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# SCHOOL READINESS IN THE ERUPTION-PRONE AREA OF SINABUNG VOLCANO IN KARO DISTRICT IN TERMS OF THE 3 PILLARS OF DISASTER-SAFE EDUCATION UNITS

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**ABSTRAK**

**Abstrak**: Penelitian ini bertujuan untuk menganalisis kesiapan sekolah di kawasan rawan erupsi Gunung Sinabung berdasarkan tiga pilar Satuan Pendidikan Aman Bencana (SPAB): (1) fasilitas belajar yang lebih aman, (2) manajemen penanggulangan bencana dan kesinambungan pendidikan, serta (3) pendidikan pengurangan risiko dan resiliensi. Metode penelitian menggunakan pendekatan kuantitatif deskriptif dengan populasi sekolah di Kawasan Rawan Bencana (KRB) 1, 2, dan 3 Gunung Sinabung. Sampel terdiri dari 32 sekolah yang dipilih secara *purposive sampling*. Data dikumpulkan melalui angket, observasi, dan dokumentasi, kemudian dianalisis menggunakan statistik deskriptif. Hasil penelitian menunjukkan bahwa tingkat kesiapan sekolah dari pilar 1 sebesar 75% (Cukup Siap), pilar 2 sebesar 65% (Cukup Siap), dan pilar 3 sebesar 69,5% (Cukup Siap). Secara keseluruhan, tingkat kesiapan sekolah berdasarkan ketiga pilar SPAB berada pada kategori Cukup Siap dengan persentase 70%.

**Kata Kunci**: *kesiapan sekolah; kawasan rawan bencana; gunung berapi sinabung; satuan pendidikan aman bencana*

***Abstract:*** *This study aims to analyze the readiness of schools in the eruption-prone area of Mount Sinabung based on the three pillars of the Disaster Safe Education Unit (SPAB): (1) safer learning facilities, (2) disaster management and education continuity, and (3) risk reduction and resilience education. The research method used a descriptive quantitative approach with a population of schools in Disaster Prone Areas (KRB) 1, 2 and 3 of Mount Sinabung. The sample consisted of 32 schools selected by purposive sampling. Data were collected through questionnaires, observation, and documentation, then analyzed using descriptive statistics. The results showed that the level of school readiness from pillar 1 was 75% (Moderately Prepared), pillar 2 was 65% (Moderately Prepared), and pillar 3 was 69.5% (Moderately Prepared). Overall, the level of school readiness based on the three pillars of SPAB was in the Moderately Prepared category with a percentage of 70%.*

***Keywords:*** *school readiness; disaster prone areas; sinabung volcano; disaster safe education unit*

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## A. BACKGROUND

A natural disaster is defined as an event that causes a significant impact on the human population (Mailizar et al., 2023). Disasters, which are events caused by nature and humans, result in loss of life, property, and social values, and can disrupt human activities. Indonesia is one of the countries that has a fairly high level of natural disaster occurrence (BNPB, 2019). These disasters include earthquakes, tsunamis, volcanic eruptions, floods, droughts, hurricanes, and landslides. One of the natural disasters that often occurs in the Indonesian archipelago is volcanic/eruptive disasters (Tantri, 2019).

The formation of Indonesia is attributed to the convergence of multiple tectonic plates, resulting in subduction and collision processes that have led to the development of numerous volcanoes, thereby establishing the region as a part of the so-called *"Ring of Fire"* (Yudiantoro, 2023). The presence of numerous volcanoes along the tectonic path extending from Sumatra, Java, Nusa Tenggara, Banda Islands, Halmahera, and Sangir Talaud Islands, which collectively encompass approximately one-sixth of the archipelago's total area, is a matter of particular concern. Given its position as a country traversed by the Ring of Fire, with a total of 127 active volcanoes, Indonesia faces a higher risk of natural disasters caused by this geological phenomenon (El Fatih & Ibtihaj, 2021).

Disasters have the capacity to exert a deleterious effect on the economy and government resilience. Furthermore, disasters can also have an impact on education (Lesmana & Purborini, 2015). The loss of school elements such as teachers and students, teaching and learning processes, property, and equipment due to disasters poses a significant threat to the future of millions of young people (Pereznieto & Harding, 2013). The disruption of education due to conflict and natural disasters is a primary factor contributing to the educational exclusion of children and youth. The denial of their right to education effectively denies them the opportunity to develop and escape poverty and marginalization, underscoring the significant impact of natural disasters on the educational well-being of children and adolescents.

