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Navigating Challenges for Disaster Resilience: Insights from Department of Public Works and Highways Personnel

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Abstract
Disasters are unforeseen, catastrophic events that have the potential to significantly harm populations, ecosystems, and economies. Disasters can occur quickly or gradually, and the scope of their effects may range from local to regional to even global. The Department of Public Works and Highways' (DPWH) efforts in building and maintaining resilient road networks are vital for ensuring access to affected areas during disasters. This facilitates the timely arrival of emergency responders, the delivery of relief supplies, and the evacuation of affected populations. This study then seeks to examine the experiences of the DPWH-BSDEO (Benguet Second District Engineering Office) personnel in their commitment to fostering disaster resilience while navigating challenges. This study utilized a qualitative research design. Data were collected from various sources, including DPWH-BSDEO employees, Municipal of Buguias personnel, Philippine National Police-Buguias, Bureau of Fire Protection-Buguias, as well as official office reports. The responses of the participants established that the challenges faced by DPWH-BSDEO personnel encompass insufficient funding, limited resources, inadequate training among disaster volunteers, vulnerability of responders to disasters, limited community cooperation, suboptimal communication, and an ineffective drainage system. Based on these findings, the researchers concluded that it is imperative to enhance the DRRM functions within the office and significantly bolster its capabilities.

Keywords: Challenges, Disasters, Resilience

1. Introduction

Since the beginning of the world (Bautista et al., 2014), it has been a fact of human life that natural disasters cause violence. Even though we are safe and comfortable in our houses, we cannot assume that our lives are secure. The threat still exists, stemming not only from the criminals but also from human nature. Climate change, spurred by the depletion of the ozone layer, has exacerbated the frequency of these catastrophic events. Typhoons, hurricanes, earthquakes, tsunamis, volcanic eruptions, and flash floods are just a few of the terrible disasters and shifting tragedies that have killed thousands, or perhaps millions, of people and damaged property around the planet. In fact, our overreactive nature at the moment encourages drastic calamities.

Year after year, the Philippines grapples with a myriad of calamities, notably powerful typhoons that trigger extensive flooding in low-lying regions and perilous landslides in mountainous terrain. The escalation of these typhoons has taken even the most well-prepared citizens by surprise, as their destructive impact continues to intensify. Consequently, these natural disasters frequently result in catastrophic harm, inflicting a substantial toll in terms of both human lives (Ardalan & Affun-Adegbulu, 2024; Garfin et al., 2023) and property devastation (Compton, 2022; Swarbrooke, 2022; Bautista et al., 2014). Throughout Philippine history, a recurring pattern of disasters has been etched into the nation's narrative. The Philippines, in terms of geography, has a perilous location along the Pacific Ring of Fire, trapped between the West Philippine Sea to the west and the huge Pacific Ocean to the east. This unique geographic placement, coupled with its distinctive geological attributes, renders the Philippines particularly susceptible to a wide array of natural hazards. Floods and storms have emerged as the most frequently encountered perils, bearing testament to the nation's vulnerability due to its geographical location. Moreover, the country's geological composition elucidates the prevalence of other catastrophic events such as earthquakes, tsunamis, and landslides (Lusterio et al., 2022; Garcia & Hernandez, 2018; France-Presse, 2013).

The annals of Philippine history bear witness to some of the most harrowing and heart-wrenching tragedies etched into the pages as a result of natural disasters (Jimenez, 2022). Among these calamities, the deadliest storm to ever beset the nation was Haiphong, ranging from September 27 to October 6, 1881. Its unforgiving fury claimed the lives of more than 20,000 individuals, leaving hundreds of thousands injured in its wake. Hurricane Haiyan, or Yolanda, which devastated the Eastern Visayas and other areas from November 7 to 8, 2013, was the country's second worst, killing approximately 6,241 people. Based on the amount of damage caused to properties, the worst typhoon to hit the Philippines was Pablo, causing damages worth no less than Php 42.2 billion. Damage caused by Yolanda was Php 35.5 billion; Pepeng from September 27 to October 14, 2009, was Php 27.3 billion; Pedring from September 26 to 28, 2011, was Php 15 billion; Frank, 13.5 billion; and Ondoy from Sept. 25 to 27, 2009, was Php 11 billion.

In order to lessen the level of vulnerability in affected areas leading to losses of human lives, property, crops, information, natural resources, and other assets in all parts of the country, attention must be accorded to these aspects. The frequency, intensity, and variability of hazards have heightened the compelling need for the country to create the Disaster Risk Reduction and Management (DRRM) Council (National Disaster Risk Reduction and Management Plan 2011–2028, n.d.). The National Disaster Risk Reduction and Management Council (NDRRMC) is tasked with coming up with a framework for Disaster Risk Reduction and Management, as well as supervising preparations for and responses to natural calamities and human-induced disasters (Bueza, 2014).

Being the infrastructure branch of the Philippine government, the Department of Public Works and Highways (DPWH) is in charge of managing natural disasters as well as continuously reducing risks and mitigating the effects of climate change on public and civil infrastructure, saving lives, protecting property, and ensuring the safety of the general public while preserving and safeguarding the environment. Through the NDRRMC, the DPWH collaborates with other national government agencies during the various stages of disasters and calamities, particularly on comprehensive policies and approach measures in prevention,

mitigation, preparedness, response, rehabilitation, and recovery of the affected population and the entire community.

