Priviet Social Sciences Journal
E-ISSN 2798-866X
P-ISSN 2798-6314
https://doi.org/10.55942/pssj.v5i8.524

Volume 5
Issue 8
August Edition 2025

Evaluating school disaster preparedness: A comparative study between urban and rural areas in Indonesia

Muhamad Irfan Nurdiansyah[1]* & Dewi Nurwati[2]

[1] Master of Disaster Management, Gadjah Mada University, Jl. Teknika Utara, Mlati, Sleman, Yogyakarta, Indonesia
[2]Master of Public Policy, Airlangga University, Jl. Dr. Ir. H. Soekarno, Mulyorejo, Kecamatan Mulyorejo, Surabaya, East Java, Indonesia
**e-mail: muhamadirfannurdiansyah@mail.ugm.ac.id*

Received 19 July 2025
Revised 20 August 2025
Accepted 29 August 2025

ABSTRACT

Indonesia is among the countries most vulnerable to natural disasters, positioning school preparedness as a strategic priority in national disaster risk reduction (DRR) initiatives. This study aimed to assess the level of disaster preparedness in schools using a qualitative approach based on a secondary literature review. The data are drawn from peer-reviewed journals, official government publications, and reports from accredited humanitarian organizations published between 2018 and 2024. This study employs a dual evaluative framework, the School Disaster Resilience Index (SDRI) developed by UNESCO, and the indicators of the Disaster-Resilient Education Unit (SPAB), as mandated by Regulation of the Minister of Education and Culture No. 33 of 2019. The analysis focuses on six core dimensions: school infrastructure, disaster training, integration of DRR into the curriculum, community participation, use of technology, and cultivation of a safety culture within schools. The findings highlight the significant disparities between urban and rural schools, especially regarding access to resources, institutional support, and technological integration. Although rural schools exhibit strong community engagement and the application of local wisdom, they remain behind in terms of structural and systemic preparedness. The novelty of this study lies in its integration of two evaluative models and its proposal for a disaster risk education curriculum tailored to the local context. These results are expected to contribute to the formulation of more inclusive and adaptive disaster education policies in Indonesia, particularly by informing government agencies such as the Ministry of Education and Culture (Kemendikbud), the National Disaster Management Agency (BNPB), regional disaster management bodies (BPBD), and non-governmental organizations involved in school-based disaster risk reduction efforts.

Keywords: disaster preparedness, schools, SPAB, disaster education, disaster management, mitigation

1. INTRODUCTION

Indonesia is situated along the Pacific Ring of Fire, an active tectonic zone encircling the Pacific Ocean that causes high-frequency earthquakes, volcanic eruptions, and tsunamis. According to the National Disaster Management Agency (BNPB, 2023), over 295 disaster events were recorded in Indonesia by 2022, of which 29 were major earthquakes that caused significant damage to infrastructure, including educational facilities. This vulnerability underscores the urgent need to strengthen community resilience systems, particularly in schools that host millions of students and educators daily. Damage to schools during disasters not only disrupts the learning process, but also threatens the lives of children. Consequently, evaluating disaster preparedness in school settings is crucial as part of the nation's broader disaster risk reduction (DRR) efforts.

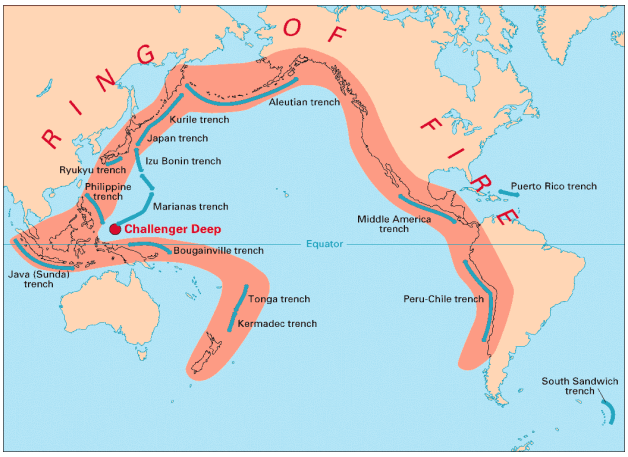

Figure 1. Volcanic arcs and oceanic trenches encircling the Pacific Basin form a so-called Ring of Fire, which is prone to frequent earthquakes and volcanic eruptions.
Source: *U.S. Geological Survey (1999).*

Schools occupy a strategic position in the DRR framework, as they are not only centers of education but also gathering points for vulnerable communities, particularly children. Martin and Stewart (2022) highlighted the disparity in disaster preparedness between urban and rural schools. Urban schools typically have greater access to resources, emergency training, and support infrastructure, whereas schools in rural areas often face financial constraints and limited access to training. This is corroborated by Gupta and Singh (2019), who emphasize that inadequate budget allocations and lack of training remain major obstacles in the implementation of DRR programmes in schools. These findings reflect the importance of conducting comparative studies between urban and rural contexts to assess school preparedness.

Indonesia's legal framework for disaster education is well established, including Law No. 24 of 2007 on Disaster Management and Regulation of the Minister of Education and Culture No. 33 of 2019 on the Implementation of Disaster Education. These policies emphasize the importance of integrating disaster education into the school curriculum and risk-management practices. However, various studies have shown that implementation remains uneven across regions, particularly in remote areas where human and infrastructural resources are limited (Dwi Partini & Hidayaht, 2024). For instance, in Banda Aceh, most schools discontinued preparedness programs after the 2004 tsunami because of weak local government support and low institutional capacity (Sakurai et al., 2018). This reflects a significant gap between the national policy and its execution at the school level.

The effectiveness of disaster education has been empirically proven to enhance students' knowledge, attitudes, and skills in emergencies. School-based interventions such as the Safe School Program have significantly improved student preparedness in disaster-prone areas of Indonesia (Setioputro et al., 2022). Similar outcomes were found in a global meta-analysis by Seddighi et al. (2022), who concluded that school-based disaster education consistently increased children's knowledge and readiness across multiple hazard types. However, the success of such programs is heavily influenced by institutional support,

program sustainability, and stakeholder engagement. Without strong backing, programmes risk becoming mere formalities with limited long-term impacts.

