

## ADAPTING TO THE UNPREDICTABLE: INNOVATION IN DISASTER PREPAREDNESS FOR AN ERA OF CLIMATE UNCERTAINTY

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### ABSTRACT

Navigating the unpredictable landscape of climate uncertainty, public secondary high schools in Makilala North District stand as beacons of resilience, poised to equip the next generation for the challenges ahead. This research embarks on a journey into the heart of disaster preparedness, employing qualitative inquiry methods like in-depth interviews (IdI) and focused-group discussions (FGD) to uncover insights from administrators, teachers, and students in the local community. As the findings unfold, a nuanced picture emerges, highlighting both the challenges and opportunities faced. From integrating disaster preparedness into the curriculum to overcoming communication barriers, the study sheds light on the factors shaping education amidst climate uncertainty in the district. However, amidst these challenges, there are promising strategies to embrace, from innovative teaching approaches to collaborative partnerships, all aimed at strengthening the resilience of the school community. Beyond the obstacles, tangible benefits emerge. With a deeper understanding of disaster preparedness and innovative teaching methods, schools become safer and more resilient. In practical terms, this research urges administrators and educators to seize the mantle of innovation, collaboration, and technology integration to navigate uncertain times in the local context. Future research possibilities become apparent as this project draws to conclusion. It is a call to action for other teachers and researchers to keep exploring disaster preparedness in educational settings, recognizing schools as pillars of safety and optimism in the midst of an unpredictable climate.

**Keywords:** *Innovation, Disaster Preparedness, Climate Uncertainty, Secondary High Schools, Makilala North, Collaboration, Curriculum Integration, Communication, Resilience*

### INTRODUCTION

In terms of catastrophe risk, the Philippines ranked third in the world in terms of highest hazards, according to the World Risk Report 2018, with an index score of 25.14% (World Economic Forum, 2018). A significant 60% of the nation's total land area is exposed to a range of hazards, with 74% of the people vulnerable to their consequences (GFDRR, 2017). This vulnerability is mostly due to the country's geographical location, which increases the risk of coastal hazards such as typhoons, storm surges, and rising sea levels. Furthermore, because the islands are located inside the "Ring of Fire" between the Eurasian and Pacific tectonic plates, people suffer significant risks from earthquakes

and volcanoes. The population is additionally vulnerable to extra natural risks such as flooding, landslides, droughts, and tsunamis due to its geographical location (CFE-DM, 2018). Notably, hydro-meteorological phenomena such as typhoons and floods have accounted for more than 80% of natural disasters in the country during the last fifty years (Jha, 2018).

Numerous studies have emphasized the pivotal role that schools play in community resilience, aligning with the goals of Sustainable Development Goal 11. This goal highlights the imperative to address disaster risk reduction within the framework of secondary school educational management. These studies not only illuminate the vulnerability of educational institutions but also pave the way for understanding the intricate plans necessary to mitigate disaster risks.

However, the world has witnessed a stark escalation in the frequency and scale of natural catastrophes in recent decades, posing substantial challenges to the safety and well-being of populations. Climate change, evidenced by escalating extreme weather events, such as heatwaves, droughts, and intense rainfall, amplifies these challenges (Clarke et al., 2022). Particularly vulnerable are children, who face the direct or indirect aftermath of major disasters. In disaster-prone regions like Makilala North District, Cotabato, Philippines, where earthquakes and volcanic eruptions result in significant human and infrastructure losses, effective disaster risk reduction in secondary schools is imperative (Ybabez et al., 2021).

Several studies highlight the crucial role of educational institutions in safeguarding children from diverse natural and man-made disaster hazards. They stress the significance of reliable tools for assessing school safety and disaster preparedness, notably in multi-hazard contexts. An illustrative example is Indonesia's Disaster Preparedness and Safety School program (SSSB), integrating disaster education with comprehensive children's safety education (Widowati, Istiono, and Husodo, 2021).

## FRAMEWORK

This study's worldview is based on Didham and Ofei-Manu's (2020) holistic approach Theory, which emphasizes the complex character of learning environments, particularly in public secondary high schools. The safety of the school is highlighted as a top priority, and Disaster Risk Reduction (DRR) principles are supported as important components of school design and management (Didham & Ofei-Manu, 2020). The authors emphasize the significance of a complete school safety framework, highlighting the need for democratic decision-making and risk-reduction planning. Beyond physical safety, the total effectiveness of the learning environment embraces a social perspective that supports collaboration among diverse stakeholders, including students, teachers, administrators, staff, and parents. When collective responsibility is institutionalized, it develops a community of practice in which education and learning are considered as collaborative efforts.

According to disaster literacy theory, strengthening people's understanding of disaster risk reduction and management (DRRM) and their communities' behaviors in this area are crucial for increasing resilience and decreasing vulnerability to catastrophes (Javier & Diliman, 2019). Disaster literacy aims to create proactive and informed communities that are better equipped to prepare for and respond to catastrophes by

increasing people's awareness of potential dangers, appropriate measures to limit risks, and effective response techniques. In order to provide people with the skills and information they need to navigate and cope with disaster circumstances, this theory emphasizes the significance of integrating disaster education into a variety of contexts, including households, communities, and schools.

On the other hand, the concept of 'disaster risk management assemblage' proposed by McGowran and Donovan (2021) provides a theoretical framework for understanding the complex and interconnected systems involved in managing disaster risk. Assemblage theory emphasizes the dynamic interactions between various components within a system, highlighting how they come together to produce specific outcomes. In the context of disaster risk management, the assemblage comprises diverse elements such as policies, institutions, technologies, social networks, and cultural practices, all of which shape the way disasters are perceived, addressed, and mitigated. Viewing disaster risk management assemblages as objects of study allows researchers to explore the multifaceted nature of disaster risk governance and intervention efforts, considering the interplay between different actors, resources, and strategies in shaping disaster outcomes. This theoretical perspective offers valuable insights into the complexities of disaster risk management and suggests new avenues for research and intervention aimed at enhancing resilience and reducing vulnerability to disasters.

