Rethinking Floods and School Mitigation in Indonesia: A Historical – Policy Evaluation of Anthropogenic Disasters and Ecological Awareness

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Abstract. Following the 2004 Aceh tsunami, disaster mitigation education in Indonesia underwent a significant transformation, shifting from a reactive emergency response toward a preventive paradigm. However, the escalation of hydrometeorological disasters, such as floods, landslides, and extreme weather, demands a shift toward disaster risk reduction and prevention. This study aims to analyze the historical dynamics of disaster mitigation education policies in Indonesia from 2004 to the present. Utilizing a descriptive qualitative approach integrated with the historical method (heuristics, source criticism, interpretation, and historiography), this study traces the implementation of Law No. 24/2007 and the establishment of the National Disaster Management Authority (BNPB) as pivotal catalysts in developing formal education through the Disaster-Prepared School (SSB) program, environmental education, and mitigation learning materials. Nevertheless, current implementation remains heavily focused on technical-procedural aspects during disasters, largely failing to address core issues such as environmental degradation, land-use conversion, uncontrolled development, and weak regional spatial planning. Through a case study of flood disasters, this research demonstrates that disasters are not merely natural phenomena but are also driven by contemporary human activities and development policies. Consequently, this study emphasizes the urgent need for a paradigm shift in formal mitigation education moving away from a strict focus on technical safety toward fostering a more critical, reflective, and sustainable ecological consciousness.

Keywords: Ecological Consciousness, Flood Mitigation, Disaster Education, Environmental Awareness.

1 Introduction

Geographically, Indonesia is an archipelago situated within the Ring of Fire and lies at the junction of the world's major tectonic plates—namely the Indo-Australian Plate and the Eurasian Plate—which makes Indonesia one of the countries with a high level of disaster risk. Based on analytical data, there are several types of disaster hazards that predominantly occur in Indonesia, namely earthquakes, tsunamis, landslides, volcanic eruptions, floods and droughts [1]. Among these various disaster threats, floods are the most prevalent in terms of frequency and impact. Analysis of disasters

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over a long period of time shows that floods (40 per cent) and earthquakes and tsunamis (27 per cent) have the most significant impact on communities, both in terms of loss of life and economic losses [2].

The risk of disasters in Indonesia has increased significantly according to BNPB data. In 2025, the BNPB reported that 4,727 natural disasters occurred during that year, the vast majority of which were hydrometeorological disasters, particularly floods. Floods in Indonesia are no longer entirely natural disasters; rather, they have shifted substantially towards being anthropogenic disasters, exacerbated by human activities and decisions [3]. The high frequency of disasters in Indonesia demonstrates that disaster risk management is an urgent necessity. The ongoing crisis of natural disasters occurring every year demonstrates that there has been an increase in both the frequency and intensity of disasters in Indonesia.

The prevalence of hydrometeorological disasters, particularly floods, suggest that the threat of disasters in Indonesia can no longer be understood solely from a geological perspective. A study on flood mitigation policy by the Directorate-General of Facilities and Infrastructure states that there are 5,590 major rivers in Indonesia, 600 of which have the potential to cause flooding [4]. Floods are one of the most widespread and frequent natural disasters in the world. On average, they affect nearly 70 million people every year [5]. Uncontrolled deforestation and large-scale land-use conversion in upstream areas have destroyed natural hydrological systems, causing rainfall that should have been absorbed into the ground to instead become destructive surface runoff.

This situation indicates that disasters are no longer understood merely as natural phenomena, but also as consequences of human actions. Therefore, mitigation efforts must not merely focus on emergency response after a disaster has occurred, but also require a more systematic approach. Substantial efforts have also been made to integrate Disaster Risk Reduction (DRR) into the education sector [6]. It is important to understand how disasters affect students' safety and well-being, including the quality of learning, and how any potential decline in the quality of learning can be adequately assessed and effectively addressed [7].