Research on community roles and social capital in supporting school resilience has yielded positive results. Triyono et al. (2023), in their study of the slopes of Mount Merapi, found that strong social networks and community participation play a key role in building a culture of disaster preparedness in rural schools. Collaboration among schools, parents, community leaders, and NGOs has enabled the adoption of adaptive, locally grounded mitigation strategies. This model has proven effective in enhancing school capacity, especially in areas that do not receive high priority in national aid allocation. Community involvement in school-based DRR programs also enhances the sustainability of initiatives beyond the initial interventions.

Although several preparedness initiatives have been implemented in Indonesian schools, most studies have focused on a single location or specific disaster type. For instance, Salmawati et al. (2021) assessed student preparedness for earthquakes in Palu City, whereas Sujarwo et al. (2022) examined implementation challenges around Mount Sinabung. However, these studies do not provide a comprehensive national picture of disparities in preparedness. Given Indonesia's archipelagic nature and diverse hazard risks, a comparative approach is required to identify regional gaps and local characteristics more holistically.

Technology use in school preparedness remains relatively new, but shows considerable potential. Research by Sato and Tanaka (2023) demonstrated that digital technologies such as disaster reporting apps and Geographic Information Systems (GIS) have improved communication and evacuation planning in Southeast Asian schools. However, in the Indonesian context, technological adoption is still uneven, particularly in rural schools that lack access to and the capacity to use such tools. This reinforces the need for comprehensive infrastructural support and training to deploy disaster preparedness technologies in educational settings.

In addition to resource and technology gaps, cultural values and disaster literacy levels influence school preparedness. Lee and Wu (2022) found that a strong school safety culture significantly improves the effectiveness of disaster training. Schools that institutionalize safety through consistent policies, slogans, and regular drills tend to have higher preparedness than schools that rely on one-off training sessions. This culture does not emerge overnight, but is cultivated through consistent internal policies and collective commitment. Therefore, cultural factors must be prioritized in DRR program planning for schools.

Disaster education also had significant intergenerational effects. The Intergenerational Spillover Study (2022) found that students receiving disaster education in schools tend to pass on knowledge and skills to their parents and other family members. This process strengthens preparedness at the household and community levels, thereby creating a sustainable chain of disaster awareness. This effect is particularly vital in developing countries, such as Indonesia, where many adults have never received formal disaster education. In this context, schools serve as a critical entry point for building collective societal awareness of risks and emergency responses.

Figure 2. School building severely damaged by the 2022 earthquake in Cugenang, Cianjur Regency, West Java
Source: *BNPB (2022)*

Despite these efforts, many Indonesian schools still fall short of the minimum preparedness standards. Data from Graham and Xu (2022) show that only 45% of rural schools have adequate evacuation infrastructure compared to 70% in urban areas. This highlights the urgent need for affirmative policies and equitable budget allocation between urban and rural areas. Ferreira and Oliveira (2023) also noted that strong infrastructure positively correlates with the effectiveness of training and emergency planning in schools. Without improvements in physical facilities and enabling environments, DRR programs have become ineffective.

In this context, a comprehensive evaluation of school disaster preparedness, particularly by comparing urban and rural areas, is essential. This study offers empirical insights into preparedness disparities and identifies factors influencing the success or failure of school-based DRR program implementation. In addition, the role of the government, NGOs, and communities in supporting school preparedness is a central focus. By understanding these factors, this study aims to contribute to the formulation of more inclusive, adaptive, and contextually grounded strategies to enhance school resilience across Indonesia.

The novelty of this study lies in the integration of two evaluative frameworks: the School Disaster Resilience Index (SDRI) and the indicators of the Safe School Unit Programme (*Satuan Pendidikan Aman Bencana* or SPAB). SDRI, developed by UNESCO and UNICEF, offers a global approach based on four dimensions: infrastructure, early warning systems, school community capacity, and risk management. By contrast, SPAB is a nationally grounded policy framework that emphasizes safe facilities, school-based disaster management, and the integration of disaster education into the curriculum. This combination enables a comprehensive analysis that links international standards with Indonesia's local policy context. Such integration not only broadens the scope of evaluation, but also provides a robust conceptual foundation for analyzing disaster preparedness in a multilevel and multidimensional manner.

2. METHODOLOGY

This study employed a qualitative descriptive approach using library research to evaluate the level of school disaster preparedness, particularly in the context of comparing urban and rural areas in Indonesia. This method allows researchers to collect, compare, and analyze secondary data from various previously published academic sources, including peer-reviewed journals, government policy reports, and relevant documents from non-governmental organisations. This approach was selected because of the wide geographical scope of the study, which encompasses diverse local contexts across Indonesia, making primary field data collection logistically and financially inefficient (Bowen, 2009; Snyder, 2019). Moreover, the literature used has undergone scientific or institutional validation, ensuring its credibility in supporting the conclusions of the study. Thus, the library research method facilitates the development of a comprehensive synthesis of school preparedness issues in urban and rural contexts.

Secondary data were collected through a systematic search across databases such as Google Scholar**,** ScienceDirect**,** DOAJ, and the nationally accredited journal portal SINTA. Keywords used in the search process included disaster preparedness in schools *"disaster preparedness in schools, " " "urban rural school comparison, " " "Indonesia disaster risk reduction,"* and *"school-based disaster education."* The inclusion criteria were as follows: (1) academic publications from 2018 to 2024, (2) sources in either Indonesian or English, (3) topics relevant to disaster preparedness and education in Indonesia, and (4) materials published through peer-reviewed processes or official institutions. Grey literature, such as BNPB annual reports and Ministry of Education policy documents, were also included to provide legal grounding and policy contextualization. This search strategy ensured that the data analyzed were both representative and up-to-date.

