

Evacuation Under Uncertainty: A Case Study on LGU's Public Safety Measure During Volcanic Eruptions in Negros Oriental

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ABSTRACT

This case study focuses on the June-December 2024 Canlaon volcanic unrest, uncovering underlying factors that contribute to the actions the local authorities and the barangay (local village) officials take during volcanic episodes. The researchers used qualitative analysis to review and examine interviews of the decision makers to determine their hazard awareness, operational procedures, and response efforts. This paper focuses on the challenges of local officials when eruptive episodes occur. They were interviewed about their sentiments on the causes and experiences inside evacuation centers of residents living within the 4-kilometer danger zone, the forced evacuation order, the affected vulnerable groups, livelihood concerns, and residents living outside evacuation centers. The findings of this paper aim to highlight important points and give a deeper understanding of how to improve local disaster risk reduction governance and operational effectiveness in handling future volcanic emergencies.

Keywords: Qualitative analysis, Volcanic unrest, evacuation response, local governance, Philippines

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Introduction

Natural disasters, specifically volcanic eruptions, create a significant threat to public safety and governance worldwide. In the event itself, ethical and political considerations arise (Bueno Gómez & Beato Bergua, 2024). Such uncertain threats span across continents and necessitate a crucial evacuation strategy for volcanic emergencies, including overcoming communication barriers, allocating resources, and ensuring community compliance. These factors are crucial for minimizing loss of life and property.

Countries in East and Southeast Asia are within the Ring of Fire, where some of the deadliest volcanic eruptions have historically occurred (Berrezueta & Carrión-Mero, 2024). Indonesia, the Philippines, and Melanesia are developing Asian nations facing societal disruptions and constant economic threats. Even Japan, a developed country in Asia, encounters the same existing governance challenges and emergency protocols (Fernandez et al., 2025). Asian

governments are challenged in terms of evacuation preparedness and adaptability, despite advancements in early warning systems.

The Philippines is one of the countries within the Pacific Ring of Fire (Chong et al., 2025). Mount Pinatubo, Taal, and Mayon's historical eruptions have stressed both the strengths and weaknesses of national disaster management systems (Sabo-o et al., 2025). In enhancing the LGUs' (Local Government Unit) capacity in evacuation contingency planning, a legislation was enacted known as Republic Act 10121 of 2010. Additionally, Republic Act No. 12076, the "Ligtas Pinoy Centers Act," is an act that mandates the establishment of disaster-resilient evacuation centers using sturdy materials that can withstand natural disasters in every city and municipality in the country (NDRRMP, 2011). A policy and institutional framework are established to safeguard populations. Issues arising, such as bureaucratic delays, resource shortages, and varied

community responses, continue to impede timely and effective evacuations.

Kanlaon Volcano, with its unique geographic features, presents a challenge in Disaster Risk Reduction and Management (DRRM) evacuation planning (Alipo-On & Mejica, 2022). Due to its subsequent volcanic unrest, LGU authorities are mandated to handle challenging uncertainties in volcanic behavior, logistical constraints, and communication impediments among stakeholders. Mandatory evacuation of residents living within the 4 to 6 kilometers (Permanent Danger Zone) PDZ is enforced by the provincial government of Negros Oriental.

Several studies conducted on disaster risk reduction highlight the crucial importance of evacuation, such as On Community Disaster Risk Reduction and Management Activities for Volcanic Eruption in Central Negros, 2022 and Moving for Safety: A Qualitative Analysis of Affected Communities' Evacuation Response During the 2014 Mayon Volcano Eruption. A gap remains in the research due to the ongoing occurrence of volcanic episodes in that specific area, where local government and public safety implementation measures must be identified.

Hence, this case study aims to examine the challenges faced by the local government due to the extended stay of the community in the evacuation centers during volcanic unrest. Analyzing how legislative procedures are effectively implemented and community responses to forced evacuation orders. This research aims to produce key findings of effective evacuation strategies that can be more informative and adaptive. The results are expected to provide disaster risk governance literature that offers useful implications for administrators, emergency responders, and communities at risk.

Methodology

Research Design

This study is a qualitative design using the instrumental single-case study. An instrumental case study is a research method that focuses on a particular case to understand a broader case or phenomenon (Kekeya, 2021). The single case identified is the local government unit of Canlaon City in Negros Oriental, Philippines. The case is bounded within a specific timeframe, which is between June and December 2025, during which the Mt. Kanlaon exhibits volcanic unrest. The study seeks to contribute to a deeper understanding of the challenges faced by the selected LGU under the uncertain episodes of volcanic unrest. This analysis offers a valuable understanding that could be applied to similar circumstances. This design will serve as a model for disaster governance, which will help and inform policymakers in managing evacuations during disasters.