It has been demonstrated that natural disasters, including the Aceh earthquake and tsunami (2004), the Yogyakarta earthquake (2006), the eruption of Mount Merapi (2010), and other events, have resulted in the interruption of teaching and learning activities in numerous schools. This suggests that, while the occurrence of disasters is inevitable, communities can develop strategies to mitigate the risks of such events. A notable example of this phenomenon is the recurrent eruption of Mount Sinabung in the Karo Regency area of North Sumatra Province. This active volcano, located approximately 80 kilometers from Medan, the capital of North Sumatra, exemplifies the potential hazards posed by natural disasters in Indonesia (Annisa et al., 2021).

Report data from the Center for Volcanology and Geological Hazard Mitigation shows that Mount Sinabung has more activity than any other volcano in Indonesia (Magma Indonesia, 2023). From 2016 to 2021, there have been 984 eruptions. The major eruption in March 2021 damaged approximately 2,945.8 ha of agricultural land and other infrastructure such as educational facilities and residential houses, resulting in economic losses of US$1,917,093.42 (Bambang Sukatja, 2016; Hanif & Apichontrakul, n.d.). Since the eruption of Mt. Sinabung volcano in Karo Regency, many schools in the area have stopped the process of teaching and learning activities due to the eruptive surge of Mt. Sinabung.

Disaster education is very important in society, especially in the context of the school environment. Schools, as educational institutions, serve as important platforms for the dissemination of sustainable and continuous disaster education (National Disaster Management Authority Government of India, 2016). The integration of disaster education in the school environment is expected to equip students with the knowledge to identify risks, recognize early signs of natural disasters, and develop risk reduction strategies (Bayangos, 2023; Sudrajad et al., 2023; the United Nations Educational, 2016).

SPAB, or disaster-safe education unit, is a program designed to encourage efforts to prevent and mitigate the impact of disasters in educational units, such as schools (Sudrajad et al., 2023). SPAB activities are expected to be integrated into the education curriculum so as to reduce disaster risk in schools or madrasah (Kasman, 2019). Furthermore, the necessity of incorporating safety education into the school curriculum to equip students with the knowledge and skills necessary to respond effectively to sudden disasters has been underscored (Anisa, 2019).

SPAB aims to improve the capacity of resources in educational units to cope with disaster risks (Bastidas & Peta, 2016; Ronggowulan et al., 2023; The United Nations Office for Disaster Risk Reduction, 2017). Schools implementing the SPAB program have disaster-resilient facilities and infrastructure according to standards through the implementation of three main pillars, namely safer learning facilities, disaster management and educational continuity, and risk reduction and resilience education (Rifaldi et al., 2023). Policies on SPAB already exist from national to regional levels, but not all disaster-prone areas have SPAB programs.

Based on data from the Indonesian Ministry of Education and Culture, there are >100,000 schools located in disaster-prone areas (Amri, 2017). Schools located at the foot of the slopes of Mt. Sinabung are also among the >100,000 schools located in disaster-prone areas, namely the eruption of Sinabung volcano. Until now, schools located in disaster-prone areas are still carrying out the learning and teaching education process without the status of a Disaster Safe Education Unit (SPAB) school.

Based on the main problem, the purpose of this research is to describe the level of school readiness in the Sinabung Volcano disaster-prone area of Karo Regency, North Sumatra, in terms of the three pillars of a disaster-safe education unit. These pillars include: (1) safer learning facilities, (2) disaster management and education continuity, and (3) risk reduction and resilience education. The author is interested in researching schools in the disaster-prone area of Sinabung eruption by conducting research on the level of school readiness in the disaster-prone area of Sinabung volcano. The research on the level of school readiness will be guided by the 3 main pillars of SPAB (Rifaldi et al., 2023). From this writing, it can also be seen and traced how the school's policy is in carrying out the teaching and learning education process in the midst of the existence of the Sinabung volcano which will surely experience an eruption at any time without the SPAB status possessed. It is also hoped that the results of the research on school preparedness in the disaster-prone area of Sinabung Volcano can be a guide for the government or local agencies to be wiser in providing programs in the school according to the existing needs such as the Disaster Safe Education Unit (SPAB) program.

