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Reconstructing Disaster Smart School Policy: Adaptive and Participatory Governance for Resilient Education in West Sumatra, Indonesia

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ABSTRACT

The high level of disaster vulnerability in Indonesia necessitates strengthening school preparedness through the implementation of the Disaster Smart School (DSS) policy. However, the system has been affected by regulatory constraints, poor governance, and regional capacity disparities, which still leave most schools in disaster-risk areas ill-prepared. To address these problems, three parts of work are conducted: the weaknesses in existing DSS policymaking and governance are analyzed, the hindering and facilitating factors in implementation are explored, and a reconstruction model for more inclusive, adaptive governance is proposed. A descriptive qualitative study was conducted, and primary data were obtained from 35 in-depth interviews with stakeholders in five regencies/cities in West Sumatra, supplemented by policy papers and documents on disaster preparedness. Thematic coding and matrix analysis in NVivo 14 were employed, and a systematic strengths, weaknesses, opportunities, and threats (SWOT) study was conducted to identify common patterns. Findings: Six interconnected challenges are identified, including overly generic policy design, fragmented cross-sectoral coordination, insufficient human resource capacity within the system, extreme interregional variation, unsustainable financing, and underutilisation of technology. On the other hand, new possibilities emerged in public engagement, youth work, and digital creativity. The examination suggests that the DSS model has been largely symbolic and has not adequately accounted for local risk conditions and institutional variation. The study indicates that a reconstruction of DSS policy is needed, guided by technically contextualized guidelines, sector-wide task forces, performance-funding practices, teacher Development integration, and digital monitoring systems. Such reforms would help reduce the disaster education gap and promote adaptive, participatory, and evidence-based governance. This also has implications for integrating disaster resilience into Indonesia's long-term education and development agenda.

1. INTRODUCTION

Indonesia is the largest archipelagic country in the world and has been subjected to a range of natural hazards, climatic variability, and geohazards [1-4]. Based on information from the National Disaster Management Agency (NDMA) [5], there were 4,489 disasters in Indonesia in 2023, of which 63% were hydrometeorological events (floods/landslides/tornadoes). In all, eight attacks directly affected more than 1,200 schools, disrupting educational activities and posing threats to the safety of students and academic personnel.

Therefore, this study suggests that the Disaster Smart School (DSS) policy falls short of its strategic goal, particularly in terms of regional preparedness. One-way policy formulation, without considering local conditions, is a significant reason for poor implementation [6-9]. Thus, governance should be reconstructed in a more adaptive, collaborative, and data-driven manner to promote a systemic and sustainable governance system [10, 11]. The challenges of the DSS policy in Indonesia can be examined from several perspectives: policy formulation, governance, public

participation, and funding (Table 1).

Table 1. Disaster Smart School (DSS) policy detailed issue

Problem Aspects	Specific Issues	Impact on DSS
Policy Design	Policies are normative, not contextual to local risks	The policy is not effectively implemented in the field
Governance and Coordination	Coordination between ministries/agencies and local governments is weak; RDMA's role is suboptimal.	Fragmentation of roles, lack of synergy between stakeholders
Implementation of Safe Schools	Only 26.4% of schools in disaster-prone zones meet the DSS indicators	Low school preparedness in facing disasters
Regional Inequality	Schools in remote areas have minimal access to DSS training and infrastructure.	The high gap in preparedness between regions
Human Resources Capacity	Teachers and principals have not been trained in DRR; the curriculum is not integrated.	Schools are unable to respond independently during a disaster.
Monitoring and Evaluation	There is no digitalized data-based evaluation and reporting system.	There is no evidence to support decision-making.
Funding	There is no specific budget allocation within Special Allocation Funds or School Operational Assistance; allocations depend on the project.	Program implementation is neither sustainable nor comprehensive.
Community Participation	Parental, student, and community involvement in SOPs and training remains low.	Low awareness and ownership of the program by the school community
Utilization of Technology	Preparedness support technology has not been used systematically in schools.	Lack of innovation and efficiency in DSS implementation
Performance Indicators	DSS is not included in the national KPI or Minimum Service Standards in the field of education	DSS is not considered a priority in educational development

The design of the policy, Regulation of the Minister of Education and Culture No. 33/2019 is perceived as overly normative. It has not issued a specific technical explanation that can be adapted to local risks that vary across areas. This has resulted in many schools struggling to operationalise DSS principles. The disaster policies in the education sector are top-down, with minimal local elaboration; thus, they are not context-bound [12, 13].

The multi-sector coordination and collaboration are challenging. Lack of coordination among the ministries/institutions and the central and regional governments has resulted in fragmented roles and lacklustre implementation. Such implementation will depend on the cooperation of the Regional Disaster Management Agency (RDMA), the education office, and the local community, as emphasized by the researchers [14].

The low realisation suggests that the policy has not been successful in building robust execution instruments at the ground level. Locational inequality is commonplace today. schools in border, remote, and disadvantaged areas have limited access to training, DSS infrastructure, and technical assistance. This further widens the educational preparedness gap and leads to disaster education inequality [15-17].

At the level of schools, human resources remain inadequate. Almost all teachers have not been specifically trained in disaster risk reduction, and educational curriculum on disaster risk reduction have not yet been well integrated into teaching and learning [18-21]. Thus, schools are highly reliant on external assistance and cannot act independently in the event of a disaster. The absence of a unified monitoring and evaluation system impedes evidence-based policymaking. Policy assessment remains manual and not digitized, and it is not publicly available. This makes monitoring, policy improvement, and public reporting challenging [22-25].

The funding is also a significant barrier. The lack of a dedicated allocation of Special Allocation Funds for DSS, either through the physical Special Allocation Funds or through the usual School Operational Costs, makes the intervention dependent on donor projects or regional initiatives. This makes the programme both unscalable and unsustainable. This is another criticism of the claim that long-term financing for disaster education has contributed to impairments in the implementation of the Sendai Framework for Disaster Risk Reduction [26-28].

The level of school community involvement, such as parents and students, in the generation of contingency plans or simulation exercises is low. The schools typically administer programs and do not share them among all partners. Indeed, engaging in support work contributes to an early-age culture of disaster prevention [29, 30]. The technology has not been deployed effectively. For instance, applications for early detection systems, digital training, or preparedness dashboards were not part of the school's management and monitoring. As a result, the education and simulation process is still traditional and less efficient [31]. It is evident that the lack of a national KPI for the DSS results in policy not being a focus of attention in education. DSS has not been incorporated into the education sector's Minimum Service Standards or the Ministry of Education, Culture, Research, and Technology Strategic Plan; therefore, it does not inform how it is evaluated or recorded.

