding flooding events in West Aceh Regency throughout 2024**

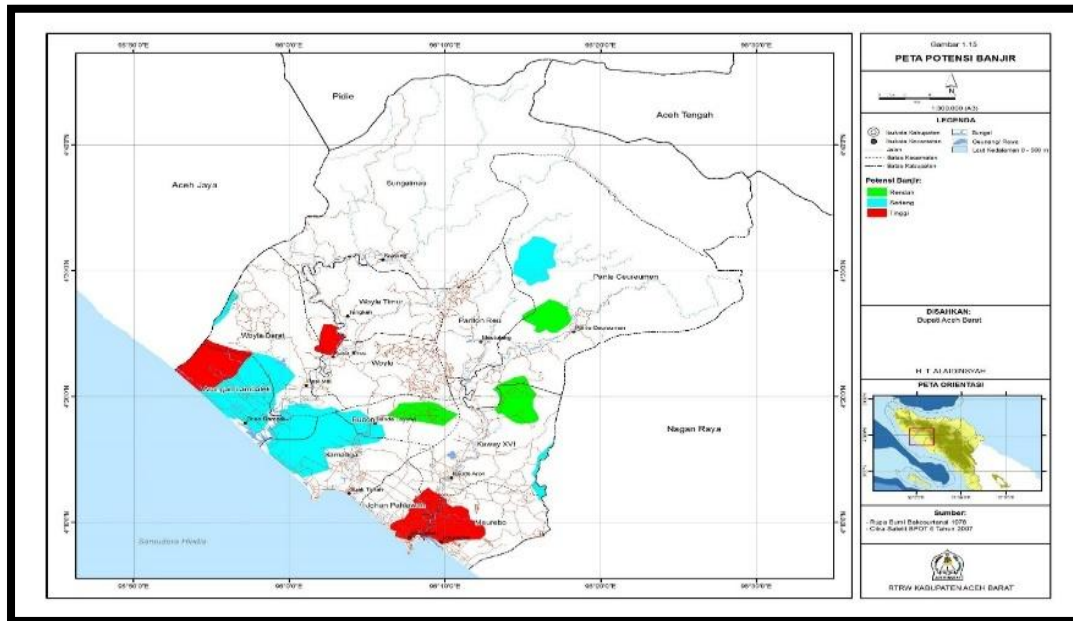
Date	Affected Districts	Water Level	Notes
15 May 2024	Woyla District, Woyla Induk District, East Woyla District, Bubon District, Johan Pahlawan Meureubo District, and Samatiga District.	20-30 cm	29 villages from seven sub-districts were submerged by floods in West Aceh Regency
20 September 2024	West Woyla District, Pante Ceureumen District, Arongan Lambalek District, Johan Pahlawan Meureubo District, and Sungai Mas District.	50-60 cm	11 villages affected by flooding in West Aceh Regency
15 Oktober 2024	Arongan Lambalek	-	Two villages were affected by flooding, namely Gampong Karang Hampa and Gunong Pulo.

Source: From BPBA, RRI, MonitorIndonesia; processed by researchers

Furthermore, the flood potential map (Picture 1) identifies Johan Pahlawan, Meureubo, and Arongan Lambalek as high-risk zones. Picture 1 is placed after the next sentence to visually confirm the spatial

concentration of risk. This map is not merely illustrative; it demonstrates that the local government possesses adequate hazard mapping, yet the persistence of floods in precisely those mapped areas suggests a failure of actuation—i.e., the inability to translate risk knowledge into coordinated, on-the-ground preventive actions. Thus, policy interventions must go beyond reactive responses and address why existing plans and maps are not effectively operationalized.

**Picture 1. Potential flood disaster map of West Aceh Regency.**



Source: BPBD Aceh Barat.

The map confirms high-risk zones, yet recurring floods in these areas indicate actual failures.

Numerous studies have examined flood mitigation challenges in Indonesia, focusing on resource constraints, weak institutional capacity, and low community participation. International research highlights that the effectiveness of flood mitigation depends on institutional strength, governance quality, and community involvement (Awoonor, 2025; Bulkeley et al., 2011; Cid & Lerner, 2023; Sharma, 2023). However, these share two critical limitations. First, most treat implementation as a “black box,” emphasizing input factors (budget, infrastructure) or outcome indicators (reduced losses) without examining the process of execution. Second, few studies in the Indonesian context apply management theory to dissect implementation failures; even when they mention coordination or leadership, they fail to systematically operationalize these as part of the actuating function in policy implementation.

Specifically, while planning (e.g., spatial planning, risk mapping) and organizing (e.g., institutional structures, division of tasks) have received considerable attention, the actuating function—which includes motivating subordinates, directing daily operations, communicating across agencies, and leading in emergencies—remains underexplored. This gap is particularly problematic in disaster governance, where success or failure often hinges on real-time decisions, interpersonal dynamics, and on-site leadership rather than on ex-ante plans or organizational charts. Therefore, the position of this article is to fill this gap by shifting the analytical lens from what policies are designed to how they are actually executed through the actuating function, using West Aceh as a case study.

Management theory distinguishes four core functions: planning, organizing, actuating, and controlling (Terry, 1953). While planning and organizing have dominated policy implementation studies (e.g., Sabatier & Mazmanian, (1980)), actuating—defined as the set of activities that direct, motivate, communicate with, and lead human resources to achieve organizational goals—is often treated as residual. This study contends

that actuating is more crucial than planning or organizing in the context of West Aceh for three reasons.

First, flood mitigation in West Aceh suffers from a plan-implementation gap rather than a planning deficit. Existing master plans, spatial plans (RTRW), and disaster risk reduction plans are already in place. The recurring failures—uncoordinated evacuation, ignored early warnings, and lack of community mobilization—stem from poor execution of those plans. Actuating addresses this gap directly. Second, the institutional environment in West Aceh is characterized by multi-agency coordination (BPBD, Public Works, Social Service, TNI/Polri, and village governments). Planning and organizing can define roles, but only actuating—through directing and communicating—ensures that these actors actually work together during a flood event. Without effective actuating, organizational structures remain paper exercises. Third, disasters demand discretionary leadership. Unlike routine public services, flood emergencies require frontline officials to make rapid decisions, motivate volunteers, and adapt to unfolding situations. Actuating (specifically, leading) provides the theoretical tools for analyzing these dynamics, whereas planning or organizing assumes stability and predictability. Hence, this study adopts Terry's actuating framework—operationalized through four indicators: motivating, directing, communicating, and leading—to systematically investigate implementation failures and challenges in West Aceh's flood mitigation. Based on the above, this study aims to: (1) analyze how local governments in West Aceh Regency implement flood mitigation policies from the perspective of the actuating function (motivating, directing, communicating, leading); and (2) identify the specific challenges that hinder effective actuation in flood mitigation.

## 2. Methods

This study employed a qualitative case study design to examine the implementation of flood mitigation policies in West Aceh Regency, focusing on the actuating function (motivating, directing, communicating, leading) as conceptualized by [George R. Terry \(1953\)](#). A case study approach was chosen because it allows an in-depth, contextualized understanding of how policy implementation failures occur within a specific local governance setting ([Yin, 2017](#)). West Aceh was selected as the research location due to its recurrent flood events—three major incidents in 2024 affecting over 40 villages—and the persistent gap between existing policy frameworks and on-the-ground outcomes.

The research was conducted from November 2024 to February 2025 across three high-risk sub-districts: Johan Pahlawan, Meureubo, and Arongan Lambalek, as identified in the flood potential map of the Regional Disaster Management Agency (BPBD) of West Aceh. Informants were selected using purposive sampling based on the following criteria: (a) direct involvement in flood mitigation policy formulation or implementation at the district or village level; (b) representation from multiple institutional levels (BPBD, village government, hamlet leadership); (c) direct experience as flood-affected community members living in high-risk zones; and (d) willingness to provide informed consent. A total of ten informants participated: one BPBD official (Head of Prevention and Preparedness), one Keuchik (village head), one Kepala Dusun (hamlet head), two community members from the existing interview records, and an additional five community members representing flood-affected villages (Meunasah Rambot, Leuhan, Pasi Mesjid, and surrounding areas). Thus, the final sample comprised five government/formal representatives and five directly affected residents, ensuring a balanced perspective between policy executors and policy recipients. To protect anonymity, each informant was assigned a code consisting of initials and age. Semi-structured interviews were conducted using an interview guide derived from Terry's four actuating indicators. Each interview lasted between 45 and 90 minutes, with an average duration of 60 minutes. All interviews were conducted in Bahasa Indonesia or Acehese based on informant preference, audio-recorded with permission, and transcribed verbatim.

To ensure data triangulation, three collection methods were employed. First, in-depth interviews (n=10) provided primary qualitative data on perceptions, experiences, and institutional practices. Second, field observations were carried out at nine locations across the three sub-districts, focusing on physical infrastructure (drainage and embankments), early warning systems, community preparedness activities, and

inter-agency coordination meetings; observational notes were recorded in a structured log. Third, document analysis included legal and policy documents (Law No. 24/2007 on Disaster Management; Aceh Qanun No. 5/2010; local action plans; and BPBD standard operating procedures); disaster reports from BNPB and BPBA (2023–2024); and relevant news media from official websites (BPBA, Media Center Aceh, Antara Aceh, and RRI).

Data analysis followed the interactive thematic model of Miles et al. (2014), consisting of three concurrent flows. Data condensation involved repeated reading of all interview transcripts, observation notes, and documents. A coding mechanism was applied using both deductive codes (derived from Terry's four actuating indicators: motivating, directing, communicating, and leading) and inductive codes emerging from field data (e.g., "sectoral ego," "one-way socialization," and "late response"). Coding was performed manually with the assistance of Microsoft Excel and cross-checked by two researchers to ensure intercoder reliability. Data display organized coded data into thematic matrices and conceptual diagrams (presented in the Results and Discussion section), with each theme linked to specific evidence such as verbatim quotes, observation logs, and document excerpts. Conclusion drawing and verification involved iterative interpretation and constant comparison across data sources. Verification was achieved through triangulation (cross-checking interviews, observations, and documents) and member checking, whereby key findings were returned to five informants for validation and correction.