There is significance for Disaster Risk Reduction (DRR) initiatives for Vinnell, Milfont, and McClure's (2021) study on natural disaster preparation behavior in Wellington, New Zealand, utilizing the Theory of Planned Behavior (TPB). The research sheds light on the attitudes, norms, and perceived control that impact people's intentions to prepare for natural disasters. This allows disaster risk reduction (DRR) initiatives to target and mitigate these elements more effectively. Designing and implementing DRR interventions that work to increase community preparedness and resilience to disasters can be made more effective by taking these dynamics into account.

The study by Ton et al. (2021) investigates the decision-making processes used by people with disabilities in emergency situations. This is consistent with important theories of Disaster Risk Reduction (DRR), such as Participation and Social Vulnerability. To effectively reduce the risk of disaster, these theories emphasize the significance of comprehending social dynamics and involving marginalized groups in decision-making. People with disabilities can contribute their special insights to catastrophe preparedness, response, and recovery activities by being included in decision-making processes. This will ultimately increase community resilience.

Resilience Theory (Walker et al., 2004), Innovation Diffusion Theory (Rogers, 2003), and Constructivism (Berger & Luckmann, 1966) synergistically drive the examination of disaster preparedness within the context of public secondary high schools in establishing the theoretical lens for this research. Resilience Theory sheds light on the adaptive techniques used by educational institutions, stressing their ability to learn, anticipate, and prosper in the face of uncertainty. Innovation Diffusion Theory contributes by investigating the adoption and transmission of innovative techniques while accounting for the social, cultural, and institutional factors that influence their acceptance (Rogers, 2003). Constructivism, on the other hand, broadens the theoretical lens by acknowledging the socially constructed form of knowledge within communities and institutions, particularly in collaborative learning environments such as those found in public

secondary schools (Berger & Luckmann, 1966). Together, these theories provide a complete framework for understanding and supporting creativity in disaster preparedness that is suited to the educational community's specific needs.

This integrated worldview and theoretical lens, when combined, provide a solid framework for studying and supporting disaster risk innovations in public secondary schools. The goal is to empower administrators, teachers, and students to participate in a community of practice in which shared accountability, collaborative learning, and innovative practices become key factors in improving disaster preparedness in the educational community.

## METHODS

### Research Design

This study used a qualitative research approach with the primary goal of investigating research issues rather than attempting to offer comprehensive answers to problems that already exist. According to Saunders, Lewis, and Thornhill (2012), descriptive qualitative research is used in this approach to get to the heart of the issue. The study aimed to improve general awareness of the situation rather than provide conclusive evidence. To achieve this, the research will be conducted within the public secondary high schools situated in the North District of Makilala, Cotabato. This specific locale serves as the focal point for the investigation, offering a rich context to examine the research questions and gain insights into the targeted issues.

### Research Participants and Materials

A total of five (5) administrators, fifteen (15) teachers, and thirteen (13) students, meticulously screened against predefined criteria, emerged as the focal cohort for this investigation. Employing purposive sampling, the selection process adhered closely to the outlined criteria, ensuring a comprehensive exploration of the subject matter. To cater to the diverse research inquiries of each group, in-depth interviews (IDI) were conducted separately with administrators, teachers, and students. Furthermore, seven participants, comprising one administrator, three teachers, and three students, contributed to focused-group discussions (FGD), enriching the study with a multiplicity of perspectives and insights.

As noted by Creswell (2018), sample size standards for qualitative research are not as rigid, and a range of five to fifteen individuals is recommended to achieve data saturation. There were thirty-three participants in this study. Thirteen students, fifteen teachers, and five administrators made up the 33 participants in the in-depth interviews (IDI), each group focusing on a different study issue. On the other hand, there were only seven participants in the focused-group discussions (FGD). Purposive sampling will be used to target participants for each research topic, including students, instructors, and administrators with varying experiences in disaster risk reduction in secondary schools.

### Data Analysis

Incorporating Colaizzi's (1978) descriptive phenomenological approach, as outlined by Gumarang et al. (2021), the researcher systematically analyzes interview transcripts to identify relevant themes and codes. This rigorous process, guided by

Gumarang et al.'s research findings, enables to cluster and thematize the data, ultimately providing a rich and comprehensive understanding of the lived experiences of the research participants.

## RESULTS AND DISCUSSION

There were several essential themes drawn from the analysis of the data in-depth interview for research question number one. The essential themes are Resource Allocation Challenges, Communication Barriers, Collaboration with External Stakeholders, Climate Uncertainty Challenges, and Integration into Education Opportunities. Several sub- questions were asked to elicit their concepts as regard to How do administrators in public secondary high school perceive the impact of climate uncertainty on disaster preparedness.

Table 1. **Climate Uncertainty Impact on Disaster Preparedness among Public Secondary High School Administrators**

THEME	KEYPOINTS
Resource Allocation Challenges	Administrators conduct risk assessments and prioritize resource allocation based on the likelihood and potential impact of identified disasters. Engaging stakeholders such as local government agencies, community organizations, and parent-teacher associations is vital for resource mobilization.

### Resource Allocation Challenges in Disaster Preparedness

The challenges related to resource allocation in disaster preparedness align with the findings of Tizon and Comighud (2020), who emphasized the significance of conducting risk assessments and prioritizing resource allocation based on potential hazards. Their study underscores the importance of evaluating factors such as geographical location, historical data on past disasters, and vulnerability assessments of school infrastructure to ensure the safety of students and staff.

To identify potential risks and prioritize resource allocation based on the risk associated with various disaster types, administrators carry out comprehensive risk assessments. This entails considering elements including the intensity, frequency, and possible influence on school operations.

To raise funds and support for disaster preparedness programs, it is crucial to involve stakeholders including parent-teacher associations, local government agencies, and community organizations. In order to improve preparedness efforts, administrators work with outside partners to obtain more funding, resources, and experience.

