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RADIO COMMUNICATION SYSTEM DURING THE 2022 MOUNT BULUSAN ERUPTION IN SORSOGON, PHILIPPINES

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Abstract:
In June 2022, the phreatic eruption of the Bulusan Volcano affected northwestern towns in Sorsogon, causing power outages, road closures, and forced evacuations. This study examines the role of the Very High Frequency (VHF) radio communication system in disaster response. Using a qualitative method—specifically, Focused Group Discussions (FGDs) and interviews—insights were gathered from key responders, village officials (barangay officials), and partner agencies with direct involvement. Thematic analysis was employed to identify key themes related to communication effectiveness, system reliability, and operational challenges. Purposive sampling included diverse participants, utilizing both homogeneous groups for specific discussions and heterogeneous groups for varied perspectives. This study found that the VHF radio system enhanced coordination and information dissemination when cellular networks in Sorsogon became unavailable. These findings align with Cid et al. (2017): despite limited availability and weak signals in some areas, the resilience of VHF radio maintained communication inside and outside disaster zones. Furthermore, communities equipped with VHF radios enabled continuous communication at the local and municipal levels. Significant challenges, however, arose, such as weak signals in remote areas, limited radio availability, and delays in information flow. The findings of Andreastuti et al. (2023) suggest that community participation in collaboration with local leaders enhances local disaster response mechanisms, including VHF radio communication, before, during, and after disasters.

Keywords: Mt. Bulusan Eruption, VHF Radio Communication, Disaster Response, One Tone-One Frequency System.

1. INTRODUCTION

In June 2022, a phreatic eruption of Mt. Bulusan occurred, producing a sluggish, gray ash plume that expanded and dispersed wet ash northwestward, impacting the towns of Juban, Casiguran, Irosin, Gubat, Barcelona, and Bulusan. Thick ashfall limited mobility, resulting in the closure of the Daang Maharlika Highway and the disruption of communication line services in these towns. This posed a significant challenge for personnel in transmitting and receiving information.

The eruption severely affected 3,954 families, or 19,770 individuals, who were displaced to evacuation centers within and outside Juban, Irosin, and Casiguran. Furthermore, agricultural damage amounting to ₱1,801,500.00 of rice and high-value crops was recorded following the event. Volcanic eruptions are extensively monitored for preparation and mitigation (Coppola et al., 2020; Kurata et al., 2022). Howev-

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er, eruptions continue to affect many communities due to a lack of awareness, resources, and preparedness. Limited research exists on readiness and cultural distinctions. Evaluating volcanic risk requires considering government styles that influence disaster preparedness and response.
Community vulnerability and behavioral intentions require further exploration (Barone et al., 2020). Although long-term eruption prediction remains challenging, contingency planning is essential to minimize impact. Communication is critical in disaster management, especially in preparing communities for volcanic hazards (Asteria, 2016). Coppola et al. (2020) note that effective communication and information dissemination can help mitigate risks for at-risk communities.

A VHF (Very High Frequency) radio is a type of two-way radio that operates on specific frequency ranges. It is well-suited for short-range communication as VHF signals travel in straight lines, which is ideal for use over open terrain. This study examines the transmission and reception of information through an Inter-Agency Operability and VHF Two-Way Radio Communication Network in Sorsogon, highlighting the effectiveness of VHF radios in facilitating communication among various agencies. It also offers recommendations to improve communication and disaster management efforts as part of national development priorities. The study collects qualitative data from selected participants but does not fully represent the experiences of the entire population. Additionally, interpretation is subjective, and biases may influence the conclusion. The research design employs Focused Group Discussions (FGDs) to gather in-depth insights into the communication system. Moreover, the absence of quantitative data, such as response times, the number of messages conveyed, and system consistency metrics, is a limitation, as this data could have supplemented the qualitative findings.

2. LITERATURE REVIEW

VHF radio communication is vital during volcanic eruptions due to its reliability, ability to facilitate real-time coordination, and cost-effectiveness. Unlike cellular and internet-based systems, which may become inoperative when infrastructure is compromised, VHF radios can function independently, thus ensuring continuous communication in remote and disaster-prone regions, contingent upon the availability and extent of repeater systems. This capability enables immediate and direct communication among responders from LDRRMOs, partnering agencies, and locals, which is imperative for effective evacuation procedures and hazard warnings. Furthermore, VHF radios are both economically viable and user-friendly, requiring minimal infrastructure, making them a practical option for local and global disaster response initiatives.