Trustworthiness was established using Lincoln et al. (1985) four criteria. Method triangulation, member checking, and prolonged fieldwork (four months) helped ensure that the information was reliable. Transferability was addressed by providing a thick description of the research context, including West Aceh's geographical, institutional, and social characteristics, enabling readers to assess applicability to other settings. Dependability was maintained through an audit trail: all interview transcripts, coding matrices, and analytical decisions were documented and are available for review. Confirmability was supported by a reflexive journal kept by the researchers and by grounding all findings in raw data (verbatim quotes, observation logs, document excerpts). Finally, it is important to clarify the theoretical framework used in this study. The analysis relies exclusively on George R. Terry's (1953) actuating function, which comprises four indicators: motivating (encouraging participation and awareness), directing (providing clear guidance and operational instructions), communicating (ensuring effective information flow), and leading (fostering coordination and synergy across institutions). Terry's framework is applied consistently throughout the analysis of flood mitigation implementation in West Aceh Regency.

### 3. Results and Discussion

This section presents the findings from our research conducted in West Aceh Regency from April and May 2025, involving in-depth interviews with ten informants (two officials from BPBD Aceh Barat, three *Keuchiks* representing each sub-district that experienced flooding (Johan Pahlawan, Meureubo, and Arongan Lambalek) and five community members from the flood-affected areas), field observations, and document analysis. The findings are organized around George R. Terry's (1953) actuating framework, which comprises motivating, directing, communicating, and leading, while also incorporating structural and non-structural mitigation efforts undertaken by the local government. The core argument emerging from the data is that flood mitigation in West Aceh suffers not from a lack of policies or plans, but from persistent failures in policy execution—particularly the uneven and incomplete implementation of the actuating function across different villages and sub-districts.

#### The Gap Between Policy and Implementation

The research findings suggest that the central problem is not the absence of flood mitigation policies, but rather the challenges in translating those policies into concrete, on-the-ground actions. This finding is consistent with earlier studies indicating that shortcomings in local disaster mitigation are more significantly affected by inadequate governance in implementation than by the policies themselves (Andrew, 2018; Aylett,

2015). In West Aceh, the local government has established a legal and institutional framework, including Aceh Qanun Number 5 of 2010 and the operational role of BPBD. However, interview data reveal a consistent pattern: while government officials describe systematic efforts, many communities report never having received the promised interventions. This gap between what is planned and what is executed forms the central theme of this analysis.

### **Low Community Participation in Flood Mitigation**

Research results show that community participation in flood mitigation in West Aceh remains low, but more importantly, they reveal that this low participation is not a natural or inevitable condition. Instead, it is systematically produced by the way government outreach is designed and delivered. Community involvement is more dominant during the emergency response phase than during pre-disaster activities such as drainage cleaning, environmental management, or disaster training. This pattern indicates that the community perceives mitigation as a government task rather than a collective responsibility. However, to stop at perception would be misleading; the perception itself is shaped by a long history of tokenistic engagement.

The government's preferred mode of outreach reflects the low level of participation. The local government, through BPBD, conducts socialization and training programs, but these are overwhelmingly one-way and formal. A typical event consists of a BPBD official delivering a lecture in a school or village hall, followed by a brief question session that rarely leads to follow-up. There is no sustained engagement and no mechanism for community input to influence actual planning or budgeting. A resident from Gampong Meunasah Rambot explained:

*"We feel the training is beneficial, but not all areas have experienced it. Here, we are still usually uninvolved in training and education activities"* (MM, 55 years old).

Another community member from Pasi Mesjid added:

*"We rarely receive encouragement or motivation from the local government to become involved. People here need to be mobilized, because floods happen so often that many still consider them normal"* (FM, 45 years old).

These testimonies show that participation is not absent by chance; it is absent because the government's approach does not create pathways for genuine involvement. Several key actors shape this dynamic. BPBD officials plan and run outreach programs at the district level. At the village level, *keuchik* (village heads) and *kepala dusun* (hamlet heads) act as gatekeepers of information. The *keuchik* of Gampong Leuhan acknowledged that his village had submitted a formal request for a river barrier but received no response from higher authorities (IW, 55 years old). This demonstrates that even when village leaders attempt to channel community needs upward, the system does not guarantee a response. Furthermore, in some cases, information provided to the *keuchik* never reaches ordinary residents. A resident from Pasi Mesjid stated:

*"Sometimes the information reaches the Keuchik, but it does not go further to ordinary residents"* (FM, 45 years old).

This filtering—whether intentional or not—creates a situation where participation is mediated by local power structures, and many citizens are effectively excluded from the planning process. Concrete forms of failed participation are observable across the regency. First, communities are invited to socialization events, but their input is never acted upon. The *keuchik* of Gampong Leuhan explicitly stated that despite submitting a request for a river barrier:

*"until now there has been no confirmation from the relevant authorities"* (IW, 55 years old).

This instance is a concrete case of exclusion from decision-making: the community was heard but not

heeded. Second, the only form of “participation” that occurs regularly is during emergency response—when residents are told to evacuate or receive aid. Pre-disaster planning meetings, if they exist, do not include ordinary villagers. Third, community members report that outreach is purely formal and lacks substance. Another resident from Gampong Pasi Mesjid said:

*“We have never been invited to any meeting where they discuss what to do about the river. The government only arrives after the flood has ended to assess the damage”* (AB, 57 years old).

These examples confirm that participation, where it exists, is merely symbolic. Local cultural and bureaucratic factors reinforce this pattern. Acehese society has strong traditions of cooperation, but the bureaucratic culture within local government treats communities as passive beneficiaries. BPBD’s own language reveals this orientation. The BPBD official repeatedly used verbs such as “provide education,” “offer training,” and “form disaster-preparedness villages” (TS, 52 years old). These verbs assume a one-way flow of expertise, not a collaborative partnership. There is no mention of listening, co-designing, or incorporating local ecological knowledge. This bureaucratic habit—seeing the community as an object of intervention rather than a subject of change—is a deep-seated cultural factor within the local government. Additionally, the government’s operational rhythm is reactive: budgets and attention are allocated to emergency response rather than participatory planning. Consequently, the very infrastructure of participation—regular public forums, feedback mechanisms, and transparent planning—is absent.

Regarding the question of trust, the data do not show overt distrust toward the government. Instead, they reveal a more subtle phenomenon: learned apathy. Residents have experienced repeated floods and have noticed that government promises often go unfulfilled. Rather than actively distrusting, they have come to expect that nothing will change. This is not apathy as a cultural trait; it is apathy produced by a governance system that consistently fails to deliver meaningful participation. Communities are not rebelling; they are quietly giving up because they have learned that their voice is not relevant. As one community member from Pasi Mesjid put it:

*“Many still consider (floods) as normal”* (DA, 40 years old).

Public outreach in West Aceh functions as a formality rather than a genuine participatory process. BPBD conducts socialization events to meet reporting requirements, but these events do not result in changes to policy or planning. They are tokenistic exercises that satisfy the bureaucratic need to show “community engagement” on paper. Village requests are routinely ignored, and many residents have never even been invited to a planning meeting, confirming that outreach is a ritual of legitimation, not a tool of empowerment. In academic terms, this form of engagement is tokenistic participation (Arnstein, 1969), where citizens are informed and consulted but have no power to ensure their views are heeded. It also approximates pseudo-participation, where communities are given a false sense of influence, when in reality their role is merely to legitimize decisions already made. When BPBD creates a “disaster-preparedness village” without involving the community in its design, it engages in pseudo-participation. The community’s name is attached to the program, but it is not owned by them. These practices represent a fundamental failure of participatory governance, which requires not just consultation but shared authority, co-design, and accountability. Without these, participation becomes a tool of legitimation rather than a pathway to resilience. The implications of this failure are significant for disaster mitigation. Without genuine participation, prevention efforts cannot be optimized, and communities remain dependent on the government. The cycle of vulnerability continues because communities have never been equipped with the skills, knowledge, or motivation to act independently. As one resident of Pasi Mesjid concluded:

*“People here need to be mobilized, because floods happen so often that many still consider them normal”* (IS, 39 years old).

That sentence captures the tragedy of tokenistic participation: it does not create resilience; it normalizes disaster.

## **Lack of Synchrony Between Policy Directives and Field Implementation**

### **The policy-implementation gap: between regulatory formalism and operational vacuum**

In [George R. Terry's \(1953\)](#) framework of management, the directing function plays a crucial role in turning policy intentions into real-world results. Directing involves giving clear instructions, delegating authority, providing technical guidance, and overseeing task execution. When directing works well, it connects the theoretical aspects of planning with the practical side of taking action. Conversely, a lack of leadership or disjointedness can cause even the most well-crafted policies to fail, resulting in what researchers in the field refer to as a policy-implementation gap ([Pressman & Wildavsky, 1973](#)). In West Aceh Regency, this gap goes beyond just a delay in execution; it highlights a deeper structural disconnect between the rules on paper and what actually happens in practice. The formal policy framework includes Aceh Qanun Number 5 of 2010, local disaster action plans, and the standard operating procedures of BPBD, all of which come together as a cohesive collection of documents. Responsibilities are laid out, coordination methods are explained, and timelines are presented. However, there is a noticeable lack of translating these documents into practical actions at the field level.