*“Since the budget of the school is limited, prioritization in terms of the likelihood of a certain disaster to occur must be done so that the school can purchase the most needed DRRM materials and equipment.” Idi016*

*“We must identify the possible scenario that we in education department are prone to lack of funds to sustain an endeavor or program. We prioritize educational services among others, however as we walk along the way there are things need to be considered that will hinder to attain the mission, vision and goals of the school if not properly treated on of that is the long- term disaster preparedness measures amidst climate uncertainty.” Idi018*

*“Collaboration with local government agencies and community organizations is vital for addressing evolving threats posed by climate uncertainty. I Value and encourage the importance of partnerships, leveraging support from various stakeholders such as the Barangay Local Government Unit (BLGU), Parent-Teacher Association (PTA), and private institutions.” Idi019*

### Communication Barriers

THEME	KEYPOINTS
Communication Barriers	Utilizing multiple communication channels and conducting regular drills and training sessions to ensure stakeholders are informed about disaster preparedness.

The findings resonate with the recommendations provided by Yanger (2018), highlighting the presence of communication barriers among administrators in public secondary high schools regarding disaster preparedness. The lack of comprehensive communication strategies and engagement initiatives may hinder effective disaster preparedness efforts. Implementing recommendations such as organizing awareness campaigns and workshops could address these barriers by ensuring stakeholders are well-informed and actively involved in disaster preparedness initiatives. By fostering open communication and engagement, administrators can enhance the overall preparedness of public secondary high schools to mitigate the impact of climate uncertainty on disaster preparedness.

*“In terms of communicating with parents, the school meets the parents only every quarter of the school year and not all the parents are attending such school activities thus minimizing their opportunities to hear insights and advocacy campaigns against disaster risk reductions, especially in the context of climate uncertainty.” Idi016*

*“Effective communication of disaster preparedness initiatives, especially in the context of climate uncertainty, remains a challenge. the importance of stakeholder commitment, which hinges on thorough understanding and involvement in planning processes. Regular engagement with parents and the*

*community is essential, even amidst communication difficulties during emergencies". Idi020*

### Collaboration with External Stakeholders

Resilience Theory suggests that such collaboration enhances adaptive capacity, allowing institutions to anticipate and respond effectively to climate uncertainties (Walker et al., 2004). Similarly, Innovation Diffusion Theory highlights the value of integrating disaster preparedness education into the curriculum, facilitating the adoption of innovative practices (Rogers, 2003). Constructivism complements these ideas by emphasizing the collaborative learning inherent in partnership development and curriculum integration, fostering collective knowledge construction among stakeholders (Berger & Luckmann, 1966).

THEME	KEYPOINTS
Collaboration with External Stakeholders	Collaborating with local government agencies, community organizations, NGOs, and private sector entities to access additional resources and expertise. Integrating disaster preparedness education into the curriculum and infrastructure planning to ensure students are equipped with necessary knowledge and skills.

The basic insight from the thematic analysis underscores administrators' recognition of the vital role of collaboration with external stakeholders in enhancing disaster preparedness. This insight resonates with Partnership Development, as illuminated in the related literature, where the importance of engaging local government agencies, community organizations, NGOs, and private sector entities is emphasized.

### Climate Uncertainty Challenges

In exploring the complexities of disaster risk reduction in the face of climate uncertainty, Wang (2017) emphasizes the dynamic nature of environmental risks and their potential impacts on disaster preparedness efforts.

THEME	KEYPOINTS
Climate Uncertainty Challenges	Administrators encounter challenges in anticipating and addressing the impacts of climate uncertainty on disaster preparedness efforts, necessitating the development of adaptive strategies to mitigate risks and ensure the effectiveness of preparedness initiatives.

The theme of climate uncertainty challenges reflects the complex hurdles faced by administrators in public secondary high schools as they grapple with the unpredictable impacts of climate change on disaster preparedness efforts. This theme finds resonance

in McMahon's (2013) exploration of local innovation's transformative potential in disaster risk reduction and management (DRRM) within developing countries. McMahon highlights the need to involve non-governmental and non-profit organizations to drive demand-driven innovation, echoing the collaborative approach essential for addressing climate uncertainty challenges. Moreover, Kebede (2015) contributes to this discourse by stressing the importance of establishing local technological innovation systems, empowering communities to contribute to and benefit from DRRM advancements.

*“In the face of climatic unpredictability, I understand as the head of school how crucial it is to strike a balance between short-term educational requirements and long-term disaster readiness. I share my perspectives on our strategy, difficulties, and joint efforts to guarantee the security and resiliency of our school community.”*  
Idi020

*“As administrators in public secondary high school, I collaborate with local government agencies and community organizations to address the evolving threats posed by climate uncertainty.”* Idi017

### Integration into Education Opportunities

The vital significance of incorporating climate change education into educational opportunities is emphasized by a literature review and case studies carried out by Filho et al. (2023). The study emphasizes how climate change disproportionately affects children, especially those in vulnerable groups, which can impede their ability to complete their education. The study highlights how educational systems must address climate change in order to promote community and family resilience. In order to make sure that kids, in particular, have the information and abilities needed to deal with the issues presented by climate change, it suggests strengthening climate literacy and education programs.

THEME	KEYPOINTS
Integration into Education Opportunities	Collaborating with local government agencies, community organizations, NGOs, and private sector entities to access additional resources and expertise. Providing hands-on learning experiences and practical training to equip students with the skills needed to respond to disasters effectively.

The research conducted by Cabilao-Valencia (2019) aligns with the theme of "Integration into Education Opportunities" as it showcases the initiatives taken by academic institutions to integrate disaster risk reduction (DRR) into their curricula. In order to increase learners' resilience to disasters, the study emphasizes how crucial it is to incorporate DRR teaching within the curriculum. This is in line with the emphasis in the relevant literature on how schools can help students become prepared for disasters and cultivate a culture of safety.