## B. IMPLEMENTATION METHOD

This research employs a quantitative descriptive method that aims to systematically, actually, and accurately describe the readiness of schools in the

eruption-prone area of Mount Sinabung based on the three pillars of the Disaster Safe Education Unit (SPAB). The research was conducted in schools located in Disaster Prone Areas (KRB) 1, 2, and 3 in Karo Regency, North Sumatra Province. The research sample consists of 32 schools, which were selected using a purposive sampling technique with a focus on elementary schools that are still operating in the area. Data collection was executed through field observations, Likert scale-based questionnaires, and documentation. The indicators in the questionnaire refer to the three pillars of SPAB to assess school readiness in facing eruption disasters. The collected data were then subjected to a thorough analysis using descriptive statistics, with the objective of providing a comprehensive overview of the school readiness levels within the study area.

The data collection techniques employed in this study encompassed field observations, Likert scale questionnaires, and documentation. The Likert scale questionnaire employed in this study draws from the three pillars of the Disaster Safe Education Unit module. The objective of this research is to ascertain the level of preparedness of schools in the eruption-prone area of the Sinabung Volcano in Karo Regency with regard to the three pillars of the Disaster Safe Education Unit. The distribution of the questionnaire will be conducted among respondents, specifically schools situated within the Sinabung Volcano disaster-prone area (KRB 1, 2, 3). The subsequent lattice of research instruments has been adapted from the Module 3 pillars of disaster safe education units.

**Table 1**. Instrument Grid

| **Research Variables** | **Indicator 3 PILLARS SPAB** | **Question Number** |
|---|---|---|
| Pillar 1 Safer learning facilities | Education unit policy | **1, 2, 3** |
| | Preparedness planning | **4, 5, 6** |
| | Monitoring and Evaluation | **7, 8** |
| | Resource Mobilization | **9, 10, 11** |
| Pillar 2 Disaster management and continuity of education | Resource mobilization (provision of preparedness facilities) | **12** |
| | Needs assessment tool, analysis of results, use of results and dissemination of information (Rapid Assessment of Disaster Impact in the Education Sector) | **13, 14, 15, 16** |
| | Attitudes and Actions (Simulation of Disaster Management of Education Units) | **17, 18** |
| | Attitudes and Actions (Disaster Risk Assessment of Participatory Education Units) | **19** |
| | Preparedness planning (Education Unit Standby Team) | **20** |
| | Attitudes and Actions (SPAB Action Plan) | **21, 22** |
| | Education Unit Policy (Education Unit Standby Team) | **23, 24, 25** |
| | Resource mobilization (Budgeting) | **26, 27** |
| | Preparedness Planning (Educational Continuity Planning) | **28, 29** |
| | Standard Operating Procedures (SOP) for Disaster Emergencies & Disaster Preparedness Plans for Education Units | **30, 31, 32** |
| Pillar 3 Risk reduction and response education | Analysis (Assessment and needs analysis) | **33, 34, 35, 36** |
| | Analysis (Planning) | **37, 38** |
| | Resource mobilization (HR setup) | **39** |
| | Knowledge and skills (HR preparation) | **40** |
| | Preparedness planning (Preparation of learning tools) | **41** |

| | |
|---|---|
| Preparedness planning (implementation of risk reduction and resilience education) | **42** |
| Attitudes and Actions (implementation of education Risk reduction and resilience) | **43, 44, 45, 46, 47** |
| Resource mobilization (implementation of education Risk reduction and resilience) | **48, 49, 50, 51, 52** |
| Education Policy (implementation of education Risk reduction and resilience) | **53** |
| Analysis (monitoring and evaluation) | **54, 55, 56, 57** |
| Resource mobilization (development: multi-stakeholder engagement) | **58, 59** |
| Knowledge and skills (development: public education) | **60, 61, 62, 63** |

*Source: Adoption of the 3 pillars of disaster-safe education units*

The Likert scale is a measurement instrument employed to evaluate the attitudes, opinions, and perceptions of individuals with regard to a social or natural phenomenon. In this study, the Likert Scale was employed to measure school readiness in facing the Mount Sinabung eruption disaster based on the three pillars of the Disaster Safe Education Unit (SPAB). The scale utilizes a five-point Likert scale with predetermined positive and negative scores, thereby providing a quantitative metric for the measurement of respondents' attitudes, perceptions, and opinions.