Volcanic eruptions impact communities' physical and psychosocial health, damage property, disrupt the economy, harm the environment, and cause communication disruptions (Inter-Agency Standing Committee, 2007). Access to timely public information and effective communication is essential for disaster response (Moro-Murphy et al., 2011). Local Government Units (LGUs) can use the findings to: improve mitigation plans and communication systems, reducing casualties and enhancing disaster management and response strategies across Sorsogon; encourage community engagement with LGUs in preparing for future volcanic hazards and improving local communication networks; and serve as a reference for future research and highlight gaps that can be addressed to enhance disaster response and recovery in Sorsogon.
In disaster response, crisis communication is crucial for accessing reliable information (Bradley et al., 2014). VHF radio and two-way radios are significant in developing or middle-income countries, especially when power is down and other means of communication are unavailable. In 2015, radio communication systems were acknowledged as reliable and effective tools for engaging with communities affect-

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ed by the Nepal Earthquake. These systems significantly contributed to safe reconstruction efforts and facilitated the dissemination of vital information regarding disaster risk reduction (Saha et al., 2021). VHF radio operates independently of centralized communication infrastructure, making it a valuable resource during disasters. Emergency professionals must recognize the crucial role that amateur radio operators can play in emergency operations plans. Research by Gill (2019) emphasizes the importance of VHF radio in these circumstances, as it also does not rely on centralized communication systems. Additionally, the study by Ahsan and Khatun (2020) highlights the crucial role of VHF radio as a management tool for disaster preparedness in coastal communities in Bangladesh for TCs. In the context of the Bicol region, the study conducted by Onsay et al. (2025) highlights the crucial role of the radio communication system in preparing for Typhoon Kristine.

According to Cid et al. (2017), these systems are inexpensive, independent of terrestrial telecommunication infrastructure, and can operate even during communication blackouts, offering flexible crisis communication solutions. During the Mt. Merapi eruption, communication difficulties led people to rely on local radio and two-way radios for evacuation orders. Similarly, volcanic early warning information in New Zealand was effectively disseminated through radio communication systems (Potter et al., 2014). During the May 2018 eruption of Mayon Volcano, VHF radios and satellite communication were crucial for evacuating approximately 60,000 people in Albay (DeVex News, 2018). Two-way radios proved resilient during Hurricane Harvey (2017) and Hurricane Helen (2024), serving as a primary communication tool during widespread power outages (Stone, 2024). In Bangladesh, VHF radios supported recovery efforts following a cyclone, strengthening community resilience (Andreastuti et al., 2023). In the Philippines, after Typhoon Yolanda, VHF radios and dual-band systems were critical in coordinating the local government's communication efforts in Tacloban (ReliefWeb, 2014). The paper by Lorenzo, E. (n.d.) on the assessment of disaster preparedness parameters and disaster resilience measures for local government, results-based monitoring, and evaluation highlights that the evolving disaster risk management in the Philippine landscape requires better coordination and response mechanisms to enhance disaster preparedness capabilities, ensuring more effective risk management and resilience. Additionally, the involvement of the local community and various stakeholders in disaster risk governance is crucial in enhancing DRR outcomes in the Philippines (Chuidian, 2014; Hugelius et al., 2016; Panao, 2022; Valenzuela, 2021).

The Province of Sorsogon, due to its topographic setting, is vulnerable to various hydro-meteorological and geological hazards, including landslides, earthquakes, tsunamis, tropical cyclones, storm surges, flooding, flash floods, and volcanic eruptions. Mt. Bulusan is a stratovolcano with four prominent craters, a base area of approximately 400 km^2, and an elevation of 1,599 meters above mean sea level (Figure 1). Formed inside the caldera of Irosin, Sorsogon, and connected to the Bicol volcanic chain, it is categorized as one of the active volcanoes in the country and has erupted 18 times, the most recent being in June 2022 (Tayam, 2022).

