p-ISSN 2460-0768 e-ISSN 2597-6044 *GeoEco, Vol. 12. No 1. January 2026 Page. 378 - 398*
https://doi.org/10.20961/ge.v12i1.105379 https://jurnal.uns.ac.id/GeoEco/article/view/105379

IMPLEMENTATION OF DISASTER RISK REDUCTION EDUCATION IN DISASTER-SAFE EDUCATIONAL UNITS: A COMPARISON OF SMAN 5 AND SMAS AL ADZKAR SOUTH TANGERANG

Jakiatin Nisa[1,2]*, Eko Teguh Paripurno[2], Yohana Noradika Maharani[2], Jaka Purwanta[2], Arif Rianto Budi Nugroho[2], Anissa Windarti[1], Eny Muryani[2]

[1]Social Studies Department, Faculty of Tarbiyah and Teacher Training, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Indonesia

[2]Master Program of Disaster Management Department, Faculty of Mineral Technology, Universitas Pembangunan Nasional Veteran Yogyakarta, Indonesia

*E-mail: jakiatin.nisa@uinjkt.ac.id

ARTICLE INFO

Article History
Received : 02/07/2025
Revised : 14/11/2025
Accepted : 05/01/2026

Citation:
Nisa, J., Paripurno, E.T., Maharani, Y.N., Purwanta, J., Nugroho, A.R.B., Windarti, A., Muryani, E. (2026). Implementation of Disaster Risk Reduction Education in Disaster-Safe Educational Units: A Comparison of SMAN 5 and SMAS Al Adzkar Tangerang Selatan. GeoEco. Vol. 12, No. 1.

ABSTRACT

Disaster risk reduction (DRR) education is critical in disaster-prone Indonesia, including vulnerable Tangerang Selatan. Disaster-safe educational units (SPAB) aim to enhance school community preparedness, yet implementation remains suboptimal, requiring comparative school evaluations. This study compares DRR education implementation in SPAB at SMAN 5 and SMAS Al Adzkar Tangerang Selatan, focusing on the school community's preparedness level. A mixed methods approach with an explanatory sequential design was employed, involving 373 respondents (principals, teachers, students, and non-teacher staff). Quantitative data were collected via written tests and structured questionnaires, while qualitative data came from in-depth interviews and observations. The results indicate that students' understanding of disaster threats at both schools was "Very High" (average score >3.21 out of 4), while teachers and educational staff scored "High" (average 2.41–3.20). Understanding of disaster risk among principals, teachers, and educational staff was "Medium" (average 1.00–1.07 out of 2), with students at SMAN 5 scoring "High" (1.38) and students at SMAS Al Adzkar "Medium" (1.19). The average score for understanding disaster capacity across all groups was in the "High" category. Qualitative findings reveal that the integration of disaster risk reduction materials into the curriculum remains limited to certain subjects, the development of specific disaster risk reduction teaching materials is suboptimal, and extracurricular activities at both schools are not explicitly designed as part of disaster risk reduction efforts. These results highlight the need to strengthen SPAB implementation comprehensively by enhancing preparedness, curriculum integration, instructional materials, and extracurricular programs to improve resilience in disaster-prone schools.

Keywords: *disaster risk reduction (DRR); disaster risk reduction education; disaster-safe education units (SPAB); school-based disaster management*

INTRODUCTION

Disasters affect people regardless of their socio-economic status (Maharani, Y., Lee, S., & Ki, S.J., 2016). The 2024 Indonesian Disaster Risk Index (BNPB, 2024) issued by BNPB shows that 80 regions in Indonesia are at high risk of disasters, covering 205 million people exposed to disaster risk, 107 million of whom are school-age children, so that SPAB programs often fail to reduce learning disruptions and life risks even though 52% of educational units are located in vulnerable zones. According to data from the Ministry of Education and Culture in the book Pendidikan Tangguh Bencana (Ministry of Education and Culture, 2019), around 24.05% or 52,902 educational units are located in earthquake-prone areas, 24.59% (54,080 educational units) are located in flood-prone areas, 1.10% (2,417 educational units) are located in tsunami-prone areas, 7.09% (15,590 educational units) are located in landslide-prone areas, and 0.77% (1,685 educational units) are located in volcanic eruption-prone areas. These percentages not only describe structural risks, but also highlights the direct implications: the low effectiveness of SPAB due to the lack of integration of preventive disaster risk reduction (DRR) education, which has caused damage to 15,358 educational units since the 2004 Aceh tsunami, disruption to 49,997 units due to smoke disasters, and total closure during the COVID-19 pandemic (Ministry of Education and Culture, 2021).

Disaster management involves a continuous and dynamic management process, as well as recovery plans that respond to dangerous situations. Current disaster management activities seem to focus only on emergency response. This means that we only take action after a disaster has occurred, while before a disaster occurs, we tend not to do anything significant. This reactive paradigm must, of course, be changed to a preventive and anticipatory paradigm. Therefore, disaster mitigation becomes an important focus. Reasonable mitigation efforts must at least be directed at efforts that include, among others, (a) developing a monitoring system, (b) developing an early warning system, (c) building information and dissemination systems, (d) building infrastructure that is adapted to the threats, (e) increasing the level of knowledge, awareness, and preparedness

of all stakeholders, especially the government and the community, and (f) creating legislation on disaster management issues. Points (a), (b), (c) and (d) are physical structural disaster mitigation programs, which in many cases require considerable costs. Meanwhile, points (e) and (f) are non-physical structural mitigation programs that require relatively less cost and therefore need to be prioritised (Widiyantoro et al., 2009).