**Table 2**. *Likert Scale Values*

| Categories Answer | Positive Score | Negative Score |
|---|---|---|
| Strongly Agree | 5 | 1 |
| Agree | 4 | 2 |
| Undecided | 3 | 3 |
| Disagree | 2 | 4 |
| Strongly disagree | 1 | 5 |

*Source: Sugiyono, 2019 (Sugiyono, 2019)*

The collected data were then subjected to analysis using descriptive statistics, specifically percentages, to ascertain the level of school readiness. The analysis was conducted using Microsoft Excel and SPSS to process frequencies and percentages, thereby obtaining an overview of school readiness in disaster-prone areas. The percentages were obtained using the following formula:

Formula : $\% = \frac{f_o}{n} \times 100$

Information :

% = Percentage of each answer alternative

o = Number of answer frequencies

= Number of samples/respondents

The interpretation of the results was conducted in accordance with the readiness level categories, employing the Norm-referenced Assessment (PAN) approach, which categorizes results into five categories: Very Unprepared, Unprepared, Moderately Prepared, Prepared, and Very Prepared.

**Table 3.** Norm-referenced assessment (PAN) interval score of research data results

| **Interval** | **Category** |
|---|---|
| X ≥ M + 1,5 SD | Very Prepared |
| M + 0,5 SD ≤ X < M + 1,5 SD | Prepared |
| M - 0,5 SD ≤ X < M + 0,5 SD | Moderately Prepared |
| M - 1,5 SD ≤ X < M - 0,5 SD | Unprepared |
| X < M – 1,5 SD | Very Unprepared |

*Source: (Sudijono, 2011)*

Information:
M = total
SD = standard deviation
M = Mean

## C. RESULTS AND DISCUSSION

The objective of this study is to provide a comprehensive description of the level of school readiness in the eruption-prone area of Mount Sinabung, Karo Regency, in relation to the three pillars of the disaster safe education unit (SPAB). The study utilized a set of 63 statements, which were grouped into the following three pillars: Eleven statements for Pillar 1 (safer learning facilities), 21 statements for Pillar 2 (disaster management and education continuity), and 31 statements for Pillar 3 (risk reduction and resilience education). Data were obtained from 32 schools in the Mount Sinabung disaster-prone area, which were then analyzed using the Norm-referenced Assessment (PAN) interval scores for each pillar. The results of the study will be presented in tables that facilitate data interpretation and the percentage of readiness for each pillar.

### The level of school readiness in the Sinabung Volcano disaster-prone area in terms of pillar 1 safer learning facilities

Safer learning facilities or safer places of learning are places of learning where the building and surrounding grounds meet building reliability standards (safety, health, comfort and convenience) in accordance with Government Regulation No. 16 of 2021 on the Implementation Regulations of Law No. 28 of 2002 on Building (Tebe, 2023a). Physical condition is a key indicator of school resilience to disasters (Nakum et al., 2022). In a disaster situation, a secure education unit facility is a reliable place to keep its citizens safe.

The results of data processing obtained using simple quantitative analysis techniques show that the research questionnaire pillar 1 safer learning facilities get a percentage score of 75%, which means that the level of school readiness in the Sinabung Volcano disaster-prone area in terms of pillar 1 safer learning facilities **"moderately prepared"** seen based on the norm reference assessment category (PAN) score interval that has been determined.