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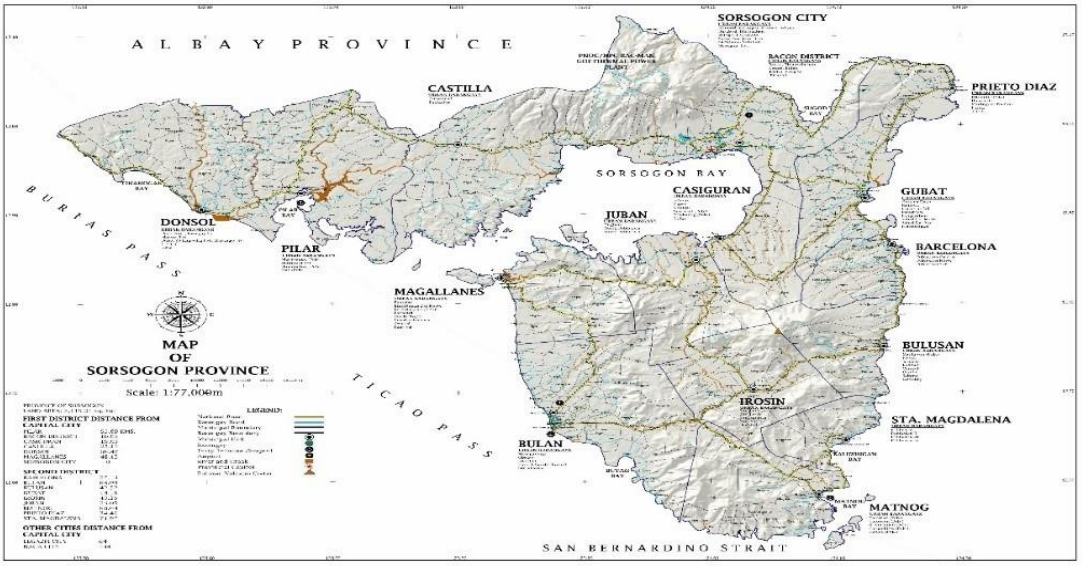
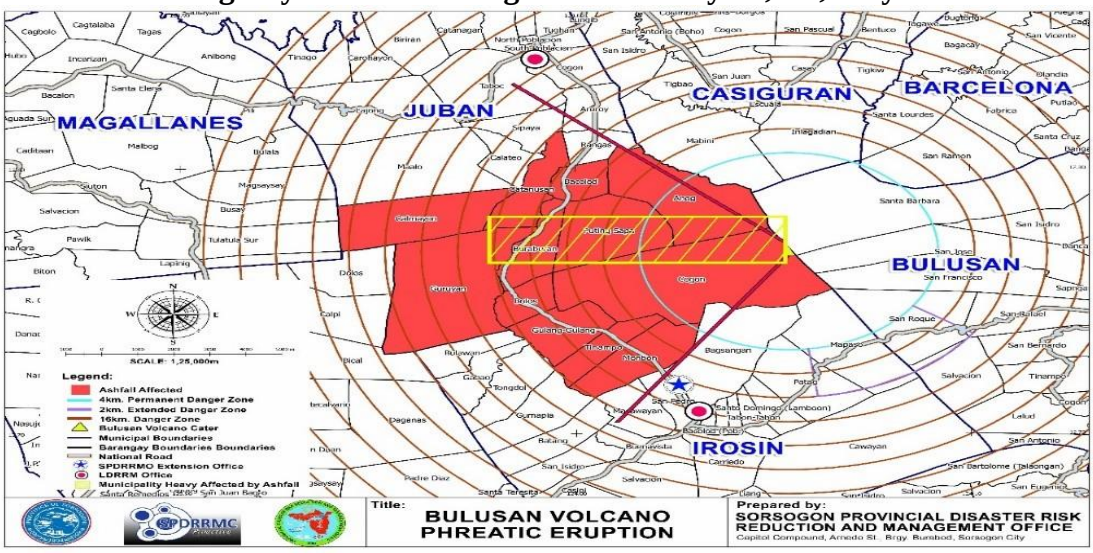
Figure 1. Map of the Province of Sorsogon. Adapted from SPDRRMO Contingency Plan for Geologic Hazard. Tayam, M., May 2022



Ashfall from the phreatic eruption was mainly distributed in the northwestern quadrant of the province due to prevailing Easterlies (winds blowing from the east to southeast), dispersing the ash in that direction. The municipality of Juban received extensive damage as thick layers of ash blanketed the area. Nearby municipalities, such as Irosin and Casiguran, also experienced ashfall due to their proximity to Juban (Figure 2; Tayam, 2022).

Figure 2. Bulusan Volcano Phreatic Eruption and Ashfall Direction. Adapted from SPDRRMO Contingency Plan for Geologic Hazard. Tayam, M., May 2022



The One-Tone-One-Frequency communication system is a key component in Sorsogon's volcanic eruption response plan, ensuring the efficient dissemination of information. An established, dependable

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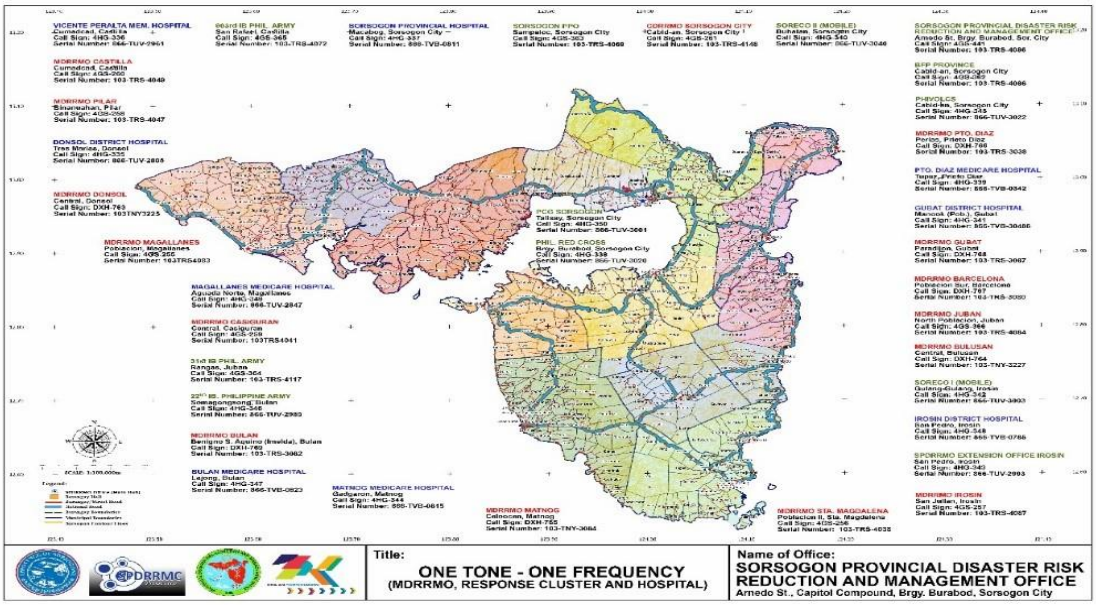
communication protocol, similar to those used by government, non-government, or private sectors, is essential. By utilizing an established communication setup in every disaster-related activity or action plan in the Province of Sorsogon, the primary objectives are to provide timely and speedy information, decisions, reports, and coordination between or within the involved persons. Although other means of communication exist, VHF Repeaters, VHF, UHF, and HF are used primarily when an incident occurs in a remote area during a volcanic eruption. This map (Figure 3) illustrates the existing communication set-up for the Province of Sorsogon under the guidance of the Sorsogon Provincial Disaster Risk Reduction and Management Office (SPDRRMO) (Tayam, 2022). The VHF radio communication system operates in a "one-tone, on frequency" mode, utilizing a Simplex system for "talk or listen" operations on a single frequency.