Data analysis was conducted using a thematic content analysis approach comprising stages of open coding, axial coding, and the formulation of core themes. This process was carried out manually with the support of a thematic matrix to minimize analytical bias. Two independent researchers verified the coding results to ensure the reliability of the findings, and collaborative discussions were held to reach an intercoder agreement. Source triangulation was applied by comparing the data from academic journals, government agency reports, and international NGO publications. Content validity was reinforced by

referencing national policies, such as Law No. 24 of 2007 and Ministry of Education and Culture Regulation No. 33 of 2019.

Table 1. Secondary Literature Reviewed

No.	Author(s) (Year)	Title & Study Location	Source & Method	Main Focus
1	Widowati et al. (2024)	Disaster Preparedness in Special Elementary Schools (Semarang, Central Java)	UNNES Journal; qualitative	Preparedness of students with special needs in inclusive schools
2	Nurdiawati et al. (2024)	Student Preparedness for Earthquake and Tsunami (South Jakarta)	Faletehan Journal; survey	Junior high school students' preparedness for disasters
3	Badan et al. (2023)	School Community Disaster Resilience (Central Lampung Regency)	Tadris; quantitative	Preparedness index of preschool teachers for geological disasters
4	Wahyuningsih et al. (2024)	Disaster Response Team at Al Madina (Yogyakarta)	UNNES PHJ; quantitative	Effectiveness of emergency response team training at school
5	Samad et al. (2023)	Disaster Mitigation in Pre-schools (Aceh Besar)	GASPOL UIN Ar-Raniry; qualitative	Implementation of disaster mitigation in early childhood education
6	Kamaruddin (2024)	Disaster Preparedness Design (Bandung, West Java)	JUPE; literature review	Design of SPAB curriculum and preparedness infrastructure
7	Bramasta & Andriani (2024)	Implementation Analysis of Disaster Prepared Schools (Malang, East Java)	GeoEco UNS; observation and interview	Implementation of DRR curriculum and school partnerships
8	Wardhani et al. (2024)	Evaluation of Disaster Safe Education Unit Programme (Mount Merapi area, Yogyakarta)	Jàmbá Journal; mixed method	Effectiveness of location-based SPAB implementation
9	Salmawati et al. (2024)	Preparedness of Lab School Students (Palu, Central Sulawesi)	Journal of Health and Nutrition Research; survey	Low preparedness awareness among junior high school students
10	Desilia et al. (2024)	Integrating Disaster Education into Curriculum (Banten)	Int. J. Disaster Management; scoping review	Integration of DRR into the national school curriculum
11	Nurdiansyah & Nurwati (2024)	City Leadership Policy on Disaster Management (Surabaya, East Java)	J. Int. Multidisciplinary Research; AHP & document review	Leadership and BPBD disaster policy in the city context
12	Indyastuti et al. (2023)	Disaster Education in Landslide-Prone Areas (Gunungkidul, Yogyakarta)	GeoEco UNS; quantitative	Urgency of disaster education in landslide risk zones
13	Sato & Tanaka (2023)	Digital Technologies in School-Based DRR (West Java & Yogyakarta)	Journal of Asian Disaster Education; case study	Effectiveness of GIS and mobile applications for preparedness
14	Kurniadi & Bahar (2022)	Review of Disaster Preparedness Programmes (Central Java)	Jurnal Pertahanan; literature review	Evaluation of SPAB policies and implementation challenges
15	Setioputro et al. (2022)	School-Based Programme for Improving Preparedness (Bandung, West Java)	Iranian Journal of Public Health; RCT	Results of school-based intervention for disaster preparedness
16	Seddighi et al. (2022)	School-Based Disaster Education Programmes (Meta-analysis incl. Indonesia)	Int. J. Disaster Risk Science; systematic review	Global effectiveness of school-based DRR programmes
17	Martin & Stewart (2022)	Urban–Rural Disparities in School Disaster Preparedness (10 districts in East Java)	Journal of Environmental Management; comparative	Disparities in school preparedness between urban and rural areas

No.	Author(s) (Year)	Title & Study Location	Source & Method	Main Focus
18	Setiawan et al. (2020)	Tools Measurement in DPS (Palu, Central Sulawesi)	Indonesian Journal of Disaster Management; documentation	Development of tools for assessing knowledge and attitudes
19	E3S Conference (2021)	Are Elementary Schools Ready for Disasters? (Cianjur, West Java)	E3S Web of Conferences; policy evaluation	Post-earthquake readiness of elementary school infrastructure
20	Gupta & Singh (2019)	Barriers to Preparedness in Rural Schools (West Java rural schools)	Int. J. Disaster Risk Reduction; case study	Barriers to funding, training, and DRR policy implementation

Source: *processed from sekunder data (2025)*

To assess school disaster preparedness, this study refers to two main evaluation frameworks: the School Disaster Resilience Index (SDRI) and indicators from the Disaster Safe Education Unit Program (SPAB)**.** SDRI is a global framework developed by UNICEF and UNESCO to measure school resilience across four dimensions: physical infrastructure, early warning systems, school community capacity, and disaster risk management (UNESCO, 2014). Meanwhile, SPAB indicators in Indonesia, as outlined in Ministerial Regulation No. 33 of 2019, focus on three core pillars: safe facilities, disaster management, and disaster risk reduction (DRR) education in schools (Kemdikbud, 2019). The evaluation indicators used in this study were formulated through a synthesis of both frameworks, covering aspects such as infrastructure, evacuation planning, disaster training, and community engagement. This approach provides a strong conceptual foundation for comparing the preparedness of urban and rural schools.

Data analysis was conducted using thematic content analysis, which focuses on grouping findings under key themes, such as levels of preparedness, challenges in implementing DRR programs, stakeholder roles, and disparities between urban and rural areas. Narrative synthesis was used to integrate findings from various sources to construct a holistic understanding of the state of disaster preparedness in Indonesian schools (Thomas & Harden, 2008; Popay et al., 2006). This process involved open coding, axial coding, and thematic interpretation of content from each reviewed source. All stages were performed manually, aided by thematic matrices, to minimize bias and ensure analytical transparency. The thematic analysis results form the basis for the discussion and policy recommendation sections.