Participants

The participants of this study included three barangay captains from the affected barangays located within the 4- to 6-kilometer danger zone who were forced to evacuate, as well as one representative each from the City Social Welfare and Development Office (CSWDO) and the Local Disaster Risk Reduction and Management Council (LDRRMC). These individuals served as camp managers and were among the most experienced and directly involved personnel during the volcanic unrest in Canlaon City.

Instruments

Data were collected through qualitative semi-structured interviews and unstructured journaling. This instrument is relevant and provides rich data necessary to understand how these policy enforcers perceived and responded to uncertainty during volcanic eruptions. Using such interviews facilitated a deeper understanding of practical governance challenges by encouraging them to share their narrative experiences while allowing unexpected topics to unfold. The journaling helped the researchers record the candid moments when the participants shared incidents and information pertinent to the case.

Data Collection Procedure

Before data collection, the researchers initiated the process by submitting formal invitation letters to the relevant offices. All participants were thoroughly briefed on the purpose of the case study, the procedures involved, and their rights as participants. The interviews were conducted at the participants' workplace for their convenience and lasted for approximately 30 minutes. The researchers respectfully requested permission to audio record the conversation. After the interviews, the researchers provided a concise summary of the key points to verify the accuracy and completeness of the gathered data. The recordings were thoroughly transcribed and written down in a verbatim transcript, summarized, and safely secured for confidentiality and data integrity to protect the participant's privacy upon completion. During the researchers' visit to the location, they maintained journals where they recorded the candid moments and information shared by the participants pertinent to the case. One of the researchers visited the evacuation centers a couple of times.

Data Analysis Framework

The study utilized Lichtman's thematic analysis framework (Lichtman, 2014), which involved coding, categorizing, and concept theme generation from specific details to a more abstract interpretation of themes. Initially, codes from interview records were created to capture the main ideas in addressing challenges related to governance in

decision-making, evacuation, and communication under uncertainty. The final analysis, which addressed public safety measures and governance during volcanic eruptions in Negros Oriental, was synthesized into a clear narrative theme. This method ensured that findings from a thorough and perceptive review of the topic were grounded in participants' actual experiences.

Data Trustworthiness

To ensure data trustworthiness, the study was conducted using the four main criteria: credibility, transferability, dependability, and confirmability, which were identified by Lincoln & Guba (Enworo, 2023). Using such criteria that evaluate the quality and worth of qualitative research standards. This case study focused on governance challenges in managing evacuations. We used a data triangulation strategy that involved multiple interviews with the LGU officials and other agency heads to gather rich and thick data. For transferability, which allowed the selected participants to verify the validity of the findings, the researchers provided a detailed description of the LGU evacuation governance challenges during volcanic unrest. Finally, dependability and confirmability were addressed together to make sure that the research was consistent and not a product of the researchers' bias. Throughout the study, a documented reflexive journal was kept and maintained to enhance transparency.

Ethical Considerations

Ethical considerations are crucial in this study. Formal consent was secured before proceeding with the interview, stating that it was a non-mandatory participation and assuring confidentiality concerning their identities since the study focused on governance struggles. The study was harmless to participants or to the community. It handled all data with caution to avoid creating social anxiety or compromising the standing of LGU personnel. Furthermore, the researchers were responsible for an honest and objective presentation of collected data, providing a fair analysis that can truly help policymakers.

Results

Many concepts emerged from the in-depth interviews and detailed journaling, yielding six major themes and several subthemes: overcrowding and inadequate infrastructure (resource scarcity); safety concerns in marginalized communities (*protection risks*); livelihood concerns (resistance); unequal access to aid (*Assistance Inequality & Social Exclusion*); human resource and logistical deficit (*staff and operational efficiency*); and hierarchical governance constraints and communication lags (*governance and coordination delays*). The utterances are labelled as "I" for interviews and "JE" for journal entries.

Overcrowding and Inadequate Infrastructure

This theme emphasizes the participants' difficulties in addressing the increasing number of evacuees and the need for additional shelters. Four or five families share one room and comfort rooms, violating standards for personal space and privacy. There is a shortage of potable water and an insufficient number of comfort rooms, which resulted in long queues and increased sanitation risks within the center.

Resource Scarcity. Severe resource scarcity includes infrastructural inadequacy, insufficient disaster capacity, resource insufficiency, logistical limitations, resource depletion, and welfare system fragility. The identification of overcrowding and unpreparedness is a significant contributing factor to the challenges faced during disasters. An imbalance in marginalized communities affects the equitable distribution of resources across evacuation areas.