Figure 3. One Tone-One Frequency. Adapted from SPDRRMO Risk Communication Plan. Tayam, M., May 2022



All stations in Sorsogon (Table 1) use this system for prompt information dissemination. The SPDRR-MO-Irosin Extension acts as the secondary hub for another congressional district. A licensed radio frequency ensures access to higher-quality, interference-free communication channels in Sorsogon, meeting government standards and regulations (Tayam, 2022).

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Table 1. Simplex Station Identification. Adapted from SPDRRMO Radio Communication System and Protocol. Tayam, M. May 2022.

STATION IDENTIFICATION	FREQUENCY	OPERATION
Operation Center (SPDRRMO)	159.57-Mhz	Simplex
Bulan Medicare Hospital	159.57-Mhz	Simplex
Donsol District Hospital	159.57-Mhz	Simplex
Gubat District Hospital	159.57-Mhz	Simplex
Irosin District Hospital	159.57-Mhz	Simplex
Magallanes Medicare Hospital	159.57-Mhz	Simplex
Matnog Medicare Hospital	159.57-Mhz	Simplex
Pto. Diaz Medicare Hospital	159.57-Mhz	Simplex
Castilla District Hospital	159.57-Mhz	Simplex
Sorsogon Provincial Hospital	159.57-Mhz	Simplex
MDRRMO Barcelona	159.57-Mhz	Simplex
MDRRMO Bulan	159.57-Mhz	Simplex
MDRRMO Bulusan	159.57-Mhz	Simplex
MDRRMO Casiguran	159.57-Mhz	Simplex
MDRRMO Castilla	159.57-Mhz	Simplex
MDRRMO Gubat	159.57-Mhz	Simplex
MDRRMO Irosin	159.57-Mhz	Simplex
MDRRMO Juban	159.57-Mhz	Simplex
MDRRMO Matnog	159.57-Mhz	Simplex
MDRRMO Magallanes	159.57-Mhz	Simplex
MDRRMO Prieto Diaz	159.57-Mhz	Simplex
MDRRMO Pilar	159.57-Mhz	Simplex
MDRRMO Sta. Magdalena	159.57-Mhz	Simplex
C/MDRRMO Sorsogon City	159.57-Mhz	Simplex
903rd Philippine Army	159.57-Mhz	Simplex
Sorsogon Prov. Police Office	159.57-Mhz	Simplex
22nd IB Philippine Army	159.57-Mhz	Simplex
SPDRRMO Extension Office - Irosin	159.57-Mhz	Simplex
PRC Sorsogon Chapter	159.57-Mhz	Simplex
PCG Sorsogon	159.57-Mhz	Simplex
BFP Sorsogon	159.57-Mhz	Simplex

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The SPDRRMO will serve as the central hub and be responsible for daily roll calls and technical assistance. Operators must check signal strength, audio quality, and updates daily at 8:30 AM and 4:30 PM. All operators must use plain language when transmitting. Preventive maintenance includes checking connections, wires, and antennas, cleaning radio sets, conducting power supply checks, and troubleshooting. Information from the scene is relayed via VHF radio to the nearest station, which forwards it to the central hub (SPDRRMO Main). The main hub then sends it to the concerned facility and relays feedback to the original sender, ensuring a timely response during emergencies.

During a Mount Bulusan eruption, emergency distress calls should be directed to the Community/Municipal Disaster Risk Reduction and Management Office (C/MDRRMO) and the Provincial Disaster Risk Reduction and Management Office (SPDRRMO) for immediate disaster response. Responders will be deployed to affected areas to conduct rapid assessments, triage victims, and implement interventions based on volcsanic disaster protocols. Priority transport will be given to victims with severe respiratory issues, burns, or trauma. Conscious victims will be informed about their transport to the designated public hospital, while the team leader will make decisions regarding unaccompanied individuals. Victims must complete a signed refusal form if they prefer a different facility. In the event of a Mount Bulusan eruption, effective communication is crucial for ensuring a swift and coordinated disaster response. Directing all emergency distress calls to the C/MDRRMO and SPDRRMO will enable the rapid deployment of responders to affected areas for immediate action.