An official from BPBD shared a detailed array of interventions, such as river normalization, the building of embankments, and the implementation of training programs (TS, 53 years old). However, these policies appear to have no tangible effect on the affected villages. The keuchik of Gampong Leuhan expressed concern:

*Noting that the government's efforts in structural mitigation have not yet been observed (IW, 55 years old).*

Whenever there is extended heavy rainfall, the river tends to overflow, as this small community is situated close to the Meureubo River and the terrain is quite low. A community member from Pasi Mesjid shared their concern:

*To date, there has been no action from the government or BPBD to repair or build flood control infrastructure (SK, 48 years old).*

The accounts shared highlight a significant contradiction: while policies are in place, their execution is lacking. The directing function, which was intended to turn these policies into specific, localized actions, has not succeeded in fulfilling its mediating role. The gap exists not by chance; it arises from the lack of a binding mechanism that effectively turns broad directives into concrete, well-resourced, and time-sensitive tasks at the village level. According to Terry, directing involves more than just giving orders; it also entails a constant evaluation to ensure that those orders are understood, accepted, and carried out effectively. In West Aceh, there is no verification process taking place. The outcome is a regulatory framework—one in which policies serve symbolic roles (indicating governmental intentions) yet lack practical effectiveness. This rigid structure often leaves no room for flexibility, creativity, or decisive action.

### **Bureaucratic interpretation problem: the fragmentation of directives through multi-level governance**

The second analytical dimension concerns how policy directives are interpreted as they move through various levels of governance. Terry's idea of directing suggests a straightforward and structured chain of command, where guidance moves from the top down with little alteration. In Indonesia, the process of decentralized disaster governance involves a lengthy, segmented implementation chain. It starts with provincial agencies,

then goes to district BPBD, then to sub-district coordinators, and finally to village heads. Ultimately, it reaches hamlet leaders and volunteers. Every connection in this chain opens up possibilities for new interpretations, selective filtering, and potential delays.

This phenomenon, referred to in implementation literature as policy distortion, becomes more pronounced when directives are articulated in vague, aspirational language instead of clear, operational terms. An official from BPBD stated that they consistently offer guidance:

*"Whenever there are mitigation activities, we give direct instructions to the village apparatus and volunteers"* (TS, 52 years old).

In contrast, the Keuchik of Gampong Leuhan shared a different perspective:

*"Directions have not been implemented in our area." "When floods happen, we often discover ourselves unsure of how to respond"* (IW, 55 years old).

A member of the Pasi Mesjid community shared their thoughts:

*"There has been no guidance from the government... no outreach has given us any instructions on what to do before, during, or after a flood"* (SK, 48 years old).

The differing accounts are not just about miscommunication; they highlight a more profound issue where the leadership lacks the tools needed to guarantee consistent understanding and implementation. Terry suggests that effective directing goes beyond simply giving orders; it also involves creating standardized procedures through written manuals, training, and supervision. In West Aceh, there is a noticeable lack of these supporting instruments. Village heads and hamlet leaders make sense of unclear directives by drawing on their personal experiences, available resources, and their evaluations of potential risks. As a result, certain villages benefit from several interventions while others receive none, and there is a lack of coordination to ensure that efforts are balanced across communities facing similar risks. This fragmentation is expected; it is a foreseeable result of a guiding system not structured to accommodate multi-level, multi-actor execution. Different implementers can interpret the same policy directive in various ways without a common understanding. Such fragmentation can result in outcomes that are inconsistent, unpredictable, and vary significantly across different locations.

### **Consequences for mitigation governance: reactive drift, accountability void, and systemic erosion of directing**

The failure to synchronize policy directives with field implementation produces three profound consequences for flood mitigation governance in West Aceh, each of which can be traced directly to weaknesses in Terry's directing function. [Picture 2](#) below illustrates how these three consequences—Reactive Drift, Accountability Void, and Systemic Erosion—interconnect and collectively lead to ineffective flood mitigation governance. First, reactive drift. Instead of guiding proactive risk reduction, the directing function only mobilizes after a disaster occurs. The hamlet head of Pasi Leuhan observed:

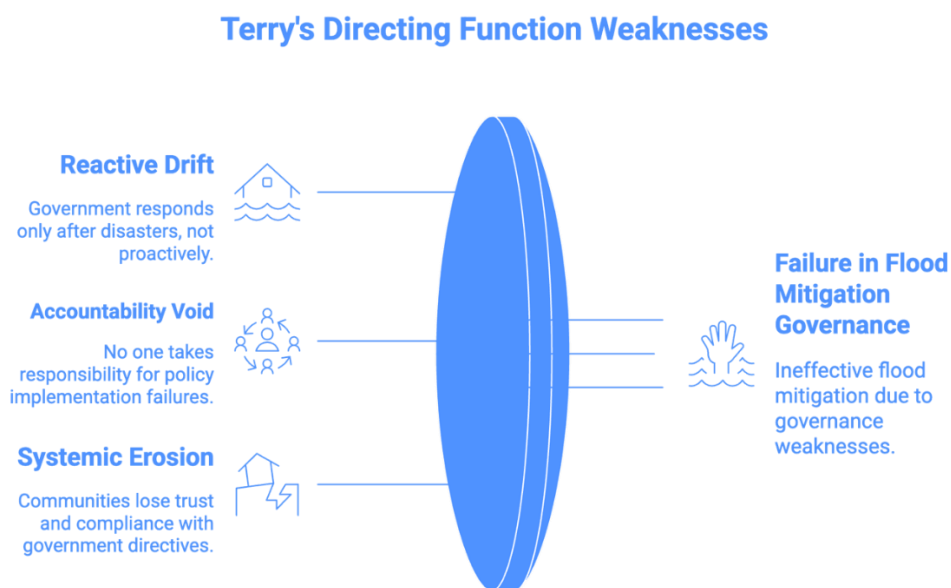
*"The government only arrives after the flood is over"* (IW, 55 years old).

This reactive orientation is antithetical to Terry's conception of directing, which emphasizes foresight, planning, and continuous guidance. When directing is absent before a crisis, the system defaults to emergency response, leaving underlying vulnerabilities untouched. The result is a cyclic pattern: a flood occurs, the government responds, communities recover, and no preventive measures are taken before the next flood. This reactive drift increases long-term costs and normalizes disaster as an unavoidable feature of life, as captured by a community member from Pasi Mesjid:

*"Floods happen so often that many still consider them normal"* (HS, 50 years old).

Second, accountability is void. When policies are not implemented, who bears responsibility? The directing function, in Terry's framework, includes a feedback and control mechanism that identifies deviations from plans and assigns corrective action. In West Aceh, no such mechanism exists. The BPBD can claim that directives were issued. Village heads (*Keuchik*) can claim that resources or clear instructions never arrived. Communities see only inaction. This accountability void is a classic feature of fragmented implementation systems (Peters, 2015): responsibility is so widely distributed that no single actor feels answerable for the gap. As a result, the gap persists without triggering organizational learning or reform. The *Keuchik* of Gampong Leuhan's statement that his village's formal request for a river barrier received no response (IW, 55 years old) exemplifies this void: a request was made, but no feedback loop existed to compel a reply or action.

**Picture 2. Terry's Directing Function Weaknesses and Their Consequences for Flood Mitigation Governance in West Aceh**



Source: Authors' illustration (2025)

Third, there is a systemic erosion of the directing function within governance. Perhaps most damaging is the long-term erosion of the directing function itself. When communities repeatedly experience that directives do not translate into action, they cease to seek direction, to trust it, or to follow it. Such behaviour is not overt resistance but a quiet withdrawal. The community member from Pasi Mesjid concluded, *"People here need to be mobilized, because floods happen so often that many still consider them normal"* (HS, 50 years old). This normalization of disaster signifies that the social contract between state and citizen—in which the state provides protection and citizens comply with guidance—has broken down at the most basic level. Directing, in Terry's sense, presupposes a reciprocal relationship: leaders provide direction, followers accept and act upon it. When that reciprocity collapses, directing becomes a performative ritual rather than a management function. Restoring it requires not merely better communication but a fundamental re-engineering of the implementation chain: written, locally contextualized technical guidelines; regular supervision and feedback loops; transparent tracking of village requests; and clear accountability for non-compliance. Without these, the gap between policy and practice will remain, and flood mitigation in West Aceh will continue to fail as a managerial and governance enterprise.

## Limitations of Communication Systems in Disaster Mitigation

In the hamlets of West Aceh affected by flooding, residents frequently express their frustration not with the lack of flood warnings, but rather with the fact that these warnings often come too late, after the water levels have already surged. The hamlet head of Pasi Leuhan shared, during a major flood, we often get evacuation information slowly since our hamlet is not prioritized:

*"There are instances when the relevant authorities arrive in the field only after the flood has subsided"* (IW, 55 years old).

This account highlights a contradiction central to disaster governance in the area: while the government is confident in the effectiveness of its communication system, those who require information the most often find themselves either uninformed or receiving it too late to take action. The difference between transmission and reception is not just a technical issue; it is a fundamental aspect of how communication is structured, supported, and spread throughout various spaces and social hierarchies.

The troubling aspect of this gap is that it is not arbitrary. In West Aceh, communication failures tend to reflect a recurring pattern influenced by both spatial and political factors. Villages that are nearer to the district capital or have better ties to local leaders tend to receive warnings more quickly and consistently. Remote hamlets, such as Pasi Leuhan, often find themselves overlooked in various considerations. An official from BPBD shared insights about a multichannel system that includes radio, social media, internet platforms, and direct coordination with village heads (TS, 52 years old). However, these channels rely on infrastructure and literacy that many residents do not possess. In remote areas, phone signals can become quite weak. Accessing the internet often depends on having data plans and smartphones. Additionally, social media platforms assume that users possess certain digital skills, which may not be the case for older individuals or those with limited financial resources. Believing that a message sent is automatically a message received can lead to significant misunderstandings. Terry (1953) suggests that communication should be viewed not merely as the act of sending messages, but rather as the process of achieving a mutual understanding. According to that measure, the communication system in West Aceh is mostly ineffective for its most at-risk communities.