The subnational focus on West Sumatra provides a policy-relevant context for DSS, given the regular schooling system located within an overlapping multi-hazard domain across 19 regencies/cities that includes steep upland catchments and a high-population-density coastal corridor. Recent provincial disaster operations center administrative data recorded over the 2014–2024 period comprise 8,503 occurrences, categorised as predominantly extreme weather events (4654; 54.73%), followed by landslides (1613; 18.97%) and floods (1370; 16.11%). The annual number of incidents varies markedly from 323 (2015) to 1,095 (2024) suggesting that schools are exposed not only to infrequent, high-impact events but also to frequent, low- to medium-impact disruptions that undermine learning continuity and safety routines over time [32].

From a perspective of the education system,

implementation scales are large: according to the Reference Education Data by the Ministry of Primary and Secondary Education, there are 5,727 units of Elementary Schools, 994 units of High Schools in West Sumatra, which amount to 6.721 official schools … for early childhood education services and religious schools under another administration [33]. In such a system, the national school safety assessment data presented in Table 1 indicate that 1,002 schools in West Sumatra are located within mapped disaster-prone areas of the province. Still, only 26.4% meet the DSS indicators, suggesting that, across districts and school types, the institutionalization of preparedness is shallow and uneven.

In terms of institutions, the delivery process of DSS in West Sumatra is an actor chain consisting of a proponent and enablers, provincial/district education offices as part of school governance, and actors at the school leader/teacher level as front-line implementers. The province has also witnessed civil-society and NGO-supported targeted school–community interventions that illustrate feasibility but highlight a pervasive scaling challenge: activities typically remain project-based, limited to some schools, and lightly integrated into regular planning, budgeting, and supervision. This institutional context is a reminder to regard DSS scale-up as a governance and routine-building challenge that entails mandating, setting minimum standards, and supervision rather than episodic training. It also underscores the role of integration in fostering a coherent message.

In the meantime, DSS policy implementation in West Sumatra faces several problems that compound complexity, especially at the outset. First, school communities lack sufficient knowledge of disaster risk and the evacuation measures that should be implemented. Additionally, students may not understand the concepts of evacuation signs, escape routes, or self-help during a disaster. Secondly, there are still no effective links between different local government bodies. For instance, during the early stage of program implementation, there was a gap in the area implementation due to miscommunication between the RDMA and the Provincial Employment Agency. Third, DSS is resource-intensive and requires technical support, including trained facilitators and adapted learning materials. Without the support of other partners, including local NGOs, the government is unable to implement the program efficiently.

Notwithstanding the hurdles, the introduction of the DSS Policy in Padang City has made notable progress. The RDMA of Padang City has been developing a strategic partnership model with civil society organizations (CSOs) and NGOs, including KOGAMI, and other organizations, since 2018. This collaboration not only contributes to the dissemination of facilitators but also to the development of a contextual disaster educational curriculum. In terms of regulation, the RDMA of Padang City has also issued a legal instrument, namely Chief Executive Decree No. 223/Year 2019, which covers facilitation assignments and the stipulation of official target schools. The success of this implementation is reflected in increased awareness and knowledge, as well as in students' skills to address disasters, particularly in schools located in the tsunami red zone. Now, schoolchildren can learn to identify evacuation signs, know where to evacuate, and be trained in self-rescue with greater confidence and organization.

The successful application of DSS in West Sumatra was not possible without several best practices adopted by the local government and its implementing partners. One of the breakthroughs lies in the model of mutualistic partnership between the RDMA and NGOs developed on equal, transparent, and trust-building as well as clear role-playing principles. This fits into a work environment that is open to people who work together efficiently and effectively to use programming. Moreover, target schools were selected purposively, with emphasis on those located in high-risk areas. The training materials were not only theoretical but also integrated evacuation simulations and an introduction to local risk maps, and focused on strengthening the school community. Governmental support, including the provision of a formal structure, contributed to the program's sustainability. The RDMA is making state facilitators legitimate actors and instruments for on-the-ground program accountability.

According to the background above, the purpose of this study is to (1) analyze the difficulty of DSS policy design, which is also realized from implementation and governance level by comparative cases analysis (2) to find out obstructed elements and supporting elements in implementing DSS at disaster-prone area, (3) on that basis a better model of policy reconstruction design can be developed to support more inclusive, adaptive and participatory DSS governance.

2. LITERATURE REVIEW

The term Safe Schools in the Indonesian context refers to the integration of disaster risk reduction (DRR) into the country's education system, based on three core components: safe school infrastructure, school-based DRR, and a curriculum guided by DRR. Some related regulations in Indonesia implement these principles; however, their implementation remains problematic due to institutional and contextual constraints in certain regions. The policy orientation of disaster risk reduction education was also viewed negatively as overly technical and less participatory, particularly in resource-poor areas [34]. Furthermore, the proportion of access to disaster education, as well as the accessibility of disaster training or workshops, varied across urban and rural areas [35], creating a disparity in preparedness.

The notion of Safe Schools in this country is understood as embedding disaster risk reduction throughout the education system through three elements: safe learning facilities, school-based disaster management, and DRR integration into the curriculum. These principles are integrated into several directly related Indonesian legal regulations, although the contextual and institutional implementation across different areas varies. A review found that disaster risk reduction education policy has been criticized as a technocratic approach and as insufficiently participatory, particularly in limited-resource settings [34]. Additionally, this investigation raised concerns about the uneven access to disaster education between urban and rural areas, which undermines preparedness [35].

Adaptive governance highlights the critical role of flexible, learning-oriented, and multi-stakeholder modes of governance in addressing complex risks such as disasters [36]. This is pertinent to examining how DSS policies may need to be rebuilt to enable greater adaptive coordination across sectors and government levels. Secondly, institutional theory suggests that the success of policy is contingent on the interaction among formal structures, norms, and socially

shaped bureaucratic routines [37]. In the case of DSS, policies are frequently unconcerned, as they are not embedded in the budget regime, notions of what counts or performance, and organisational culture within educational organisations [38-40].

The co-production theory posits that public policies are more effective when they are created and implemented through collaborative efforts among state actors and communities [41]. The roles of the school community, teachers, parents, and the RDMA in developing ownership and sustainability of DSS are also main factors.

The second group is referred to as disaster smart schools, and partnerships among government, NGOs, and organizations in the area of disaster should be emphasized with mutual hardship for safer support of earthquake and tsunamis issues; educational disparity towards policy advocacy strategies to improve West Sumatra's governance on disaster education [42]. The article shifts the focus from policy structures to disaster risk reduction in West Sumatra, Indonesia, and calls for stronger governance. This educational focus can contribute to learning pathways and support DRR outcomes, as identified in the most recent Sendai Frameworks for Action, including addressing inequality and disaster education [3].