As mandated by Republic Act No. 10121, otherwise known as the "Philippine Disaster Risk Reduction and Management Act of 2010," the DPWH actively engages in collaborative endeavors and allocates resources as part of the government's disaster risk reduction management initiatives. The DPWH is concerned with a variety of potential hazards, including geophysical, hydro-meteorological, civil unrest, and other disasters. In keeping with this dedication, the department works to improve its capabilities by creating proactive, comprehensive planning and response plans. These programs aim to increase the communities' resilience, adaptation, and safety in the event of calamities, thereby promoting sustainable development (Gravillo, 2023).

The study explored the experiences of DPWH-BSDEO's (Department of Public Works and Highways—Benguet Second District Engineering Office) personnel in developing the community's resilience to disaster. By delving into their experiences, the study aims to shed light on the challenges encountered during the execution of disaster resilience initiatives. Understanding these challenges is crucial for identifying gaps and areas for improvement in disaster preparedness and response strategies. Ultimately, the findings of this study can inform policymakers, disaster management agencies, and community leaders about the practical obstacles hindering effective disaster resilience efforts, thereby facilitating the development of more targeted and effective interventions to enhance community resilience.

2. Conceptual Background

This study is firmly based on the framework of two important theories, namely, the Person Relative to Event (PrE) Theory and the Protection Motivation Theory (PMT). According to PrE theory, a person's behavior is influenced by how they see the situation and how capable they are. A disaster might be viewed as a stress-inducing event, and the preparation for such a disaster can be likened to a problem-focused coping technique to successfully address this situation. The interplay between the danger assessment of the oncoming catastrophe and an individual's assessment of their coping resources determines whether or not one should prepare for a disaster (Mulilis & Duval, 1997). This indicates that in a disaster response scenario, people will react based on their perceptions of the severity and proximity of the crisis, as well as their belief in their abilities to respond effectively. Emergency responders can utilize this information to design response methods that take into account both the perceived threat and the affected population's level of self-efficacy. According to PrE theory, subjective norms, in addition to perceived costs and benefits, play an important role in influencing behavioral intentions. Subjective norms (Motoyoshi, 2004) have a large influence on behavior in social circumstances, such as community disaster preparedness.

The Protection Motivation Theory (PMT) model was developed to help researchers better understand how and why individuals react to potential threats to their health and safety (Milne et al., 2000). PMT has become one of the most extensively used decision-making frameworks for disaster prevention (Becker et al., 2013) and the theory can be utilized to explore disaster preparedness behavior (Grothmann & Patt, 2005). Moreover, Clubb and Hinkle (2015) state that an individual may hold the belief that exposure to a potential threat is not a cause of significant concern or is not serious enough to warrant further protective measures. The authors also opine that an individual may believe that a potential protective response will

not be successful in defending them against a potential threat or that the costs of such a response outweigh any potential benefits. The individuals will decide not to use a certain protective response if this occurs. Conversely, if an individual perceives a serious threat and has the resources to acquire a protective reaction or believes that the response will be effective, they are more likely to take the recommended protective action.

People's attitudes towards disaster preparedness are influenced by their personal characteristics, family circumstances (Özdemır & Yilmaz, 2011), belief-related variables such as hazard beliefs, and how they assess their self-efficacy and outcome efficacy (Bubeck et al., 2012). In particular, perceived efficacy plays a critical role in predicting disaster preparedness (Paton & Johnston, 2015; Paton, 2003). Further, Lindell et al. (2016) found that people with higher levels of disaster preparedness include families with vulnerable family members (e.g., the elderly, children, and the disabled). Other predictors of disaster preparedness behavior include high educational levels (Bubeck et al., 2012), home ownership, length of residence at their current address (Spittal et al., 2008), perceived vulnerability (Eisenman et al., 2006), and previous disaster exposure (Espina & Teng-Calleja, 2015; Takao et al., 2004).

In this study, PMT can be used to investigate how DPWH personnel perceive the threats posed by disasters and their susceptibility to them. This includes understanding their perceptions of the severity of disasters, such as the potential damage to infrastructure and the safety risks to themselves and their communities. Additionally, the study can investigate DPWH personnel's beliefs about their ability to respond effectively to disasters, such as their confidence in their training, access to resources, and coordination with other agencies.

3. Methodology

Research Design. The study utilized a qualitative approach. This approach allows for in-depth exploration and understanding of the challenges faced by personnel in their efforts to foster disaster resilience within the community. By engaging directly with DPWH personnel through interviews, qualitative research enables the collection of rich, nuanced insights into their perspectives, experiences, and strategies for navigating challenges related to disaster resilience.