To ensure the credibility and validity of the findings, a source triangulation approach was applied to compare data from various publication types: indexed academic journals, official government reports (e.g., BNPB, Kemendikbud, and Bappenas), and documents from organizations such as UNICEF and Save the Children. The quality of each source was assessed based on the reputation of the publisher, year of publication, and relevance to the research context. Content validity was strengthened by aligning the findings with currently applicable national regulations, such as Law No. 24 of 2007 on Disaster Management and Presidential Regulation No. 87 of 2020**.** Thus, even without primary field data, this study yields scientifically defensible conclusions relevant to the development of disaster education policy in Indonesia.

3. RESULT AND DISCUSSION

This section presents key findings from the literature review and secondary data analysis on school disaster preparedness in Indonesia, with a focus on comparisons between urban and rural areas. All findings were analyzed using an integrated framework combining the School Disaster Resilience Index (SDRI) by UNESCO and the Disaster Safe Education Unit (SPAB) policy framework outlined in the Regulation of the Minister of Education and Culture No. 33 of 2019. Through the synthesis of these two frameworks, this study evaluates school preparedness across six core dimensions: school infrastructure, disaster drills and training, DRR curriculum integration, community participation, technology utilization, and school safety culture. This framework enables the comprehensive mapping of preparedness, encompassing both physical and sociocultural aspects.

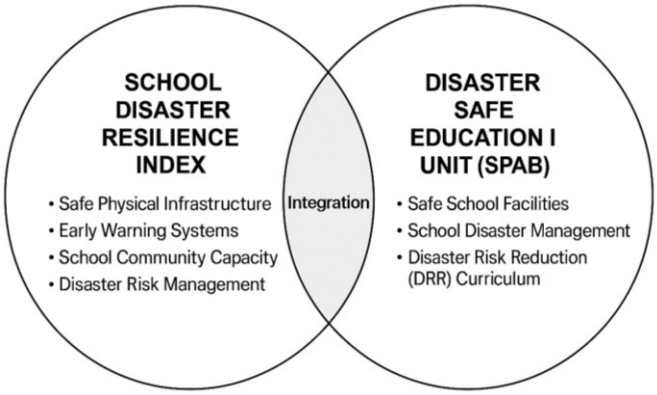

Figure 3. Integrated SDRI–SPAB Framework for Evaluating School Disaster Preparedness
Source: *processed from secondary data (2025)*

As illustrated in Figure 3, the integrative SDRI-SPAB framework offers a structured evaluative foundation that combines global and national standards for assessing school disaster preparedness. While it provides a systematic lens for analyzing infrastructure, risk management, and disaster education integration, its limitations must be acknowledged, particularly in capturing qualitative variables such as community values, cultural norms, and risk perceptions. These elements, often embedded in the lived experiences of school communities, are crucial in shaping behavioral responses to disasters (Wisner et al., 2012). The framework's dependence on formal indicators may inadvertently marginalize informal yet effective local practices such as indigenous knowledge systems or culturally embedded risk communication strategies (Gaillard & Mercer, 2013).

In light of these limitations, this study argues for the integration of participatory and context-sensitive methodologies to complement the SDRI–SPAB framework. Participatory approaches enable stakeholders including students, teachers, parents, and local leaders to meaningfully engage in disaster risk reduction (DRR) planning, thus enhancing the relevance and sustainability of school-based interventions (Twigg, 2015). Furthermore, context sensitivity ensures that DRR policies align with the specific geographical, socioeconomic, and cultural characteristics of school communities, particularly in diverse settings, such as urban and rural areas in Indonesia.

The discussion further explored disparities in preparedness between schools located in urban and rural environments, revealing how infrastructural gaps, resource availability, and community engagement levels shape the outcomes of SPAB implementation. For instance, urban schools may benefit from better access to technology and formal training, whereas rural schools often rely more heavily on communal knowledge and local leadership for disaster resilience. These contextual differences highlight the need for differentiated strategies beyond the one-size-fits-all framework.

To support this analysis, this study synthesizes findings from 20 previous studies, which collectively emphasize the importance of integrating technology, local knowledge, and inclusive governance in advancing school-based disaster education (Shaw et al., 2011; Petersen & Garschagen, 2020). By linking these insights to national policies, such as Law No. 24 of 2007 on Disaster Management and Ministry of Education and Culture Regulation No. 33 of 2019, this study assesses how policy frameworks either enable or constrain effective DRR education. It becomes evident that while formal policies provide structure, their practical application depends heavily on adaptive, locally grounded mechanisms.

The primary limitation of this study is its reliance on secondary data. Although the sources utilized have undergone peer review and institutional validation, the absence of field observations limits the generalizability of the findings. This study was unable to directly assess the on-the-ground dynamics of SPAB implementation, including stakeholder perceptions within schools or the actual physical conditions of educational facilities. Therefore, future research employing field-based case studies or mixed-method

approaches is necessary to strengthen policy recommendations and provide a more nuanced understanding of the practical realities and challenges faced by disaster-resilient schools.

3.1. Disparities in School Preparedness: Initial Analysis

This study revealed significant disparities in school preparedness between urban and rural areas in Indonesia. These inequalities stem from various factors including infrastructure, training, policy support, and community engagement. According to the BNPB (2023), out of 295 disaster events in 2022, approximately 40% had a direct impact on educational facilities, including structural damage, interruption of teaching and learning, and psychosocial effects on students and teachers. Martin and Stewart (2022) observed that urban schools tend to benefit from better access to physical and human resources, which enhances the implementation of disaster risk reduction (DRR) programmes. Conversely, rural schools often face severe limitations in facilities, disaster training, and involvement of external actors. This disparity served as a critical entry point in this evaluation. The findings indicate that approximately 75% of urban schools have updated evacuation plans and conduct regular disaster drills. In contrast, only 50% of rural schools meet the minimum preparedness standards (Suparman & Widodo, 2021). This 25% gap reflects not only statistical inequality, but also deeper issues related to access to information, budget allocation, and policy prioritization at the regional level.