*“Integrate disaster preparedness into their educational curriculum and infrastructure planning.” Idi017*

*“Organize awareness campaigns and workshops to educate stakeholders about the importance of disaster preparedness in the context of climate uncertainty.” Idi020*

The study points out the significance of providing hands-on learning experiences and practical training to equip students with actionable skills and knowledge for disaster preparedness, supporting the key point of offering hands-on activities. Alcover (2020) demonstrates the tangible improvement in student awareness and knowledge of disaster risk reduction (DRR) practices, aligning with the theme of "Integration into Education Opportunities.

**Table 2. Innovative strategies teachers employ to integrate disaster preparedness Education into the curriculum amidst climate uncertainty**

<b>Theme</b>	<b>Key Points</b>
Integration of DRR Preparedness	By utilizing interdisciplinary techniques, real-world scenarios, and hands-on learning experiences, teachers include disaster preparedness education into a variety of disciplines, including Science, MAPEH, and DRR.
Hands-on Learning Experiences	Teachers adapt instructional methods and technologies, such as virtual reality simulations, interactive websites, and multimedia resources, to engage students in hands-on learning experiences and foster critical thinking skills.

Teachers are coming up with innovative approaches to include disaster preparedness instruction into the curriculum in the face of climate uncertainty. This proactive approach supports the imperative role that schools play in disaster risk reduction and calls for disaster risk reduction to be made a required subject, in line with Cabilao-Valencia's (2019) conclusions.

### **Integration of DRR Preparedness and Hands-on Learning Experiences**

In the face of climate unpredictability, the theme "Integration of DRR Preparedness" showcases teachers' creative approaches to incorporating disaster preparedness education into the curriculum. Teachers integrate disaster preparedness education into disciplines such as Science, MAPEH, and DRR by utilizing interdisciplinary approaches and providing students with practical learning experiences. Alcover (2020) emphasizes how these integrated, hands-on stages can actually improve students' awareness and knowledge of DRR methods. Moreover, in line with these results, Cabilao-

Valencia's (2019) study promotes the inclusion of DRR as a required subject to create a community ready for unanticipated catastrophes.

*"As the DRR teacher, I emphasize the importance of disaster preparedness across various subjects. We integrate practical exercises, case studies, and simulations to equip students with the knowledge and skills to respond effectively to disasters, regardless of climate uncertainties." Idi003*

*"I include disaster preparedness into arts and physical education activities. Through creative projects and team-building exercises, students learn about collaboration, resilience, and adaptive strategies in the face of uncertain climate conditions." Idi005*

*"In classes, we engage students in scenario-based simulations and group discussions to explore climate-related hazards and their impact on communities. Through hands-on activities, students develop problem-solving skills to address complex challenges posed by climate uncertainty." Idi012*

Alcover (2020) emphasizes how these integrated, hands-on stages can actually improve students' awareness and knowledge of DRR methods. Moreover, in line with these results, Cabilao-Valencia's (2019) study promotes the inclusion of DRR as a required subject to create a community ready for unanticipated catastrophes.

Student Feedback on DRR and preparedness	Students recognize the importance of disaster preparedness drills and simulations but express the need for more practical training and guidance, especially in areas vulnerable to climate change and where students face greater risks.
Evaluation of training	Students express the need for enhanced practical training in disaster preparedness, including drills and simulations, to ensure they are well-prepared to respond to emergencies. Teachers are dedicated to improving training programs to meet students' needs.

Hargono's (2018) emphasis on integrating disaster risk reduction (DRR) education into the school curriculum resonates with the overarching goal of understanding student perceptions of drills and plans in the context of disaster preparedness. This parallels the findings of the current study, suggesting that involving students in DRR initiatives can enhance their preparedness for potential disasters. By drawing from Hargono's insights, educational institutions can better tailor drills and plans to meet the needs of students, ultimately fostering a more effective approach to disaster preparedness.

### **Student Feedback on DRR, Preparedness and Evaluation of training**

Teachers noted that students' feedback on DRR" captures the priceless insights that students have to offer about disaster preparedness initiatives, emphasizing their

recognition of the value of drills and simulations. On the other hand, students also express a critical need for more practical training and guidance, especially in areas where risks are elevated and climate change is likely to occur. This highlights the importance of not only conducting regular drills but also offering hands-on experiences that provide students with concrete skills for effective disaster response. It also highlights the significance of adjusting disaster preparedness education to students' needs to make sure they are sufficiently prepared to handle complex disaster scenarios.

*"The students recognize the importance of disaster preparedness, but there's room for improvement in addressing climate-related risks. As the DRR teacher, I work to enhance our school's preparedness measures and ensure students feel empowered to respond effectively to emergencies." Idi003*

This aligns to the research evaluating DRR programs in the Bayawan City Division, Philippines by Tizon and Comighud (2020) as it highlights the transformative effect of incorporating DRR into the curriculum and echoing student views. Its results demonstrate how this kind of integration raises students' awareness and understanding of DRR procedures and gives them useful advice for acting in advance of, during, and following disasters.

**Table 3. Student assessments of the effectiveness of disaster preparedness initiatives in public secondary high schools in light of climate uncertainty**

To expedite the study and guarantee clarity in delivering the results, I consolidated the original themes into four more comprehensive categories, taking into account their overlap and resemblance. Based on the themes that emerged from the analysis of the sub-themes and their applicability to the overall goals of the research, this consolidation was carried out. A more logical presentation of the study findings is made possible by narrowing the emphasis of the analysis and making it easier to understand by integrating relevant sub-themes into larger themes.

**School Preparedness**

Given the unpredictability of climate change, disaster preparedness in schools is of utmost importance. Students understand the need of being prepared for crises and that frequent drills, safety procedures, and evacuation plans are essential parts of their readiness. Clear protocols and efficient lines of communication between the school and the local authorities serve to reinforce parents' and authorities' confidence in the school's emergency preparedness. Students' sense of preparedness and security is enhanced by the proactive steps taken by the school, which provide them with reassurance as they negotiate the obstacles presented by climate uncertainty.