A paradigm shift regarding disaster risk reduction has begun to take shape through various policy and institutional reforms, ultimately establishing disaster mitigation as a key component of disaster management. The momentum generated by the tsunami in Aceh became a fundamental turning point in the establishment of disaster management institutions in Indonesia, as set out in Law No. 24 of 2007 on disaster management and the formation of the National Disaster Management Agency (BNPB) as the lead coordinating body [8]. This momentum served as a catalyst for the creation of disaster risk reduction policies through the integration of mitigation into the education sector. The focus on disaster education within the Indonesian curriculum began in 2006 through the development of school-level curricula and local content tailored to the characteristics of each region. Subsequently, during the period 2007–2012, disaster risk reduction education was further strengthened through various collaborative programmes between the Indonesian and German governments (2005–2008), as well as through the Save the Children programme [8]. These policies subsequently formed the initial foundation for the development of disaster mitigation education in Indonesia [9].

In response to the introduction of this policy framework, the Indonesian government subsequently incorporated disaster mitigation education into the formal education system [10]. In this context, schools are regarded as strategic spaces for building disaster awareness by developing disaster preparedness within schools [11]. Education is a key mechanism enabling children to participate in disaster risk reduction efforts. The urgency of disaster mitigation in schools is inseparable from the role of education in shaping students' awareness and behavior towards the environment [12]. This makes schools one of the most effective settings for instilling disaster mitigation education. Students act as agents in conveying information regarding disaster mitigation. Furthermore, schools are high-risk environments where a disaster could result in loss of life [13]. Consequently, disaster mitigation education in schools is not merely about building long-term collective awareness but is an urgent necessity.

Despite these policy achievements, the implementation of disaster education in Indonesia still faces a significant gap between policy direction and on-the-ground reality. Disaster mitigation education remains dominated by technical and procedural aspects such as evacuation procedures, disaster warning signs, and emergency response drills. The implementation of the disaster education curriculum within the formal education system has yet to take place in a systematic and sustainable manner. Consequently, the disaster education students receive tends to focus more on what to do when a disaster strikes than on how and why such disasters occur in the first place.

This situation highlights a disconnect between a mitigation paradigm focused on procedural safety and the more fundamental need to foster ecological awareness amongst students. This study pursues three related aims. First, it traces the development of disaster mitigation education in Indonesia since the 2014 Aceh tsunami, examining how policy frameworks and institutions such as Law No. 24 of 2007, the establishment of BNPB, and the Disaster Ready Schools program have shaped the development of disaster education in schools. Second, it evaluates the extent to which this education addresses the anthropogenic and ecological roots of flooding, such as land use change, deforestation, and weak spatial planning, rather than remaining confined to the technical and procedural aspects of disaster response. Third, drawing on these findings, it considers the paradigm shift required to move disaster mitigation education beyond procedural safety toward the cultivation of a critical ecological awareness that enables students to understand, and not merely react to, the root causes of disaster.

2 Theoretical Framework

An extreme natural event is not a disaster, but it can only become a disaster when it affects a population whose social circumstances have made it vulnerable. Disasters are not merely the result of natural phenomena, but also the interaction between nature and society within a social, political and economic context. 'Hazard' refers to natural events that can affect a number of locations such as coastlines, hillsides, fault lines, rainforests, savannahs, etc., at different times (seasonally, at different times of the day, or at recurring intervals). Wisner's assumption in the pseudo-equation is expressed in the following formula.

Risk = Hazard × Vulnerability
(R = H × V)

Risk arises from the presence of hazards and vulnerabilities. Vulnerability acts as a multiplier that amplifies the impact of hazards. The symbol 'x' indicates that if either the hazard or the vulnerability is absent, then the risk will not materialise. If a hazard strikes an uninhabited area, it cannot be described as a disaster. Meanwhile, the presence of vulnerability without a triggering hazard cannot, in itself, be described as a disaster. Therefore, a disaster is a combined function of natural hazards and the number of people, characterised by their varying levels of vulnerability to specific hazards, who occupy the space and time in which the event occurs [14].