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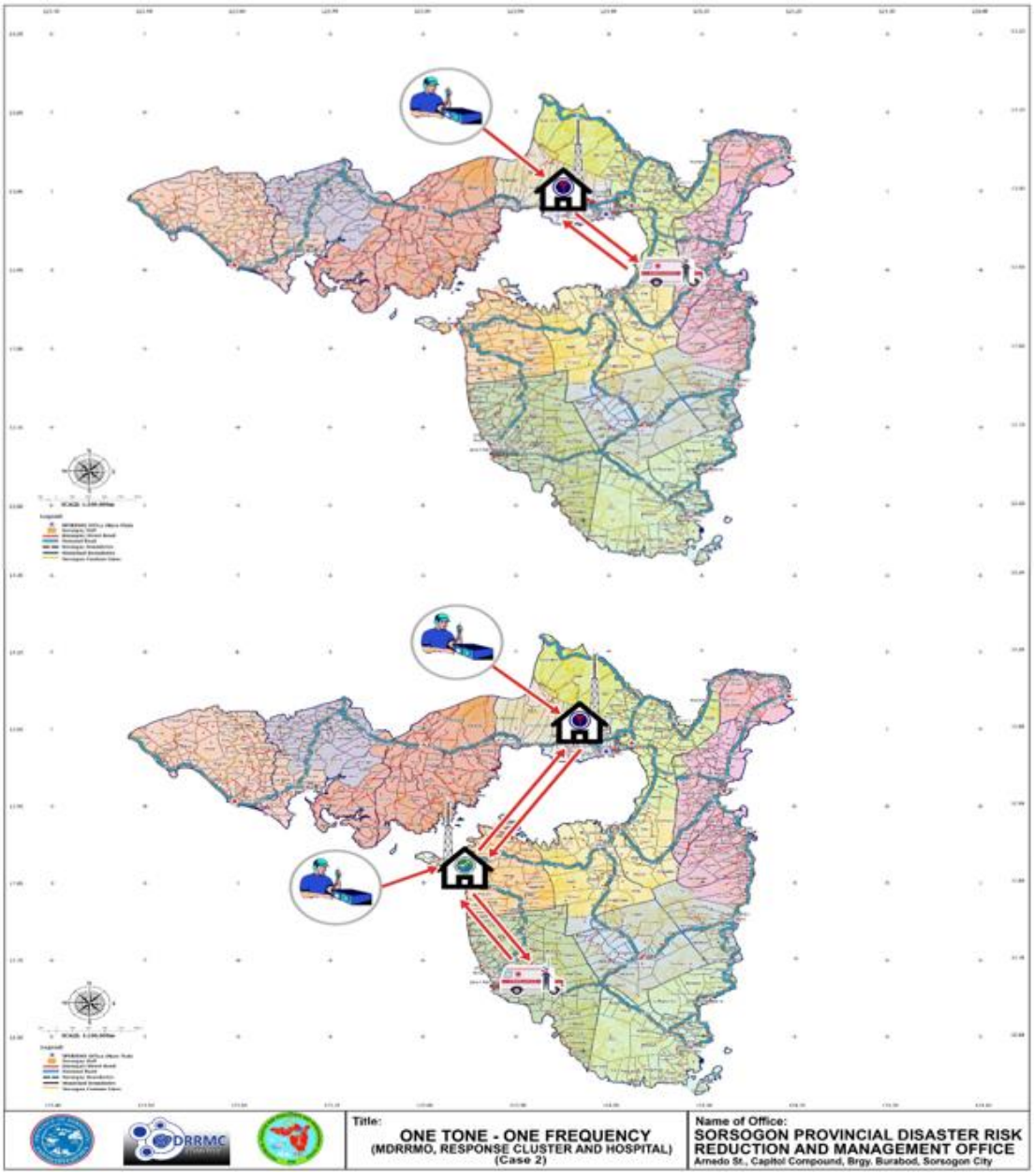
Figure 4. One Tone-One Frequency. Adapted from SPDRRMO Risk Communication Plan. Tayam, M., May 2022.



3. MATERIAL AND METHODS

This study examines how information is received and transmitted through an Inter-Agency Operability and VHF Two-way Radio Communication Network among Local Government Units (LGUs), the barangay level, and other national agencies. It proposes recommendations for the Provincial Government of Sorsogon, including disaster officials, to prioritize improving communication in disaster management as a key aspect of national development in the Philippines.

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Following the methodology outlined by Wimmer & Dominick (2013) and Minichiello et al. (2008), the study uses qualitative data collection methods, including Focus Group Discussions (FGDs) and in-depth interviews. Ideas and insights from participants were used to support questions, highlight different viewpoints, reinforce key findings, and provide insights into often-overlooked areas.