The authors emphasize the importance of systematic disaster education and community capacity building in West Sumatra, particularly for children, to reduce vulnerabilities and strengthen preparedness, underscoring the need for targeted policies and ongoing education in other disaster-prone areas [43]. The article focuses on the importance of holistic, decolonizing peace educational curriculum and teacher capacity in Indonesia to counter social injustices. It indicates that effective community-based education management and its flexibility are very important for developing resilience in disaster-prone areas such as West Sumatra [44].

The paper points out that achieving effective disaster education within disaster-afflicted schools relies on best-practice policies and community support, as well as overcoming obstacles such as the relevance of content and the availability of qualified teachers, to improve environmental knowledge and resilience in places such as West Sumatra [45]. The article outlines the importance of integrating disaster mitigation education into all subjects within the Indonesian curriculum, raising awareness of inequities in DME, and mandating the closure of such gaps through an updated policy focused on students who are born and growing up surrounded by hazards [46].

Comparative studies indicate that upscaling disaster education is more effective as a system reform than as a stand-alone approach. The Comprehensive School Safety Framework (CSSF) is a frequently cited source that embodies embedded learning within an inclusive package/coordinated policy and action agenda, safer school facilities, school safety/continuity management planning, and educational programmes for risk reduction. The essential lesson is that learning becomes scalable and sustainable only when governance, routines, and resources are harmonized at the school/district level with the curriculum, activities, and community preparedness [47].

In New Zealand, assessed drills have demonstrated that practice, unambiguous action scripts, and public visibility enhance protective-action knowledge and preparedness behaviour [48]. These align with Indonesia's DSS, particularly in low-capacity areas: use a minimum viable package, scale out through train-the-trainer and shared kits, and track a few realistic indicators to foster learning without overwhelming the system.

3. METHODS

To examine the challenges and opportunities in reconstructing the DSS policy, this research employs a descriptive qualitative analysis. We took this approach because it provides researchers with a chance to explore in depth the views and experiences of different stakeholders regarding the implementation of the DSS policy on the ground.

Data Types and Sources

Key information was gathered through semi-structured interviews with 35 respondents from the Province of West Sumatra. Informants included school principals, teachers, the Regional Education Office (REO), the RDMA, and local community committees. Purposive sampling was used to select informants based on their roles in implementing the DSS policy. Secondary data are obtained from national and regional policy papers, DSS program evaluations, and school preparedness data provided by the National Disaster Management Agency (NDMA), Indonesia's disaster risk information platform (InaRISK), and Education Management Information System (EMIS).

Application Usage

All interviews (n = 35) were transcribed, and NVivo 14 was used for systematic thematic analysis. The process of analytic coding involved: open coding to identify initial themes and sub-themes; axial coding to organise relationships between categories; matrix coding to ascertain the relationship between main themes and specific indicators, depicted in a heatmap.

NVivo was used to generate reference frequencies (counts of codes), which were then used to construct the findings matrix. Consequently, the number of informants and the depth of the interviews emerged as the main strengths of the qualitative data in this study. Through NVivo, this study presents conceptual maps and thematic matrices that reinforce the analysis's findings and also offer policy implications. Furthermore, adding this technology will lend further credence to the process because of the digital trail it would leave.

Analysis Techniques

a. SWOT analysis is used to identify the strategic strengths, weaknesses, opportunities, and threats of DSS policies.

b. NVivo-based Thematic Analysis helps extract and map thematic meaning from informant narratives.

c. Source triangulation was done by comparing interview data, official documents, and field observation results.

4. RESULTS AND DISCUSSION

All transcripts (n = 35) from five regencies/cities in West Sumatra Province were analyzed in NVivo 14. The *open coding process* yielded 162 initial codes, which were subsequently reduced to 6 main themes and 21 sub-themes that explained the obstacles and opportunities for DSS policy reconstruction. The following is a narrative of each theme accompanied by empirical indicators (number of references

= R; percentage of text coverage = C%).

Normative & Less Contextual Policy Design

Analysis indicates that policies remain "one-size-fits-all." In NVivo, 34 sources of information (R = 34 | C = 6.8%) highlighted the absence of technical guidance appropriate to local disaster typologies (Table 2).

Table 2. The absence of technical guidance appropriate to local disaster typologies

Indicator	Short Description	R	C%
Absence of Local Annex	There are no specific technical attachments per province/district.	12	2.2
Generic SOP Templates	School SOP copied and pasted from the internet without risk adaptation	9	1.7
Curriculum Misalignment	DRR is only an extra material, not yet embedded in the Indonesia's Independent Curriculum	13	2.9

Fragmentation of Governance & Cross-Sector Coordination

Forty-two sources of information (C = 8.5%) mapped the weak synergy among actors and the emergence of institutional fragmentation (Table 3).

Table 3. Emergence of institutional fragmentation

Indicator	Short Description	R	C%
RDMA Not in the School Board	RDMA is rarely involved in the Principal's Working Meeting	14	2.4
Dual Reporting Lines	School reports to the Education Office; RDMA cannot get data	11	1.9
No Task Force Regulation	There is no Governor/Regent's Decree regarding the DSS Task Force	17	4.2

Government informants predominantly attributed implementation gaps to resource constraints and the absence of earmarked budgets, whereas school leaders emphasized ambiguous technical guidance and ad-hoc coordination routines. This divergence suggests that implementation failures are reinforced by misaligned problem framings across governance levels, thereby weakening accountability and encouraging symbolic compliance rather than operational preparedness.

Limited HR Capacity

28 sources of information (C = 5.3%) indicated a teacher-principal competency gap, hampering human capability (Table 4).

Table 4. Emergence of institutional fragmentation

Indicator	Short Description	R	C%
Untrained Teachers	Teachers have never participated in formal DRR training	10	1.8
High Staff Turnover	The principal moved before the DSS program was completed	6	1.0
Simulation as Ceremony	Evacuation drills are carried out to fulfill the agenda	12	2.5

Regional & Resource Disparities

This theme emerged most frequently (46 sources; C = 9.7%), supporting the concept of disaster education inequality (Table 5).

Unsustainable Funding & No KPIs

Twenty-five sources of information (C = 4.6%) highlighted the absence of specific budget lines and performance indicators in the Strategic Plan (Table 6).