Structural non-physical mitigation programs, which are relatively less costly and should be prioritised as mentioned above, can be implemented through disaster risk reduction (DRR) education, which is conceptually defined as the systematic process of integrating knowledge about hazards, vulnerability, and disaster capacity into the curriculum, extracurricular activities, and school management to build sustainable resilience. Disaster preparedness refers to the ability of the school community to anticipate, respond to, and recover from threats through proactive attitudes, risk knowledge, and resource mobilisation. School resilience is the capacity of educational institutions to absorb disaster shocks, adapt, and maintain learning functions, while disaster capacity includes internal resources (staff training, infrastructure) and external resources (partnerships). Education that is safe from all types of disaster threats is realised through the Disaster Safe Education Unit Program (SPAB), which the Ministry of Education and Culture has established as an effort to prevent and reduce disaster risks covering all education units in Indonesia, regulated by Permendikbud Number 33 of 2019 for pre-disaster, emergency, and post-disaster situations.

SPAB was initially known as the Disaster-Safe School/Madrasah (SMAB), which was limited to schools/madrasahs. Meanwhile, SPAB is intended to accommodate all educational units, consisting of early childhood education, elementary schools/MI, junior high schools/MTs, senior high schools/MA, SKB/PKBM, and SLB. The priority for implementing SPAB in Indonesia has been in post-disaster areas, followed by disaster-prone areas. The Disaster-Safe Education Unit (SPAB) Framework supports disaster risk reduction education, aimed at education sector policymakers, planners, school management, and partners to promote children's rights, sustainability, and resilience.

South Tangerang is prone to annual flooding in the subdistricts of Pondok Aren, Ciputat, and Pamulang (Nisa, J., 2021), threatening educational units such as SMAN 5 and SMAS Al Adzkar, which disrupts continuous learning.

A critical analysis of previous research shows that earlier studies were still descriptive and contextual in nature, limited to the effectiveness of SPAB, such as at SMA 1 Cangkringan, which was not yet optimal due to a lack of program continuity and student capacity building (Wicaksono, 2022). Other studies, such as school-based disaster management, show a strong foundation but low optional investment, and a similar program in Gokmenoglu et al. (2021) is effective in teacher training but hampered by policy.

Ikramullah's (2019) research on "The Implementation of Disaster Preparedness School (SSB) in Banda Aceh City" in 12 schools (elementary, junior high, and high schools) found that the implementation of SSB was categorized as quite good overall, with a high level of school community preparedness and supporting factors including school commitment, fund allocation, and government partnerships (Paripurno, 2016).

However, activities that have not been carried out well are disaster simulations and disaster seminars/workshops.

Based on this background, a comparative empirical study between public and private high schools in flood-prone urban areas such as South Tangerang is needed to analyze differences in DRR implementation in the development of teaching materials and extracurricular activities, as well as to measure preparedness based on understanding of threats, risks, and disaster capacity, in order to enrich understanding of the variety of SPAB practices and produce more adaptive policy recommendations for disaster risk reduction education.

MATERIALS AND METHODS

This study uses a Mixed Methods approach that integrates quantitative and qualitative data to obtain a more comprehensive understanding (Creswell, 2017) of the implementation of disaster risk reduction education. The research was conducted at the Disaster Safe Education Unit (SPAB) of SMAN 5 and SMAS Al Adzkar South Tangerang with a total population (principals, teachers, students, and staff) of 1017 and a sample of 373, consisting of 2 principals,

Principal Sampling Technique using total sampling, 2 principals. The teacher sample was taken through purposive sampling only for teachers who taught subjects, as well as homeroom teachers and extracurricular advisors. The staff sample used proportional random sampling, and the student sample was taken using cluster random sampling using the Slovin formula.

The Mixed Methods design used is Explanatory Sequential Design, which consists of two sequential phases. The first phase is quantitative data collection through a multiple-choice test to measure preparedness as defined by Brown (2014), consisting of 10 questions on understanding threats, risks, and capacity. Then, a questionnaire assesses attitudes, consisting of 9 questionnaire items, all of which have been validated by experts. Question validity was examined through expert review and empirical testing using SPSS software, while content validity was based solely on expert review.

The second phase involved qualitative data collection through in-depth interviews and participatory observation. Interviews were conducted with school principals and teachers regarding policies, curriculum, syllabus, lesson plans/teaching modules, and student worksheets related to DRR in schools. Quantitative data analysis (test results) techniques used descriptive statistics to describe the comparative levels of preparedness of the school community in supporting disaster risk reduction in both schools. Then, qualitative data analysis was carried out simultaneously during data collection and after the data had been collected in entirety.

The interview data was reduced by selecting, focusing, simplifying, abstracting, and transforming the data. The final step in this qualitative data analysis was concluding and verifying them by interpreting the data presented to draw preliminary conclusions. These conclusions were then continuously verified during the research process by triangulating data sources to obtain valid and accountable findings.