The lack of effective feedback loops makes the issue even more challenging. A member of the Pasi Mesjid community expressed, *"We feel that there is a lack of openness, direction, and socialization about what we should do when floods come"* (HS, 50 years old). The feeling of being left out of the communication process goes beyond just emotions; it highlights a malfunctioning feedback system. When communities find themselves unable to ask questions, report on local conditions, or receive confirmation of their messages, they experience communication as a one-sided monologue. In disaster communication theory, Reynolds and Seeger (2005) emphasize that effective crisis communication requires a dynamic exchange that fosters the sharing of information and personal experiences, not merely one-way broadcasting. The absence of such exchange in West Aceh means that policies fail to resonate with the actual needs of the community, and local knowledge—which could improve early warning and response—remains untapped. The Keuchik of Gampong Leuhan shared that his village had formally requested a river barrier, but unfortunately, they have not received any response to date (IW, 55 years old). This silence is not just a small mistake; it represents a deeper issue that undermines trust. As time goes by, people begin to move away from depending on official information. People often rely on informal networks—such as neighbors, family, and local leaders—where misinformation can circulate freely. Some residents adopt a sense of resignation, with sentiments like, *"Many still views (floods) as just a part of life"* (SY, 39 years old). The way we have come to accept disasters as normal reflects a sense of learned helplessness that arises from ongoing failures in communication.

The inequality present in this system is not a mere coincidence. This approach to governance prioritizes the distribution of communication resources based on visibility and political advantage, rather than focusing on vulnerability and genuine need. Remote hamlets often find themselves with limited warnings, guidance, and information following disasters. This means they are more prone to experiencing greater losses and tend

to take longer to bounce back. This situation exemplifies a well-known issue: the individuals who stand to benefit the most from information are often the ones who have the hardest time accessing it. The effects ripple through all other functioning aspects. Without effective communication, directing cannot issue clear instructions; motivating cannot inspire participation; and leading cannot coordinate multi-agency responses. To disrupt this ongoing cycle, West Aceh should view communication not merely as a one-way broadcast but as a practice rooted in relationships. This approach should emphasize fairness, ensure that feedback is actively sought and addressed, and work towards rebuilding trust through openness and attentiveness.

### **Weak Leadership in Encouraging Mitigation Synergy**

According to [George R. Terry's \(1953\)](#) framework, the leading function is responsible for mobilizing, directing, and motivating human resources to work effectively and efficiently toward organizational goals. Leadership, from this perspective, goes beyond just giving orders; it involves motivating others, building trust, and guiding various individuals to work together towards common goals. In flood mitigation efforts in West Aceh Regency, leadership tends to operate more within procedural and administrative frameworks rather than serving as a strategic catalyst that fosters collaboration. This limitation becomes particularly evident in the fragmented approach to mitigation initiatives, where programs often operate in isolation instead of being woven into a unified risk reduction strategy. The current circumstances suggest that the primary function has not fully embraced its responsibility to foster harmony among institutional initiatives and facilitate collaborative efforts.

Field interviews reveal that coordination challenges continue to persist, often stemming from limitations in leadership. One of Keuchik shared:

*Coordination meetings take place, yet they often feel more like formalities." "Each agency continues to operate on its program without genuine integration" (MK, 47 years old ).*

This observation indicates that the current coordination mechanisms tend to be more symbolic than effective, lacking the ability to foster meaningful collaboration among stakeholders. Rather than encouraging a sense of shared responsibility for mitigation goals, leadership practices often strengthen the divisions between sectors, leading agencies to focus on their individual mandates instead of working towards common outcomes. In many instances, this scenario has resulted in overlapping initiatives in certain regions while leaving others overlooked, which has further intensified spatial disparities in mitigation efforts within flood-prone communities.

The ongoing presence of sectoral ego and the lack of effective communication between agencies highlight more profound structural and cultural challenges within local governance. In this context, established bureaucratic habits that hinder collaboration across sectors, as well as the structures of institutions, seem to limit leadership. However, to move beyond describing these symptoms, it is necessary to diagnose why sectoral ego persists and why coordination remains merely formal. The lens of collaborative governance, as developed by [Ansell & Gash \(2008\)](#), provides a systematic framework for identifying the structural barriers that prevent the emergence of synergy among diverse stakeholders.

According to [Ansell & Gash \(2008\)](#), collaborative governance is a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative. Its success depends on a virtuous cycle of trust-building, face-to-face dialogue, commitment to shared process, and tangible small wins. In West Aceh, this virtuous cycle is broken, and three structural barriers can be identified. First, a fundamental power and resource imbalance among agencies. BPBD is formally responsible for disaster mitigation, but it lacks hierarchical authority over other sectoral agencies such as Public Works (*Pekerjaan Umum dan Perumahan Rakyat*, PUPR) or Social Service, which control their own budgets and have their own mandated priorities. As a result, BPBD cannot compel collaboration; it can only request it. This imbalance is not a matter of individual leadership failure but an institutional design flaw: the coordinating agency is placed at a lower echelon than the agencies it is

supposed to coordinate. Second, the absence of an institutionalized forum for sustained, inclusive deliberation. Coordination meetings occur sporadically, often after a disaster, and do not include all relevant stakeholders—particularly village governments and community representatives. Without a standing forum where participants meet regularly, share information, and make binding decisions, collaboration remains episodic and symbolic. Third, the lack of formal accountability mechanisms. In the absence of clear performance indicators, monitoring systems, and consequences for non-collaboration, agencies have no incentive to move beyond their sectoral mandates. The meeting becomes an end in itself: attendance is recorded, minutes are produced, but no binding follow-up actions are enforced. These three structural barriers—power imbalance, absent institutional forum, and weak accountability—are not merely contextual factors; they are the very mechanisms that produce and reproduce sectoral ego and formalistic coordination.

As a result of these structural barriers, the leadership function operates within a system that systematically disincentivizes genuine collaboration. This condition directly affects how effective flood mitigation efforts can be. Instead of operating as a unified system, efforts to mitigate flood risks tend to be scattered, reactive, and not adequately responsive to the intricate challenges posed by flooding. This fragmentation ultimately obstructs the creation of thorough strategies that are essential for managing floods effectively, as it prevents the integration of diverse resources and expertise needed to address the multifaceted nature of flood risks. When leadership fails to foster trust and encourage collaboration—not because individual leaders are incapable, but because the institutional architecture does not reward or enable such behavior—it significantly hinders the effectiveness of integrated disaster governance.

Research in collaborative governance emphasizes that strong leadership is crucial for connecting different institutions and promoting teamwork in addressing challenges (Ansell & Gash, 2008). However, leadership alone cannot overcome structural barriers that are embedded in the very design of inter-agency relations. Without addressing the power imbalance, creating a binding collaborative forum, and installing accountability mechanisms, efforts to encourage mitigation synergy will remain trapped in procedural rituals.

Collectively, these findings indicate that enhancing leadership in disaster mitigation necessitates a transition from mere administrative coordination to more transformative and collaborative leadership approaches. This process focuses on empowering local leaders to foster dialogue, cultivate trust among various sectors, and harmonize differing institutional interests in pursuit of a shared mitigation agenda. Without a change in approach, flood mitigation efforts will remain isolated, hindering their capacity to tackle the interconnected nature of flood risks and to safeguard vulnerable communities effectively. Even when individual leaders are competent, leadership cannot operate successfully due to these structural constraints, according to Terry's (1953) leading function. A combination of individual power and an institutional setting that promotes cooperation, responsibility, and common goal-setting is necessary for effective leadership. That setting has not yet materialized in West Aceh.

### **Government Structural Efforts in Flood Mitigation**

This study reveals that the government of West Aceh Regency has engaged in various structural mitigation efforts, focusing mainly on the development and rehabilitation of physical infrastructure. The interventions consist of building drainage systems, normalizing rivers, reinforcing embankments, and developing roads in areas that are prone to flooding. These measures illustrate a traditional engineering-focused strategy for disaster mitigation, emphasizing the physical management of water flow and minimizing immediate risk exposure. This method is commonly preferred by local governments because it leads to clear and noticeable results, especially when it comes to showing quick reactions to frequent flooding issues. Nonetheless, the prevalence of structural solutions stems not only from political choices but also from the ongoing limitations faced by non-structural approaches.

In practice, this approach is often favored by local governments due to its tangible and politically visible outcomes, particularly in demonstrating rapid responses to recurring flood events. However, the dominance

of structural solutions is not merely a matter of political preference; it is also a consequence of the persistent weakness of non-structural approaches. Nonstructural measures—such as community education, disaster training, public outreach campaigns, and institutional capacity-building—are frequently implemented as procedural formalities rather than genuine empowerment strategies.

Outreach events tend to be one-way lectures that fulfill reporting requirements but do not change behavior or build local ownership. Training programs are often conducted sporadically, without follow-up or evaluation, and rarely adapt to local ecological knowledge or cultural practices. As a result, non-structural efforts fail to generate the sustained behavioral change and community resilience that would reduce long-term vulnerability. This failure, in turn, reinforces the government's reliance on structural interventions: when non-structural programs show little impact, policymakers double down on what is visible and measurable—concrete infrastructure. Thus, the overemphasis on structural mitigation is not only a reflection of political visibility but also a symptom of the chronic underperformance and tokenistic implementation of non-structural measures.

The findings of this study indicate that the government of the West Aceh Regency has undertaken a range of structural mitigation efforts, primarily through the development and rehabilitation of physical infrastructure. These interventions include drainage construction, river normalization, embankment reinforcement, and road development in flood-prone areas. Such measures reflect a conventional engineering-based approach to disaster mitigation, which prioritizes physical control of water flow and reduction of immediate hazard exposure. In practice, this approach is often favored by local governments due to its tangible and politically visible outcomes, particularly in demonstrating rapid responses to recurring flood events.