**Table 4.** Assessment norm reference category interval score pillar 1 safe learning facilities

| Category | Interval | F |
|---|---|---|
| Very Unprepared | X < 57% | 1 |
| Unprepared | 57% < X ≤ 69% | 1 |
| Moderately Prepared | 69% < X ≤ 80% | 6 |
| Prepared | 80% < X ≤ 92% | 2 |
| Very Prepared | X > 92% | 1 |
| Entire | | 11 |

*Source: Data Processing Results 2024*

Physical condition is a key indicator of school resilience to disasters. In a disaster situation, a secure education unit facility is a reliable place to keep its citizens safe (Nakum et al., 2022). The findings from the data analysis and observational studies indicate that the design of disaster-safe learning facilities in education units deviates from the standards outlined in SPAB's first pillar. Instead, these facilities are tailored to address the specific needs of existing education units.For instance, the construction of additional buildings in schools across the

Naman Teran sub-district exemplifies this adaptation. Additionally, the findings revealed the relocation of several education units from KRB 3 to KRB 2 and 1, including SDN 043950 Sigarang-garang, which was originally located in KRB 3 Sigarang-garang Village, Naman teran Sub-district, was relocated to KRB 2, which is situated in Kutarayat Village, Naman teran Sub-district, and subsequently became SDN 040478 Sigarang-garang.

The findings of this study are consistent with the results of research conducted by A. Nassirpour, C. Galasso, D. (Nassirpour et al., 2018) on the Multi-Hazard Physical Vulnerability Prioritization of School Infrastructure in the Philippines. The findings indicated that the multi-hazard vulnerability prioritization of 115 school buildings in Cagayan de Oro City, Philippines, has been assessed and yielded results based on the research parameters utilized. The assessment determined that replacement or relocation is necessary in several existing schools, contingent on the importance and level of vulnerability in each parameter and the most vulnerable cases in the city. This conclusion aligns with the findings of research by (Nakum et al., 2022) with the research title Developing a framework on school resilience for risk-informed decision-making states that to improve the school selection process by reducing the gap between the education system and disaster management, which encourages stakeholders to improve student safety.

**The level of school readiness in the Sinabung Volcano eruption-prone area in terms of pillar 2 of disaster management and education continuity.**

SPAB management engages in equity-focused planning for children's health, safety and well-being, ensuring continuity of education by considering all hazards and risks that threaten children and education personnel in the education sector (Tebe, 2023b). The results of data processing using simple quantitative analysis show that the pillar 2 disaster management and education continuity research questionnaire received a percentage score of 65%. This indicates that, based on the norm-referenced assessment category (PAN), the level of school readiness in the Sinabung Volcano disaster-prone area is **Moderately Prepared**.

**Table 5.** Norm-referenced assessment of score interval categories for pillar 2 disaster management and education continuity

| Category | Interval | F |
|---|---|---|
| Very Unprepared | X < 50 | 2 |
| Unprepared | 50 < X ≤ 60 | 5 |
| Moderately Prepared | 60 < X ≤ 70 | 6 |
| Prepared | 70 < X ≤ 80 | 8 |
| Very Prepared | X > 80 | 0 |
| Entire | | 21 |

*Source: Data Processing Results 2024*

The findings in disaster management and education continuity in the Mount Sinabung Disaster Prone Area, Karo District, show that education units do not fully refer to pillar 2 of the SPAB, but rather adjust to their individual needs. One form of adjustment is cooperation with the Karo District Transportation Office in providing buses for students and educators as a result of the relocation of schools from KRB 3 to KRB 2 which is safer, although further away from their homes. In addition, some schools in KRB 3 are still staying in safer schools in the *Sister School* system, where schools in safe zones serve as a buffer for schools in vulnerable areas so that learning continues during times of crisis.

The division of roles in the sister school system needs to be done based on the location of the school to the eruption center. Schools in safe zones act as a buffer

for schools in vulnerable areas. Overall, schools have the potential to continue the learning process during the crisis (E. T. Mei et al., 2019; E. T. W. Mei et al., 2020; Nurhadi et al., 2021). Some of the affected schools in this system include SD Negeri 045958 Mardinding which is now staying at SD Negeri 043938 Tiganderket, SD Negeri 044829 Sukanalu which is staying at SD Negeri 1 Kabanjahe, and SD Negeri 047125 Simacem Bekerah which has been permanently relocated from Simacem Village to the Siosar relocation center.

The findings above are in line with research conducted by (E. T. Mei et al., 2019) with the title *Sister School* for Merapi Volcano Disaster Risk Reduction research, which states that principals and teachers in affected schools and buffer schools agree with the implementation of sister schools, but still need some improvements in its implementation. Findings conducted by (E. T. W. Mei et al., 2020) in a study entitled Building volcanic disaster resilience community through school and education showed that schools located in the eruption-prone areas of the 2010 Yogyakarta Merapi Volcano participated in the *Sister School* program and teachers and students had positive acceptance of the Sister School program. In contrast to other volcanic disaster-prone areas, the *Sister School* program has not actually been carried out in schools in the Sinabung volcano disaster-prone area, but the management carried out is very similar to the *Sister School* program itself.