Table 5. Disaster education inequality

Indicator	Short Description	R	C%
Underdeveloped Regions' Infrastructure Gap	Schools in remote area have no permanent evacuation routes	17	3.8
Logistics Delay	Procurement of Portable Fire Extinguisher & evacuation signs late >12 months	11	2.0
Bandwidth Limitation	DRR e-learning failed because the internet was weak	18	3.9

Table 6. Specific budget lines and performance indicators

Indicator	Short Description	R	C%
No DSS Tag in School Operational Assistance	Regular School Operational Assistance does not contain a DSS account code	8	1.6
Project-Based Funding	CSR/NGO project 1-3 years, no exit strategy	9	1.7
KPI Vacuum	DSS is absent from the Education Office's KPIs	8	1.3

Table 7. Theme emerged as an opportunity stream

Indicator	Short Description	R	C%
Youth Climate Clubs	High school students form a disaster preparedness club	6	1.1
Mobile Early Warning	SMS-gateway evacuation pilot	5	1.0
Digital Dashboard Demand	The principal asks for a preparedness measurement application	6	1.0

Community Participation & Technology as an Opportunity

Although less frequent (17 sources of information; C = 3.1%), this theme emerged as an opportunity stream (Table 7).

Synthesis of Findings

a. The normative nature of policies and institutional fragmentation explain the low number of safe schools (26.4%).

b. Regional disparities highlight the need for affirmative finance and offline technology support.

c. Youth participation & technology becomes a policy window for policy improvement, in line with the adaptive governance framework.

Such findings reinforce the need for the reincarnation of DSS policy design, informed by contextual guidance, cross-sectoral taskforce arrangements, performance-based funding schemes, and digital dashboard integration, harnessing energy from youth movements in schools to reinforce culture and DRR awareness. The findings of this study also indicate several systemic issues related to the implementation of the DSS policy in Indonesia, identified through qualitative data analysis using NVivo. Six themes were appropriately identified as interrelated problem nodes: normative policy design, fragmented governance, poor human resource (HR) capacity, regional disparities and unsustainable funding, and community participation & technology potential as

opportunities.

First, the DSS's policy design is perceived as highly normative and not grounded in the local risk realities of each region. After coding the NVivo search results, 34 references were identified that mentioned the lack of technical attachments at the regional level. SOPs used in schools tend to be overly general and, in some cases, are taken directly from the internet, with no consideration for local disaster types or features. Furthermore, the application of DRR material in the curriculum is not yet very favourable for pupils; most teachers deliver it only as a CNP activity rather than as core learning aligned with curriculum objectives.

Second, there are serious problems in governance and cross-sector coordination. The division of responsibilities among the Ministry of Education, Culture, Research, and Technology, RDMA, and authorities has meant that no single body bears full responsibility for DSS operations. 42 information sources in NVivo indicate the non-involvement of RDMA in school planning forums and the absence of a regional head decree to establish a cross-sector team for DSS management. This is consistent with the institutionalism concept that disconnected institutions can impede policy execution [37].

Third, the capacity of school human resources to support DSS policies is also low. Up to 28 information sources indicate that the typical primary teacher and principal have never attended a specific course on disaster education. In other instances, new principals were rotated before DSS could be implemented long enough to achieve meaningful sustainability. Indeed, evacuation simulation drills, as preparedness exercises, were conducted ceremoniously rather than based on systematic assessment. This depicts the low level of human capability development, as initiated by Sen [49], in which persons or institutions lack the capacity to respond to hazard risks.

Fourth, conclusions are dominated by regional differences. It is strongly recommended that evacuation routes, fire extinguishers, and reliable internet connections for accessing online DRR learning are not available in these types of schools, especially in regencies/cities. In NVivo coding, 46 sources of information reflect logistical and accessibility barriers.

A fifth issue concerns the chartering of DSS policies. Nowhere in the SOAF or PSAF could a specific budget code or nomenclature be found that specifically covered DSS activities. Using NVivo, identify 25 sources of information on the lack of KPIs or sustainable budgeting tools. Projects in DSS primarily depend on long-term funding from donor agencies or corporate corporate social responsibility (CSR) initiatives and lack exit strategies.

Sixth, at present, community involvement and digital technology are not at their prime; however, both show promise as avenues for shaping DSS policy. Seventeen sources reported positive actions, including the establishment of student-led disaster preparedness groups, the use of SMS gateways as early warning systems, and school principals' requests to create a digital dashboard for school preparedness. This indicates the presence of a policy window, as described by King [50], in which opportunities to change policy may arise when problems, solutions, and political streams converge.

These results generally support the conclusion that the current reconstruction of communication DSS policy should focus on promoting flexible, locally applicable technical guidelines; intersectoral teams with regional regulations as facilitators; teacher training; teacher competency enhancement; and budget reforms based on service performance across digital monitoring systems. Moreover, the active involvement of school communities and local technologies has the potential to address structural and spatial constraints and to enhance DSS governance in the future.