RESULTS AND DISCUSSION

1. Research Results

   a. Community Preparedness in Disaster Risk Reduction at School

This section describes the level of preparedness of the SPAB 2 South Tangerang community. The school community in question consists of the Principal, Teachers, Students and

Educational Staff. In the implementation of disaster risk reduction education, preparedness is one of the indicators that must be met. The level of disaster preparedness of the school community in the results of this study was obtained from the average score of understanding of threats, risks and disaster capacity in the school environment and its surroundings.

Table 1. Number of Respondents SMAN 5 and SMAS Al Adzkar South Tangerang

School Civitas	Total	Percentage
Principal	2	0,54
Teachers	22	5,90
Students	344	92,22
Educational Staff/Non-Teacher	5	1,34
Total	373	100

Source: Research Results, 2024-2025

Table 1 shows the number of respondents/school community involved in the study. Respondents consisted of principals, teachers, students, and staff/non-teachers, including janitors (Caraka-Cleaning Service) and security officers (Service/Security). The total number of respondents was 373, the majority of whom came from the student category, namely 344 people. Respondents, based on gender, are as follows:

Table 2. Gender of Respondents

Gender	Total	Percentage
Male	216	57,91
Female	157	42,09
Total	373	100

Source: Research Results, 2024-2025

Table 2 presents the distribution of respondents by gender. Of the total 373 respondents, 216 (57.91%) were male, while 157 (42.09%) were female.

b. Understanding of Disaster Threats in Schools

The Disaster threats refer to the potential for natural or man-made events that can cause damage, disruption or danger to life and the environment (BNPB, 2020). In the school context, understanding disaster threats is a fundamental aspect of building disaster preparedness for the entire school community.

Disaster threats can originate from natural disasters, such as earthquakes, floods, landslides, tsunamis, and volcanic eruptions, as well as non-natural disasters, such as fires, technological failures, or disease outbreaks (UNDRR, 2019). The

following are the results of the average score of the preparedness sub-understanding of disaster threats of the SPAB 2 South Tangerang community.

Table 3. Average Preparedness Scores for Sub-Understanding of Disaster Threats

No	Understanding Disaster Threats	School Community	SMAN 5		SMAS Al Adzkar	
			Number of Respondents	Average	Number of Respondents	Average
1	Definition of Disaster as a threatening event	Principal	1	3	1	3
2	The most common threats in the immediate environment (school/home)	Teachers	15	3,07	7	3
3	The leading causes of disaster threats in the immediate environment (school/home)	Students	272	3,80	72	3,21
4	Types of disaster threats	Educational Staff/Non-Teacher	3	2,5	2	3

Source: Research Results, 2024-2025

Table 3 shows the scoring results of the school community's understanding of various aspects of disaster threats, with the number of questions about understanding "disaster threats" consisting of 4 questions. With the number of questions about understanding the threat of disaster as many as 4 items, the average score of each group of respondents is categorised into five levels of understanding, namely, 0.00 - 0.80 Very Low, 0.81 - 1.60 Low, 1.61 - 2.40 Medium, 2.41 - 3.20 High, 3.21 - 4.00 Very High.

Based on **Table 3**, students in both schools have an average of the "Very High" category.

Teachers in both schools have a mean of "High" category. Principals in both schools have the same mean of 3.00, which is also in the "High" category. Educational staff in both schools also had a mean of the "High" category.

c. Understanding of Disaster Risk in Schools

Understanding of disaster risk is an important aspect of disaster preparedness in the school environment. Disaster risk is not only related to the possibility of disaster occurrence but also includes factors that can increase or reduce the impact of disasters on the school community. This understanding of disaster risk is the basis for developing mitigation and preparedness strategies to reduce potential losses caused by disasters.

Understanding of disaster risk in this study includes two components, namely factors that increase disaster risk and ways to reduce the risk of disaster losses. Factors increasing disaster risk are related to geographical conditions, infrastructure, and the readiness of human resources in schools. Meanwhile, disaster risk reduction involves the implementation of mitigation strategies, education of the school community, and preparedness in dealing with emergencies.

Table 4. Average Preparedness Scores for Sub-Understanding of Disaster Risks

No	Understanding Disaster Risks	School Community	SMAN 5		SMAS Al Adzkar	
			Number of Respondents	Average	Number of Respondents	Average
1	Factors that increase disaster risk	Principal	1	1	1	1
		Teachers	15	1,07	7	1
2	Reducing disaster risk	Students	272	1,38	72	1,19
		Educational Staff/Non-Teacher	3	1	2	1,5

Source: Research Results, 2024-2025

Based on **Table 4** above, with the number of risk understanding questions as many as 2 items, the range of scores for the preparedness category of the disaster risk understanding sub-component is: Mean 0.00 - 0.40 Very Low, 0.41 - 0.80 Low, 0.81 - 1.20 Medium, 1.21 - 1.60 High, 1.61 - 2.00 Very High.