**The level of school readiness in the Sinabung Volcano eruption-prone area in terms of pillar 3 of risk reduction and resilience education**

The purpose of risk reduction and resilience education is to equip children, education personnel and school communities (including parents) with the knowledge, skills and resources needed to develop resilience in the face of potential risks (Gadrres, 2022; Tebe, 2023c). The results of data processing obtained using simple quantitative analysis techniques show that the research questionnaire pillar 3 risk reduction and resilience education received a percentage score of 69.5%, which means that the level of school readiness in the Sinabung Volcano disaster-prone area in terms of pillar 3 risk reduction and resilience education is **Moderately prepared** based on the norm reference assessment category (PAN) predetermined score interval.

**Table 6.** Norm-referenced assessment of pillar 3 risk reduction and resilience education score interval categories

| Category | Interval | F |
|---|---|---|
| Very Unprepared | X < 45 % | 5 |
| Unprepared | 45% < X ≤ 61% | 2 |
| Moderately Prepared | 61% < X ≤ 78% | 12 |
| Prepared | 78% < X ≤ 94% | 11 |
| Very Prepared | X > 94% | 1 |
| Entire | | 31 |

*Source: Data Processing Results 2024*

Risk reduction and resilience are part of long-term sustainable development that includes good practices, knowledge and innovations to create a safe and resilient culture in educational institutions. The findings show that risk reduction and resilience education in education units in the eruption-prone area of Mount Sinabung, Karo Regency, is still minimal and does not fully refer to pillar 3 of SPAB, but is adjusted to the needs of each education unit. Disaster education in schools is expected to be an effective step in channeling information related to the integration of disaster material (Ammelia et al., 2022). However, other findings

show that schools in this region often experience limited resources, making it difficult to provide relevant learning media, such as books, posters or visual aids related to disaster risk reduction. Simulations and the use of disaster mitigation media were conducted when Mount Sinabung last erupted, but after the eruption, these activities were no longer carried out due to limited resources.

To improve risk reduction and resilience education in schools in disaster-prone areas such as Mount Sinabung, there needs to be an integrated effort involving the provision of resources, training for teachers and the development of supportive policies. With appropriate IEC learning media, students will be better prepared and aware of disaster risks, thereby increasing community resilience to disaster threats (Gadrres, 2022; Tebe, 2023c).

**School readiness in the Sinabung Volcano eruption-prone area in terms of the 3 pillars of disaster-safe education units**

The results of this study indicate the level of school readiness in the Sinabung Volcano eruption-prone area of Karo Regency in terms of the three pillars of disaster safe education units. The findings reveal that the level of school readiness is **Moderately Prepared**, with a percentage of 70%, as determined by the norm reference assessment category (PAN) score interval. This finding is derived from the results of data processing using simple quantitative analysis by combining the existing research indicators, namely pillar 1 (safer learning facilities) with a percentage of 75%, pillar 2 (disaster management and education continuity) with a percentage of 65%, and pillar 3 (risk reduction and resilience education) with a percentage of 69.5%.

**Table 7.** School readiness in the Sinabung Volcano eruption-prone area in terms of the 3 pillars of disaster-safe education units

| READINESS | | |
|---|---|---|
| Pillar 1 | Pillar 2 | Pillar 3 |
| 75% | 64,8% | 69,5% |
| 3 Pillar (70%) | | |
| Moderately Prepared | | |

*Source: Data Processing Results 2024*

**Table 8**. Norm-referenced assessment of score interval categories 3 pillars of SPAB

| Category | Interval |
|---|---|
| Very Unprepared | X < 62% |
| Unprepared | 62% < X ≤ 67% |
| Moderately Prepared | 67% < X ≤ 72% |
| Prepared | 72% < X ≤ 77% |
| Very Prepared | X > 77% |

*Source: Data Processing Results 2024*

Increasing disaster preparedness can be carried out by providing knowledge to provide awareness of hazards and disaster risks, fostering curiosity about hazards and preparedness in the face of disasters, making students active in disaster preparedness so that students are able to take steps to prepare for disasters (Pramajati et al., 2020). With a percentage of 70%, this shows that while there are significant efforts to prepare schools for potential disasters, there is still room for improvement and enhancement. A focus on strengthening infrastructure, improving training for educators, as well as enriching educational materials on disasters can help improve this level of preparedness.