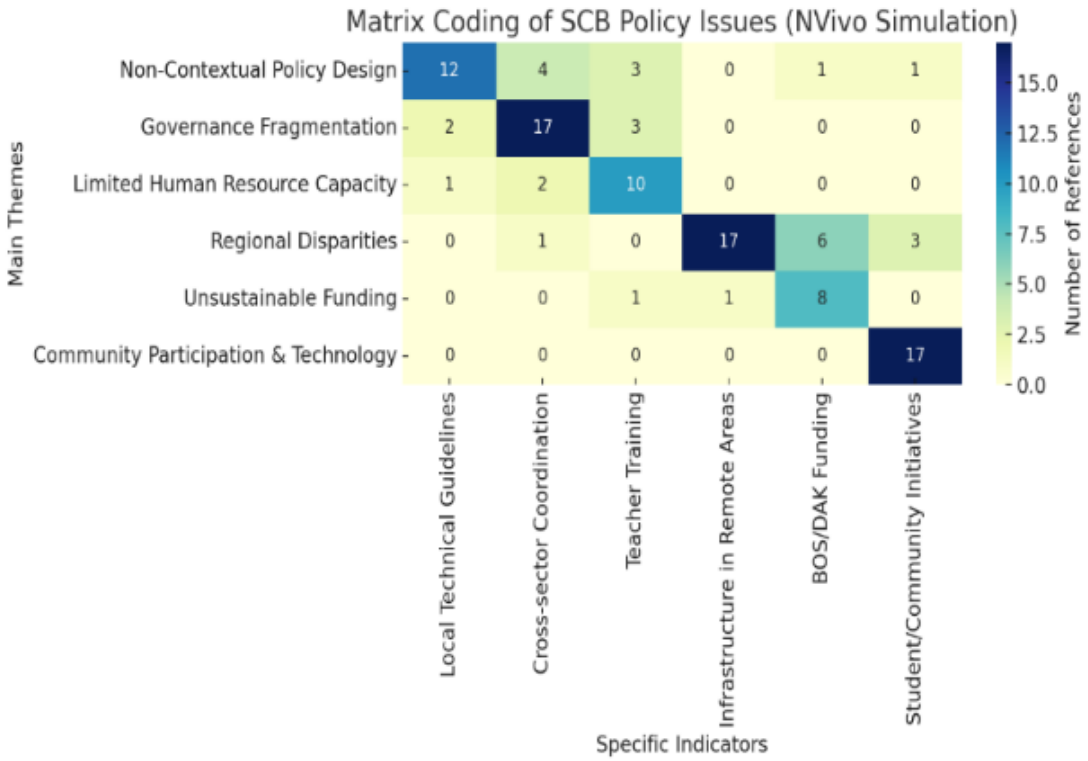

Figure 1. Disaster Smart School Research findings coding matrix heatmap

Table 8. Disaster Smart School research findings coding matrix

Main Theme	Local Technical Guide	Cross-Sector Coordination	Teacher Training	Infrastructure in the 3T Region	School Operational Assistance/Special Allocation Fund	Student/Community Initiatives
Non-Contextual Policy Design	12	4	3	0	1	1
Fragmentation of Governance	2	17	3	0	0	0
Limited HR Capacity	1	2	10	0	0	0
Regional Disparities	0	1	0	17	6	3
Unsustainable Funding	0	0	1	1	8	0
Community Participation & Technology	0	0	0	0	0	17

Strong thematic connections emerge from the NVivo coding matrix linking DSS policy issues to field-level implementation indicators. The rows of the matrix reflect key themes, and the columns indicate specific indicators that serve as focal points of action. Uncontextual policy design is primarily associated with the absence of local technical support. The theme governing fragmentation is predominantly operationalised through the indicator Cross-Sector Coordination, which indicates a lack of policy coherence among these institutions. Low human resource capacity correlates with poor teacher training. On the other hand, regional disparities take the lead in terms of three distinct issues. Alternatively, community participation & technology has the potential to leverage community-oriented policies and digital technologies. The latter matrix provides the rationale for developing more responsive and evidence-based DSS measures (Figure 1).

Based on Table 8 above, the thematic connection between DSS policy questions and parochial indicators in the field is evident in our codings. The rows in the matrix symbolise key themes identified in policy documents and interviews, while the columns represent key indicators that are crucial junctures in the implementation of DSS policies. It can be inferred from the matrix that non-contextual policy design is the most strongly associated theme, based on parameter-local technical guidance derived from 12 sources of information. This reinforces the need to reconstruct policies in accordance with local policy configurations. The governing fragmentation, meanwhile, ranks No. 2 and also ranks extremely high on the cross-sector coordination indicator, with 17 information sources. This can be attributed to the lack of synergy between RDMA and the Education Office Agency, which would seem most fundamental to adaptive governance of education disaster policy. Many informants indicated that there is no permanent coordination space and that an institutional architecture to ensure the continued operation of DSS in the region is absent. The category-limited HR capacity was the most frequent tag for teacher training, demonstrating that the opportunity to have a DRR program systematically impairs teachers and school managing directors'' proficiency in responding to disasters and production of operational SOPs.

There is an element of regional disparities in the relationship at a very high rank for infrastructure (17 contents) and for Special Allocation Fund/School Operational Assistance (6 contents), which means that many schools located at disadvantageous locations do not have evacuation routes, safety equipment, or simply proper budget. It is consistent with the notion of disaster education inequality and further supports the claim that DSS policies should prioritise spatial equity. Lastly, although the source is less common than other themes, the theme Community Participation & Technology indicates potential for bottom-up capacity building. Seventeen sources of information on student and community initiatives emerged, including the establishment of disaster-preparatory clubs by students, the role of social media in disaster socialization, and the involvement with education activities of evacuation training by parents. Accordingly, this is a favorable sign for building more participatory and community-prepared policies, while also leaving room for the integration of digital technology into preparedness strategies.

In general, this coding matrix gives a powerful visual and quantitative impression of how each DSS policy theme is distributed and contributes to these macro-level indicators. These results not only reinforce previously studied field narratives but also provide an essential foundation for developing a more accurate, evidence-based framework for reconstructing local policy.

Policy Reconstruction

Policy Reconstruction Policy reconstruction is a mechanism of updating the content, form, and operation of public policy in such a way that would allow it to be more applicable, effective, and sensitive to the changing environment. From the perspective of the DSS policy in Indonesia, the urgency of reconstruction stems from the incongruity between normative goals and their on-the-ground realization. The findings of data analysis using NVivo demonstrate the complexity of interpreting and reframing examples in relation to policy reconstruction, as described in this research [51] and in the post-positivist policy reconstruction approach in reference [52].

Problem Reframing

The idea of policy reconstruction recognizes that reformulation is an essential first step. Results: The study indicates that DSS policies tend to overemphasize normative dimensions without contextualizing specific field problems. The reframing of the issue in this arena is not that we have an implementation problem, but that it was a failed design to begin with, one that lacked understanding of local variation and institutional capability. In other words, a risk-informed design approach for localized hazards should be adapted to reconstruct the DSS policies.

Reconstruction of Policy Contents and Aims

According to the NVivo findings, the absence of context-specific SOPs, the lack of teacher training, and the use of internet-copied SOPs are indicators of weak articulation of operational policy objectives. As part of a broader redefinition of policy, the goals of DSS must be reframed to develop not simply safe schools but adaptive, collaborative,

community-preparedness governance. This is in line with the conception of policy development [53], which must address both what works and what is important in its social context.

Reconstruction of Policy Actors and Institutions

Reordering of roles and the relationship between actors are significant components of reconstruction theory. The facts, such as poor cooperation among segments, the inactive form of RDMA according to schools, and the lack of community, indicate that this institution is non-adaptive [37]. To reduce and manage the disaster risk, it is required to change the actor structure through the establishment of a Regional Disaster Smart School Task Force, which is composed of elements of the Education Office Agency, RDMA, and the school committee, as well as legalized in the regional head regulation, so that it has implementative power.

Reconstruction of Implementation Mechanism

The application of reengineering to policy underscores the importance of redesigning both the implementation process and the instrument. Field observations. In practice, disaster education in schools is minimal, and exercises are theoretical; schools lack a preparedness assessment program. The reproduction of the actual process is through:

a) Development of flexible and modular technical guidelines based on the nature of the regional risk.

b) Development of a school digital readiness dashboard that uses the information from Ministry of Education, Culture, Research, and Technology, NDMA, and RDMA.

Retrofit of Instruments and Financing Strategies

Policy reforms are not the only issues that must be addressed within these new financing instruments. Accordingly, it is established that DSS has no authority code for the School Operational Assistance budget. Therefore, realignment is needed through:

a) Identification of DSS special account code in Regular School Operational Assistance Funds and inclusion of corresponding DSS performance indicator in the Minimum Service Standards (MSS) on education.

b) CSR funding, Climate finance (green fund), result-based budgeting, and various blended financing models.