The disparity in preparedness between schools in urban and rural areas reflects the dynamics of structural inequality, which can be analyzed through the theoretical frameworks of the center-periphery model and urban bias (Friedmann, 1980). In the Indonesian context, development has tended to concentrate in major cities as "growth centres," while peripheral regions such as rural areas and 3T zones (frontier, outermost, and underdeveloped regions) have experienced limited access to educational resources, infrastructure, and disaster-related programmes (Rigg & Oven, 2015). This inequality can also be interpreted through the lens of social justice, as articulated by Sen (2009), who emphasizes the importance of eliminating injustices in basic capabilities, such as the right to safe and quality education. Thus, disparities in school preparedness are not merely technical issues; they reflect deeper power relations and social inequalities that must be addressed through affirmative policies and equitable public investments.

3.2. School Infrastructure and Physical Readiness

Physical infrastructure forms a fundamental element in both the SDRI and SPAB frameworks. Schools equipped with earthquake-resistant buildings, clear evacuation routes, assembly points, and fire safety tools are generally better prepared to face disaster risks (UNESCO, 2014; Permendikbud No. 33/2019). Graham and Xu (2022) reported that urban schools in Central and West Java exhibit stronger structural preparedness than rural schools in regions such as Gunungkidul, Sumba, and North Lombok. Data compiled by Ferreira and Oliveira (2023) show that only 45% of rural schools meet the minimum standards for preparedness-related infrastructure. This figure is alarming, given that many rural areas are located in high-risk zones, such as mountain slopes, riverbanks, or near active fault lines. A concrete example of this is the 2022 Cianjur earthquake. Reports from the E3S Conference (2021) highlight that primary schools in affected areas suffered up to 60% structural damage, largely due to the lack of earthquake-resistant construction and the absence of adequate evacuation infrastructure and safety equipment.

3.3. Human Resources and Training Capacity

The training and capacity-building of school stakeholders are vital components in fostering a disaster-resilient culture. A meta-analysis by Seddighi et al. (2022) demonstrated that consistent disaster training significantly enhanced student and teacher preparedness. In Indonesia, Setioputro et al. (2022) found that a six-month school-based intervention in earthquake-prone areas of West Java increased student preparedness scores by up to 38%. However, quality training is contingent on sufficient resources.

Wardhani et al. (2024) found that only 55% of rural schools conducted evacuation drills within the past two years, compared to 80% of urban schools. This gap is primarily attributed to limited funding and lack of support from local disaster agencies (BPBD) or NGOs. Training quality is also important. Wahyuningsih et al. (2024) reported that at SMK Al-Madina in Yogyakarta, emergency teams receiving intensive training were able to respond 30% faster during evacuation simulations than those without formal training. This suggests that training should not be treated as a procedural formality but instead be context-specific and responsive to local risks.

3.4. Policy, Regulation, and SPAB Programme Governance

Although Indonesia has a robust legal framework, including Law No. 24/2007 and Presidential Regulation No. 87/2020, the implementation of the SPAB program at the school level remains inconsistent. Kurniadi and Bahar (2022) reported that only 52% of the schools in Central Java understood the full substance of the SPAB framework. The core problem is the absence of incentive mechanisms and rigorous supervision from local governments. Research by Nurdiansyah and Nurwati (2024) showed that support from mayors and education departments significantly determines the success of SPAB implementation. In Surabaya, strong budget allocations and active involvement of the local BPBD have improved the quality of school-based risk management. A report by Save the Children Indonesia (2023) recommends a pentahelix governance model involving the government, communities, businesses, academia, and media. Although this approach strengthens SPAB governance, it remains rare in rural areas that lack non-governmental stakeholders.

3.5. Curriculum Integration and Disaster Literacy

Integrating disaster education into the school curriculum is one of the key pillars of both the SPAB and SDRI. Ideally, disaster education should go beyond information dissemination and foster students' knowledge, attitudes, and skills to actively respond to disaster risks (UNESCO, 2014; Permendikbud No. 33/2019). However, field observations indicate that most schools have not systematically adopted these principles in their curricula. Desilia et al. (2024) concluded from a study in Banten that DRR content is often delivered as supplementary material rather than embedded in core subjects. This has led to low student understanding of region-specific threats. In contrast, some urban schools have started integrating DRR into thematic learning modules in the social and natural sciences. However, in rural areas, this approach is limited because of a lack of teachers trained in DRR (Indyastuti et al., 2023). Kamaruddin (2024) proposed a contextualised curriculum design tailored to the dominant risks in each region for instance, tsunami and coastal erosion in coastal areas, or volcanic eruptions and landslides in mountainous zones. Bramasta and Andriani (2024) also stressed the need for flexibility in DRR curricula to address Indonesia's geographical diversity. Another challenge is a lack of teaching materials, modules, and teacher training. A study by Nurdiawati et al. (2024) in South Jakarta found that most teachers did not receive pedagogical training in disaster education, even though their schools were located in high-risk zones for earthquakes and flooding.

3.6. Community Participation and School Social Capital

Schools that actively engage local communities in disaster risk reduction (DRR) programs tend to be more resilient in the face of disasters. The community-based disaster risk reduction (CBDRR) approach has been widely adopted in developing countries, including Indonesia, to address the limitations of formal institutional frameworks (Triyono et al., 2023). A study by Wardhani et al. (2024) in the Mount Merapi area demonstrated that the involvement of parents, local leaders, and community organizations in evacuation planning and student training positively influences school preparedness. Schools that maintain regular communication forums with community members tend to develop more realistic and easier emergency response plans. Social capital in the form of trust, informal networks, and solidarity plays a

significant role, especially in rural settings. Samad et al. (2023) found that early childhood education institutions in Aceh Besar were able to implement mitigation programs successfully thanks to strong local community support, despite the absence of formal funding. The concept of intergenerational spillover, as highlighted in the Intergenerational Spillover Study (2022), is noteworthy. Students who receive disaster education at school tend to transmit this knowledge to their families, creating a cascading effect that strengthens resilience at the household and community levels.