Sampling and Participants of the Study. The research was carried out in Buguias, Benguet, Philippines, involving a group of ten individuals selected through purposive sampling. The participants in the study are personnel of DPWH-BSDEO, the Municipal Office, the Philippine National Police, and the Bureau of Fire Protection in Buguias

Data Collection Techniques and Procedures. Interviews using a semi-structured guide were the primary method for gathering data. Ethical principles guided the research process, beginning with the implementation of informed consent to ensure that participants were fully aware of the questions posed during the interviews. Participants were also briefed on the study's objectives, providing them with a clear understanding of the research's purpose and trajectory.

Analysis of Data. The researchers used thematic analysis to examine the collected data. Thematic analysis is the process of identifying patterns or themes within qualitative data (Maguire & Delahunt, 2017). Braun and Clarke (2006) advocate that it is the first qualitative method that should be learned as '…it provides core skills that will be useful for conducting many other kinds of analysis' (p. 78). The main goal of a thematic analysis is to locate and identify noteworthy patterns in the data. It is crucial to stress that thematic

analysis entails more than just summarizing data; rather, it involves understanding and offering insightful interpretations of the data.

4. Results and Discussions

Despite the implementation of various activities aimed at enhancing service delivery, the office continues to face challenges hindering the government's efforts to create safer, more adaptive, and disaster-resilient communities.

4.1. Insufficient Funding

The DPWH-BSDEO (Department of Public Works and Highways —Benguet Second District Engineering Office) personnel face a primary challenge of insufficient funding, which is crucial for the successful execution of Disaster Risk Reduction and Management (DRRM) activities. Limited financial resources can lead to significant issues, such as difficulties in allocating resources during emergency response operations. Items like fuel and equipment may not receive the necessary priority due to funding constraints, thus potentially hindering the effectiveness of DRRM activities. Participant 2 shared:
"There is insufficiency of funding for the purchase and rental of equipment for clearing, protective personal equipment, search and rescue equipment, and information dissemination equipment."

Participant 4 likewise narrated the repercussions of inadequate funding in their operations. He said:
"Finding the requisite funds is a big problem we have, especially with structural mitigation. It is obvious that when an area is damaged, it takes a staggering amount of money to rebuild and repair it. Given the high cost of structural mitigation, we frequently shift our attention to non-structural mitigation initiatives."

While the DPWH-BSDEO has set a percentage of the Annual Maintenance Work Program/Performance Budget (AMWP/PB) to address emergencies, this allocation often falls short due to budget constraints. The primary focus tends to shift towards addressing pressing problems such as the procurement of materials, tools, and labor necessary for the maintenance of national roads and bridges. The rating on the maintenance of national roads is apparently more relevant. In light of the funding inadequacy problem, Participants 1 and 4 said the office seeks assistance and augmentation from private entities (contractors), the Local Government Unit, the Philippine National Police, and the Bureau of Fire Protection. The funds requested will also be allocated to address the repair and restoration of the obstructed drainage system.

The result corroborates the observation of Blasco (2015), where there is a high propensity to underestimate the importance of DRRM funds until a calamity strikes. This perception can be harmful, as proactive disaster preparedness is crucial. Research group IBON Foundation (2020) pointed out that despite the country being disaster-prone, the government reduced the allocation for calamity funds in the 2020 national budget. IBON noted that in the recently passed 2020 national budget, the Duterte administration only allocated Php16 billion for the National Disaster Risk Reduction and Management Council (NDRRMC) Fund or Calamity Fund. This is a Php 4 billion decline from the Php 20 billion in 2019. Furthermore, the increase in quick reaction funds to Php 6.8 billion from Php 6.3 billion remains insufficient. This highlights the need for a stronger and more proactive approach to disaster risk management, emphasizing the significance of adequate funds and resources in protecting communities. Such a reduction in funds will importantly impair the ability of the office to respond effectively during

catastrophes, particularly given the country's vulnerability to various types of disasters, primarily due to its geographical location.

Although Section 21 of Republic Act 10121, the Philippine Disaster Reduction and Management Act, mandates that local governments set aside 5% of their expected revenues for DRRM to be used in emergencies, poor towns are unable to comply with this because they have small budgets. Instead, attention is paid to issues like hunger, education, and health; as a result, communities without DRRM budgets or with extremely modest ones lack the necessary tools (Blasco, 2015).

In addition, the recent pandemic has reshaped the landscape of the national budget. The COVID-19 pandemic has brought unprecedented economic and development challenges, with lasting impacts on the economic and developmental landscapes of countries worldwide as well as the achievement of sustainable development goals. In the Fiscal Year 2021 budget, a strong emphasis has been placed on programs aimed at addressing the crisis. The Department of Budget and Management (DBM) reported that agencies are instructed to review and reprioritize their programs, activities, and projects toward containing the spread and mitigating the effects of the pandemic while marshaling an economic recovery under the “new normal.” Unfortunately, this reprioritization has led to the reallocation of budgets intended for slope protection and other DRRM activities. Other than responding to the pandemic, other DRRM activities are not often among the top priorities in the country. This observation aligns with Silver’s (2014) findings that less priority is accorded to DRRM activities. To address this issue, there is a need for a shift in perspective where disaster risk reduction should be viewed as an integral component of development.