Reconstruction of Social Interaction and Participation (Deliberative Re-Engagement)

Policy is being reshaped through a deliberative reconstruction, shaped not only by the bureaucracy but also through local involvement. Induct insights of NVivo that there is a grassroots dimension to the development of student alert clubs and school principals seeking an early warning mechanism. Therefore, the rebuilding process should include: First, the co-production of preparedness documents by schools, communities, and local authorities. Second, direct student participation in community-oriented school readiness training, simulations, and surveillance.

By adopting the framework of public policy reconstruction theory, this study suggests the need for an all-encompassing reconstruction not only of the content but also of the actors, mechanisms, and incentives within the DSS policy in Indonesia. This reconfigured DSS policy should move from a symbolic policy to an engaged, context-based, and spatially justice-oriented policy. This will ensure that schools are not merely aware of disasters but also ready and resilient in confronting their impacts within their localities.

More details of the consequences arising from the policies and strategies for DSS reconstruction can be observed in Table 9 below:

Table 9. Policy implications and strategies for implementing Disaster Smart School

Strategic Aspects	Policy Implications	Implementation Strategy
Contextual Policy Design	There is a need to decentralize technical guidance and to modularize SOPs based on local risks.	Prepare DSS technical guidelines for each risk (e.g., earthquake, flood), with local attachments from local governments and universities.
Cross-Sector Coordination	It is necessary to form cross-sector teams in the regions through regional head regulations.	Through the DSS Task Force, integrate it into the Regional Medium-Term Development Plan and the Development Planning Deliberation Forum, pursuant to a Governor/Regent Decree.
Strengthening Human Resources Capacity	DRR training must be integrated into the teacher professional development system (CPDMIS).	Develop DRR micro-credentials and include them in the CPDMIS for teachers and principals.
Results-Based Funding	Need for DSS account code in the School Operational Assistance and incentive scheme for schools that meet preparedness indicators.	Implement a results-based budgeting framework and a CSR partnership for schools in underdeveloped regions.
Digital Monitoring & Evaluation	There is a need for a national dashboard system to monitor school preparedness in real time.	Develop an integrated preparedness dashboard with EMIS (Ministry of Education) and InaRISK (NDMA)

Contextual Policy Design: Local Risk-Based Modularization

One of the key implications for DSS policy reconstruction is the need to shift from a national normative model to a contextual, modular approach responsive to on-the-ground risks. Field observations indicate that a one-size-fits-all approach characterizes existing DSS policies, and their flexibility does not make them adaptable to areas facing diverse threats. In this regard, the recommendation in the study [54] Sendai Framework Mid-Term Review suggests that only a local risk-based approach will ensure the success of disaster-resilient education policies. Thus, it is recommended that a Guideline to the Technical Standards of DSS for Risk Category be developed, together with the appendix used by local governments and universities. This also resonates with the concept of tailored policy development [55], which emphasizes that fit with local socio-ecological conditions is of great consequence for the effectiveness of public policies.

Cross-Sector Coordination: Strengthening Regional Institutions

Cross-sectoral capacity integration is an essential factor in

DSS policy governance. The fragmentation in institutions, as revealed in the study—RDMA, the Education Office Agency, and schools are operating silos, is a sign of failed institutional integration. Across various governance theories and systems, Head [56] emphasized that inter-actor collaboration and consistent role division are key to addressing complex problems such as education disasters. The recommended implementation strategies are to establish a regional DSS Task Force following a Governor/Regent Decree and to integrate the DSS into the Regional Medium-Term Development Plan and the Development Planning Meeting Forum, so that it is mainstreamed into regional development planning rather than sectoral plans. This serves, at the same time, as an institutionalized mechanism to ensure policy coherence among regional presidencies.

Strengthening Human Resources Capacity: Integration of Training into Continuing Professional Development Management Information System (CPDMIS)

School human resource capacity is the fulcrum of DSS success, but it is currently very weak. According to the study [57], the success of school-based disaster risk reduction interventions largely depends on people's level of risk comprehension and the way safety measures are practiced. One of the key recommendations is to embed DRR training within CPDMIS and to develop online micro-credentials for teachers and principals. This process is consistent with a model of policy capacity building that emphasizes the need for ongoing, locally based training [58].

Results-Based Financing: An Incitement for Spatial Equity

The financing barrier is key because the DSS policy lacks a clearly defined and sustainable funding mechanism. The studies [54] institution suggests that the DRR policy is financed through result-based financing, which rewards educational units that meet preparedness indicators. For the reformation of the DSS Policy in this aspect, it is necessary to set up a program with a special account code in the school operational assistance subsidy or physical education special allocation fund, a results incentives system that can induce schools to carry out the DSS standard positively. This approach would also need to consider spatial equity by making positive allocations to schools in the frontier, outermost, and disadvantaged regions, through cooperation with private-sector CSR or green-transition funding. This is an emerging public policy trend in which sustainability, efficiency, and inclusion are embedded in policy financing design [57].

Table 10. Comprehensive SWOT Matrix for the Disaster Smart Schools Policy

Internal	Strengths (S)	Weaknesses (W)
Policy & Regulatory	• A national legal umbrella already exists (Minister of Education and Culture Regulation No. 33/2019) and aligns with the Sendai Framework. • School-Safety language is echoed in the National Disaster Management Plan.	• Policy text is highly normative and gives little operational guidance for diverse local hazards. • DSS has no Key Performance Indicator (KPI) in the education sector Strategic Plan, so provincial/district units rarely treat it as a priority.
Institutional Capacity	• A small but growing core of "model schools" (~26% of at-risk schools) and trained rapid-response teams can serve as champions.	• Cross-ministry/agency coordination is weak; RDMA involvement is ad-hoc. • Fewer than 40% of schools have a functioning SOP or mapped evacuation route.
Resources & Human Capital	• Post-disaster public awareness is relatively high, and teachers are motivated when training is available.	• Only a minority of teachers/headmasters have received DRR training; DRR is scarcely embedded in Indonesia's Independent Curriculum.
Data & Technology	• Nationwide push for EdTech after COVID-19 has normalized digital learning and dashboards.	• No unified, digital monitoring-evaluation platform; readiness data remains manual and fragmented.
Financing	• CSR programs from SOEs and private banks already fund sporadic school-safety upgrades.	• There is no dedicated budget line in School Operational Assistance or Physical Special Allocation Fund; programs rely on short-term donor projects.
External	**Opportunities (O)**	**Threats (T)**
Policy Environment	• Government's new Climate-Resilient Development Roadmap (2025–2045) explicitly mentions "safe schools". • Decentralization allows provinces to craft context-specific DRR regulations.	• Political-budget shifts every five years can deprioritise DRR education. • Overlapping mandates between NDMA, Ministry of Education, Culture, Research and Technology, & MoHA risk policy fatigue.
Technology & Innovation	• Rapid diffusion of low-cost sensor networks, IoT early-warning, and AI-based hazard mapping.	• Digital divide—limits access to EdTech.
Funding Landscape	• Green/climate-resilience funds and multilateral loans increasingly accept "safe schools" as eligible expenditure.	• Macroeconomic slowdowns (post-pandemic debt load) could squeeze education and DRR budgets simultaneously.
Socio-Cultural Context	• Rising youth activism on climate issues can be channeled into peer-led DRR education.	• Disaster mis-/disinformation and low risk perception persist in remote communities.
Hazard Trends	• Frequent but moderate events provide learning laboratories to pilot and refine programs.	• Intensifying hydro-meteorological hazards amplifies potential losses and strains local capacity.