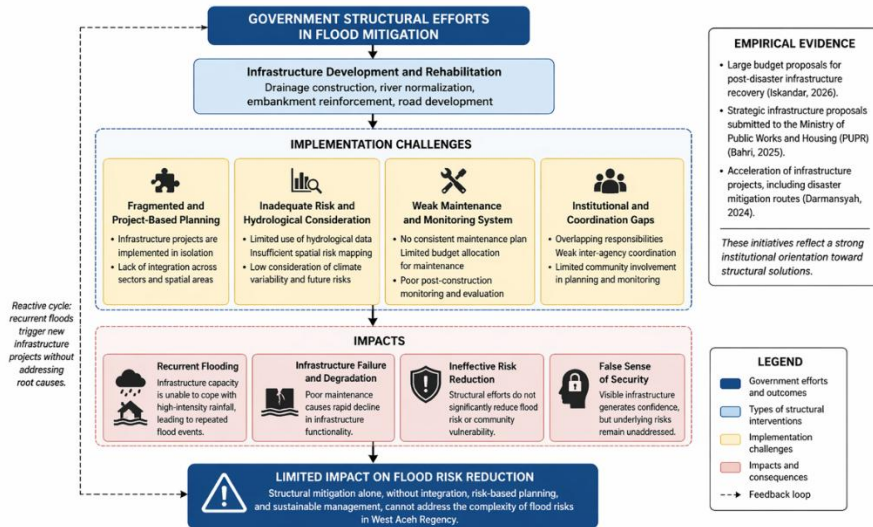
Empirical evidence further shows that these structural efforts are supported by continuous government initiatives to secure funding and expand infrastructure development. For instance, the local government has actively proposed large-scale budgets for post-disaster infrastructure recovery and strategic development projects to the central government (Iskandar, 2026). In addition, multiple strategic infrastructure proposals submitted to the Ministry of Public Works and Housing (PUPR) highlight the government's ongoing commitment to strengthening physical mitigation capacity (Bahri, 2025). These efforts are also complemented by the acceleration of infrastructure projects, including road improvements designated as disaster mitigation routes, which are expected to enhance accessibility during emergency situations (Darmansyah, 2024). Collectively, these initiatives demonstrate a strong institutional orientation toward structural solutions as the primary mitigation strategy. To better illustrate the underlying structure of these efforts and the challenges embedded within their implementation, [Picture 3](#) elucidates the foundational framework of these initiatives and the obstacles inherent in their execution, depicting the correlation between infrastructure development, implementation deficiencies, and their consequent effects on flood mitigation.

As depicted in [Picture 3](#), structural mitigation efforts in West Aceh are not merely facing isolated technical problems; rather, they are trapped in a causal chain of interconnected failures that systematically undermine flood risk reduction. The diagram identifies three core implementation challenges—fragmented planning, inadequate risk-based analysis, and weak maintenance systems—and traces how each generates specific negative outcomes that, in turn, reinforce one another.

First, fragmented and project-based planning means that infrastructure interventions (drainage, embankments, roads) are designed and executed in isolation, without integration across sectors or spatial coordination across neighboring villages. This fragmentation leads to two immediate consequences: (1) infrastructure is often built without regard to upstream-downstream dynamics, displacing flood risk rather than reducing it; and (2) interventions are prioritized based on political visibility rather than hydrological urgency, creating spatial disparities in protection. Second, inadequate risk-based analysis compounds the problem. Planning processes often do not include high-resolution hydrological data, long-term climate variability forecasts, or new spatial risk maps. As a result, even when infrastructure is built, its design capacity

does not match actual rainfall intensity or flood patterns, leading to recurrent flooding after the intervention. Third, weak maintenance and monitoring systems ensure that whatever infrastructure is built degrades rapidly. Drainage systems clog, embankments erode, and roads become impassable precisely when needed during emergencies due to the lack of a dedicated maintenance budget, clear assignment of responsibility, and post-construction monitoring.

**Picture 3. Problem structure of government structural efforts in mitigation in West Aceh Regency**



Source: Authors' illustration (2025)

These three challenges do not operate sequentially but reinforce each other in a vicious cycle. Fragmented planning leads to poorly sited and undersized infrastructure, accelerating deterioration and placing greater strain on weak maintenance systems. Maintenance crews do not receive early warnings about siltation or structural stress due to inadequate risk analysis, leading to the detection of problems only after failure. And the absence of systematic monitoring means that planners receive no feedback loop on which interventions worked and which failed, so the same mistakes are repeated in subsequent projects. The ultimate consequences—as shown in [Picture 3](#)—are fourfold: recurrent flooding despite infrastructure investment; infrastructure failure and degradation; ineffective risk reduction (flood impacts remain unchanged); and a dangerous false sense of security among both officials and communities, who assume that visible concrete structures have solved the problem. This false security is perhaps the most insidious outcome, because it discourages investment in non-structural measures and community-based adaptation, leaving underlying vulnerabilities entirely unaddressed. Thus, the diagram illustrates that structural mitigation alone, without integrated, risk-informed planning and sustainable maintenance systems, cannot break the cycle of recurring flood disasters in West Aceh.

However, despite these efforts, the study finds that the effectiveness of structural mitigation remains limited and, in some cases, problematic. Infrastructure development is frequently implemented in a fragmented, project-based manner rather than as part of an integrated, risk-informed planning framework. Several informants noted that drainage systems in certain areas cannot accommodate high-intensity rainfall, resulting in recurrent flooding despite infrastructure interventions. This suggests that planning processes often fail to adequately incorporate hydrological data, spatial risk mapping, and long-term climate variability. As a result, structural measures tend to be reactive, addressing visible symptoms of flooding rather than its underlying systemic drivers.

A further critical issue lies in the weak governance of infrastructure maintenance. Field findings indicate inconsistent implementation of post-construction monitoring and maintenance systems, leading to a rapid

decline in the functionality of mitigation infrastructure. In some locations, poorly maintained drainage systems become clogged or damaged, ultimately reducing their capacity to manage water flow during peak rainfall periods. This reflects a broader governance gap, where infrastructure development is not accompanied by sustainable management mechanisms. As emphasized in literature on disaster risk reduction, the effectiveness of structural mitigation is highly dependent on continuous maintenance, institutional coordination, and integration with non-structural measures (UNDRR, 2020).

The implications of these findings are significant. Despite substantial investments and political commitment to infrastructure development, the overall impact on flood risk reduction in West Aceh remains marginal. This indicates that structural mitigation, when implemented in isolation, is insufficient to address the complexity of flood risks in dynamic socio-environmental systems. Instead, it risks creating a false sense of security while leaving underlying vulnerabilities unaddressed. Therefore, a fundamental shift is required—from infrastructure-centered mitigation toward a more comprehensive, risk-based approach that integrates technical planning, environmental management, and community engagement. Without such integration, structural efforts will continue to serve as short-term solutions rather than sustainable risk-reduction strategies, ultimately failing to address the root causes of vulnerabilities and increasing the likelihood of future crises.

### **Government Non-Structural Efforts in Flood Mitigation**

In addition to structural approaches, local governments also undertake various non-structural efforts to mitigate flood disasters. These efforts include outreach activities, disaster education, and the establishment of institutions such as disaster preparedness teams at the village level. This non-structural approach aims to increase community capacity to independently address disaster risks. Within the modern mitigation framework, this approach is considered a crucial element in building community resilience.

However, research indicates that implementing non-structural approaches still faces various obstacles. Outreach activities tend to be formal and fail to encourage active community involvement, thereby limiting the effectiveness of disaster mitigation efforts and preventing communities from fully engaging in planning and implementation. The material presented is often untailored to local conditions, making it less relevant to community needs. This results in a relatively low level of community understanding of disaster mitigation. These limitations indicate that non-structural approaches are not fully based on participatory principles. However, the literature emphasizes that the success of non-structural mitigation is largely determined by active community involvement in every stage of the process (Beerens & Tehler, 2016; Shaw, 2012). Without strong participation, community capacity-building efforts will struggle to achieve optimal results, leading to ineffective non-structural programs that fail to address the community's specific needs and challenges.

Consequently, despite the implementation of various non-structural programs, their impact on improving community preparedness remains limited, indicating that these programs often fail to engage the community effectively and do not address specific local needs. This suggests that non-structural approaches need to be redesigned to be more context-specific and grounded in community needs. Thus, mitigation is not solely the government's responsibility but also becomes part of the community's collective awareness of disaster risk.

Based on the overall findings outlined, it is clear that issues in flood disaster mitigation do not exist in isolation but are interconnected within a policy implementation system. Therefore, a conceptual framework is needed that can explain the relationships between these dimensions in an integrative manner.

To improve community readiness and adaptability, the Government of West Aceh Regency has also implemented a number of non-structural mitigation strategies in addition to structural interventions. Public awareness campaigns, disaster education programs, and the formation of disaster preparedness groups at the village level are some of these activities. From a conceptual standpoint, these initiatives are consistent with modern frameworks for disaster risk reduction, which emphasize social resilience, community involvement, and institutional capacity-building as essential elements of successful mitigation tactics. Non-

structural alternatives are frequently presented in policy discourse as crucial complements to physical infrastructure, especially in addressing the sociocultural aspects of catastrophe susceptibility.

The results of this study, however, show that the application of these non-structural interventions is still primarily procedural and has not yet had a significant impact. There is little community involvement because outreach initiatives are usually carried out as official requirements rather than as interactive operations. Several interviewees report that socialization programs often occur in a one-way manner, lacking follow-up or engagement. One of the community members from Pasi Pinang village stated:

*Typically, we just listen during meetings, even though we receive invitations. It is uncommon to have a conversation about what our village truly needs (JA, 39 years old).*

This is part of a larger trend where communities are not actively involved in mitigation planning but rather are positioned as passive beneficiaries. As a result, the process of knowledge transfer becomes superficial and fails to produce significant behavioral change at the community level. The absence of contextualization in the creation and implementation of non-structural initiatives is another serious problem. Outreach and educational materials are often similar, with little modification to local socio-environmental conditions, cultural customs, or prior disaster experiences. This situation creates a gap between the information provided and the real difficulties that communities in West Aceh's flood-prone areas face. As a result, local knowledge is still underutilized even though it may be a useful tool for adaptive strategies. This suggests that non-structural mitigation initiatives are not yet grounded in participatory principles, which are generally acknowledged as essential for developing long-term community resilience (Beerens & Tehler, 2016; Shaw, 2012).