Floods, as a disaster, are conceptually the result of the interaction between natural hazards and human-shaped environmental conditions. Therefore, vulnerability to flooding is determined not only by rainfall, but also by changes in land use and water catchment areas. From the perspective of the chain of explanation developed by Piers Blaikie and Harold Brookfield [15], changes in environmental conditions do not occur naturally, but are the result of a chain of relationships extending from the decisions of land managers in managing land, through patterns of access to and control over resources, to the political and economic structures that shape spatial planning.

Thus, changes in land use and the reduction of water catchment areas are the result of hierarchical power relations at the local, regional, national and global levels. From this perspective, disaster vulnerability rooted in structural factors creates pressures and unsafe spaces, thereby increasing the risk of flooding when faced with hydrometeorological hazards. Consequently, when the triggers for flooding are environmental conditions shaped by a series of human decisions, flooding cannot be understood merely as a natural event. Rather, more broadly, flooding can be characterised as an anthropogenic disaster resulting from social, political and economic processes [14] [15].

In the context of disaster mitigation education, it is important to build awareness starting with a critical understanding of the socio-political processes that shape disasters. Paulo Freire, in Pedagogy of the Oppressed (2008), uses the term 'conscientização', which refers to critical awareness. Freire criticises the 'banking' model, arguing that it aims to make individuals adapt to the world, thereby limiting learning to the mastery of facts and procedures without fostering an understanding of socio-political structures. Conversely, through 'problem-posing' education, learners are enabled to identify the structural root causes of disasters. From this perspective, learning based on critical awareness enables learners to analyse disasters right down to their underlying social causes. As further elaborated by Richard Kahn through the concept of 'ecopedagogy' in Critical Pedagogy, Ecoliteracy, and Planetary Crisis: The Ecopedagogy Movement (2010), critical awareness connects ecological consciousness—that is, the ability to interpret environmental crises as socio-political decisions—rather than resigning oneself to the whims of nature.

Based on this framework, this study considers that an understanding of flooding as an anthropogenic disaster cannot be separated from an educational approach that encompasses its causes and mitigation efforts. Blaikie and Brookfield's political ecology perspective, as well as Wisner's PAR model, are used to explain that

flood risk is shaped by a series of social, political and economic relations that result in vulnerability. On this basis, Paulo Freire's concept of 'problem-posing education' and Richard Kahn's 'Ecopedagogy' are used as a pedagogical foundation to assess the extent to which flood mitigation education is able to guide learners to identify the structural roots of disasters. Consequently, this framework serves as an analytical lens to determine whether flood mitigation education in Indonesia remains at the stage of knowledge transfer and disaster adaptation, or has developed a critical ecological consciousness that encourages learners to understand, critique and transform the socio-ecological conditions that give rise to floods as anthropogenic disasters.

3 Method

This study employs a historical method, drawing on policy and environmental history. This framework was chosen because disaster mitigation education cannot be understood as a single, stand-alone policy; rather, it reflects historical processes that unfold over a long period. In Indonesia, changes in disaster management orientation are closely linked to the development of state institutions, development dynamics, and shifts in how society and the government understand the relationship between humans and the environment [16]. From this perspective, flooding is not treated as a natural phenomenon separate from human activity, but as a historical consequence of social, economic, and political decisions that shape spatial planning, land use, infrastructure development, and the management of natural resources. Consequently, this study examines how the construction of knowledge about flooding has been shaped by disaster mitigation education policy since 2004 and analyzes its implications for the orientation of disaster mitigation learning within school settings.

To achieve this objective, the study employed a historical method comprising four main stages: heuristics, source criticism, interpretation, and historiography [16]. In the heuristic stage, the researchers searched for and collected documents recording the development of disaster management policies and mitigation education in Indonesia. The primary sources included Law No. 24 of 2007 on Disaster Management; documents related to the establishment of the National Disaster Management Agency (BNPB); the Disaster-Ready Schools guidelines; curriculum materials; disaster risk reduction learning modules; and various regulations on disaster risk reduction from 2004 to the present day. These documents were supplemented with scientific articles, academic books, reports from international organizations, and research findings discussing the transformation of the disaster management paradigm, disaster risk reduction education, and the link between development and increasing flood risks [17].