Based on **Table 4**, the principals in both schools have an average score of 1.00, which falls into the "Medium" category. Teachers at SMAN 5 and SMAN Al Adzkar had a mean score of 1.07 and 1.00, which fell into the “Medium” category. Students had an understanding of disaster risk that was also in the “High” category, averaging 1.38 for SMAN 5 and the “Medium” category, with a mean of 1.19 for Al Adzkar High School. Non-teaching staff at SMAN 5 had a mean of 1.00 in the "Medium" category, while at SMAS Al Adzkar the mean was 1.50 in the "High" category.

c. Understanding of Disaster Capacity in Schools

Disaster capacity is one of the important aspects of disaster preparedness. This capacity reflects the extent to which the school community - including principals, teachers, students and education personnel - understands, manages and responds effectively to disaster threats. The understanding of disaster capacity covers various aspects, ranging from

preparedness in facing disasters, utilisation of early warning systems, use of technology in rapid assessment, to the implementation of regular evacuation training.

The following table shows the average score of preparedness sub understanding of capacity:

Table 5. Average Preparedness Scores for Sub-Understanding of Capacity

No	Understanding Disaster Capacity	School Community	SMAN 5		SMAS Al Adzkar	
			Number of Respondents	Average	Number of Respondents	Average
1	Plans for emergencies	Principal	1	3	1	2
2	Early Warning System	Teachers	15	2,67	7	2,71
3	Drone technology in rapid assessment	Students	272	2,66	72	2,49
4	Evacuation training	Educational Staff/Non-Teacher	3	1,50	2	3

Source: Research Results, 2024-2025

Table 5 shows the understanding of preparedness, including the sub understanding of disaster capacity of the school community. Based on the table above, with the number of questions 4 items as in the threat understanding table, it shows that the principal at SMAN 5 South Tangerang has an average of 3.00 in the "High" category. In contrast, the principal at SMAS Al Adzkar has an average of 2.00 in the "Medium" category. Teachers in both schools, SMAN 5 and SMAS Al Adzkar, showed a "High" category, with mean scores of 2.67 and 2.71, respectively. Students in the two schools had the same category of "High". Educational staff showed more mixed results, with a mean of 1.50 at SMAN 5 in the "Low" category and a mean of 3.00 at SMAS Al Adzkar in the "High" category.

d. Curriculum Review, Teaching Material Development, and Extracurricular Activities in the Implementation of Disaster Risk Reduction Education

Disaster risk reduction education in school curricula not only covers theories about various types of disasters, but also instils practical skills that enable students to act quickly and appropriately in emergencies. This educational model emphasises experiential learning, where students not only understand disaster concepts from textbooks but also

through simulations, preparedness training, and direct involvement in mitigation efforts within the school environment and its surroundings. Thus, the disaster curriculum is not merely academic content but also part of character development and mental preparedness in facing disasters.

As part of the implementation of SPAB, disaster education in schools needs to be designed so that it can be adapted to local conditions and risk characteristics in each region. This is so that the material provided is more relevant and applicable to students. In some schools, the disaster education curriculum has been integrated into subjects such as Natural Sciences (IPA), Social Sciences (IPS), and Civic Education (PKn), while in other schools, project-based approaches or extracurricular activities are used to deepen students' understanding of disaster-related issues. This flexible approach allows schools to adopt the most suitable strategies to meet their needs in building disaster mitigation and preparedness capacity.

However, based on interviews conducted at two SPAB schools in South Tangerang, SMAN and SMAS Al Adzkar, the implementation of the disaster curriculum still faces various challenges. According to the principals of each school, there is no formal disaster education in the curriculum currently being implemented. Similarly, in terms of learning outcomes/objectives, there are no specific outcomes/objectives outlined to achieve an understanding of disaster risk reduction efforts at the school. Teachers also expressed the same concerns, stating that the lack of implementation of the disaster risk reduction curriculum is primarily due to resource constraints, insufficient training for educators, and the absence of a national policy explicitly requiring disaster risk reduction education as part of the core curriculum.

The development of teaching materials in Disaster Risk Reduction Education is an integral part of implementing the disaster curriculum in educational institutions, particularly in schools labelled as SPAB. The teaching materials developed must equip students with disaster literacy that is not only theoretical but also applicable in everyday life. In the context of education, the development of teaching materials refers to the principles of systematic, relevant, and appropriate instructional material design that aligns with the needs and characteristics of

students. Generally, the development of teaching materials involves identifying learning objectives, selecting and organising content, employing effective delivery strategies, and evaluating the effectiveness of the materials in enhancing students' understanding. These principles also form the basis for the development of disaster education materials, which require a multidisciplinary approach that integrates scientific, social, and cultural aspects.

At SPAB schools, the development of disaster education materials is not only aimed at increasing students' knowledge about various types of disasters but also at fostering a proactive mindset and preparedness in facing potential disasters in their environment. Therefore, teaching materials must be designed contextually, based on the environment, and contain elements of mitigation and preparedness that can be directly applied by students. This concept aligns with the general principles in the development of teaching materials that prioritise relevance, integration, and sustainability in the learning process. Additionally, approaches based on direct experience, such as disaster simulations, local case studies, and the use of digital technology to enhance learning interactivity, are important strategies in ensuring the effectiveness of disaster education materials. Thus, the development of disaster education materials is not only an academic effort to enrich the curriculum but also a strategic step in building a disaster-aware culture within the school environment and the broader community.

Based on interviews conducted at two SPAB schools in South Tangerang, SMAN and SMAS Al Adzkar, the development of disaster education materials has not yet been implemented at all. According to the principals of each school, there has been no modification or integration of educational materials with disaster education. Similarly, in terms of the application of approaches, models, and learning methods, there are also no other learning resources used to integrate disaster risk reduction efforts into subject learning.