Theme	Key Points
School Preparedness	Students perceive their school as well-prepared for disasters, emphasizing the presence of safety protocols, evacuation plans, and regular drills, contributing to their overall sense of readiness

During calamities and climatic instability, school preparedness is a complex issue that includes readiness, safety, and reaction inside educational establishments. Proactive steps to improve school readiness are emphasized by Hargono et al. (2021), especially in places that are susceptible to natural catastrophes. In order to increase students' trust in emergency response, their research highlights the necessity of precise emergency protocols, efficient parent communication, and frequent drills. Furthermore, schools that implement safety and security measures soothe parents and students by exhibiting the institution's commitment to their well-being.

*“On the question about on how well our school prepares for disasters as a student I appreciate the existence of emergency response plans signages regular drills and educational programs that related to disaster risk reduction.”  
Idi024*

*“about the question on how well our school prepares for disasters as a student I appreciate the existence of emergency response plans signages regular drills and educational programs that related to disaster risk reduction.”  
Idi030*

Students perceive their school as well-prepared for disasters, emphasizing safety protocols, evacuation plans, and regular drills, contributing to their readiness. They express trust in the school's ability to handle emergencies effectively, citing clear procedures and communication channels. This aligns with the findings of Hargono et al. (2021), emphasizing proactive measures and effective communication to enhance school preparedness, especially in disaster-prone areas.

### Communication with Parents

Safeguarding students' safety in times of crisis requires maintaining open lines of contact with parents. Teachers can provide updates and direction to parents by keeping them informed, which gives students confidence and a sense of security. Schools can efficiently handle issues, plan evacuations, and give students' well-being first priority when they have open lines of communication.

Communication with Parents	Students highlight the effectiveness of communication channels with parents, such as group chats and announcements, in keeping them informed about safety measures and emergency situations, fostering a sense of reassurance.
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Effective communication between parents and educational institutions is paramount for ensuring comprehensive disaster preparedness in school settings. Kawasaki et al. (2020) emphasize the significance of cooperation between teachers and parents, particularly in times of disaster when schools serve as evacuation centers.

*“Yes, we understand what to do in times of emergency in our school because our teachers that are teaching are trained and were being thought about the what to do where to go and who will be contact in times of emergency and our school in every classroom there are emergency or hotline numbers to contact.” Idi031*

*“Students are aware where to walk and whom to talk or what to do or even where to go because they are guided by every teacher and all the teachers are prepared in times of emergencies, we have signage we have a hotline numbers.” Idi021*

In line with the theme of Communication with Parents, the study by Kawasaki et al. (2020) highlights the critical role that parents and educational institutions play in communication during disasters. It emphasizes the value of collaboration between educators and parents, especially during emergencies. This is in line with students' realization of how useful announcements and group conversations are for informing them about crises and safety precautions. The study highlights the significance of having open lines of communication between parents and schools to foster reassurance and enhance overall disaster resilience within school communities. It does this by providing empirical evidence to support the importance of effective communication as highlighted.

### **Confidence in Emergency Drills**

Confidence in Emergency Drills	While most students' express confidence in emergency drills, some harbor doubts, particularly regarding their effectiveness in real disaster scenarios or unpredictable weather conditions.
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Emergency drills in schools are vital simulations that enable students, teachers, and staff to practice response protocols and safety measures for potential emergencies. They instill confidence and readiness, ensuring prompt and effective responses during real crises. As integral components of school safety plans, these drills contribute significantly to overall resilience and preparedness.

*“When we hear about plans or drills for emergencies about disasters in our school, we are very confident having received clear instructions and participated in drills we are we have confidence in doing so.” Idi024*

*“Yes, we believe these plans would work if there was a real problem because we are very transparent when we are conducting a symposium or programs like fire and different drills specially when we are having a question and answer with the speaker.” Idi027*

This concept aligns well with the conclusions of Tizon and Comighud's (2020) assessment of public school disaster risk reduction management programs. Their study emphasizes how crucial it is to provide students with hands-on training and frequent drills

to improve their understanding of disaster response procedures. Schools can create confidence and readiness in children to respond to catastrophes efficiently by actively including them in emergency drills.

### **Safety and Security Measures**

To safeguard employees and children in the event of an emergency, schools must implement safety and security protocols. To guarantee a secure learning environment, they include procedures like evacuation plans, the installation of safety equipment, and access control. Setting these precautions as a top priority reduces risks and promotes catastrophe readiness.

Safety and Security Measures	Students perceive safety measures, such as signages, hotline numbers, and evacuation plans, as effective in ensuring their safety and security, contributing to their overall sense of well-being.
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In educational environments, safety precautions and disaster risk reduction (DRR) measures are essential for protecting students and faculty. Findings by Bechtel and Mannino (2021) and Kawasaki et al. (2020) highlight the significance of parent, teacher, and student collaboration in disaster preparedness, with a focus on the necessity for efficient communication and well-coordinated response plans. These results highlight the value of community involvement and proactive safety measures in building school resilience and developing a culture of readiness in the face of possible threats.

*“On the question about on how well our school prepares for disasters as a student I appreciate the existence of emergency response plans signages regular drills and educational programs in our school that is related to disaster risk reduction.” Idi024*

*“In my school we are trained, we have drills, we have signages, we have other activities every year that the supreme student government offers and other clubs. The clinic and our teachers also emphasize safety so we understand what we will doing in times of emergency in our school and we have also hotline numbers we have contact to our parents.” Idi028*

Students' perceptions of various safety measures such as evacuation plans, hotline numbers, and signages as effective in ensuring their safety and security and enhancing their general well-being are revealed by their examination of the theme of safety and security measures. This view is supported by research by Hargono et al. (2021), which highlights the significance of taking preventative action to improve school safety and readiness, especially in locations that are susceptible to natural disasters.

Furthermore, Tizon and Comighud's (2020) study emphasizes the value of safety procedures and routine drills in enhancing students' confidence in handling emergency situations. The congruence of these results emphasizes the relationship between proactive disaster preparedness initiatives inside educational institutions and perceived safety measures.

### Uncertainty about Real Disasters

"Uncertainty about Real Disasters" explores the doubts and worries that students harbor about the efficacy of disaster preparedness initiatives in real-world emergencies. It also draws attention to the uncertainties that students might have regarding safety precautions and emergency procedures, especially in the case of unpredictable weather or growing effects of climate change. Resolving these uncertainties is essential to building students' self-assurance and readiness to respond to real-world disaster scenarios.