The findings suggest that the DPWH-BSDEO faces challenges in responding effectively and efficiently, primarily attributed to inadequate funding. The limited financial resources hinder the DPWH personnel's capacity to proactively address issues. This constraint not only affects their ability to respond promptly but also compromises their overall effectiveness in disaster management and response efforts. Additionally, the lack of sufficient funding may lead to delays in critical actions and undermine the agency's preparedness for future disasters.

4.2. Limited Resources

In the event of sudden major natural disasters such as earthquakes, landslides, and storms, it is crucial to provide an immediate life-saving response to rescue individuals who may be trapped and to stabilize or evacuate survivors. These calamities often result in infrastructure damage, leading to people being trapped in debris or sustaining injuries, sometimes resulting in significant loss of life. The critical window for intervention can mean the difference between life and death, with every passing hour being of utmost importance. Hence, responders need appropriate emergency clearing tools specific to the disaster's nature and prioritize personal protective equipment (PPE) tailored to their roles. However, it is essential to highlight that, apart from supplies and equipment, manpower resources are also fundamental requirements during disaster response. The inadequacy of these essential resources can disrupt the smooth execution of disaster risk reduction and management (DRRM) plans and operations.

Six participants retorted that the primary challenges within this thematic area are the inadequacy of equipment, skills, and manpower. The following statements provided by these participants serve as

compelling evidence to corroborate this issue:
"There is a delay in response due to a lack of equipment." Participant 10
"There is inadequate equipment during a disaster and a scarcity of manpower to operate equipment." Participant 6
"When contacted by the DPWH, there is no driver available, and the response is delayed. Addressing the shortage of personnel by the national office is crucial." Participant 7

Participant 9 further emphasized that aside from shortages in equipment and manpower, another critical challenge in disaster response is responders' lack of essential skills. He pointed out:
"They [responders] lack the necessary knowledge and skills to respond in times of emergencies. It is very important that they have a clear understanding of their roles."

These statements mirror that the quality of response during a disaster is influenced not only by the completeness of equipment but also by the skills of the responders. The limitation of resources emerges as a significant challenge during disaster response, as highlighted by various authors (Baur & Rieck, 2020; Ghaffari et al., 2020; Mondal et al., 2019). The findings are likewise congruent with those of Agub (2017), who noted a common issue in the Philippines' disaster management: the lack of capacity among line agencies and LGUs to undertake DRRM activities. Reasons for this include limited manpower and equipment, inadequate technical knowledge and understanding, and insufficient physical infrastructure in disaster-prone areas. These challenges collectively increase the risks faced by communities.

The research finding that the DPWH-BSDEO lacks appropriate equipment, skills, and staff to deliver disaster response efficiently implies that immediate attention and investment are required to rectify these efficiencies. Without adequate equipment, skills, and manpower, the DPWH-BSDEO may fail to respond effectively to catastrophes, potentially resulting in delays, inefficiencies, or even the exacerbation of disaster impacts. Therefore, prioritizing the acquisition of necessary equipment, improving people skills, and increasing manpower resources within the DPWH-BSDEO are all critical steps toward improving disaster response capabilities and overall disaster resilience in affected areas.

4.3. Inadequate Training Among Disaster Volunteers

In instances of delayed response, it's common for bystanders or volunteers, who may not possess any formal training or skills in administering first aid interventions, to become the initial responders or actively participate in rescue operations. Nevertheless, one participant conveyed the view that although volunteerism during disaster response is commendable, it has the potential to hamper their operations. He said, "Untrained people who are suddenly asked to help but lack the necessary training add to our workload."

Based on this statement, although the intention of offering assistance is commendable, there are instances where the spirit of volunteerism may inadvertently jeopardize a person's well-being. An example is giving first aid, which is a difficult task that requires appropriate training. A lack of understanding of the proper procedures can endanger the life of the person in need. Given these situations, the responders are not only focused on attending to the victim or patient but also on overseeing unexperienced volunteers.

Wentink and Van Neikerk (2017) posit that having more volunteers can be beneficial in carrying out duties, particularly during emergencies where manpower is essential. However, such altruistic acts may pose risks not only to the health and safety of the survivors but also to the volunteers themselves, particularly when they lack essential knowledge and equipment.

The result further corroborates the findings of Catlett et al. (2014) that while the citizens' philanthropy is inspiring, these unsolicited or "spontaneous" volunteers may be placing themselves and others at risk for injury and, in some rare instances, death due to their lack of training in safe and proper disaster response. Aminizade et al. (2017) therefore recommend that emergency services and other organizations control the volunteers' participation because it is inevitable for citizens to congregate in emergency and crisis settings. This is crucial to ensure that the organizational response won't be delayed by inexperienced volunteers acting haphazardly and that those affected by the accident will have access to enough resources.

Governments and organizations throughout the world are increasingly acknowledging the opportunities and challenges arising from the involvement of volunteers. This implies that the office can take full advantage of the value of crisis and emergency management by integrating the knowledge, skills, resources, systems, and interests of the community.

4.4. Vulnerability of Responders to Disasters

Another challenge emphasized by the participants is their heightened vulnerability to risks during disaster response, primarily due to adverse weather conditions. These conditions not only incumber the clearing operations but also jeopardize the safety of the responders. Compounding this vulnerability is the terrain of the locality, which has been prone to landslides due to deforestation activities. These human-induced activities have led to a series of landslides within the community.