Extracurricular activities are an important part of the educational process, serving not only as a forum for developing students' interests and talents but also as a means of building character, life skills, and awareness of the surrounding environment.

Extracurricular activities are a strategic tool for instilling a culture of disaster awareness among students. Through extracurricular activities, schools can equip students with a deeper understanding of disaster risks and technical skills in mitigation and emergency response efforts.

Disaster education through extracurricular activities aims to internalise preparedness values more practically and interactively. Some forms of extracurricular activities that can support the implementation of SPAB include the Red Cross Youth (PMR), Scouts, Environmental Cadres, Nature Lovers, and Science and Technology Clubs that focus on disaster innovation. Activities in these extracurricular programs cover various aspects such as first aid training, disaster evacuation simulations, school risk mapping, and environmental greening and conservation programs as part of mitigation against hydrometeorological disasters such as floods and landslides.

In addition to equipping students with technical skills, extracurricular activities in SPAB also play a role in building independence, leadership, and teamwork. In emergencies, these skills are crucial for helping students respond quickly and effectively to disasters. Simulation-based activities, such as evacuation drills, fire extinguisher use, and search and rescue operations, can enhance students' preparedness and provide hands-on experience in handling emergency conditions.

Based on observations and interviews, the current extracurricular activities at the two schools were found not to be directly designed with the primary purpose of being part of disaster risk reduction (DRR) efforts. Extracurricular activities such as the Boy Scouts and the Red Cross Youth (PMR) that are held in both schools have long been part of the educational environment in Indonesia and have values closely related to character building, leadership, discipline, and social and environmental awareness. However, despite not being explicitly based on the DRR framework, the activities within these extracurricular programs have a substantial overlap with the principles of disaster preparedness and mitigation.

Ministry of Education and Culture Regulation No. 62 of 2014 on Extracurricular Activities in Primary and Secondary Education states that extracurricular activities aim to develop students' potential in an optimal and

integrated manner, covering moral, spiritual, social, emotional, and skill aspects. Under this regulation, extracurricular activities are categorised into mandatory and optional types, with optional activities encompassing various initiatives that enhance students' skills across different aspects of life. Although the Permendikbud does not explicitly mention DRR as part of the main policy in extracurricular activities, the various activities have a significant contribution to improving students' preparedness in facing potential disasters in the school environment and the community.

2. Discussion

In terms of understanding disaster threats, the data shows that students at both schools have a very high level of understanding of disaster threats, with SMAN 5 slightly ahead of SMAS Al Adzkar (average 3.80 vs. 3.21; see Table 3). This indicates that the disaster education and simulation programs implemented in these schools are effective in increasing students' awareness of potential threats in their environment. These findings are in line with the research by Shiwaku et al. (2016), which emphasises the importance of simulations and continuous education in improving students' understanding of disaster threats. However, the lower scores between students and educational/non-teaching staff (average 2.50-3.00; see Table 3) indicate a gap in the involvement of the entire school community. This is consistent with the findings of UNDRR (2019), which states that non-teachers are often less involved in disaster training, even though their role is important in disaster preparedness and response. Therefore, these results emphasise the need for increased socialisation and inclusive training for all elements of the school, not just teachers and students.

Understanding of disaster capacity, which includes preparedness, early warning systems, use of technology, and evacuation training, also showed good results, especially at SMAN 5. The principal at SMAN 5 has a higher understanding of disaster capacity compared to the principal at SMAS Al Adzkar (average 3.00 vs. 2.00; see Table 5), which shows the strategic role of leadership in driving mitigation and preparedness programs in schools. This is in line with Maryani's (2018) research, which found that active leadership by school principals contributes

significantly to the success of disaster risk reduction programs.

The difference in disaster preparedness between students at the two schools also shows that the intensity and quality of training and simulations greatly affect their level of preparedness (see Table 5). Students at SMAN 5 had an average of 2.66, while those at SMAS Al Adzkar had an average of 2.49, which is almost in the High category. Gaillard's (2020) study confirms that the integration of technology and practical training can significantly improve students' response capacity, which presents an opportunity for program development in both schools.

Educational staff/non-teachers showed more varied results, with an average of 1.50 at SMAN 5 and 3.00 at SMAS Al Adzkar (see Table 5). These results are interesting because educational staff at SMAN 5 have a lower level of understanding than educational staff at SMAS Al Adzkar. The gap with educational staff/non-teachers is lower (average 2.50-3.00; Table 3), consistent with UNDRR (2019) and SPAB SMA Negeri 1 Cangkringan (Wicaksono, 2022), where non-teachers are minimally involved due to uneven training and lack of program continuity (there has never even been special training). This confirms that Pillar 2 of the CSSF mandates participatory SPAB management through capacity building for educational personnel, emergency response SOPs (evacuation, shelter-in-place, lockdown), and school simulations for the inclusion of the entire school community, as well as a risk-based policy foundation that prioritizes SPAB liaison officers at the school level is a must (GADRRRES, 2022), which is also in line with the recommendations from the research by Gokmenoglu et al., (2021) on the Turkish Ministry of National Education school-based disaster education program: A preliminary results of the program evaluation.