Digital Monitoring & Evaluation: School Readiness Dashboard

The DSS policy monitoring and evaluation system should be improved through a digitized, data-driven, and nationally integrated approach. There is currently no digitized, open-source school readiness assessment service. To address this challenge, the proposed solution is to develop a national school preparedness dashboard that will draw data from both EMIS and InaRISK. Decision makers are encouraged to digitize the system as part of DRR policies, not only for efficiency and accountability but also for policy makers to make effective evidence-based decisions. Digitizing government monitoring and evaluation (M&E) systems can improve the efficiency and effectiveness of program

evaluation, and with more targeted and evidence-based decision-making processes and accountability oversight will be strengthened [59, 60].

The five primary DSS constructs conceptualized and described in the proposed DSS reconstruction table illustrate the imperative to shift the dominant paradigm of a symbolic administrative system toward a new policy paradigm articulated around contextual, collaborative and performance-based policy systems. By drawing on contemporary public policy literature, such as adaptive governance, policy modularization, and result-based financing, Indonesia can develop a disaster-resilient education system. This rebuilding strategy is also crucial for achieving the SDGs, as emphasized in the National Medium-Term Development Plan 2025–2045, which emphasizes system resilience and social inclusion.

SWOT Analysis

Furthermore, based on the research findings, a SWOT analysis was conducted with detailed explanations as shown in Table 10.

Although the mapping of the entire SWOT landscape is provided in Table 10, its implementation in low-cap districts should prioritize this explicitly to avoid developing an exhaustive reform agenda that would be impractical to implement in one go. Hence, the SWOT cells are converted to a staged strategy based on three decision criteria: (i) anticipated reduction in risk to student safety, (ii) feasibility within existing local administrative capacity, and (iii) resource intensity. Equity is considered a cross-cutting principle: remote and high-risk area actions, which have the most significant impact on reducing disaster education inequality, are prioritised.

Priority 1 (0–12 months): Establish governance and regular work patterns that are low-cost yet high-value. This tier ensures that minimum standards and accountability are sufficiently defined (addressing W1, W10) by releasing modular hazard specific technical annexes and integrating a limited number of DSS indicators into district education KPIs; formalizing the light inter-agency DSS Task Force via Governor/Regent decree (addressing W2, T1); and mandates basic SOPs, evacuation mapping established at target schools to have drills at least twice per year (addressing W3,15). These activities are based more on orderliness and arrangement than on high capital investment and are appropriate for low-capacity localities.

Table 11. SWOT action strategy

Problem-Table Issue (Internal/External)	Mapped to SWOT Cell	Leveraged S/O	Strategic Implication
Normative, non-contextual regulation	Weakness (W1)	S1 – Existing national legal umbrella; O1 – provincial autonomy	Issue detailed technical guidelines jointly with RDMA & universities; allow provinces to customize annexes.
Poor cross-sector coordination	Weakness (W2) & Threat (T1)	S2 – Model-school champions; O1 – new climate-roadmap mandates	Formalize an inter-agency "Safe-School Task-Force" in the Governor's Regulations; use the schools as a pilot model.
Low compliance (only 26% DSS)	Weakness (W3)	S2, S3 – trained response teams, public awareness	Pair compliant schools with non-compliant neighbors in a "buddy system"; allocate School Operational Assistance Performance incentives.
Regional disparities (3T areas)	Weakness (W4) & Threat (T2)	O2 – Decentralized rule-making; O3 – donor climate funds	Direct Special Allocation Funds-DRR plus blended finance to the hardest-hit districts; embed digital off-grid solutions.
Limited teacher capacity	Weakness (W5)	S3 – teacher motivation; O2 – EdTech growth	Integrate micro-credentials on DRR into the national Teacher Learning Management System (CPDMIS).
No digital M&E platform	Weakness (W6)	O2 – IoT / AI innovation	Develop a national "Safe-School Dashboard" linking EMIS and NDMA InaRISK data.
No dedicated funding line	Weakness (W7) & Threat (T3)	O3 – climate-resilience funds; S1 – CSR precedent	Create a results-based budgeting scheme: schools unlock funds after passing readiness audits.
Low community participation	Weakness (W8)	S3 – high post-disaster awareness; O4 – youth activism	Launch student-parent disaster clubs; embed drills in annual community days.
Limited technology utilization	Weakness (W9)	O2 – EdTech diffusion	Pilot gamified DRR modules and VR evacuation drills in selected provinces.
Absence of the KPI/Minimum Service Standards indicator	Weakness (W10)	S1 – policy umbrella; O1 – climate-roadmap	Add percentage of schools meeting DSS standards.

Priority 2 (1-3 years): develop capacity and targeted resources to address the gap between intention and practice. Once minimal routine maintenance is in place, districts can expand their training and supervision by embedding DRR micro-credentials within CPDMIS and using train-the-trainer cascades (answering W5, harnessing O2). Simultaneously, a modest outcome-based fund may be piloted to assist low-capacity schools with small top-ups contingent on observable indicators, thereby lowering W7 while safeguarding equity. Start digital monitoring W6 offline-first dashboard do rather than expensive bespoke systems linking existing EMIS with InaRISK data Controlled resource demands.

Priority 3 (3–5 years): Disseminate more expensive innovations and structural upgrades once the foundations of the system are established. Higher on the scale within this tier lie a strengthened EdTech, IoT early-warning integrated into high-risk clusters, and wider infrastructure retrofit through blended finance to support climate-resilience uptake (opening up O3 while addressing the downsides of T2 and T3). Sequencing is essential: state-of-the-art digital tools and infrastructure investments are most effective when they reinforce governance routines that have already been institutionalized, rather than when they attempt to compensate for their absence (Table 11).