Laborers and operators work around the clock, which makes them physically exhausted. While travelers anxiously await the reopening of the road, the personnel also have loved ones awaiting their safe return. But despite the physical and emotional exhaustion they endure, their commitment remains unwavering. Their duty and the well-being of road users remain their top priorities. Responding to disasters is both rewarding and challenging work. Disasters are inevitable, and sometimes, even trained responders and personnel are not immune to their impact. Responders themselves are being exposed to dangers. In particular, two participants recount a harrowing experience during one of their clearing operations that almost took their lives.

"While conducting our clearing operation in the onslaught of a typhoon, our primary objective was to make the road passable. Unexpectedly, a landslide occurred, and I urgently alerted the laborers. We ran, but unfortunately, we were caught in the landslide's path. We are thankful that some residents and LGU personnel happened to be passing by and came to our rescue. Additionally, we're grateful that we didn't remain in the vehicle, as it was swept away by the landslide. My personal protective equipment and clothing were ruined. When I regained consciousness, I suffered from temporary amnesia. We were rushed to the hospital. At that time, there was no signal, so I couldn't contact my family. It was only three days after the incident that my family learned of the ordeal." Participant 3

"I vividly recall an instance when we were performing a clearing operation in Bekes, Buyacaoan, Buguias. The edge of the mountain suddenly collapsed and nearly got us. Fortunately, one of our companions raised the alarm, enabling us to escape in time. Regrettably, our equipment was left behind and taken by the landslide." Participant 8

The accounts of the participants are testaments to DPWH-BSDEO personnel's susceptibility to risks while on the line of duty. In another landslide incident in Banaue, Ifugao, on November 12, 2020, five DPWH personnel lost their lives. Further, Rohrer (2022) and Kowalczuk et al. (2009) have observed that responders face risks not only during the disaster itself but also experience adverse effects that may become evident after the rescue operations. The result then implies that there is a critical need to prioritize the safety and well-being of responders. This finding suggests that DPWH-BSDEO should focus on implementing measures to enhance the preparedness and resilience of their responders to mitigate the risks associated with disaster situations. Additionally, it underscores the importance of addressing environmental factors, such as adverse weather conditions and terrain vulnerabilities, to create safer working environments for responders.

4.5. Limited Community Cooperation

While DPWH-BSDEO is doing everything on its end to fulfill its mandate, it is equally imperative for the community to contribute its share. As the adage goes, "it takes two to tango." Unfortunately, in the case of Buguias, this cooperative spirit appears to be lacking. This sentiment is echoed in the accounts provided by the participants.

"Non-cooperation of people in the Road Right-of-Way and resistance from affected residents on the implementation of structural structures and clearing operations. There is also an illegal disposal of waste leading to drainage blockages." Participant 2

"There are various human-induced activities like deforestation and illegal disposal of waste. Deforestation makes the soil more brittle, making the area more prone to natural disasters such as landslides and floods. As for the illegal dumping of garbage, it can cause flooding by obstructing natural water channels or hastening erosion processes." Participant 3

Based on the statements, a significant number of residents are not cooperating when it comes to the Road Right-of-Way (RROW). Until now, the community lacks understanding regarding its importance, which, in fact, is a lifesaving initiative. Another manifestation of poor cooperation is the affected residents' expression of resistance to the implementation of clearing operations. Some affected land owners insist on compensation before allowing the office to widen and open the road. Other landowners refuse to permit personnel to deposit debris on their nearby land. This, in turn, slows down the operation as debris must be transported to more distant dumping sites. Furthermore, despite the government's advisories urging the public not to travel, many people not only ignore these warnings but even demand that the administration restore the closed roads even during typhoons and at night. These manifestations of poor coordination not only jeopardize the safety of travelers but also expose the entire community to unnecessary risks.

Another clear sign of non-cooperation in the community is the unlawful disposal of waste, leading to the

blockage of the drainage system. Obstructed drainage systems have adverse consequences. These include flooding that results in property damage and may even force people to relocate to escape rising floodwaters. Additionally, flooding can harm water supply infrastructure and contaminate domestic water sources.

The result underscores the significance of involving the community in the development of disaster risk reduction plans. According to Person Relative to Event Theory (PrE) theory, communities with a strong sense of cohesion and shared beliefs about disaster preparedness tend to exhibit more effective responses. Therefore, disaster response efforts can benefit from fostering such community resilience through education, engagement, and empowerment.

4.6. Suboptimal Communication

This theme highlights signal reception issues resulting in poor coordination with BENECO (Benguet Electric Cooperative, Inc.), which is a vital partner in disaster response. Additionally, it sheds light on the issue of road closures not being reported when needed. The problem of deployment and coordination arises from a loss of signal, thereby delaying disaster response. For instance, removing electrical poles during a clearing operation often requires equipment and personnel with technical expertise. And these are the resources that BENECO possesses. However, due to poor or nonexistent signal coverage, contacting BENECO personnel becomes problematic, leading to extended waiting times for responders. As narrated by one of the participants:

“We are cognizant of the importance of coordination because we basically do not have all the essential resources. For example, we seek the assistance of BENECO when removing electrical poles because they have resources for that particular task. Unfortunately, due to poor signal reception, we find it difficult to coordinate with them.”