From a governance standpoint, this restriction also highlights a flaw in the framework's communication and motivation mechanisms. Motivational elements, such as fostering a sense of ownership and group responsibility, are largely lacking in communication techniques, which often focus on information distribution rather than discussion and engagement. This leads to a situation in which communities have only a cursory awareness of disaster risks but lack the capacity and initiative to take preventive measures. Long-term, these circumstances impede the growth of resilient communities that can adjust to frequent flood hazards. These results imply that non-structural mitigation in West Aceh has not yet advanced past a symbolic or compliance-focused strategy. Despite several initiatives, their influence on community resilience and readiness remains minimal. This demonstrates that the issue is not only software availability but also program design and execution. Non-structural initiatives risk becoming performative rather than transformative in the absence of genuine engagement and contextual adaptation, producing ineffectual results that fail to meet the community's unique requirements, such as addressing specific local vulnerabilities and fostering active participation from community members.

When considered collectively, these results support the claim that West Aceh's flood mitigation issues cannot be understood in a vacuum and must instead be viewed as part of an interconnected system of policy implementation. The more general problems of leadership, coordination, and policy translation mentioned in earlier sections are intimately related to the constraints seen in nonstructural approaches. To capture these interdependencies and offer a more thorough explanation of how structural and non-structural dimensions, along with actuating functions, impact the overall efficiency of catastrophe mitigation, an integrated conceptual framework is required.

## **A Conceptual Framework for Disaster Mitigation Based on Actuating and Structural-Nonstructural Integration**

Based on the research findings, a conceptual framework can be formulated that integrates the implementation dimension (actuating) of management with a disaster mitigation approach encompassing both structural and non-structural aspects. This framework draws on the thinking of George R. Terry, who emphasized that a

policy's success is largely determined by the effectiveness of its implementation, not just at the planning stage. Disaster mitigation primarily tests policies in complex social realities.

Conceptually, this research found that the effectiveness of disaster mitigation is determined by the interaction between four main dimensions of the implementation function: participation (motivating), clarity of direction (directing), communication (communicating), and leadership (leading). These four dimensions do not operate in isolation but interact to shape the quality of policy implementation in the field. A significant impact on the entire mitigation system occurs when one dimension weakens.

### **Novelty of the Framework**

The framework developed in this study offers novelty at three levels. First, the relationships among variables are new because this framework explicitly positions the actuating function (motivating, directing, communicating, leading) as a mediating variable between mitigation policies and on-the-ground outcomes. Unlike previous studies that focus separately on technical infrastructure (structural) or social capacity (nonstructural), this framework demonstrates that neither approach can be effective without a functioning actuating system. In other words, it addresses the missing link that local disaster governance research has largely overlooked. Second, the implementation model is new because it moves beyond classical top-down (Sabatier & Mazmanian, 1980) and bottom-up SS models. The framework proposes an integrated actuating model in which success is determined not only by policy clarity or community participation alone, but also by the quality of the connection between them—achieved through the simultaneous and equitable application of motivating, directing, communicating, and leading across all stages of mitigation. Third, the framework suggests a new governance typology, which can be termed “Actuating-Based Disaster Governance.” This typology differs from existing models (e.g., command-and-control, network governance, and collaborative governance) because it places the execution function as the primary unit of analysis, not institutional structures or coordination mechanisms alone. In this typology, governance effectiveness is measured by how well the actuating function is distributed across space, social groups, and phases of disaster management.

### **How Actuating Mediates Mitigation Effectiveness**

The mediating role of actuating can be understood through a causal chain: mitigation policies (input) → actuating function (process) → mitigation effectiveness (output). Drawing on empirical findings from West Aceh, each actuating dimension mediates effectiveness in a specific way. Motivating mediates by transforming community perception from passive acceptance (floods are normal) to active ownership (floods can be prevented through collective action). Without sustained motivation, training and outreach remain procedural formalities. Directing mediates by bridging abstract policies and concrete actions. Clear, written, context-specific directives ensure that every village official and volunteer understands their role before a disaster occurs. Communication is mediated by creating two-way feedback loops. Effective communication delivers early warnings and brings local knowledge from communities to decision-makers, enabling adaptive policy adjustments. Leading mediates by ensuring that multiple sectoral agencies (BPBD, Public Works, Social Services, TNI/Polri, and village governments) move in a coordinated manner. When leadership functions properly, it transforms formalistic coordination into binding, accountable collaboration. Thus, actuating serves as a complete mediation variable: well-designed policies will have little impact without effective actuating, while even imperfect policies can be partially improved through strong actuating.

### **Interdependence Between Structural and Non-Structural Approaches**

This study reveals that structural and non-structural approaches are not merely complementary but systemically interdependent. The interdependence is twofold. On one hand, structural measures require non-structural support. Embankments and drainage systems will function sustainably only if communities understand how to maintain them and institutional mechanisms for regular monitoring and repair exist. Temporary evacuation sites in Pasi Mesjid are no longer usable due to the lack of a maintenance system,

illustrating this dependence. On the other hand, nonstructural measures require structural grounding. Training and socialization programs lose credibility when communities see no visible physical improvements. The Keuchik of Gampong Leuhan noted that his village's repeated requests for a river barrier received no response, while socialization had never been conducted—demonstrating that non-structural efforts without structural follow-up breed cynicism. Actuating functions as the glue that binds these two approaches together: directing ensures that infrastructure projects include maintenance plans; communicating ensures that communities receive information about both structural and nonstructural measures; motivating encourages collective responsibility for both; and leading ensures that agencies responsible for structural works coordinate with those responsible for community capacity building. When actuation is weak, the two approaches drift apart, each failing to compensate for the other's limitations.

### **How Governance Fragmentation Affects Mitigation**

Governance fragmentation in this study refers to the dispersal of responsibility, authority, and coordination across multiple agencies that are supposed to work together for flood mitigation but lack binding integration mechanisms. The impact of fragmentation in mitigation operates through three mechanisms. First, fragmentation creates role ambiguity. When BPBD, Public Works, Social Service, and the military each have their mandates and budgets without a compulsory coordination mechanism, no single agency feels fully responsible for implementation failures. As a result, remote hamlets like Pasi Leuhan receive no clear directives—each agency assumes another is in charge. Second, fragmentation reinforces spatial inequality. Without a mechanism to ensure equitable resource distribution, infrastructure projects and training programs tend to cluster around the district capital or politically connected villages. Remote, less vocal hamlets are systematically neglected, as evidenced by the hamlet head of Pasi Leuhan's statement that his hamlet is "not prioritized." This spatial inequality is not accidental; it is a structural outcome of fragmented governance. Third, fragmentation creates an accountability void. When mitigation fails—when floods recur despite significant expenditure—there is no mechanism to trace responsibility. BPBD can claim it issued directives; Public Works can claim it built infrastructure; Social Services can claim it distributed aid. However, no agency takes responsibility for ensuring the integration of all these activities and their actual impact on communities. The absence of accountability perpetuates the vicious cycle of reactive, fragmented, and inequitable mitigation. Addressing fragmentation, therefore, requires not just better coordination but institutional redesign: a binding collaborative forum, clear performance indicators, and transparent accountability mechanisms.

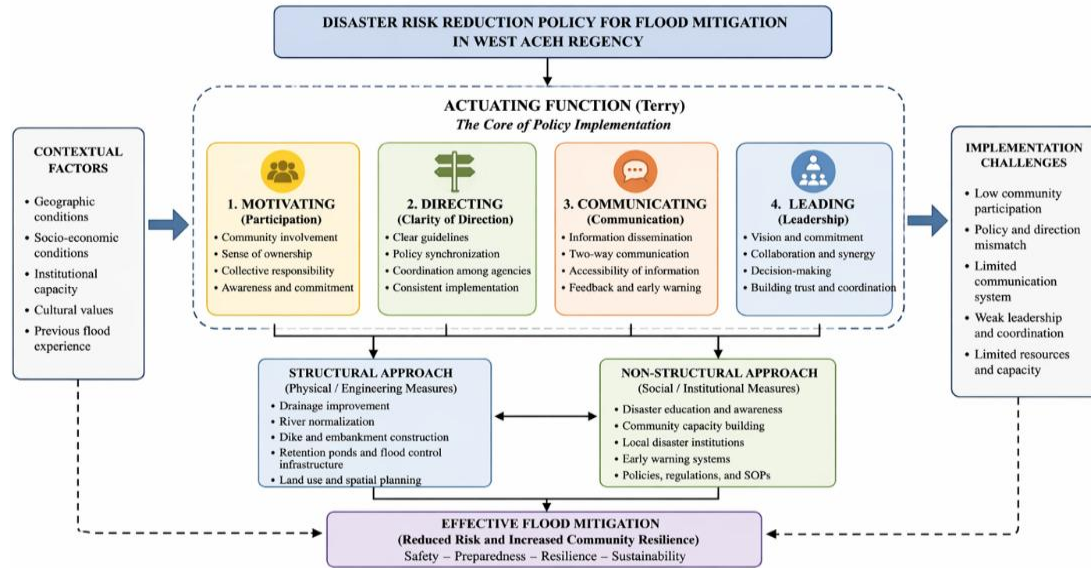
### **Integrative Framework and Its Implications**

Picture 4 presents the resulting conceptual framework visually. It shows how contextual factors (geographic, socio-economic, institutional, cultural, and experiential) shape the actuating function, which in turn integrates structural and non-structural approaches to produce effective flood mitigation (reduced risk, increased resilience, safety, preparedness, and sustainability). The arrows in the diagram indicate that actuating is not a passive intermediary but an active mediator: it receives inputs from policies and contextual conditions, processes them through motivating, directing, communicating, and leading, and then channels them into both structural and nonstructural actions. The bidirectional arrows between structural and non-structural approaches signify their interdependence, while the feedback loops from implementation challenges back to contextual factors illustrate how repeated failures can degrade institutional capacity and community trust over time.