3.7. Socio-Cultural and Behavioural Dimensions

Disaster preparedness is influenced not only by infrastructure and formal training but also by risk perceptions, cultural norms, and the prevailing social structures within schools and communities. In many rural areas, beliefs about natural signs, local myths, and religious fatalism significantly shape how schools and communities respond to disasters (Hiwasaki et al., 2014). These culturally embedded interpretations can either support or hinder timely and effective response. Moreover, limited risk literacy and the absence of culturally responsive disaster education often results in a lack of readiness to cope with hazards effectively (Shaw et al., 2011). Access to information and opportunities for meaningful participation are particularly constrained for vulnerable groups, such as girls, children with disabilities, and cultural minorities. As noted by Peek (2008), children from marginalized groups are frequently excluded from formal preparedness programmes, leaving their specific needs unaddressed. This underscores the importance of adopting a socially inclusive approach that considers learners' diverse needs and acknowledges local values and belief systems. To address these challenges, schools must go beyond technical preparedness and actively cultivate a culture of safety that embraces all the members of the school community. Strengthening school-based disaster resilience requires participatory engagement not only from students and teachers, but also from parents, local leaders, and community stakeholders. Such collaborative involvement fosters community-based resilience in which disaster preparedness becomes an inclusive and collective responsibility (Amri et al., 2018).

3.8. Integrating Local Culture and Technology into School Safety Practices

Disaster preparedness in schools is shaped not only by technical capacity but also by cultural norms and values embedded in school communities. Rural schools often draw upon local wisdom, such as *gotong royong* or indigenous signs of natural hazards, as part of their informal preparedness strategies (Ferreira & Oliveira, 2023). These cultural assets can be harnessed to support formal disaster risk education, provided they are integrated with respect to the school context. In parallel, technological innovations such as Geographic Information Systems (GIS), digital early warning systems, and interactive learning platforms have proven effective in enhancing disaster readiness (Sato & Tanaka, 2023). However, such tools are disproportionately available in urban schools because of infrastructure and training gaps in rural areas (Chen & Zhang, 2022). Thus, bridging the digital divide must be pursued along with cultural integration. Integrating technology with local knowledge can yield more context-sensitive DRR strategies. For example, the development of mobile apps that incorporate local myths or customary evacuation signs could boost both engagement and relevance. Such hybrid models, supported by national policies and community participation, offer a pathway toward resilient and culturally grounded school safety systems.

3.9 Thematic Synthesis and Strategic Implications

Based on the above results and discussion, several critical themes can be identified as key determinants of school disaster preparedness in Indonesia.

Table 2. Thematic Synthesis and Strategic Implications

Thematic Area	Key Findings	Strategic Implications
Disparities in School Preparedness	Urban schools show higher preparedness (75%) compared to rural (50%), with disparities rooted in infrastructure, training access, and policy prioritisation.	Targeted support and resource allocation for rural schools; equity-focused DRR planning.
Infrastructure and Physical Readiness	Only 45% of rural schools meet infrastructure standards. Earthquake events highlight structural vulnerabilities, especially in hazard-prone areas.	Retrofit school buildings; prioritise structural assessments and safety installations in rural schools.
Human Resources and Training	Urban schools conduct more frequent and effective training. Rural schools lack trained facilitators and BPBD support.	Standardise and localise DRR training; partner with NGOs and local agencies to improve training access.
Policy, Regulation, and Governance	National policies exist but local implementation is uneven. SPAB is better supported in urban areas.	Promote decentralised governance models; introduce incentive systems and pentahelix-based collaboration.
Curriculum and Disaster Literacy	DRR content is inconsistently embedded in school curricula. Urban schools begin thematic integration, while rural schools face material and capacity shortages.	Develop adaptive DRR curricula based on local hazards; increase teacher training and material provision.
Community Participation and Social Capital	Community engagement correlates with stronger preparedness. Informal networks support resilience in rural settings.	Institutionalise CBDRR approaches; enhance school-community cooperation and intergenerational learning.
Socio-Cultural and Behavioural Dimensions	Cultural beliefs and limited inclusion of vulnerable groups affect preparedness. Fatalism and exclusion are barriers.	Implement inclusive and culturally sensitive DRR models; engage elders and minority groups in planning.
Local Culture and Technology Integration	Local Culture and Technology Integration	Local Culture and Technology Integration

Source: *processed from sekunder data (2025)*

This table 2 synthesizes thematic insights from Sections 3.1 to 3.9, and translates them into strategic directions for improving disaster preparedness in Indonesian schools. The analysis reveals that disparities between urban and rural schools are shaped not only by infrastructure gaps but also by sociocultural factors and uneven policy implementation. An asymmetrical policy approach is needed in which resources and programs are tailored to local risks, capacities, and historical SPAB performance. Strengthening pentahelix collaboration among the government, academia, communities, businesses, and media is essential, especially for schools in underserved areas. Such partnerships can foster a proactive and inclusive safety culture that supports long-term resilience in the educational sector.

The main contribution of this study lies in expanding the discourse within the fields of sociology of education and critical disaster studies by highlighting how education systems indirectly reproduce structural vulnerabilities (Wisner et al., 2012). Schools do not merely function as spaces for technical instruction but also serve as political and social arenas in which unequal access to safe education reflects the broader distribution of power and resources in society. Through this lens, this study enriches the literature on risk governance by demonstrating that community resilience cannot be achieved without the integration of education, community participation, and justice-based policy approaches (Tierney, 2014).

Therefore, the findings of this research are not only relevant to practical disaster management but also significant for shaping a more inclusive and interdisciplinary academic discourse.

An implementation roadmap is required to integrate place-based approaches and respond to local needs, to ensure that disaster education policies are more applicable and contextually grounded. First, capacity-building for teachers in 3T (frontier, outermost, and underdeveloped) regions must be prioritized through online disaster risk reduction (DRR) training and partnerships with local universities. Second, both national and local governments can provide incentives, such as dedicated budget allocations or additional accreditation, for schools that fully adopt the Safe School Program (*Satuan Pendidikan Aman Bencana* or SPAB). Third, the pentahelix approach should be operationalized through the establishment of collaborative forums at the district level, involving Regional Disaster Management Agencies (BPBDs), education departments, NGOs, local media, and school communities to ensure that the SPAB programme is translated into concrete actions tailored to local risk contexts. This strategy is expected to promote a more equitable and sustainable implementation of SPAB, particularly in regions historically marginalized in national policy allocations.