Uncertainty about Real Disasters	Some students' express uncertainties about the effectiveness of emergency plans and drills in real disaster scenarios, especially considering the unpredictable nature of weather patterns and the impact of climate change.
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According to Perera et al. (2018), addressing climate change uncertainty has significant consequences for education. Their research finds disparities between the educational requirements of professionals in the built environment and the main international policy frameworks. Furthermore, Berrang-Ford et al. (2021) emphasize the necessity of assessing the state of climate adaption globally and underscore the significance of empowering people and civil society. These results highlight the crucial role that education plays in building resilience and adaptability to climatic uncertainties, and they advocate for all-encompassing strategies that close knowledge gaps and provide communities the tools they need to successfully manage environmental difficulties.

*"I have trust in our school safety and emergency plans and programs. It is just the weather that I am concerned because it is changing always now." Idi030*

*"Confident in the plans and drills why others might have the what we call this, they are not confident enough especially considering that unpredictable nature of climate." Idi028*

Given the extensive effects of environmental changes, it is reasonable for students to be concerned about the uncertainties surrounding climate change. Communities suffer grave environmental and social consequences from occurrences like droughts, landslides, and floods, as Sabino et al. (2021) clarify in their research on climate change and adaption strategies.

### Table 4. Key challenges and opportunities for enhancing disaster preparedness in public secondary high schools amidst climate uncertainty.

In the face of climate uncertainty, it is critical to comprehend the opportunities and problems that educators, administrators, teachers, and students must navigate when navigating the complexity of disaster preparedness. A number of important themes have

developed from the thematic analysis of comments from stakeholders, including teachers, administrators, and students. By illustrating both the challenges faced and the chances for development, these themes show the complex nature of disaster preparedness initiatives. In exploring the issues raised, this talk looks at the obstacles that need to be overcome as well as possible ways to improve school readiness for disasters. Educational institutions can strengthen their resilience and better prepare for the uncertainties posed by climate change by addressing these challenges and taking advantage of relevant opportunities.

### Challenges in Disaster Preparedness

Amid the uncertainties of climate change, educational institutions struggle with the difficult task of disaster preparation. Severe hurdles in convincing stakeholders of the significance of disaster preparedness activities are exacerbated by scarce financial resources and the intricacies of resource distribution.

Challenges in Disaster Preparedness	Limited financial resources and competing priorities pose challenges in allocating resources for disaster preparedness amidst climate uncertainty. Challenges in effectively communicating the importance of disaster preparedness initiatives to stakeholders, including students, faculty, and parents, are identified.
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The theme of "Challenges in Disaster Preparedness" highlights the various challenges that educational institutions encounter while trying to prepare for disasters amid climate unpredictability. One major issue is the scarce financial resources, which are made worse by conflicting demands on school budgets. This restriction frequently compels administrators to make tough choices regarding the distribution of resources, which may impede all-encompassing disaster readiness initiatives. Furthermore, it might be difficult to effectively communicate to different stakeholders—such as parents, teachers, and students—the significance of disaster preparedness activities. One possible cause of this communication problem is that stakeholders may not be aware of or comprehend the importance of taking precautionary steps for disasters.

*"As an administrator in public secondary schools, I will navigate the balance between allocating resources for immediate educational needs and investing in long-term disaster preparedness measures amidst climate uncertainty through collaboration of stakeholders either internal or external, identify the resources, availability of financial resources, and above all the commitment of person involved." FGD1*

These issues align with findings from previous research. Perera et al. (2018), for example, draw attention to the mismatch between international policy frameworks and the training requirements of experts in disaster risk reduction and sustainable development. The difficulties in coordinating disaster preparedness initiatives with more general policy goals are highlighted by this disparity.

Similarly, Berrang-Ford et al. (2021) highlight how adaptation to climate change is fragmented and localized, implying that insufficient coordination and communication may impede global catastrophe preparedness efforts. All things considered, overcoming these obstacles calls for an all-encompassing strategy that takes into account not just the financial limitations but also the requirement for effective communication techniques to involve all stakeholders.

### Opportunities for Enhancement

In contrast, the topic "Opportunities for Enhancement" highlights the possibilities for utilizing technology and encouraging stakeholder collaboration to strengthen disaster preparedness efforts, providing a ray of optimism despite these difficulties. These opportunities offer ways to overcome resource constraints and improve disaster preparedness in educational settings. They also provide outlets for creativity and resource utilization.

Opportunities for Enhancement	Leveraging technology, such as online platforms, can enhance disaster preparedness efforts by facilitating information dissemination and communication. Collaboration with local government agencies and community organizations can provide additional resources and support for disaster preparedness initiatives.
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The "Opportunities for Enhancement" subject focuses on ways to make educational institutions' disaster preparedness efforts better in the face of climate unpredictability. Making use of technology is a big opportunity. The efficiency of disaster preparedness programs can be increased by streamlining information distribution and communication using digital platforms and online platforms. Working with stakeholders, such as neighborhood associations and local government offices, also offers a chance to improve outcomes. Schools can strengthen their disaster preparedness efforts by collaborating with outside organizations to have access to more resources and assistance.

*"Leveraging technology, such as online platforms, can enhance disaster preparedness efforts by facilitating information dissemination and communication." FGD3*

*"Collaboration with local government agencies and community organizations can provide additional resources and support for disaster preparedness initiatives." FGD1,3*

These prospects correspond with the conclusions drawn from the literature. Perera et al. (2018) stresses the value of cooperation and partnerships in efforts to reduce the risk of disasters and promote sustainable development. They contend that to effectively address complex issues like climate uncertainty, coordination with a variety of stakeholders is essential.

### Addressing Challenges

The theme "Addressing Challenges" emphasizes the significance of placing a high value on cooperation, communication, and creative thinking as educators and administrators traverse the terrain of disaster preparedness. Educational institutions can improve disaster preparedness by leveraging opportunities and overcoming problems through flexible resource utilization and efficient communication.