Thus, the primary contribution of this research lies in strengthening the implementation perspective in disaster mitigation studies. While previous research has focused primarily on policy or technical aspects, this study demonstrates that the implementation dimension is a key yet often overlooked factor, underscoring the need for practical strategies and stakeholder engagement to ensure effective disaster mitigation. Therefore, an integrative approach that combines structural, non-structural, and managerial aspects is crucial

in building an adaptive and sustainable disaster mitigation system, as it ensures that all relevant factors are considered and effectively coordinated to enhance resilience against disasters.

**Picture 4. Conceptual Framework of Flood Disaster Mitigation Implementation based on Actuating Function and Integration of Structural and Nonstructural Approaches in West Aceh Regency**



Source: Authors' illustration (2025)

The conceptual framework generated in this study contributes to the development of disaster mitigation studies, particularly in strengthening the perspective of policy implementation based on the implementation function. By integrating managerial dimensions and mitigation approaches, this research offers a more comprehensive approach than previous studies that tended to separate technical and social aspects, thereby enhancing the effectiveness of disaster mitigation strategies and fostering collaboration among stakeholders.

#### 4. Conclusion

This study has examined the implementation of flood mitigation policies in West Aceh Regency through the lens of George R. Terry's actuating function, which comprises motivating, directing, communicating, and leading. The findings demonstrate that flood mitigation efforts in the regions are not fully effective, not because of a lack of policies or plans, but because of persistent failures in policy implementation. The primary obstacles identified include low community participation (motivating), inconsistencies between policy directives and field implementation (directing), inadequate and inequitable communication systems (communicating), and weak, reactive leadership that fails to foster inter-agency synergy (leading). These obstacles are not isolated; they interact systematically to produce a fragmented, reactive, and spatially uneven mitigation regime. The study also reveals that while the local government has invested in both structural measures (drainage, embankments, river normalization) and non-structural measures (training, outreach, institutional strengthening), these two approaches have not been integrated effectively. Structural efforts often lack community participation and maintenance systems, while non-structural efforts remain procedural formalities without visible physical follow-up. Consequently, the overall impact on flood risk reduction remains marginal, and the cycle of recurrent flooding continues.

This study contributes to disaster governance literature by shifting analytical attention from policy design to policy execution, specifically through the actuating function. While most existing studies focus on planning, budgeting, or institutional arrangements, this research demonstrates that the success of flood mitigation is equally—if not more—dependent on how policies are implemented at the local level. The findings extend Terry's management framework into the domain of disaster governance by showing that motivating, directing,

communicating, and leading are not merely managerial tasks but are mediating variables that determine whether structural and non-structural interventions achieve their intended outcomes. Furthermore, the study proposes a new governance typology—actuating-based disaster governance—which complements existing models (e.g., collaborative governance and network governance) by foregrounding execution quality as the primary unit of analysis. The conceptual framework developed here (Picture 3) offers a theoretical tool for analyzing implementation failures in other decentralized disaster contexts, particularly where multi-agency coordination and community participation are weak.

Several practical recommendations emerge from the findings. First, strengthening the directing function requires developing clear, written, locally contextualized technical guidelines for every high-risk village, accompanied by regular training and supervision. Second, improving the communication function requires establishing two-way feedback mechanisms, including low-technology channels (such as two-way radio networks or community liaison officers) that reach remote hamlets, and transparent monitoring of communication reach and comprehension. Third, enhancing the motivating function requires a shift from tokenistic outreach to genuine participatory planning, in which village requests are systematically addressed, and community knowledge is incorporated into decision-making. Fourth, reinforcing the leading function requires institutional redesign to address structural barriers to collaboration: elevating the authority of BPBD over other sectoral agencies, creating a legally mandated multi-stakeholder forum that meets regularly and makes binding decisions, and installing clear accountability mechanisms with performance indicators and consequences for non-compliance. Finally, structural and nonstructural approaches must be integrated into a single implementation chain, in which every infrastructure project includes a community maintenance plan and every training program is linked to visible physical improvements.

This research has several limitations. First, the study was conducted in a single regency (West Aceh), which limits the generalizability of findings to other regions with different geographical, cultural, or institutional contexts. Second, the data collection relied primarily on qualitative methods (interviews, observations, and document analysis) and involved a relatively small number of informants (10). While the study provided rich contextual detail, it does not permit statistical generalization or quantification of the relationships among the actuating dimensions. Third, the study focused on government-led mitigation efforts; the roles of private-sector actors, non-governmental organizations, and informal community networks were not systematically examined. Fourth, the research was conducted over a limited period (April 2025 to May 2025), which may not capture the long-term dynamics of policy implementation or changes in community attitudes across multiple disaster cycles. Fifth, despite efforts to ensure objectivity, the potential for researcher bias in interpreting qualitative data cannot be eliminated.

Several directions for future research emerge from this study. First, comparative case studies across multiple regencies in Indonesia—with varying levels of flood risk, institutional capacity, and political contexts—would help assess the transferability of the actuating-based framework and identify contextual factors that moderate its effectiveness. Second, longitudinal research tracking the same communities over several years could examine how actuating failures accumulate or are corrected over time and whether improvements in one dimension (e.g., communication) can compensate for weaknesses in another (e.g., leadership). Third, quantitative studies could develop and validate an instrument to measure the four actuating dimensions and, using larger samples, test their relative contributions to mitigation outcomes. Fourth, action research or participatory studies that involve researchers, government officials, and community members in co-designing and testing interventions to strengthen actuating functions would provide practical evidence on what works and under what conditions. Fifth, subsequent research should investigate the function of non-governmental entities and informal governance structures in supplementing or offsetting the deficiencies in state action. Finally, comparative international studies across disaster-prone countries in Southeast Asia or the Pacific Ring of Fire could explore how different governance traditions shape the actuating function and its relationship to flood mitigation effectiveness.

In sum, this study concludes that effective flood mitigation in West Aceh requires more than additional infrastructure or policies; it demands a fundamental strengthening of the actuating function—motivating,

directing, communicating, and leading—as an integrated, equitable, and proactive system of policy execution. Without such strengthening, even the best-designed mitigation strategies will continue to fail, and vulnerable communities will remain trapped in a cycle of recurrent disaster and reactive response.

## References

- Andrew, M. (2018). Revisiting community-based disaster risk management. In I. Davis, S. O. Bender, F. Kringgold, & F. J. McDonald (Eds.), *Environmental Hazards* (5). Routledge. <https://doi.org/10.4324/9781315067261>
- Ansell, C., & Gash, A. (2008). Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory*, 18(4), 543–571. <https://doi.org/10.1093/jopart/mum032>
- Arnstein, S. R. (1969). A Ladder of Citizen Participation. *Journal of the American Institute of Planners*, 35(4), 216–224. <https://doi.org/10.1080/01944366908977225>
- Awoonor, M. D. (2025). Enhancing Local Governance through Community Participation in Rural Development Projects in Nigeria: Literature Review. *African Journal on Impact, Economic and Social Studies*, 2(3), 0–20. <https://doi.org/10.63159/611020>
- Aylett, A. (2015). Institutionalizing the urban governance of climate change adaptation: Results of an international survey. *Urban Climate*, 14, 4–16. <https://doi.org/10.1016/j.uclim.2015.06.005>
- Bahri, S. (2025). Usulkan Lima Proyek Strategis, Bupati Aceh Barat Temui Menteri PU. *Aceh Tribunnews*.
- Beerens, R. J. J., & Tehler, H. (2016). Scoping the field of disaster exercise evaluation - A literature overview and analysis. *International Journal of Disaster Risk Reduction*, 19, 413–446. <https://doi.org/10.1016/j.ijdrr.2016.09.001>
- BNPB. (2025). Data Bencana Indonesia Tahun 2024.
- Bulkeley, H., Schroeder, H., Janda, K., Zhao, J., Armstrong, A., Chu, S. Y., & Ghosh, S. (2011). The Role of Institutions, Governance, and Urban Planning for Mitigation and Adaptation. *Cities and Climate Change* (pp. 125–159). The World Bank. [https://doi.org/10.1596/9780821384930\\_CH05](https://doi.org/10.1596/9780821384930_CH05)
- Cid, A., & Lerner, A. M. (2023). Local governments as key agents in climate change adaptation: challenges and opportunities for institutional capacity-building in Mexico. *Climate Policy*, 23(5), 649–661. <https://doi.org/10.1080/14693062.2022.2163972>
- Darmansyah, D. (2024). Jadi Jalur Mitigasi Bencana, PUPR Aceh Barat Kebut Pengaspalan Ruas Marek- Pasi Jambu. *Catat.Co*. <https://www.catat.co/news/jadi-jalur-mitigasi-bencana-pupr-aceh-barat-kebut-pengaspalan-ruas-marek-pasi-jambu/index.html>
- Fahrimal, Y., & Husna, A. (2023). Komunikasi Risiko Berbasis Masyarakat dalam Menghadapi Banjir di Kabupaten Aceh Barat. *Calathu: Jurnal Ilmu Komunikasi*, 5(2), 74–91. <https://doi.org/10.37715/calathu.v5i2.4004>
- Fahrimal, Y., Husna, A., & Husna, F. (2023). Perilaku Komunikasi Risiko dalam Fase Kesiapsiagaan Masyarakat menghadapi Bencana Banjir di Aceh Barat. *Jurnal Ilmu Komunikasi*, 9(1), 26. <https://doi.org/10.35308/source.v9i1.7244>
- Fikri, A. F., Maarif, S., Ruswandi, D., Prakoso, B., Rahmah, N. A., Tyas, T. H., Widana, I. K., & Bandaso, R. M. (2022). Kapasitas Masyarakat Pesisir Pidie Jaya dalam Menghadapi Abrasi dan Implikasinya Terhadap Keamanan Insani. *Jurnal Pembangunan Wilayah Dan Kota*, 18(4), 390–399. <https://doi.org/10.14710/pwk.v18i4.38513>
- Hutchings, S. J., & Mooney, W. D. (2024). Seismotectonics of the Philippine and Taiwan Subduction Systems and Implications for Seismic Hazards. *Geochemistry, Geophysics, Geosystems*, 25(6). <https://doi.org/10.1029/2023GC010990>
- Irsyam, M., Cummins, P. R., Asrurifak, M., Faizal, L., Natawidjaja, D. H., Widiyantoro, S., Meilano, I., Triyoso, W., Rudiyanto, A., Hidayati, S., Ridwan, M., Hanifa, N. R., & Syahbana, A. J. (2020). Development of the 2017 national seismic hazard maps of Indonesia. *Earthquake Spectra*, 36(1S), 112–136. <https://doi.org/10.1177/8755293020951206>
- Iskandar, T. D. (2026). Pemkab Aceh Barat usulkan Rp200 miliar untuk pemulihan infrastruktur