In more practical terms, the SWOT strategy can be made operational as a minimum viable package first rule: until components of Priority 1 are demonstrably present and operational, districts should not proceed to Priority 2 or 3. This process transforms the SWOT into an implementable roadmap with precise sequencing and resource-sensitive decisions.

Strategic sequencing is essential: implement Priority 1 governance and minimum routines first, then expand capacity and targeted financing (Priority 2), and only then scale up higher-cost technologies and infrastructure (Priority 3) to keep the recommendations feasible for low-capacity districts.

Analytical Highlights

A. Leverage Strengths & Opportunities to Correct Weaknesses: Example: the existing regulatory umbrella (S1) and decentralized autonomy (O1) can be used to develop localized technical annexes that address the "normative-only" weakness.

B. Mitigate Threats by Reinforcing Strengths: Political deprioritisation (T1) can be mitigated by embedding DSS indicators into mandatory national KPIs—an action facilitated by the existence of a legal framework (S1).

C. Exploit Opportunities for Quick Wins: Digital-education momentum (O2) offers a cost-efficient path to scale teacher training (addressing W5) and set up the long-overdue monitoring dashboard (addressing W6).

D. Address Equity Gaps: Blended finance from climate funds (O3), coupled with CSR (S1), enables targeted investment in Remote Areas, thereby addressing the most severe weakness (W4) and threat (T2).

The DSS policy in Indonesia faces structural and institutional challenges that can be examined using classical public policy theory, particularly its cycle model input data [61]. In the production process, DSS policy has become a regulated product and is subsequently regulated under the Minister of Education and Culture Regulation Number 33 of 2019. Based on this model, the mere legislation is not enough for the policy effect when there are no legitimation and destigmatization parts as part of an implementation and evaluation cycle, which respond to local processes. This is the primary drawback of SWOT: it is a normative policy or approach without contextual guidelines and lacks performance-based indicators.

Additionally, applying the institutional theory perspective from the researchers (60), it is possible to argue that insufficient cross-sectoral coordination and overlapping responsibilities between the Ministry of Education, Culture, Research, and Technology, NDMA, and local governments produce institutional fragmentation. This contributes to the low degree of synergy in DSS implementation, as indicated by the SWOT weaknesses and threats columns. The lack of a dedicated unit or task force to promote integration at the regional level also hinders the translation of policies into practice.

The adaptive governance perspective emphasizes institutional flexibility, shared learning, and collaborative mechanisms in managing dynamic risks, such as natural disasters [62-64]. From this perspective, the educational system's limited flexibility in tailoring DSS policies to local contexts is a key limitation. For instance, schools in remote locations have more unequal access to preparedness infrastructure and training. This is consistent with evidence that disaster education inequality in Indonesia indicates that risk exposure is greater among individuals who lack equal access to risk-mitigation education [65, 66].

In terms of capability theory [49], DSS policies that do not provide resource support and expert training for teachers and principals impede the development of human capabilities to respond to emergencies. The schools are passive and dependent elements, no longer able to function in terms of their capacity as adapting units within a disaster management system. Participation rates in the school community, including among parents and students, also indicate the inadequacy of policies in fostering inclusive collective agency [67, 68].

From a policy perspective, the SWOT analysis highlights an opportunity space to bolster DSS through technological devices, augmented financial resources from green funds and multilateral donors, and youth activism on climate change-related issues. According to the Multiple Streams Framework [50], policy windows emerge when the problem stream, policy stream, and political stream intersect, thereby facilitating deliberative policy reconstruction. This opportunity remains open, even though the government has included disaster-resilient education in the National Long-Term Development Plan.

For DSS policies to be more adaptive and impactful, a co-production approach [41] is instrumental: policies should be designed and implemented in cooperation with the government, educational institutions, RDMA, communities, and the private sector. This is what is recommended in the SWOT synergy strategy column, namely developing a school readiness dashboard, linking it with the Ministry of Education, Culture, Research and Technology and NDMA data; incentive-based budgeting linked with preparedness parameters based on which schools have done their homework; evolving DRR training micro-credentials for teachers through the CPDMIS system.

5. CONCLUSIONS

This article demonstrates that substantial, structural, and inherent implementation problems continue to hinder the implementation of the DSS policy at the school level in Indonesia. Using interview data and institutional mapping, the study demonstrates a state of continued policy on paper in which formal DSS components exist but operational functions, risk assessment, drills, coordination, and improvement are either weak or absent. The most pressing constraints are cross-sector fragmentation, disparate district- and school-level capacities and resources, and a monitoring culture focused more on reporting than on learning.

At a conceptual level, the findings contribute to a reconstruction of the public policy lens by revealing that DSS underperformance is not merely about inaction but also reflects incoherence and misalignment between policy ambition, instrument choice, and accountability relations. DSS design remains normative administrative and underinvests in enabling instruments such as easily understandable minimum service standards, practical competencies for teachers and principals, and predictable support for basic levels of preparedness. The study also helpfully conveys that the problem is framed differently across levels of governance: government informants highlight fiscal and logistical constraints. At the same time, school leaders report unclear directives and ad hoc coordination. This divergence helps

explain why responsibilities spill across agencies and why compliance can be merely cosmetic rather than operational.

To make the plan politically feasible in low-capacity areas, it recommends a staged minimum viable preparedness pathway rather than an overly ambitious package of reforms implemented simultaneously. Phase 1 must focus on low-cost, high-yield basics at the school level: simple SOPs, evacuation maps, and signage in each school for staff and children occupying the facility; once or twice yearly drills supervised by a small team to create an in-house cadre of school safety officers. As a rule of thumb, it could be introduced for IDR 10–30 million per school for initial setup and approximately IDR 3–10 million per year for refreshes and drills. Concurrently, districts need to develop a light cross-sector coordination mechanism through the DSS Task Force, with focal points, simple reporting templates, and quarterly meetings. Between each phase, increasing community participation such as student clubs, parent/community training, and local leaders may require only minimal resources to maintain, while building a culture of risk and ownership.

INCD Phase 2 should build capacity and equity through training-of-trainers and by embedding preparedness in teacher and principal professional development. This should be accompanied by small, results-based top-up grants for low-capacity schools with few visible readiness indicators. Phase 3 is when we can scale and learn through digital M&E but only once minimum standards and coordination routines are in place. An offline-first dashboard based on existing tools may cost approximately IDR 10–30 million per district, whereas a fully customized system might cost IDR 150-500 million to develop and maintain; thus, digitalization should serve as an accelerator of functional preparedness, not its replacement. Ultimately, DSS effectiveness is contingent on policy ambition aligning with local capacity: finance minimum standards, institutionalize coordination, and develop learning loops before scaling more sophisticated solutions.

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