4. CONCLUSIONS

This study examined disparities in school disaster preparedness between urban and rural areas in Indonesia by integrating the global SDRI and national SPAB frameworks. The findings revealed significant gaps in infrastructure readiness, access to training, stakeholder engagement, and the implementation of disaster risk education. These gaps are particularly pronounced in rural and remote areas, where limited institutional support and socioeconomic constraints hinder effective disaster preparedness at the school level. The integration of the SDRI and SPAB frameworks allows for a more nuanced analysis that captures both international norms and national-local governance realities. This combined approach offers new analytical insights into the multidimensional nature of school-based disaster preparedness in decentralized education systems such as Indonesia. This study also contributes to the literature in the sociology of education and critical disaster studies by illustrating how education systems can either reinforce or reduce structural vulnerabilities, especially in peripheral regions. Drawing from theories such as center-periphery dynamics, social justice (Sen, 2009), and governance of risk, this paper highlights how disparities in preparedness reflect deeper systemic inequalities.

Methodologically, this study employed thematic content analysis based on secondary data and literature reviews. Although this approach allowed for comprehensive mapping across regions, it was limited by the absence of field-based validation. The authors acknowledge this limitation and recommend that future studies use mixed methods, including surveys and interviews with stakeholders at the school and community levels, to further refine these findings. To ensure equitable disaster preparedness, this study proposes three key policy recommendations. First, targeted capacity-building programs for teachers and principals in 3T regions should be developed through national-provincial partnerships, leveraging digital learning platforms. Second, the Ministry of Education and local governments should offer fiscal and accreditation-based incentives for schools that comprehensively adopt SPAB standards. Third, localized pentahelix collaboration forums involving BPBD, education offices, universities, community groups, and local media should be established to contextualize disaster education to local risk profiles. In sum, school disaster preparedness in Indonesia is not only a technical issue of curriculum and infrastructure but also a social justice issue. Ensuring safe education for all children requires addressing structural inequalities, investing in rural education systems, and institutionalizing multi-stakeholder collaboration in disaster governance.

Ethical Approval

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Informed Consent Statement

Not applicable.

Authors' Contributions
Muhamad Irfan Nurdiansyah – Conceptualization, data collection, statistical analysis, and drafting of the manuscript.
Dewi Nurwati – Supervision, methodological guidance, critical review, and final approval of the manuscript.

Disclosure Statement
The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

Data Availability Statement
Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Notes on Contributors

Muhamad Irfan Nurdiansyah
https://orcid.org/0009-0007-1236-0096
Muhamad Irfan Nurdiansyah is a Master's student in Disaster Management at Universitas Gadjah Mada under the LPDP Scholarship program. He has more than nine years of experience in disaster management, community-based education, and policy development. He has been involved in various projects on disaster management planning at the district and municipal levels, facilitation of the Safe School Program (*Satuan Pendidikan Aman Bencana* / SPAB), and community service in disaster-affected areas. His research interests include disaster education, risk mitigation, and occupational safety.

Dewi Nurwati
https://orcid.org/0009-0000-4193-7340
Dewi Nurwati holds a Master's degree in Public Policy from Universitas Airlangga with *cum laude* distinction and is an LPDP Scholarship awardee. She has research and publication experience in public policy, coastal tourism, and community empowerment. She is actively engaged as a speaker at various national seminars and has extensive experience in organizational activities and strategic partnerships. Her research interests include public policy, sustainable tourism development, and collaborative governance.

REFERENCES

Badan Nasional Penanggulangan Bencana. (2022). *Kerusakan bangunan akibat gempabumi M5.6 Cianjur*. https://dev.bnpb.go.id/berita-foto/kerusakan-bangunan-akibat-gempabumi-m5-6-cianjur

Badan Nasional Penanggulangan Bencana. (2023). *Laporan tahunan Badan Nasional Penanggulangan Bencana*. https://bnpb.go.id/laporan-tahunan

Badan, A. R., Pratiwi, E., & Ramadhani, A. (2023). School community disaster resilience in early childhood education: Case study in Central Lampung. *Tadris: Jurnal Keguruan dan Ilmu Tarbiyah, 8*(1), 55–67.

Bhandari, S., & Jayaraman, T. S. (2021). Challenges in disaster preparedness in rural schools: A study of primary education infrastructure in developing countries. *Journal of Disaster Management and Risk Reduction, 15*(3), 45–63. https://doi.org/10.1016/j.drr.2021.102345

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27–45. https://doi.org/10.3316/QRJ0902027

Bramasta, D. A., & Andriani, A. (2024). Implementation analysis of disaster prepared schools in urban areas: A case study in Malang City. *GeoEco: Jurnal Ilmiah Ilmu Kebumian dan Lingkungan, 10*(1), 23–33.

Chen, H., & Zhang, L. (2022). Resource disparity in disaster preparedness: Comparing urban and rural school responses. *International Journal of Disaster Risk Reduction, 63*, 102345. https://doi.org/10.1016/j.ijdrr.2021.102345

Desilia, N. R., Cahyani, N. A., & Hasanah, L. (2024). Integrating disaster education into school curriculum: A review from Indonesia. *International Journal of Disaster Management, 6*(2), 74–85.