- pascabencana. *Antara Aceh*. <https://aceh.antaranews.com/berita/402998/pemkab-aceh-barat-usulkan-rp200-miliar-untuk-pemulihan-infrastruktur-pascabencana>
- Kazhimi, R. (2020). Mitigation of the Wonorejo active fault on the Probolinggo-Banyuwangi toll road. *E3S Web of Conferences*, 156, 01001. <https://doi.org/10.1051/e3sconf/202015601001>
- Kementerian PUPR Balai Wilayah Sungai Sumatera I. (2025). Banjir Akibat Curah Hujan Tinggi Melumpuhkan Sejumlah Wilayah di Aceh Barat. *Berita Balai*. <https://sda.pu.go.id/balai/bwssumatera1/article/banjir-akibat-curah-hujan-tinggi-melumpuhkan-sejumlah-wilayah-di-aceh-barat>
- Lincoln, Y. S., Guba, E. G., & Pilotta, J. J. (1985). Naturalistic inquiry. *International Journal of Intercultural Relations*, 9(4), 438–439. [https://doi.org/10.1016/0147-1767\(85\)90062-8](https://doi.org/10.1016/0147-1767(85)90062-8)
- Liu, S., Li, H., Boufadel, M. C., & Li, G. (2008). Numerical simulation of the effect of the sloping submarine outlet-capping on tidal groundwater head fluctuation in confined coastal aquifers. *Journal of Hydrology*, 361(3–4), 339–348. <https://doi.org/10.1016/j.jhydrol.2008.08.003>
- Lomban, A. A., & Ariyani, N. (2023). Efektifitas Komunikasi InaRisk Personal Membangun Budaya Sadar Bencana Masyarakat. *Ijd-Demos*, 5(1). <https://doi.org/10.37950/ijd.v5i1.387>
- Løvholt, F., Kühn, D., Bungum, H., Harbitz, C. B., & Glimsdal, S. (2012). Historical tsunamis and present tsunami hazard in eastern Indonesia and the southern Philippines. *Journal of Geophysical Research: Solid Earth*, 117(B9). <https://doi.org/10.1029/2012JB009425>
- Media Center Provinsi Aceh. (2024). Januari-Oktober 2024, Bencana Alam di Aceh Terjadi 241 Kali. *InfoPublik: Portal Berita*. <https://infopublik.id/kategori/nusantara/882873/januari-oktober-2024-bencana-alam-di-aceh-terjadi-241-kali>
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook*. SAGE Publication.
- Morante-Carballo, F., Pinto-Ponce, B., Santos-Baquerizo, E., Briones-Bitar, J., Berrezueta, E., & Carrión-Mero, P. (2024). Systematic Review on Seismic Hazards in the Coastal Regions of the Pacific Ring of Fire. *International Journal of Safety and Security Engineering*, 14(5), 1591–1605. <https://doi.org/10.18280/ijssse.140526>
- Mudjiharto, M. (2020). Perdamaian Aceh Pasca Bencana Tsunami Aceh 2004 dan Mou Helsinki: Telaah Kritis Disaster Diplomacy Pemerintah Indonesia dalam Penyelesaian Konflik Aceh. *Jurnal Politik Profetik*, 8(1), 89–111. <https://doi.org/10.24252/profetik.v8i1a4>
- Mulki, Y., & Alhadi, Z. (2022). Kapabilitas Pemerintah Kabupaten Pasaman Barat dalam Mitigasi Bencana Banjir di Kenagarian Batahan. *JISIP (Jurnal Ilmu Sosial Dan Pendidikan)*, 6(3). <https://doi.org/10.58258/jisip.v6i3.3382>
- Munawarah, R., & Maulidian, M. O. R. (2022). Mitigasi Bencana Banjir di Desa Teluk Halban Kecamatan Bendahara Kabupaten Aceh Tamiang. *Jurnal Pendidikan Geosfer*, 7(1), 85–94. <https://doi.org/10.24815/jpg.v7i1.23700>
- Muntafi, Y. (2021). Seismic Properties and Fractal Dimension of Subduction Zone in Java and Its Vicinity Using Data from 1906 to 2020. *International Journal of GEOMATE*, 21(85). <https://doi.org/10.21660/2021.85.j2217>
- Peters, B. G. (2015). *Pursuing Horizontal Management: The Politics of Public Sector Coordination*. University Press of Kansas.
- Pradhan, D. (2020). Local Customary Laws and Decentralised Community Based Disaster Mitigation. *Proceedings of the International Conference on Community Development (ICCD 2020)*. <https://doi.org/10.2991/assehr.k.201017.038>
- Prayitno, G., & Windesi, I. R. (2025). Infografis Pemetaan Perkiraan Bahaya Banjir di Kabupaten Waropen Berbasis Sistem Informasi Geografis Menggunakan arcGIS. *Jurnal Teknologi dan Informatika*, 2(2), 32–43. <https://doi.org/10.70539/jti.v2i2.41>
- Pressman, J. L., & Wildavsky, A. B. (1973). Implementation: How great expectations in Washington are dashed in Oakland: Or, why it's amazing that federal programs work at all, this being a saga of the Economic Development Administration as told by two sympathetic observers who seek to build morals

- on a foundation of ruined hopes (Vol. 708). *University of California Press*.
- Reynolds, B., & W. Seeger, M. (2005). Crisis and Emergency Risk Communication as an Integrative Model. *Journal of Health Communication, 10*(1), 43–55. <https://doi.org/10.1080/10810730590904571>
- Rizki, A. (2025). Banjir Meluas di Aceh Barat, 58 Gampong Terdampak BPBD Lakukan Evakuasi dan Posko. *BPBD Aceh Barat*. <https://bpbd.acehbaratkab.go.id/berita/kategori/banjir/banjir-meluas-di-aceh-barat-58-gampong-terdampak-bpbd-lakukan-evakuasi-dan-posko>
- Sabatier, P., & Mazmanian, D. (1980). The Implementation of Public Policy: A Framework of Analysis. *Policy Studies Journal, 8*(4), 538–560. <https://doi.org/10.1111/j.1541-0072.1980.tb01266.x>
- Septikasari, Z., Retnowati, H., & Wilujeng, I. (2022). Pendidikan Pencegahan dan Pengurangan Risiko Bencana (PRB) Sebagai Strategi Ketahanan Sekolah Dasar dalam Penanggulangan Bencana. *Jurnal Ketahanan Nasional, 28*(1), 120. <https://doi.org/10.22146/jkn.74412>
- Setyowati, A. B. (2020). Making Territory and Negotiating Citizenship in a Climate Mitigation Initiative in Indonesia. *Development and Change, 51*(1), 144–166. <https://doi.org/10.1111/dech.12541>
- Sharma, R. (2023). Civil society organizations' institutional climate capacity for community-based conservation projects: Characteristics, factors, and issues. *Current Research in Environmental Sustainability, 5*, 100218. <https://doi.org/10.1016/j.crsust.2023.100218>
- Shaw, R. (2012). Community based disaster risk reduction. *Emerald Group Publishing*.
- Syugiarto, S., Khaldun, R. I., Tawil, Y. P., & Kusnadi, H. W. (2022). Pemulihan Pasca-Bencana di Indonesia: Perlukah Dilakukan Perubahan Kebijakan?. *Jurnal Ilmiah Ilmu Sosial, 8*(2), 152–161. <https://doi.org/10.23887/jiis.v8i2.47443>
- Tanauma, A., Pasau, G., & Tamuntuan, G. (2021). Strategi Mitigasi Bencana Tsunami Di Desa Kema Satu Kabupaten Minahasa Utara. *The Studies of Social Sciences, 3*(2), 36. <https://doi.org/10.35801/tsss.2021.3.2.37255>
- Terry, G. R. (1953). Principles of Management. *University of Michigan*.
- Tjoetra, A., & Maifizar, A. (2019). Peran Perguruan Tinggi dalam Mitigasi Bencana (Studi Kasus pada UnitKegiatan Mahasiswa Penanggulangan Kebencanaan Universitas Teuku Umar). *Talenta Conference Series: Local Wisdom, Social, and Arts (LWSA), 2*(1), 1–8. <https://doi.org/10.32734/lwsa.v2i1.582>
- UNDRR. (2019). Global Assessment Report on Disaster Risk Reduction 2019. *United Nations*.
- UNDRR. (2020). Ecosystem-Based Disaster Risk Reduction: Implementing Nature-based Solutions for Resilience.
- Yin, R. K. (2017). Case study research and applications: Design and methods. *Sage publications*.
- Zhao, S., McClusky, S., Cummins, P. R., Miller, M. S., & Nugroho, H. (2023). New Insights into Crustal Deformation of the Indonesia–Australia–New Guinea Collision Zone from a Broad-Scale Kinematic Model. *Journal of Geophysical Research: Solid Earth, 128*(2). <https://doi.org/10.1029/2022JB024810>
- Zulkifli, B., Ihsan, F., Makkawaru, M. A., Fadhalna, M., & Tallo, A. J. (2024). Identifikasi Daerah Rawan Banjir di Kabupaten Sikka Menggunakan Geographic Information System (GIS). *Angkasa: Jurnal Ilmiah Bidang Teknologi, 16*(1), 52. <https://doi.org/10.28989/angkasa.v16i1.1966>