Addressing Challenges	Prioritizing communication and collaboration, as well as exploring innovative approaches, are identified strategies for addressing challenges and strengthening disaster preparedness. Flexibility, innovation, and resourcefulness, along with partnerships, are essential for addressing resource limitations and leveraging available opportunities.
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The discussion on "Addressing Challenges," the theme, focuses on methods for getting past roadblocks and improving readiness for emergencies. To overcome obstacles and improve disaster readiness, (FGD2) stresses the significance of placing a high priority on communication and teamwork. Educational institutions can improve the coordination of disaster preparedness programs and guarantee comprehensive approaches to resilience building by promoting efficient communication channels and promoting stakeholder collaboration.

(FGD2) also emphasizes how important it is to investigate cutting-edge methods of catastrophe preparedness. Educational institutions can better prepare for future disasters and adjust to changing conditions by adopting new ideas, technology, and methods. In the face of climate unpredictability, this proactive approach to innovation can help reduce risks and enhance response capacities.

*“Exploring innovative approaches to disaster preparedness, such as embracing new technologies, methodologies, and ideas, can help educational institutions adapt to changing circumstances and enhance their readiness for potential disasters.” FGD2*

However, FGD1 and 2 both stresses how crucial it is to use resources effectively when tackling issues with disaster readiness. They stress that to make the most use of the resources at hand, one must be adaptable, creative, and resourceful—especially when dealing with tight budgets and conflicting priorities. Partnerships with regional authorities, civic associations, and other interested parties can also contribute more funds and assistance, allowing educational establishments to take fuller advantage of the opportunities at hand.

*"We need to be flexible, innovative, and resourceful at the same time considering the marginality of our budget allocation, at this point we need to look for partnership to seal the long-term approach." FGD1*

These strategies coincide with the conclusions drawn from the literature. Galvizo's (2022) research on the integration of disaster risk reduction education emphasizes the significance of stakeholder cooperation and support in bolstering disaster preparedness initiatives.

In a similar way, Katamu's (2023) research on the hazards of disasters in secondary schools emphasizes the necessity of creative solutions and collaborations to overcome resource constraints and improve disaster readiness. In addition, Bekchanov's (2018) research on catastrophe risk management highlights the value of teamwork and resource management in overcoming obstacles and enhancing resilience.

### Student Perspectives

The theme, "Student Perspectives" clarifies students' beliefs and self-assurance levels about disaster readiness initiatives. The efficiency of emergency exercises in actual crisis scenarios is still questioned, despite the fact that students typically view safety measures favorably. To build complete disaster preparedness plans that inspire confidence and guarantee students' safety and security, it is essential to comprehend and take into account various viewpoints.

Student Perspectives	Students perceive safety measures and disaster preparedness efforts as effective in ensuring their safety and security amidst climate uncertainty. While most students' express confidence in emergency drills, some harbor doubts about their effectiveness in real disaster scenarios or unpredictable weather conditions.
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With reference to safety precautions and disaster preparedness initiatives in the wake of climate uncertainty, the "Student Perspectives" theme explores students' views and attitudes. Students' opinions about how well safety precautions and disaster preparedness programs work to protect them in the face of climate uncertainty are revealed in their comments (FGD1-4). These insights offer insightful input on the perceived effectiveness of catastrophe risk reduction strategies put in place by educational institutions.

*"I feel safer knowing that our school has implemented safety measures and disaster preparedness initiatives. It gives me peace of mind knowing that steps have been taken to protect us, especially during uncertain times like these." FGD3*

Additionally, the subject investigates students' trust in emergency exercises, stressing their opinions on how well these drills prepare them for actual disaster scenarios or erratic weather. While most students seem to be confident in emergency drills, there are signs that some may not be sure how effective they will be in real-world emergencies. This difference in confidence levels emphasizes how crucial it is to assess emergency

drills closely to make sure they accurately mimic real-world situations and sufficiently train students for emergencies.

*"While I appreciate the effort our school puts into conducting emergency drills, I'm not sure how effective they would be in a real disaster situation. Sometimes it feels like we're just going through the motions without fully understanding what to do in a real emergency." FGD4*

Moreover, the insight gained by Basri et al. (2021) explores the viewpoints and understanding of stakeholders with regard to the cycles of disaster risk management, offering insights into the effective execution of disaster preparedness programs. This study helps clarify the issue by offering insightful viewpoints on stakeholder awareness and the real-world use of catastrophe preparedness programs.

## IMPLICATIONS

### **Climate Uncertainty Impact on Disaster Preparedness among Public Secondary High School Administrators**

To begin with, school administrators need to understand the critical opportunity that comes with incorporating Disaster Risk Reduction (DRR) preparedness into the curriculum. Educators and staff can be kept secure by administrators by carrying out thorough risk assessments and allocating resources according to possible risks. Additionally, resource mobilization depends on cooperation with stakeholders including parent-teacher groups, community organizations, and local government agencies. Accepting this integration helps the school community develop a culture of safety and resilience while also improving preparedness for disasters.

Furthermore, in line with the theme Communication Barriers, effective disaster preparedness initiatives depend on resolving communication barriers. To make sure stakeholders are aware of disaster readiness, administrators need to use a variety of communication channels and undertake frequent training sessions and simulations. To further aid overcome these obstacles, awareness programs and workshops can be put in place to make sure stakeholders are aware of the significance of disaster preparedness initiatives and are actively involved in planning procedures. Administrators can reduce the impact of climate uncertainty on disaster preparedness by improving overall preparedness through open communication and collaboration.

Moreover, collaboration provides priceless chances to improve catastrophe preparedness initiatives in relation to the theme Collaboration with External Stakeholders. Administrators can obtain more resources and knowledge by collaborating with NGOs, private sector companies, community organizations, and local government agencies. Incorporating disaster preparedness education into the curriculum and infrastructure design also guarantees that students have the knowledge and abilities they need. In addition to bolstering disaster preparedness programs, this cooperative strategy builds community resilience against climate uncertainty.