Participant Selection and Data Collection

Participants were selected for their firsthand experience in disaster responses, providing direct insights into Mt. Bulusan's communication challenges. Purposive sampling included individuals from diverse roles, such as barangay officials, emergency responders, social workers, medical staff, teachers, and radio operators.A mix of homogeneous groups for sensitive discussions and heterogeneous groups for diverse perspectives was employed. The homogeneous approach grouped participants based on shared backgrounds, such as barangay officials or medical personnel, to encourage open discussions on specific challenges. In contrast, heterogeneous groups combined different sectors to facilitate cross-sectoral insights and collaboration. Four focus group discussions (FGDs) were conducted, each lasting 60 minutes, to examine participants' experiences in depth. Selection also considered geographical representation from affected municipalities, experience with VHF communication, and willingness to participate. This approach ensured a comprehensive understanding of communication effectiveness, system reliability, and operational challenges. The selection of participants aimed to enhance the understanding of disaster response and community resilience, particularly concerning the Mount Bulusan eruption. Various sectors played crucial roles in the response, rehabilitation, and recovery efforts. The study ensured a comprehensive view of how the Mount Bulusan eruption was managed at various levels by including participants actively involved in different aspects of the disaster response. Their collective experiences illuminated the strengths and weaknesses of existing disaster response mechanisms and highlighted areas for improvement in future preparedness and recovery efforts.

Focus Group Composition

The four focus groups were organized as follows:

- **Group 1: Community Representatives**. This group comprised twelve community representatives from Juban, Irosin, and Casiguran, the municipalities most severely affected by the eruption. These representatives shared firsthand experiences of evacuations, relief distribution, and recovery efforts. As primary recipients of assistance, they provided critical insights into the effectiveness of emergency response measures, gaps in aid distribution, and the long-term socio-economic impacts on their communities.
- **Group 2: Barangay Officials**. The second group featured ten barangay officials from these towns, who were crucial in coordinating local disaster response. Their responsibilities included mobilizing community-based emergency plans, managing evacuation centers, and ensuring the efficient distribution of resources such as food, water, and medical supplies. Their perspectives highlighted the logistical challenges in disaster response, including communication barriers, limited resources, and the need for better coordination between local and national agencies.
- **Group 3: Disaster Management Professionals**. The third group consisted of nine professionals, including four social workers, a radio operator, and two responders from the Sorsogon Provincial Disaster Risk Reduction and Management Office (SPDRRMO). These individuals were chosen for their expertise in disaster response and management. Social workers played a vital role in addressing the psychological and social well-being of affected individuals. The radio operator provided essential communication sup-

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port. SPDRRMO responders shared their experiences coordinating rescue and relief efforts, emphasizing the importance of rapid assessment and deployment in volcanic disaster scenarios.

- **Group 4: Education, Health, and Emergency Services**. Finally, the fourth group included three teachers from Juban, five medical staff members from Irosin, and two firefighters. These participants were involved in disaster preparedness and response efforts following the eruption. Teachers ensured student safety and incorporated disaster preparedness education. Medical staff provided critical emergency healthcare services. Firefighters assisted in rescue operations, evacuation efforts, and managing fire hazards.

Organizing participants into these four groups facilitated a thorough analysis of the disaster response during the Mount Bulusan eruption. Each group had specific roles that provided insights into aid distribution, logistical coordination, and emergency management. This categorization ensured a diversity of perspectives, improved data organization, and highlighted strengths and gaps in the disaster response. By representing key sectors—community members, local officials, professionals, and emergency responders—the study identified challenges in inter-agency coordination and resource allocation, offering valuable insights for enhancing future preparedness and response efforts.

Data Analysis

Data collected from FGDs and interviews were analyzed and outlined following the methodology established by Bradley et al. (2014) for evaluating the effectiveness of disaster risk communication. A thematic analysis was employed to identify key themes related to communication effectiveness, system reliability, and operational challenges. Transcripts were meticulously reviewed, coded, and categorized to emphasize both the strengths and limitations of the VHF radio system. The findings were subjected to validation through peer debriefing and participant verification to minimize potential bias. Nevertheless, the absence of quantitative data regarding response times and message transmission rates limited the scope of the analysis.

4. RESULT AND DISCUSSION

SPDRRMO Focused Group Discussion Interviewees

Communication Effectiveness

Interviewees highlighted that using "One Tone—One Frequency" shortens the relay of information from the ground to concerned offices, ensuring all Local Government Units (LGUs) operate on the same frequency for uniform communication across Sorsogon. VHF radios were essential for facilitating communication regarding food, medical, and psychosocial support. They transmitted updates from barangay-level evacuation centers to the municipal and provincial levels. This role is supported by the study of Bradley et al. (2014), which emphasizes the importance of avoiding delays in relaying information during disaster response. Effective communication is essential for accessing reliable information and delivering needed services. A key implication of the study is the necessity to prevent and mitigate disasters, prepare the population in advance, and disseminate information both before and during the disaster response.

System Reliability

In some LGUs, specific barangays were equipped with VHF radios for local and municipal communication. However, delays occurred in some barangays due to the topographic setting and the distance from the repeater system.

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Operational Challenges

During the Mt. Bulusan eruption's road-clearing operations, concerned agencies relied on VHF radios to coordinate ash-clearing activities along the Maharlika Highway from Juban to Irosin, especially considering the zero-visibility period in Juban and Irosin after the eruption.