This finding underlines the significance of recognizing that offices or agencies responsible for Disaster Risk Reduction and Management cannot operate in isolation. To ensure the success of disaster response and mitigation efforts, cooperation and effective communication with relevant stakeholders, such as BENECO, are crucial. Further, private transportation entities, such as SUVs (Sports Utility Vehicle), PUVs (Public Utility Vehicle), farmers’ trucks, and others, often continue to travel during typhoons. This is primarily due to the following reasons: students affected by class cancellations need to return home, and vegetables must be transported to prevent damage by the typhoon. However, many drivers do not report road closures either because of the absence of signal coverage or the lack of contact numbers for relevant personnel. In cases where reports are made, specific details, like the location of the closed road, are frequently missing. Additionally, due to poor signal quality, the reporting of road closures and reopening times can be delayed.

The finding is congruent with PrE theory, which accentuates the pivotal role of effective communication in influencing people's perceptions and behaviors. In disaster response, clear and timely communication is indispensable for informing the public about the event, its potential impact, and what actions they should take. Paton et al. (2006) likewise contend that increased information exchange is positively associated with higher levels of disaster preparedness among individuals.

Communication permeates almost every facet of our lives, regardless of the situation. In emergency situations, the significance of effective communication becomes even more critical. Timely information is crucial to ensuring the safety and well-being of both oneself and the individuals involved in the emergency response.

4.7. Ineffective Drainage System

A road lacking a drainage system is susceptible to damage because it lacks cross drains with outfalls or designated discharge points to channel the flow of water. This is an important aspect that the office should take into account when redesigning the road. Participant 4 pointed out:

"The drainage is poorly designed for waste disposal, and flooding is one of the most obvious and immediate effects of a poor drainage system. Flash floods can happen when water is not properly directed away from urban areas during periods of heavy rain or storms."

The drainage system along the road was nearly non-existent. It appeared as though the drainage had become more of a receptacle for garbage disposal, obstructing the natural flow of water into the catchment area. This consequently led to flooding issues, particularly during the rainy season. These floods have the potential to seriously harm buildings, residences, and commercial establishments. Communities may be uprooted as a result, and there may be injuries or even fatalities. The state of drainage in the community essentially requires rehabilitation or improvement to serve its purpose.

The major objective of highway drainage is to maintain all parts of the highway in optimum drainage condition. This is a crucial step in the prevention of highway deterioration brought on by surface infiltration into different parts of the highway from the road surface and neighboring areas. Another objective is to prevent traffic jams and slip accidents brought on by water flooding the ground. Thus, drainage facilities should be given consideration similar to the requirements for pavement and other road facilities.

5. Conclusions and Recommendations

There is a critical need for comprehensive improvements in disaster preparedness and response mechanisms in DPWH-BSDEO. To navigate the challenges, the office may consider creating separate units for Disaster Risk Reduction and Management (DRRM) field offices at strategic locations. The establishment of a disaster management unit with field offices can significantly contribute to the principle of shared responsibility and foster proper integration and collaboration among stakeholders. This will strengthen the capabilities of the office to a large extent and reduce the likelihood and severity of disasters. The office can improve its communication and response systems through the use of advanced technology. This involves the use of "hi-tech" gadgets or systems of Disaster Risk Reduction (DRR), such as satellite Geographic Information System (GIS) in mapping disaster-prone areas, real-time disaster modeling, night vision goggles, better personal protective equipment, Light Emitting Diode (LED) for information technology, and others. Conducting an Information, Education, and Communication (IEC) campaign in the community is crucial, along with educating people on how they can reinforce disaster resilience and involving them in the development of the disaster risk reduction plan. Coordination with the Local Government Unit to address non-cooperating members and allocating funds for DRRM trainings and

response activities, including clearing slides, is recommended. Capacitating volunteers and community members to aid in operations is essential. Future research should focus on assessing the efficiency and effectiveness of DRRM programs, as well as evaluating the level of disaster resilience within the office compared to other municipalities and National Offices under the National Disaster Risk Reduction and Management Council (NDRRMC).

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7. Conflict of Interest

The authors confirm that they do not have any conflicting goals or objectives.