Research findings on the development of disaster education teaching materials that form part of the disaster education curriculum indicate a gap between the ideal concept of disaster education and its implementation in the field. In general, a disaster curriculum that includes the development of effective disaster teaching materials should not only focus on the theory of disaster types, but also instil practical skills through experiential learning, simulations, training, and direct involvement in mitigation (UNESCO,

2023). However, findings in the field show that the implementation of the disaster curriculum in both schools still faces various challenges.

Based on interviews with the principals and teachers at SMAN 5 and SMAS Al Adzkar, it was found that there is no formal disaster management curriculum explicitly implemented in either school. In fact, learning outcomes and objectives related to disaster risk reduction efforts are not explicitly formulated. According to teachers at both schools, the absence of a disaster management curriculum is due to various factors, including limited resources, lack of training for educators, and the absence of a national policy requiring disaster management education as part of the core curriculum. These challenges are consistent with the findings of the study. This indicates that disaster management education is not yet a priority in the education systems of both schools.

This finding contradicts the Disaster Safe Education Unit (SPAB) model launched by BNPB (2020), which mandates the integration of disaster education into school curricula. As part of the implementation of the Disaster Safe Education Unit (SPAB), disaster education in schools needs to be designed so that it can be adapted to local conditions and risk characteristics in each region (UNISDR, 2005). This is so that the material provided is more relevant and applicable to students. In some schools, the disaster curriculum has been integrated into several subjects such as science, social studies, and civics, as well as through project-based and extracurricular activities. However, its implementation still faces challenges, such as a lack of practical understanding and limited resources. This is supported by Sonmez et al. (2023) and Green, R.P. et al. (2020), who highlight the importance of synergy between curriculum, textbooks, and learning practices in DRR education. Effective interaction between the three can improve students' understanding and skills in disaster risk reduction, but implementation in schools is often still partial and not yet optimal. Meanwhile, other schools use project-based approaches or extracurricular activities to deepen students' understanding of disasters (Kurniawan, 2025). This flexible approach allows schools to adopt strategies that best suit their needs in building disaster mitigation and preparedness capacities.

The development of disaster education materials in Indonesia began after the 2004 Aceh tsunami through collaboration between TDMRC-UNESCO-LIPI (LIPI, 2006), resulting in comprehensive teaching materials covering risk identification, mitigation, and disaster response. However, evaluation of these teaching materials is still lacking, resulting in a decline in their quality and effectiveness, even though they are essentially useful (Amri et al., 2017). These teaching materials cover various aspects. In early childhood education, teachers develop semester and annual programs, which are then further detailed in Daily Lesson Plans (RPPH) related to topics such as volcanic eruptions, floods, and landslides (Nurani et al., 2022). Differences in disasters in each region cause differences in the teaching context. In disaster-prone areas such as Mount Merapi in Yogyakarta, the integration of disaster education optimises community resilience in facing volcanic eruptions.

Findings at SMAN 5 & SMAS Al Adzkar (without an explicit curriculum) highlight this gap, similar to the results of the study Integrating Disaster Education into School Curriculum in Indonesia: A Scoping Review (Desilia, N. R., Lassa, J., & Oktari, R. S., 2023), which identified barriers to integrating DRR into the national curriculum due to a lack of synergy between textbooks and practice (Gokmenoglu et al., 2023). The CSSF explicitly mandates in Pillar 3 (Disaster Risk Reduction and Resilience Education) a curriculum review to instil important knowledge and skills such as disaster risk identification, risk reduction, response preparedness, life skills, climate adaptation, social-emotional learning (SEL), and child protection, as a requirement for integrating DRR content into formal/non-formal curricula and developing quality teaching materials.

Extracurricular activities regulated in Permendikbud Number 62 of 2014 emphasise the goal of developing students' potential in an optimal and integrated manner—covering moral, spiritual, social, emotional, and skill aspects, including both compulsory and elective activities that strengthen capacity. However, this regulation does not explicitly mention Disaster Risk Reduction (DRR) as a primary focus. Extracurricular activities are aligned with Pillar 3 of the CSSF, which explicitly recommends extracurricular

learning pathways such as Scouts and PMR to integrate DRR education.

Empirical findings from various studies confirm the effectiveness of this approach. Tamil (2020) proved that flood preparedness education through extracurricular role-playing significantly improved students' rapid response, while Puspadiningrum et al. (2017) showed that integrated Scouting extracurricular activities for earthquake preparedness were able to build contextual disaster response skills. Similarly, Mardiyah (2017) demonstrated that the "Dasi Sigab" extracurricular activity based on local wisdom is effective as a disaster mitigation measure.

At SMAN 5 and SMAS Al Adzkar, extracurricular activities serve as a strategic gateway to address the absence of a formal DRR curriculum. Activities such as Scouting and PMR can be optimised not only to comply with Permendikbud Number 62 of 2014 but also to carry out the mandate of Pillar 3 for quality PRB material, as well as a key message for public education and the participatory involvement of students and educators in building resilience to disaster threats, especially flooding in South Tangerang.