Communication Effectiveness Juban, Casiguran, and Irosin Interviewees Including Barangay Officials

Communication Effectiveness

FGD participants from three municipalities agreed that no prior information was given during the unrest period of Mt. Bulusan. Only after the eruption did local officials inform them using the public address system, while additional information was transmitted through VHF radio to the LGU/MDRRMO. An interviewee from Añog, Juban, said, "It was a gloomy day, and clouds covered Mt. Bulusan." We did not hear any rumbling sound before it erupted. After Mt. Bulusan spewed ashes, the LGU-Juban informed us through VHF radio and advised an immediate evacuation, as our barangay was within the 4-km PDZ. We were the first to be affected." Inlagadian, Casiguran participants stated, "Since we are located on the north vent of Mt. Bulusan, we were the first to see the ash plume." Minutes later, ash reached our barangay, and our officials advised us to evacuate immediately." Interviewees from Monbon shared, "Mt. Bulusan faces our barangay." We did not experience ashfall right after the eruption, but we did hear rumbling sounds, especially at night. Local officials announced the evacuation using a megaphone in coordination with the Municipal Disaster Risk Reduction and Management Office (MDRRMO). Similar key findings from the study by Adreastuti et al. (2023) indicated that the local community's perceived risks, knowledge, and experiences are essential to have a desired public response where the personal communication of the local community and local officials, including experts in a geological context is necessary to instill self-responsibility in times of disaster, considering such communication within the communities have experienced a history of eruptions.

System Reliability

Some barangay officials revealed that while some have VHF radios, others do not. They rely on traditional methods, such as the public address system, to relay information. One official noted, "We used cellular phones as an alternative to inform concerned officials, but it would be better if we were provided with VHF radios." This demonstrated that capacity, with the involvement of local leaders, could facilitate the participatory risk assessment of communities grounded in traditional practices, local realities, and existing policies and strategies. Andreastuti et al. (2023) also noted that local capacity can enhance participation and communication, disaster response, and local leaders' support. In emergencies and when cellular signals are weak, VHF radios become a reliable option; they are exceptionally reliable when phone signals are weak or unavailable.

Operational Challenges

Barangay officials prioritized ensuring public safety before disseminating information, sometimes leading to communication delays. Additionally, another barangay official stated, "After the ashfall, our priority was to evacuate and ensure everyone's safety." We will report the situation and the number of evacuees only after we have settled." Some officials admitted they were unfamiliar with using VHF radios. One said, "If VHF radios can help us relay information faster, we would appreciate training and a manual on how to use them." Additionally, one of the key findings of Andreastuti et al.'s (2023) study highlighted the importance of addressing public needs during the eruption of Merapi Volcano in Indonesia.

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The lack of such support can hinder access to vital information before, during, and after a volcanic eruption. Therefore, education, training, and skill development in volcanic management are essential components of effective disaster risk management.

Partnered Agencies

Communication Effectiveness

Interviews with barangay officials and FGD participants from Juban, Casiguran, and Irosin revealed significant issues with communication effectiveness during the Mt. Bulusan unrest. Participants from all three municipalities agreed that they received no prior information before the eruption. Local officials only informed them using the public address system after the event, with additional information transmitted via VHF radio to the Local Government Unit (LGU) and Municipal Disaster Risk Reduction and Management Office (MDRRMO).

An interviewee from Añog, Juban, stated, “It was a gloomy day, and clouds covered Mt. Bulusan. We did not hear any rumbling sound before it erupted.” He added, “After Mt. Bulusan spewed ashes, the LGU-Juban informed us through VHF radio and advised an immediate evacuation, as our barangay was within the 4-km PDZ. We were the first to be affected.” Participants from Inlagadian, Casiguran, reported, “Since we are located on the north vent of Mt. Bulusan, we were the first to see the ash plume. Minutes later, ash reached our barangay, and our officials advised us to evacuate immediately.” Interviewees from Monbon shared, “Mt. Bulusan faces our barangay.” They noted, “We did not experience ashfall right after the eruption, but we did hear rumbling sounds, especially at night.” Local officials announced the evacuation using a megaphone in coordination with the MDRRMO. These findings align with the study by Andreastuti et al. (2023), which indicated that the local community's perceived risks, knowledge, and experiences are essential for a desired public response. The study emphasizes that personal communication between the local community, local officials, and geological experts is necessary to instill self-responsibility in times of disaster, particularly within communities with a history of eruptions.

System Reliability

Some barangay officials disclosed a disparity in resources: while some barangays have VHF radios, others do not, forcing them to rely on traditional methods, such as the public address system, to relay information. One official noted, “We used cellular phones as an alternative to inform concerned officials, but it would be better if we were provided with VHF radios.”. This situation demonstrates that building local capacity, with the involvement of local leaders, can facilitate participatory risk assessment grounded in traditional practices, local realities, and existing policies and strategies. Andreastuti et al. (2023) also noted that local capacity can enhance participation, communication, disaster response, and local leaders' support. In emergencies and when cellular signals are weak or unavailable, VHF radios are a reliable communication option.

Operational Challenges

Barangay officials prioritized ensuring public safety before disseminating information, which sometimes resulted in communication delays. One barangay official stated, “After the ashfall, our priority was to evacuate and ensure everyone’s safety. We will report the situation and the number of evacuees only after we have settled.” Additionally, some officials admitted they were unfamiliar with using VHF radios. One official said, “If VHF radios can help us relay information faster, we would appreciate training and a manual on how to use them.” The lack of support and familiarity with communication tools can hinder

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access to vital information before, during, and after a volcanic eruption, a key finding also highlighted in Andreastuti et al.'s (2023) study on the Merapi Volcano in Indonesia. Therefore, education, training, and skill development in volcanic management are essential components of effective disaster risk management.