References

1. Agub, S. B. (2017). *Examining the Philippines Disaster Risk Reduction and Management System. Policy Brief.* https://legacy.senate.gov.ph/publications/SEPO/PB_Examining%20PH%20DRRM%20System_Revised_27June2017.pdf
2. Aminizade, M., Moghaddam, M. N., Jam, M. B., Shamsi, M., Majidi, N., Amanat, N., & Hoseini, S. H. (2017). The role of volunteer citizens in response to accidents and disasters. *Health in Emergencies and Disasters Quarterly*, 2(3), 107–124. https://doi.org/10.18869/nrip.hdq.2.3.107
3. Ardalan, A., & Affun-Adegbulu, C. (2024). Introduction to natural disasters. In *Elsevier eBooks* (pp. 594–597). https://doi.org/10.1016/b978-0-323-80932-0.00094-x
4. Baur, N., & Rieck, J. (2020). Project Management with Scarce Resources in Disaster Response. In *Operations research proceedings* (pp. 607–614). https://doi.org/10.1007/978-3-030-48439-2_74
5. Bautista, M.L.P., Bautista, B., Narag, I. C., Aquino, A. D., Papiona, K., Delos Santos, A. L., Nadua, J., Deximo, J. P., Sevilla, W. I., Melosantos, L. P., Bonita, J., Badilla, R. A., Duran, A. C., Monteverde, M. A. C., Cinco, T. A., Hilario, F. D., Celebre, C. P., Tuddao, A., Ares, E., Castro, O.T.,…Jones, A. T. (2014). Enhancing risk analysis capacities for flood, tropical cyclone severe wind and earthquake for Greater Metro Manila area - Summary Report - Philippines. *ReliefWeb.* https://reliefweb.int/report/philippines/enhancing-risk-analysis-capacities-flood-tropical-cyclone-severe-wind-and
6. Becker, J., Paton, D., Johnston, D., & Ronan, K. R. (2013). Salient beliefs about earthquake hazards and household preparedness. *Risk Analysis*, 33(9), 1710–1727. https://doi.org/10.1111/risa.12014
7. Blasco, J. M. (2015). *Disaster risk reduction problems encountered in the Philippine setting*. https://beupdatedworldproblems.blogspot.com/2015/03/disaster-risk-reduction-problems.html
8. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa
9. Bubeck, P., Botzen, W., & Aerts, J. H. (2012). A Review of Risk Perceptions and Other Factors that Influence Flood Mitigation Behavior. *Risk Analysis*, 32(9), 1481–1495. https://doi.org/10.1111/j.1539-6924.2011.01783.x
10. Bueza, M. (2014). The role of LGUs, local councils during disasters. *RAPPLER.* https://www.rappler.com/newsbreak/44026-role-lgu-local-councils-disasters

11. Catlett, C., Kirsch, T., & Sauer, L. (2014). Untrained Volunteers May Do Harm as Well as Good During Disasters, Johns Hopkins Study Finds. *Johns Hopkins Medicine*. https://www.hopkinsmedicine.org/news/media/releases/untrained_volunteers_may_do_harm_as_well_as_good_during_disasters_johns_hopkins_study_finds
12. Clubb, A. C., & Hinkle, J. C. (2015). Protection motivation theory as a theoretical framework for understanding the use of protective measures. *Criminal Justice Studies*, *28*(3), 336-355. https://doi.org/10.1080/1478601X.2015.1050590
13. Compton, C. (2022). Disaster, relocation, and property. In Routledge eBooks (pp. 75–85). https://doi.org/10.4324/9781003139614-8
14. Eisenman, D. P., Wold, C., Fielding, J., Long, A., Setodji, C., Hickey, S., & Gelberg, L. (2006). Differences in individual-level terrorism preparedness in Los Angeles County. *American journal of preventive medicine*, *30*(1), 1–6. https://doi.org/10.1016/j.amepre.2005.09.001
15. Espina, E., & Teng-Calleja, M. (2015). A Social Cognitive Approach to Disaster Preparedness. *Philipp. J. Psychol*. 48 (2), 161–174. https://www.pap.ph/assets/files/journals/a-social-cognitive-approach-to-disaster-preparedness.pdf
16. France-Presse, A. (2013). *10 deadliest natural disasters in the Philippines | Inquirer News.* INQUIRER.net. https://newsinfo.inquirer.net/524569/10-deadliest-natural-disasters-in-the-philippines
17. Garcia, M. E. J. N., & Hernandez, A. A. (2018). Pattern analysis of natural disasters in the Philippines. *SciSpace - Paper*. https://typeset.io/papers/pattern-analysis-of-natural-disasters-in-the-philippines-arfmwwire6
18. Garfin, D. R., Ramos, D. M., & Silver, R. C. (2023). Responses to natural disasters. In *Elsevier eBooks* (pp. 44–57). https://doi.org/10.1016/b978-0-323-91497-0.00205-8
19. Ghaffari, Z., Nasiri, M. M., Bozorgi-Amiri, A., & Rahbari, A. (2020). Emergency supply chain scheduling problem with multiple resources in disaster relief operations. *Transportmetrica*, 16(3), 930–956. https://doi.org/10.1080/23249935.2020.1720858
20. Gravillo, M. F. G. (2023). Safety and Disaster Management Operation and Coordination of Department of Public Works and Highways in Caraga,Philippines. *Medium*. https://medium.com/@gmarkfredelben/safety-and-disaster-management-operation-and-coordination-of-department-of-public-works-and-af254b48866
21. Grothmann, T., & Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change*. 15, 199–213. https://doi.org/10.1016/j.gloenvcha.2005.01.002
22. IBON Foundation. (2020). *Lower disaster budget shows lack of govt priority. https://www.ibon.org/lower-disaster-budget-shows-lack-of-govt-priority/#:~:text=IBON%20noted%20that%20in%20the,the%20Php20%20billion%20in%202019*.
23. Jimenez, A. J. B. (2022). The Philippines' worst and deadliest disasters. *Philstar.com.* https://www.philstar.com/the-freeman/opinion/2022/10/02/2213743/philippines-worst-and-deadliest-disasters-
24. Kowalczuk, K., Jankowiak, B., Krajewska-Kułak, E., Sierakowska, M., Lewko, J., Krajewska, K., & Van Damme, K. O. (2009). Exposure of medical rescuers to aggression at the workplace. *SciSpace - Paper*. https://typeset.io/papers/exposure-of-medical-rescuers-to-aggression-at-the-workplace-20xjvokhjv