One participant shared: *There is a lack of water supply, as there are 4 to 5 families in one room. There is also a lack of comfort rooms (CRs)/toilets, so people have to queue/line up* (I). Another participant said: *"The use of schools and churches as evacuation centers is very challenging as they are not designed for big families"* (I). Another participant said: *"Our Barangay is also used as an evacuation center, with only 2 comfort rooms for many users."*

Safety Concerns in Marginalized Communities

This theme highlights the participants' approaches to marginalized groups, which include children, pregnant women, senior citizens, people with disabilities (PWDs), and displaced families, who are mostly affected due to an extended period of displacement in the unsafe shelter conditions that have inadequate facilities.

Protection Risks. The vulnerability of women, children, and other marginalized groups significantly increases due to displacement. An attempted sexual assault was reported, while others experienced personal health complications, some resulting in death. There was a compromised safety of vulnerable populations that exposed gaps in protection mechanisms that reflect broader issues of collective trauma and insecurity.

One participant confirmed: *At that time, there was a bedridden person left behind there, about 4 km away. The police went to them, but they didn't believe (or trust/listen to) them. When the councilors and I went to them, that person believed (or trusted/listened to) us* (I). Another participant said: *"There were incidents of attempted rape, and the women were being watched while they were taking a bath/showering"* (JE).

Livelihood Concerns

These livelihood concerns, as described by the participants, influence evacuation decisions that complicate disaster policy enforcement. For residents whose primary income depends on agriculture, the reluctance to evacuate is due to unsecured crops and livestock left in the danger zones. Results show that livelihood security is compromised by disaster preparedness and response strategies.

Resistance. According to the participants, there is resistance to meeting the basic needs of affected communities due to tensions between authorities and local agencies. The participants emphasized the weak food system, which directly affects evacuees' well-being, particularly during prolonged emergencies. Also, the livelihood considerations shape decision-making, sometimes at the expense of immediate physical security.

One participant shared: "People do not want to evacuate because their livestock and farms will be left behind" (I). Another one shared: "It was supposed to be the livelihood/source of income for the residents, mainly focused on farming/crops. Their livelihood is severely affected. The vegetables that were planted were affected by the volcanic ash. It cannot be sold" (JE). According to one participant, the common reasons for the evacuees are their farms and crops. One participant narrated what the evacuees told him as they said: "If we don't return to our farm/land, we won't have any source of income." The LGU then helps them: "What we did was, they leave early in the morning and are transported by the barangay vehicle. They return in the afternoon. However, some evacuees will not return and hide. The police will really be the ones to fetch them" (I).

Access to aid is unequal

Some evacuees shared that they would rather stay close to the five-kilometer danger zone than move back into the evacuation centers. They said that life inside the camps has become stressful, especially with the misunderstandings and frustrations that come up whenever relief goods are distributed. A lot of families mentioned that they often end up providing their own food and water because they feel the assistance is not reaching everyone fairly.

Assistance Inequality & Social Exclusion. Participants revealed that resource allocation creates discrepancies and challenges in determining which individuals or groups should be prioritized for aid. The disproportion leads to perceptions of social exclusion and marginalization among affected populations. One participant shared: "Why are they not being given aid when they are also affected? That's what the outside evacuees said" (I).

Human and Logistical Resource Deficit

Participants also highlighted that there is a shortage of Barangay Health Workers (BHWs) and responders, making it difficult to accommodate the needs of the evacuees. Emergency responders are unable to obtain adequate rest due to the combination of repeatedly retrieving supplies from distant sites and transporting ill evacuees to the medical facility.

Staff and Operational Efficiency. The inability to fulfill the urgent needs of evacuees, which includes transporting the vulnerable groups and their needed supplies. Such evidence directly implies a gap between governance readiness and the increasing needs of evacuees. The frequent resource limitations directly influenced the timely disaster response.

One participant shared the following: "Lack of staff to manage the evacuation center and logistic support is lacking. Depleted resources mean limited funds" (JE). In an interview, one participant said: "Challenged by the constant back-and-forth transportation of the evacuees" (I). Another participant said: "Limited vehicles, limited medical support, weak signal, we are operating under capacity" (I). Still another participant said: "Our responders are getting sick because of a lack of rest and equipment" (I). Another participant commented that: "Mostly, their needs really cannot be met. There was a big change, and most of their complaints are about transportation, especially fuel" (JE).