CONCLUSIONS

Based on the results of research on the implementation of Disaster Risk Reduction (DRR) Education in Disaster Safe Education Units (SPAB) at SMAN 5 South Tangerang and SMAS Al Adzkar Pamulang South Tangerang, it can be concluded that: (1) DRR Education teaching materials have not been developed, including modifications, integration into subjects, or alternative learning resources; (2) Extracurricular activities such as Scouts and PMR are not explicitly designed for DRR, but have the potential to support preparedness; (3) The level of preparedness of the school community (principals, teachers, students, and non-teaching staff) is generally high, especially among students with an average understanding of disaster threats of 3.80 (SMAN 5) and 3.21 (SMAS Al Adzkar), although non-teaching staff are lower, especially at SMAN 5. These findings indicate the need to reinforce the Comprehensive School Safety Framework, the Hyogo Framework for Action, and the Sendai Framework for Disaster Risk Reduction (UNISDR, 2015) in inclusive disaster risk reduction for the school community. This empirical comparative study fills the gap

in the DRR literature on educational units with evidence of variations in the implementation of public and private urban high schools prone to flooding, contributing to strengthening school resilience. Its implications emphasise the integration of DRR in the development of teaching materials and structured training programs. The research sample was limited to only two high schools (373 respondents, 92% students) with a cross-sectional approach without longitudinal data or intervention, so further research is needed at other levels and regions on a larger scale. This study recommends the need to increase capacity-building training for the school community and to conduct routine evaluations of SPAB implementation in educational units.

REFERENCES

Amri, A. (2017). *Pendidikan Tangguh Bencana 'Mewujudkan Satuan Pendidikan Aman Bencana Di Indonesia'*. Jakarta: Sekertariat Nasional Satuan Pendidikan Aman Bencana, Direktorat Pembinaan Pendidikan Khusus Dan Layanan Khusus, Direktorat Jendral Pendidikan Dasar Dan Menengah, Kementerian Pendidikan dan Kebudayaan.

Badan Nasional Penanggulangan Bencana (BNPB). (2024). *Indeks Risiko Bencana Indonesia*. https://inarisk.bnpb.go.id/irbi.

Badan Nasional Penanggulangan Bencana (BNPB). (2020). *Buku Saku Tanggap Tangkas Tangguh Menghadapi Bencana*. Jakarta Timur: Pusat Data Informasi dan Humas BNPB. https://bnpb.go.id/buku/buku-saku-tanggap-tangkas-tangguh-menghadapi-bencana.

Brown LM, Haun JN, Peterson L. (2014). A proposed disaster literacy model. *Disaster Med Public Health Prep*. Jun; *8*(3): 267-275. https://doi.org/10.1017/dmp.2014.43

Creswell, John W. 2017. *Pendekatan Metode Kualitatif, Kuantittatif dan. Campuran*. Yogyakarta: Pustaka Pelajar.

Desilia, N.R., Lassa, J., and Oktari, R.S. (2023). Integrating Disaster Education into School Curriculum in Indonesia: A Scoping Review. *International Journal of Disaster Management*, Vol 6, No.2 (2023). https://doi.org/10.24815/ijdm.v6i2.34867.

GADRRRES. (2022). *Kerangka Kerja Satuan Pendidikan Aman Bencana (SPAB) yang Komprehensif Tahun 2022-2030. Untuk Hak dan Resiliensi Anak di Sektor Pendidikan*. GADRRRES.

Gaillard, J. C., d'Ercole, R., & Leone, F. (2020). Cartography of population vulnerability to volcanic hazards and lahars of Mount Pinatubo (Philippines): a case study in the Pasig-Potrero River basin (province of Papanga). *Géomorphologie: relief, processus, environnement*, *7*(3), 209-222.

Gokmenoglu, T., Sonmez, ED., Yavuz., I., A Gok. (2021). Turkish Ministry of National Education

school-based disaster education program: A preliminary results of the program evaluation. *International Journal of Disaster Risk Reduction*. Volume 52, Januari, 101943. https://doi.org/10.1016/j.ijdrr.2020.101943.

Green, R.P., Varchetta, A., McFarlane, K., Iyer P., Goyeneche, M. (2020). Comprehensive school safety policy: A global baseline survey. International Journal of Disaster Risk Reduction, Volume 44. https://doi.org/10.1016/j.ijdrr.2019.101399

Ikramullah. (2019). *Pelaksanaan Pembinaan Sekolah Siaga Bencana (SSB) di Kota Banda Aceh (Studi Di SD, SMP dan SMA Siaga Bencana)*. Thesis. Bandung: Universitas Pendidikan Indonesia.

LIPI. 2006. *Pengembangan Framework untuk Mengukur Kesiapsiagaan Masyarakat terhadap Bencana Alam*. Jakarta: LIPI-UNESCO/ISDR.

Kurniawan, F.A. (2025). Sinergi Antara Kurikulum Merdeka dan Pendidikan Kebencanaan dalam Membangun Kesiapsiagaan di Satuan Pendidikan. *Dinamika Pembelajaran: Jurnal Pendidikan Dan Bahasa*, 2(4), 300–313. https://doi.org/10.62383/dilan.v2i4.2575.

Maharani, Y., & Lee, S., & Ki, S.J. (2016). Social Vulnerability at a Local Level around the Merapi Volcano. *International Journal of Disaster Risk Reduction*. Volume 20, December, Pages 63-77. https://doi.org/10.1016/j.ijdrr.2016.10.012.