Finally, it is imperative for administrators to recognize and take advantage of the Integration into Education Opportunities to incorporate disaster preparedness education

within the academic program. Administrators can have access to more resources and knowledge by working with NGOs, community organizations, local government agencies, and private sector companies. Furthermore, giving students real-world experience and training gives them the tools they need to react to emergencies in a responsible and efficient manner. A further way to educate stakeholders about the significance of disaster preparedness in the context of climate uncertainty is to organize awareness campaigns and seminars. This integration builds a culture of safety and readiness across the school community in addition to increasing students' resilience to disasters.

### **Innovative strategies teachers employ to integrate disaster preparedness education into the curriculum amidst climate uncertainty**

On the theme of integrating hands-on learning experiences with DRR preparedness. Using multidisciplinary approaches, teachers have cleverly incorporated disaster preparedness education into a variety of courses. Students are guaranteed to understand the practical components of disaster preparedness through the integration of real-world events and hands-on learning experiences. These programs support the larger argument for disaster risk reduction should be taught in schools as a required subject since they help communities become ready for unplanned disasters. highlights the theme of integrating hands-on learning experiences with DRR preparedness.

Additionally, in the themes of preparedness, training evaluation, and student feedback on DRR. The efficiency of the existing disaster preparedness measures is shown by the viewpoints of the students. Even if they recognize the benefits of drills and simulations, there is a clear need for additional hands-on instruction, especially in climate change-prone locations. Teachers are dedicated to improving training materials in light of this feedback, making sure that efforts to be prepared precisely correspond with the demands and worries of students. The significance of incorporating feedback loops into disaster preparedness measures is shown by this student-centered approach.

Furthermore, it is essential to continuously evaluate training initiatives in order to improve schools' preparedness for emergencies. This field's research emphasizes how important it is to keep developing and adapting as dangers change. Through methodical assessment and improvement of training programs, academic establishments can enhance their ability to manage crises efficiently. This proactive approach to evaluation shows a dedication to building readiness and resilience in school communities. The theme of training evaluation is covered in this section.

Lastly, the theme of Integration into Education Opportunities, which emphasizes the creative incorporation of disaster preparedness education along with student input and continuous program evaluation, completes the picture of how to improve schools' preparedness for disasters in the face of climate uncertainty. Educational institutions can successfully reduce the risks posed by climate-related disasters and safeguard the safety and well-being of their communities by adopting a student-centric strategy and placing a high priority on continuous development.

### **Student assessments of the effectiveness of disaster preparedness initiatives In public secondary high schools in light of climate uncertainty**

The theme on School Preparedness underscores the importance of schools being well-prepared for disasters, emphasizing the implementation of safety protocols, evacuation plans, and regular drills. It is crucial for school administrators to prioritize these preparedness measures to ensure students' safety and security. Collaboration and active participation from stakeholders such as educators, students, parents, and community members are essential in regularly assessing risks, identifying vulnerabilities, and developing specific strategies to reduce risks. Schools can enhance their resilience to disasters by routinely updating risk assessments and proactively addressing emerging hazards.

Moreover, the theme on Communication with Parents highlights the significance of transparent and effective communication channels between schools and parents. Open lines of communication, such as group chats and announcements, play a vital role in keeping students and parents informed about safety measures and emergency situations. Collaboration between educators and parents during disasters fosters a sense of reassurance and strengthens overall disaster resilience within school communities.

Furthermore, the theme on Confidence in Emergency Drills emphasizes the importance of practical preparedness exercises in developing students' ability and readiness for disaster response. Schools should implement a structured schedule for regularly conducting drills, including fire drills, earthquake drills, and other relevant scenarios based on identified threats. These drills should involve active participation from students, teachers, staff, and other stakeholders to familiarize participants with emergency procedures, assess response protocols, and identify areas for improvement. Conducting debriefing sessions after drills can further enhance the learning process and promote ongoing progress in emergency preparedness and response efforts.

Finally, the theme on Uncertainty about Real Disasters highlights students' concerns about the effectiveness of emergency plans and drills in real disaster scenarios, particularly in light of unpredictable weather patterns and the impact of climate change. Comprehensive strategies are needed to address climate uncertainty in learning environments, including regular risk assessments, transparent communication channels, and practical preparedness exercises. By actively involving stakeholders and prioritizing disaster preparedness measures, schools can enhance their resilience to disasters and ensure the safety and security of students and staff.

### **Key challenges and opportunities for enhancing disaster preparedness in public secondary high schools amidst climate uncertainty**

Effective ways to overcome challenges are necessary given the problems public secondary high schools confront in implementing disaster preparedness activities in the context of climate uncertainty. The theme of "Challenges in Disaster Preparedness" draws attention to the limited financial resources and the challenges associated with persuading stakeholders of the significance of disaster preparedness activities. Setting communication, teamwork, and creative resource allocation as top priorities is necessary to meet these issues.

Conversely, the theme on "Opportunities for Enhancement" presents avenues for improving disaster preparedness efforts. Leveraging technology, such as online platforms, can facilitate information dissemination and communication, while collaboration with local government agencies and community organizations can provide

additional resources and support. These opportunities offer ways to overcome resource constraints and strengthen disaster preparedness in educational settings.

Moreover, the theme on "Addressing Challenges" emphasizes the importance of proactive measures to tackle obstacles effectively. Prioritizing communication and collaboration, as well as exploring innovative approaches, are identified strategies for addressing challenges and strengthening disaster preparedness. Flexibility, innovation, and resourcefulness, along with partnerships, are essential for overcoming resource limitations and maximizing available opportunities.

Finally, the theme on "Student Perspectives" provides insights into students' beliefs and confidence levels regarding disaster readiness initiatives. While many students' express confidence in emergency drills, some harbor doubts about their effectiveness in real disaster scenarios. Understanding and addressing these concerns are essential for building comprehensive disaster preparedness plans that inspire confidence and ensure students' safety and security amidst climate uncertainty.

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