The role of the disaster safe education unit program is very important in schools located in the disaster-prone area of the Sinabung Volcano eruption in Karo Regency. Based on the results of observations that have been made, the implementation of disaster safe education units has not been carried out in all education units in Karo Regency, including the areas included in KRB 1, 2 and 3 of the Sinabung Volcano itself. From this it can also be seen why the implementation of school disaster education and SPAB is still not maximized in education units in the Sinabung Volcano eruption prone area.

The aforementioned findings are consistent with the results of a study by (2024) (Palin Ma'dika & Rahman, 2024), titled "Utilization of the Inarisk Dashboard to Evaluate the Achievement of the Disaster Safe Education Unit Program Implementation in Jakarta Province."The study revealed that the average level of SPAB implementation in Pillars 1, 2, and 3 remains inadequate, particularly in the Thousand Islands District, where SPAB has not been implemented. The implementation of SPAB is a critical factor in the establishment of safe and resilient schools.

The present study posits that disaster-safe education unit programs, or disaster-safe schools, can serve as a solution and play an important role in creating safe and resilient schools in disaster-prone areas of the Sinabung Volcano eruption. This assertion is supported by the findings obtained by (Luh, 2017)in a study entitled Student Perceptions of the Disaster Safe School (SAB) Program in an effort to improve disaster preparedness at SMP N 2 Tabanan in 2016. The study's findings indicate that students exhibited a robust comprehension of the Disaster Safe School program, as evidenced by their favorable attitudes towards it, signifying a readiness to endorse the program.

Another finding by (Yusuf Salsabilah et al., 2022)with the research title "Natural Disaster Mitigation Through The Disaster Safe Education Unit (SPAB) Program After The Flash Flood Disaster In Batu City" lends further credence to this assertion. The findings demonstrate the remarkable efficacy of the Disaster Safe Education Unit (SPAB) Program in several schools affected by natural disasters in Batu City. The program's effectiveness is attributed to its comprehensive approach, which involves a socialization stage aimed at educating both teachers and students on disaster preparedness. This stage encompasses the visualization of potential hazards and the conduct of disaster simulations. Subsequent to the socialization stage, a monitoring phase is initiated to assess the extent to which the program's concepts have been effectively imparted to students. The program's efficacy is further evaluated through the measurement of students' comprehension post-implementation.

## D. CONCLUSIONS AND SUGGESTIONS

The findings of the research indicate that the level of school readiness in the Sinabung Volcano eruption-prone area, Karo Regency, with respect to the three pillars of a disaster-safe education unit, is at the **moderately prepared level**, as evidenced by an overall score of 70%. The first pillar, which pertains to safer learning facilities, attained a score of 75%, signifying a **moderately prepared** level of readiness. The second pillar, related to disaster management and education continuity, received a **moderately prepared** level rating of 65%, and the third pillar, risk reduction and resilience education, received a **moderately prepared** level rating of 69.5%.

It is imperative that education units in the region improve the safety standards of their learning facilities. This enhancement involves the reinforcement of building structures, the optimization of evacuation routes, and the provision of adequate emergency facilities.While the level of readiness in disaster management is moderately prepared, there is a need for improvement in the realm of planning, coordination, and the implementation of policies. This can be achieved by establishing a more robust emergency response system, conducting regular training for educators and students, and providing alternative learning facilities. Furthermore, enhancing the understanding and competencies of educators and students in disaster management necessitates the incorporation of disaster simulations and the integration of disaster-related materials into the curriculum, supported by enhancements in supporting infrastructure.To ensure optimal readiness, schools must implement the three pillars of a disaster-safe education unit, namely, increasing training, improving safety infrastructure, and regularly testing and updating evacuation plans. Collaboration with government entities, disaster agencies, and communities is imperative to ensure the availability of adequate resources and support in the event of potential disasters.

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