5. CONCLUSION AND RECOMMENDATION

The Focus Group Discussion (FGD) findings among participants revealed both positive and negative facets of the radio communication and operational systems used during the eruption of Mt. Bulusan. On the positive side, the radio communication system in Sorsogon enhanced communication efficiency, and the use of VHF radios proved crucial during the disaster. Partner agencies effectively utilized this system and could potentially equip barangays with it, which would aid local and municipal communication. Nevertheless, challenges were noted; some areas faced communication issues due to topographic settings, and crucial facilities lacked VHF radios. Additionally, the cellular signal was unreliable during power outages; therefore, VHF radios are essential as a substitute for communication during disaster response to prevent information gaps (Table 2).

Table 2. Key Findings of Focused Group Discussion

	KEY FINDINGS	
	POSITIVE	**NEGATIVE**
COMMUNICATION EFFECTIVENESS	One Tone - One Frequency improved communication between local government units (LGUs) and agencies, ensuring uniform and efficient information relay across Sorsogon. VHF radios facilitated the coordination of food, medical, and psychosocial support from the barangay to the municipal and provincial levels. -During clearing operations, VHF radios proved essential for coordinating tasks during zero-visibility periods caused by ashfall. -Partnered agencies, including the PSWDO and hospitals, effectively utilized VHF radios for patient referrals and coordinating services	-No prior information was given to residents during the unrest period of Mt. Bulusan. Most were informed only after the eruption had occurred. -Teachers and some barangay officials lacked VHF radios, resulting in delays in the relay of information. -Delays in communication occurred due to topographic challenges and the distance of some barangays from repeater systems.

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	during emergencies.	
SYSTEM RELIABILITY	Some barangays were equipped with VHF radios, enabling local and municipal officials to communicate effectively. -Medical staff and BFP personnel successfully used VHF radios for patient transport and information relay when cellular signals were weak.	-Some barangays still relied on traditional public address systems and cellular phones due to the absence of VHF radios. -Cellular networks were unreliable during emergencies, mainly when power outages were caused by thick ashfall.
OPERATIONAL CHALLENGES	Teachers and social workers assisted barangay officials in monitoring evacuees, ensuring that organized evacuation procedures were followed despite communication challenges. -Barangay officials prioritized immediate evacuation procedures to ensure the safety of their constituents before providing updates.	-Barangay officials reported unfamiliarity with VHF radio operations and expressed the need for training and manuals. Teachers emphasized the difficulty of communication when there was no electricity, which delayed the relay of critical information. -BFP personnel mentioned that, although they occasionally used VHF radios, they still relied on unreliable cellular communication.

The radio communication system in the province is currently limited to Local Disaster Risk Reduction and Management Offices (LDRRMOs), district hospitals, and select frontline agencies. It enables the timely and efficient sharing of information, decision-making, reporting, and coordination among or within the involved parties. The availability of funds for Local Government Units (LGUs) will influence the procurement of VHF radios in respective barangays. Nonetheless, the implementation of the "One Tone-One Frequency" VHF radio communication system in Sorsogon demonstrates its effectiveness in strengthening disaster response, ensuring effective management, and timely support delivery across the province of Sorsogon. Given the topographic challenges causing weak radio signals and communication delays, the author recommends installing an additional repeater. This would improve information transmission from remote areas and reduce delays. However, a comprehensive study is necessary to determine the optimal placement of these repeaters and ensure coordination with telecommunications providers. A

structured policy is crucial for implementing additional repeaters in Sorsogon. LGUs should integrate GIS-based assessments to determine optimal locations and coordinate with the National Telecommunications Commission (NTC) and private providers for co-location and investment sharing. Clear budget guidelines under the Local Disaster Risk Reduction and Management Fund (LDRRMF) must support funding, maintenance, and upgrades. Embedding these measures into official policies will enhance real-time communication and disaster response.

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AUTHOR'S PROFILE

Alvin Paul Habla is a meteorologist at the Sorsogon Provincial Disaster Risk Reduction and Management Office (SPDRRMO), where he plays a vital role in monitoring weather systems and providing timely forecasts to support disaster preparedness and response in the province. His professional work focuses on analyzing meteorological data, interpreting atmospheric patterns, and delivering actionable information to local government units and communities vulnerable to natural hazards such as typhoons, floods, and volcanic eruptions.Driven by a passion for research in the field of meteorology, Habla actively explores the intersection of science and disaster risk management. His interests include enhancing communication systems for early warning dissemination, improving resilience strategies through climate data, and applying innovative forecasting methods to strengthen community preparedness. Through his work, he contributes to safeguarding lives and livelihoods in disaster-prone areas, ensuring that scientific insights are translated into practical measures for risk reduction.

Habla's dedication to both applied meteorology and academic research reflects his commitment to advancing knowledge while serving the public. His professional journey embodies the integration of technical expertise with a humanitarian mission, making him a valuable contributor to the field of disaster risk management and meteorological science.