Maryani, E. (2018). Model Pembelajaran Mitigasi Bencana Dalam Ilmu Pengetahuan Sosial Di Sekolah Menengah Pertama. *Jurnal Geografi GEA*, *10*(1), 42 - 58.

Ministry of Education and Culture/Kemdikbud. (2019). *Pendidikan Tangguh Bencana "Mewujudkan Satuan Pendidikan Aman Bencana Di Indonesia."* Jakarta: Kemdikbud, 1–120. https://pk.kemdikbud.go.id/read-news/mewujudkan-satuan-pendidikan-aman-bencana-di-indonesia.

Ministry of Education and Culture/Kemdikbud. (2021). *Pendidikan Tangguh Bencana "Mewujudkan Satuan Pendidikan Aman Bencana di Indonesia*. *Kemdikbud*, 1–120. https:/ https://spab.kemdikbud.go.id/web/files/FINAL_Buku_SPAB_Versi-2_Bahasa_20DES.pdf

Nisa, J., Desfandi, M., Suryaningsih, T. (2021). Development of WebGIS of the Level of Community Participation in Flood Mitigation and Preparedness. *Sixth International Conference on Informatics and Computing (ICIC)*. 978-1-6654-2155-3/21/$31.00 ©2021 IEEE. https://doi.org/10.1109/ICIC54025.2021.9632992

Nurani dkk. (2022). Pengenalan Mitigasi Bencana Banjir untuk Anak Usia Dini melalui Media Digital Video Pembelajaran. *Jurnal Obseso*. *6* (6). DOI: https://doi.org/10.31004/obsesi.v6i6.2940.

Paripurno, E.T. (2006). *Penerapan PRA untuk Manajemen Bencana*. Yogyakarta: Pusat Studi Manajemen Bencana UPN Veteran Yogyakarta.

Permendikbud. (2019). Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 33 of 2019 concerning the Implementation of the Disaster-Safe School Program Salinan Permendikbud No. 33 Tahun 2019. https://jdih.kemendikdasmen.go.id/detail_peraturan?main=2120.

Permendikbud. (2014). Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 62 of 2014 concerning Extracurricular Activities in Primary and Secondary Education. Salinan Permendikbud No. 62 Tahun 2014. https://jdih.kemendikdasmen.go.id/detail_peraturan?main=103.

Puspadiningrum, D., Winarni, E, dan Hasnawati. (2017). Ekstrakurikuler Pramuka Terintegrasi Siaga Bencana Gempa Bumi Terhadap Keterampilan Tanggap Bencana Siswa SD. *Jurnal PGSD Jurnal Ilmiah Pendidikan Guru Sekolah Dasar, 10*(2):73-78. https://doi.org/10.33369/pgsd.10.2.73-78.

Shiwaku, K., & Shaw, R. (2016). Future Perspectives of Disaster Resilience of Education System in Japan and Aboard. In K. Shiwaku, A. Skurai, & R. Shaw (Eds.), *Disaster Resilience of Education Systems*. Japan. Springer. http://doi.org/10.1007/978-4-431-55982-5.

Sonmez, ED., Gokmenoglu, T. (2023). Understanding the teachers' disaster preparedness beliefs. *International Journal of Disaster Risk Reduction*. Volume 85, February, 103511. https://doi.org/10.1016/j.ijdrr.2022.103511.

Mardiyah, S. (2017). *Dasi Sigab (Dalang Siswa Siap Siaga Bencana): Model Pendidikan Kebencanaan Sebagai Ekstrakulikuler Berbasis Kearifan Lokal Di Daerah Rawan Bencana di Indonesia*. Semarang: UNNIS.

Tamil, N. (2020). Edukasi Kesiapsiagaan Bencana Alam pada Siswa Melalui Metode Role Playing dalam Kegiatan Ekstrakurikuler di Sekolah. Amanah: *Jurnal Amanah Pendidikan Dan Pengajaran*, *1*(1). https://jurnal.pgrisultra.or.id/ojs/

UNESCO. (2023). What you need to know about the Comprehensive School Safety Framework 2022–2030. https://www.unesco.org/en/articles/what-you-need-know-about-comprehensive-school-safety-framework-2022-2030.

UNISDR. (2005) *Hyogo framework for action 2005–2015: building the resilience of nations and communities to disasters*. Geneva, Switzerland: UNISDR.

UNISDR. (2015). Sendai framework for disaster risk reduction 2015–2030. Geneva, Switzerland; UNISDR.

Wicaksono, F.A., dan Sibue. R.P. (2022). Efektivitas Program Satuan Pendidikan Aman Bencana di SMA Negeri 1 Cangkringan Kabupaten Sleman Provinsi Daerah Istimewa Yogyakarta. *Jurnal Pemerintahan dan Keamanan Publik (JP dan KP)*, Vol. 4, No. 2, Agustus.

Widiyantoro, S., Zaim, Y., Afnimar, Puspito, N. T., Sengara, I. W., & Sapiie, D. S. dan B. (2009). *Bencana Kebumian: Membangun Kesiapsiagaan Bencana di Indonesia sebagai Alternatif Bentuk Upaya Pengurangan Risiko*

Bencana. Buku Ringkasan dalam Mengelola Risiko Bencana di Negara Maritim Indonesia. LPPM ITB: Bandung.