Once the sources have been collected, the next stage is critical analysis, which assesses the validity, historical context, purpose of compilation, and perspectives reflected in each document [16]. Interpretation then follows through thematic analysis organized around three main focuses: the evolution of the disaster management paradigm from a responsive approach toward risk reduction; the representation of flooding in disaster mitigation policies and educational materials; and the relationship between disaster education, ecological awareness, and the anthropogenic factors that shape risk [16]. This analysis examines how the state and educational institutions

define disasters and determine which forms of knowledge are deemed important to convey to students. It does so by critically reading policy documents, teaching materials, and contemporary disaster-related literature to identify the gap between disaster risk theory and educational practice in schools. In this way, the approach examines not only what is taught but also the conceptual assumptions underpinning the way disasters are explained to students.

The final stage, involving historiography, involved compiling an analytical narrative that situates the development of disaster mitigation education within changes to national disaster policy following the 2004 Aceh tsunami [16]. Beyond describing the establishment of the National Disaster Management Agency (BNPB), the implementation of Law No. 24 of 2007, or the development of the Disaster-Ready Schools programme, this narrative critically examines the paradigm underpinning mitigation education. By focusing on flooding, this study examines how various factors that tangibly contribute to increased risk such as land-use change, damage to river basins, the expansion of built-up areas, and weak spatial planning controls, are often marginalised in the curriculum. As a result, disaster mitigation education tends to emphasise survival skills rather than an understanding of social and ecological processes that give rise to such risk [18].

4 Result and Discussion

To understand why disaster education in Indonesia continues to privilege technical preparedness over critical ecological understanding, one must first examine how the post-2004 policy reforms were translated into the education system. Although the institutional reforms introduced disaster risk reduction as a national priority, their pedagogical translation remained largely procedural rather than transformative. By tracing the evolution of disaster education policies from Law No. 24/2007 to the Disaster Prepared School (SSB) and Disaster-Safe Education Unit (SPAB) programs a consistent pattern emerges: disaster mitigation was successfully institutionalized as technical preparedness, while the anthropogenic and structural causes of disaster remained largely absent from curriculum design and learning objectives

4.1 The Long Genealogy: Disaster Response in Indonesia from Independence to 2004

Historically, disaster management policy in Indonesia can be traced back to the Dutch colonial period. According to Haryono in Lassa, the emergency management policy during the colonial era was known as the Regeling op de Staat van Oorlog en van Beleg (SOB), which was enacted in 1939. This regulation served as a key foundation that shaped disaster management and emergency policy in Indonesia during the first two decades following independence in 1945, and its influence can be traced right through to the New Order era [10].

Exactly one year after gaining independence in 1946, Indonesia began to establish emergency management arrangements, taking into account both natural disasters and man-made emergencies, through National Law No. 6 of 1946 [10]. The enactment of this Act signalled recognition that natural disasters were one of the external factors that could potentially threaten the state. Consequently, disasters began

to be treated as an issue requiring attention, with civil society positioned as an alternative force for managing emergencies. Law No. 6 of 1946 did not last long and soon became irrelevant—an example of 'institutional death', a term coined here to describe laws that are abandoned by the government (thus becoming a wasted investment) or where there is a lack of law enforcement at all levels. When the first regime under President Soekarno became authoritarian, the law was amended by Law No. 1 of 1948 and subsequently by Law No. 30 of 1948 concerning the transfer of full sovereignty to the president during a national state of emergency [10].

During the period 1945–1959, the central government's focus was, in fact, entirely on nation-building. As Lassa states in his paper, during this period there was virtually no shift in the approach to disaster management, as there were no major events to prompt the establishment of disaster management institutions or policies. The national government's focus was entirely on nation-building, and the majority of its priorities centred on the details of various developments in sectoral legislation [7].