Hierarchical Governance Constraints and Communication Lags

Local teams rely on Incident Management Team (IMT) protocols, which are responsible for providing alert systems that cause setbacks in evacuation efforts and the effectiveness of disaster response. Furthermore, this structural challenge is exacerbated by inconsistent telecommunications infrastructure; signal blackouts prevent the immediate relay of official messages to local government units, resulting in communication breakdowns and untimely mobilization of certain communities.

Governance and Coordination Delays. A delay in the delivery of essential assistance reduces the efficiency of disaster response operations. One participant shared that overlapping responsibilities and unclear communication channels further intensify these delays. "Coordination depends on the IMT before implementation" (JE). In an interview, one shared: "We get a very weak signal here in our area" (I).

Discussion

This case study highlights governance challenges in disaster response and presents six themes by using interviews

and on-site visit journaling. These themes collectively underscore the different aspects and realities the LGU personnel face in disaster preparation and response.

Overcrowding and inadequate infrastructure

Structural Resource Scarcity. Overcrowding families in evacuation centers increases health and sanitation risks that compromise disaster resilience (Calilung et al., 2025; Borines, 2023; Bartel & Naismith, 2023). The lack of infrastructure, especially in the evacuation centers, rooms for personal space, and hygiene comfort rooms directly implies a gap between governance readiness and the increasing needs of evacuees, which weakens the policy enforcement and monitoring mechanism. The frequent resource limitations directly influenced the timely disaster response to anticipate, allocate, and distribute resources before and during crises (Lentz & Maxwell, 2022; Afrihyia et al., 2025). To accommodate fluctuating populations during emergencies (Uddin et al., 2018), the need for flexible shelter designs must be built to address the shortages in utilities and facilities.

Safety concerns in marginalized communities

Protection Risks. Governance challenges extend to safety concerns for marginalized groups, such as children, pregnant women, Persons with Disability (PWDs), and senior citizens within evacuation settings. These groups are at risk of exposure to an unsafe environment, and this can make the evacuation difficult and worse. The research findings in displacement settings are supported by recent studies on the protection risk faced by marginalized populations (Mendis et al., 2023; Alam et al., 2025; Jevtić et al., 2025). This results in trauma and mental health burdens from gaps in protection mechanisms (Keya et al., 2023). Furthermore, the reported incident involved attempted sexual assault, and the challenge in convincing a bedridden person to evacuate points out a deficit in building community trust and security.

Livelihood concerns

Resistance. Those areas within the 4-kilometer danger zone where the evacuees' livelihood is also located pose significant challenges to evacuation compliance. Residents' resistance to evacuating is due to livelihood concerns (Leneman et al., 2021). To safeguard economic livelihoods and to improve public trust, disaster preparedness and response strategies must be incorporated (Armia, 2024). This integration must be supported to decrease the economic losses before and after disasters (Roth Tran, B., & Wilson, 2025). To avoid tensions between authorities and local communities, there must be inclusion in livelihood protection in evacuation planning (Yee et al., 2024; Adadu et al., 2024) when people's need to protect their immediate survival (livelihood) clashes with government safety rules,

especially when the government cannot guarantee support for their losses.

Unequal Access to Aid (Assistance Inequality and Social Exclusion)

Residents' reluctance to evacuate and disparities in aid distribution all reflected wider tensions between community needs and institutional processes. These interconnected factors affected how authorities and constituents navigated the uncertainties during volcanic unrest. These situations show how support can become uneven, shaped by who has power, who gets recognized, and who has access to resources (Kaplan et al., 2025; Mansourihanis et al., 2025; Entress et al., 2025). Outside evacuees and peripheral communities revealed disparities in prioritization and experienced reduced access to relief. The key observation made by one participant was that the increasing demands of displaced populations did not align with the institutional capacity. Additionally, during a disaster, to improve balance and a strong bond, openness and community relief distribution are essential (Bonfanti et al., 2023).

Human Resource and Logistical Deficit

Staff and Operational Efficiency. The participant is asking for additional human resource assistance to accommodate the needs of evacuees and logistical support. The findings align with studies showing that understaffing and inadequate preparedness reduce the quality of essential relief services and care (Isangula et al., 2023; Hamidizadeh et al., 2024). Emergency responders are unable to obtain adequate rest due to the combination of repeatedly retrieving supplies from distant sites and transporting ill evacuees to the medical facility. The inability to meet the urgent needs of evacuees, including transporting vulnerable groups and their necessary supplies, limited vehicles and fuel, and the constant back-and-forth to obtain supplies, reduces efficiency.