25. Lindell, M. K., Prater, C. S., Wu, H. C., Huang, S. K., Johnston, D. M., Becker, J. S., & Shiroshita, H. (2016). Immediate behavioural responses to earthquakes in Christchurch, New Zealand, and Hitachi, Japan. *Disasters*, *40*(1), 85–111. https://doi.org/10.1111/disa.12133
26. Lusterio, A. C. D., Matabang, G. R., & Singco, M. T. a. J. T. (2022). Investing in community participation for disaster recovery. In *Elsevier eBooks* (pp. 25–53). https://doi.org/10.1016/b978-0-12-818639-8.00016-8
27. Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *All Ireland Journal of Higher Education*, 9(3). https://ojs.aishe.org/index.php/aishe-j/article/view/335
28. Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and Intervention in Health-Related Behavior: A Meta-Analytic Review of Protection Motivation Theory. *Journal of Applied Social Psychology*, 30(1), 106–143. https://doi.org/10.1111/j.1559-1816.2000.tb02308.x
29. Mondal, T., Boral, N., Bhattacharya, I., Das, J., & Pramanik, P. (2019). Distribution of deficient resources in disaster response situation using particle swarm optimization. *International Journal of Disaster Risk Reduction*, 41, 101308. https://doi.org/10.1016/j.ijdrr.2019.101308
30. Motoyoshi, T. (2004). An overview of psychological research on disaster: determinants of disaster preparedness. *Bulletin of the Graduate School of Education and Human Development, Nagoya University*, *51*, 9-33.
31. Mulilis, J., & Duval, T. S. (1997). The PRE Model of Coping and Tornado Preparedness: Moderating Effects of responsibility. *Journal of Applied Social Psychology*, 27(19), 1750–1766. https://doi.org/10.1111/j.1559-1816.1997.tb01623.x
32. National Disaster Risk Reduction and Management Plan 2011-2028. (n.d.). https://www.adrc.asia/documents/dm_information/Philippines_NDRRM_Plan_2011-2028.pdf
33. Özdemır, Ö., & Yılmaz, C. (2011). Factors affecting risk mitigation revisited: the case of earthquake in Turkey. *Journal of Risk Research*, 14(1), 17–46. https://doi.org/10.1080/13669871003782751
34. Paton, D. (2003). Disaster preparedness: a social-cognitive perspective. *Disaster Prevention and Management*, 12(3), 210–216. https://doi.org/10.1108/09653560310480686
35. Paton, D., Kelly, G., Buergelt, P., & Doherty, M. (2006). Preparing for bushfires: Understanding intentions. *Disaster Prevention and Management*, 15(4), 566–575. https://doi.org/10.1108/09653560610685893
36. Paton, D., & Johnston, D. (2015). The Christchurch earthquake: Integrating perspectives from diverse disciplines. *International Journal of Disaster Risk Reduction*, 14, 1–5. https://doi.org/10.1016/j.ijdrr.2015.02.003
37. Rohrer, B. (2022). "No post-trauma after trauma?" A qualitative study with refugee helpers being confronted with sequential traumatization. *Psychological Applications and Trends*, 450-454. https://doi.org/10.36315/2022inpact101
38. Silver, F. (2014). Priority, capacity, information (A three-stage approach to implementing disaster risk reduction and management at the local level). *Project NOAH Open-File Reports*, Vol. 3, 115-136.
39. Spittal, M. J., McClure, J., Siegert, R. J., & Walkey, F. H. (2008). Predictors of Two Types of Earthquake Preparation: Survival Activities and Mitigation Activities. *Environment and Behavior*, *40*(6), 798-817. https://doi.org/10.1177/0013916507309864
40. Swarbrooke, J. (2022). Natural disasters. In *Edward Elgar Publishing eBooks* (pp. 293–295). https://doi.org/10.4337/9781800377486.natural.disasters

41. Takao, K., Motoyoshi, T., Sato, T., Fukuzondo, T., Seo, K., & Ikeda, S. (2004). Factors determining residents' preparedness for floods in modern megalopolises: the case of the Tokai flood disaster in Japan. *Journal of Risk Research*, 7(7–8), 775–787. https://doi.org/10.1080/1366987031000075996
42. Wentink, G., & Van Niekerk, D. (2017). The capacity of personnel in disaster risk management in South African municipalities. *The Journal for Transdisciplinary Research in Southern Africa*, 13(1). https://doi.org/10.4102/td.v13i1.427