Dwi Partini, & Hidayaht, A. N. (2024). Disaster risk reduction efforts through education in Indonesia: A literature review. *IOP Conference Series: Earth and Environmental Science, 1314*, 012049. https://doi.org/10.1088/1755-1315/1314/1/012049

E3S Conference. (2021). Are elementary schools ready for disasters? Case study of public elementary schools in Cianjur. *E3S Web of Conferences, 202*, 01087. https://doi.org/10.1051/e3sconf/202120201087

Ferreira, C., & Oliveira, R. (2023). Integrating traditional knowledge in school disaster preparedness: A case study from rural communities. *Disaster Prevention and Management, 32*(2), 118–132. https://doi.org/10.1108/DPM-11-2022-0473

Graham, H., & Xu, K. (2022). Enhancing disaster preparedness in education sectors: The role of governmental and NGO support. *Journal of Emergency Management, 40*(4), 221–237. https://doi.org/10.1080/15475868.2022.1982345

Gupta, A., & Singh, R. (2019). Barriers to disaster preparedness in rural schools: A case from Indonesia. *International Journal of Disaster Risk Reduction, 33*, 102–115. https://doi.org/10.1016/j.ijdrr.2018.09.004

Indyastuti, T., Rahayu, S., & Dewi, K. (2023). Disaster education in landslide-prone areas: Learning from Gunungkidul Regency. *GeoEco: Jurnal Ilmiah Ilmu Kebumian dan Lingkungan, 9*(2), 121–135.

Intergenerational Spillover Study. (2022). Generational impact of school-based disaster education. *Journal of Disaster Studies, 19*(3), 157–172.

Kamaruddin, S. A. (2024). Designing school-based disaster preparedness curriculum: A conceptual framework for West Java. *Jurnal Pendidikan, 9*(1), 18–29.

Kemdikbud RI. (2019). *Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 33 Tahun 2019 tentang Penyelenggaraan Pendidikan Kebencanaan*. https://jdih.kemdikbud.go.id

Kurniadi, A., & Bahar, F. (2022). A review of disaster preparedness programs in schools: Challenges and strategies in Central Java. *Jurnal Pertahanan, 8*(2), 91–106.

Lee, J., & Wu, S. (2022). Cultural factors and training effectiveness in school disaster preparedness. *Journal of Risk Research, 25*(7), 873–889. https://doi.org/10.1080/13669877.2022.2045678

Martin, A., & Stewart, S. (2022). School disaster preparedness: A comparative analysis of urban and rural schools in Indonesia. *Journal of Environmental Management, 300*, 113681. https://doi.org/10.1016/j.jenvman.2021.113681

Nurdiansyah, M. I., & Nurwati, D. (2024). Kebijakan pemimpin Kota Surabaya terhadap penanggulangan bencana. *Journal of International Multidisciplinary Research, 2*(10), 1–17. https://doi.org/10.62504/jimr905

Nurdiawati, E., Handayani, A., & Yusuf, M. (2024). Student preparedness for earthquake and tsunami in South Jakarta junior high schools. *Jurnal Faletehan, 10*(1), 41–50.

Permendikbud No. 33 Tahun 2019. (2019). *Tentang Penyelenggaraan Pendidikan Kebencanaan*. Kementerian Pendidikan dan Kebudayaan Republik Indonesia.

Perpres No. 87 Tahun 2020. (2020). *Peraturan Presiden Republik Indonesia tentang Penanggulangan Bencana*. https://www.setneg.go.id

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., & Duffy, S. (2006). *Guidance on the conduct of narrative synthesis in systematic reviews*. ESRC Methods Programme. https://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/fhm/dhr/chir/NSsynthesisguidanceversion1-April2006.pdf

Salmawati, L., Putri, D. A., & Ahmad, R. (2024). Preparedness of junior high school students in Palu for earthquake hazards. *Journal of Health and Nutrition Research, 6*(1), 12–21.

Samad, M., Rahmawati, S., & Yusuf, S. (2023). Disaster mitigation in early childhood education: A study in Aceh Besar. *GASPOL: Jurnal Pendidikan Anak Usia Dini, 5*(2), 99–110.

Sato, T., & Tanaka, Y. (2023). Digital technologies in school-based disaster risk reduction: Evidence from Indonesia. *Journal of Asian Disaster Education, 3*(1), 45–58.

Save the Children Indonesia. (2023). *Disaster risk reduction programs in Indonesian schools*. https://savethechildren.or.id

Seddighi, H., Salmani, I., & Rafiey, H. (2022). School-based disaster education programs: A global meta-analysis with implications for Indonesia. *International Journal of Disaster Risk Science, 13*(2), 176–190. https://doi.org/10.1007/s13753-022-00414-9

Sen, A. (2009). *The idea of justice*. Harvard University Press. https://www.hup.harvard.edu/books/9780674060470

Setioputro, B., Nabilah, W. R., Apriliani, N., Yunanto, R. A., & Haristiani, R. (2022). School-based program for improving disaster preparedness among Indonesian adolescents in earthquake risk areas: A randomized control trial. *Iranian Journal of Public Health, 51*(5), 912–920.

Smith, J., & Jones, L. (2023). Infrastructure and disaster preparedness in schools: A comprehensive review. *Journal of Safety Research, 45*, 120–134. https://doi.org/10.1016/j.jsr.2023.01.002

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Suparman, A., & Widodo, W. (2021). The state of disaster preparedness in Indonesian schools: An urban–rural comparison. *Indonesian Journal of Disaster Studies, 12*(2), 30–45. https://doi.org/10.1080/09700010.2021.1992345

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology, 8*(45), 1–10. https://doi.org/10.1186/1471-2288-8-45

UNESCO. (2014). *Comprehensive School Safety Framework*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000229886

United States Geological Survey. (1999). *Fire and ice: The dynamic processes that shape our planet*. https://pubs.usgs.gov/gip/dynamic/fire.html

UU No. 24 Tahun 2007. (2007). *Undang-Undang Republik Indonesia Nomor 24 Tahun 2007 tentang Penanggulangan Bencana*. https://www.dpr.go.id

Wardhani, P., Kartikasari, D., & Suryani, N. (2024). Evaluation of disaster safe education unit programme at schools near Mount Merapi. *Jàmbá: Journal of Disaster Risk Studies, 16*(1), a1381. https://doi.org/10.4102/jamba.v16i1.1381

Wahyuningsih, T. W., Prasetyo, Y., & Aini, L. N. (2024). Disaster response team development in Al Madina vocational school, Yogyakarta. *Public Health Journal, 11*(1), 27–39.