Hierarchical Governance Constraints and Communication Lags

Governance and Coordination Delays. The systemic friction dimension represents the institutional restrictions that shape all other categories. The reliance on the Incident Management Team (IMT) combined with weak telecommunication often leads to communication failures and subsequent operational delays (Abbas & Miller, 2025). Significantly, the need to wait for higher-level approvals, combined with weak communication, bureaucratic steps, and limited autonomy at the frontline, slowed response efforts. These gaps restricted the ability of local responders to meet urgent demands.

Volcanic evacuation governance in Negros Oriental is shaped by a persistent disparity between the capacity of

local institutions and the demands generated by large-scale displacement, resulting in resource shortages, uneven protection, livelihood-driven resistance, inequitable assistance, and slowed decision-making. There is a disparity in how evacuees experience displacement, the delivery of services by the responders, and the pressure on the emergency systems.

In times of surpassed logistical and material capacity, greater shortages become unavoidable, affecting the factors of shelter conditions, food availability, transportation, and the welfare of evacuees. In fact, the inability of institutions to provide specialized protection for high-risk groups results in disproportionate impacts and heightened exposure to hazards. In addition, the communities weigh the economic consequences of evacuation against the limited ability of authorities to compensate for livelihood loss, leading to delayed compliance.

Moreover, disproportionate assistance emerged. When formal systems are unable to support all displaced populations, aid distribution often becomes inconsistent. Delays due to limited autonomy, communication problems, and administrative processes hinder emergency responses. During the crises, these operational limitations highlight not only inefficiencies but also a structural gap between community needs in volcanic emergencies and the ability of institutions to address them under stress.

Conclusion

This case study emphasizes the lessons learned from the struggles and efforts of local authorities during the 2025 volcanic activity in Canlaon City, Negros Oriental, in strengthening evacuation governance.

- First, disaster preparedness lies at the heart of effective disaster management planning and response, reflecting the commitment of communities and authorities to anticipate local hazards, recognize vulnerabilities, and utilize available resources to protect lives before disasters occur. This includes developing response and recovery capacities, creating a systematic organization, ensuring widespread public awareness, fostering collaboration within communities, and comprehensive planning. These are essential for minimizing loss of life and property, speeding recovery, and reducing economic damage.
- Second, effective disaster risk reduction requires moving beyond one-size-fits-all approaches, especially the inclusion of highly vulnerable groups. Accordingly, an inclusive strategy for empowerment and resilience is imperative, one that addresses systemic barriers, fosters trust through sustained engagement, and ensures that communities are placed at the center of planning and decision-making processes.

- Third, the fear of losing the evacuees' agricultural source of income greatly shaped their livelihood concerns. To constitute a sustainable recovery, livelihood security is essential in maintaining social stability. The concerned LGUs should enable training programs and provision of suitable land areas for farming and crop product protection for the evacuees to adapt and rebuild their lives, and to provide stability and food security.
- Fourth, strict implementation of prohibiting individuals from returning and building houses within the 4-kilometer danger zone.
- Fifth, construction of the evacuation centers with enough comfort rooms with efficient supply of water, that can accommodate the needs of affected residents without disrupting school classes (since schools are typically used as evacuation centers).
- Sixth, equal and timely distribution of relief is important to avoid chaos and to build trust for all affected residents.
- Lastly, there is a need for well-trained additional human resources and logistics for the smooth transportation of goods and services. For reliable communication and to further enhance responsiveness, decentralization is important.

Effective disaster management requires comprehensive planning and preparedness strategies, resource allocation, proper training, and community-centered approaches that should be learned.

Limitations and Directions for Future Studies

This research is limited by its focus on a single city and a selected group of barangays within the four to six-kilometer danger zone. With the present area of coverage, the findings may not fully represent the experiences of other cities or regions that face volcanic hazards. The study solely relied on qualitative interviews with local officials, which provided valuable insights but, on the other hand, may not reflect the perspectives of evacuees, vulnerable individuals, or even the higher-level policymakers. The context of ongoing volcanic unrest during the data gathering phase may have also influenced participant responses, especially those involving emotional or stressful experiences.

Future studies should produce more comparative insights, including a wider range of locations that experience similar volcanic risks. It would be beneficial for future researchers to gather the perspectives on capturing the lived realities of displacement more comprehensively from evacuees, especially women, children, farmers, older adults, and persons with disabilities. Also, consider combining

qualitative and quantitative approaches to measure in terms of gaps in logistics, resource distribution, and protection services. In addition, it needs to strengthen livelihood protection programs, improve communication systems, and provide more autonomous decision-making at the community level through providing a deeper knowledge of disaster governance. These areas of inquiry can support the development of more resilient and responsive systems for managing volcanic emergencies.

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