In the mid-1950s, the government published the 1956–1960 Five-Year Development Plan, one of the earliest development policy documents to demonstrate an early awareness of disaster risks in the context of development. There are at least two important written messages: an awareness of the role of forest ecosystem services in reducing disaster risk, and post-disaster policies mandating the social services sector to provide assistance to communities affected by natural disasters [10].

In the 1960s, there were changes to regulations concerning disaster management, leading to the establishment of various institutions related to disaster management. During this period, at least several institutions were established to address disaster-related issues, such as the Central Committee for Natural Disaster Relief, as provided for in Presidential Decree No. 54 of 1961, the Coordination Team for the Implementation of Natural Disaster Management, established under Law 14/U/Kep/1967, and the Central Advisory Body for Natural Disaster Management (BP2BAP), established by Presidential Decree No. 256 of 1966 [19]. However, the existence of these institutions did not yet reflect sufficiently significant changes. Most of the institutions established were still ad hoc in nature and were only activated after a disaster had occurred. Lassa emphasised that these institutions merely reacted to disaster events; there was almost no evidence that they possessed an ad hoc structure capable of acting before such events occurred [10].

The development of disaster management policy in Indonesia during the 1970s began to be influenced by the dynamics of regional cooperation emerging in South-East Asia. Attention to disaster management at the ASEAN level increased with the formation of the ASEAN Expert Group on Disaster Management (AEGDM) in 1971. This body served as a forum for coordination amongst disaster management experts in the Southeast Asian region. Nevertheless, the influence of this regional cooperation had not yet been sufficient to bring about significant changes to disaster management in Indonesia. Existing policies remain focused on post-disaster emergency response. The 1979 disaster management regulations emphasised natural disasters by upgrading the Natural Disaster Mitigation Coordination Team (TKP2BA) to the National Coordination Agency for Natural Disaster Mitigation (Bakornas PBA), established by Presidential Decree No. 28 of 1979 [19]. However, disaster risk management activities during this period were reactive in nature, focusing on

emergency response and recovery, as indicated by the decree. This structure was often activated only after a disaster had occurred [20].

Significant changes in disaster management policy began to emerge in the 1990s, in line with the growing discourse surrounding the International Decade for Natural Disaster Reduction (IDNDR). The Indonesian government began to revise its previous disaster management policy, which had been more focused on post-disaster emergency response, through Presidential Decree No. 43/1990 on the "National Coordination Council for Disaster Management", which stated that the state needed to manage disasters (both natural and man-made) across various phases, such as prevention, mitigation, emergency response, rehabilitation and reconstruction [10]. Prior to the 1990s, disaster management tended to be reactive once a disaster had occurred (disaster response-based); the paradigm shifted towards disaster mitigation in the 1990s with the establishment of Bakornas PB [21]. However, in practice, this regulatory change has not yet been fully implemented, with the prevailing paradigm still tending to be dominated by a reactive approach that addresses disasters only after they have occurred. The policies implemented still emphasise post-disaster management and recovery over disaster risk reduction efforts.

In the 2000s, the management paradigm shifted to integrated disaster management, and since the establishment of the BNPB in 2008, Indonesia's current disaster management paradigm has been based on Disaster Risk Reduction (DRR) [22]. Indonesia began to face various multidimensional crises relating not only to natural disasters but also to social conflicts occurring in a number of regions. In response to these issues, the government undertook institutional reforms by transforming Bakornas PB into the National Coordination Agency for Disaster Management and Refugee Assistance (Bakornas PBP). This policy was set out in Presidential Decree No. 3 of 2001, which was subsequently amended by Presidential Decree No. 111 of 2001 [19]. However, these institutional changes essentially remained focused on managing the impacts of and responding to crises as they occurred. Mitigation efforts and disaster risk reduction had not yet become the primary focus of disaster management policy. Consequently, the disaster management paradigm in Indonesia was still dominated by a reactive approach to emergency response and post-disaster recovery.

The limitations of this paradigm became starkly apparent following the 2004 Aceh tsunami, which claimed the lives of nearly 200,000 people and subsequently marked a turning point in Indonesia's disaster management paradigm, characterised by a shift from a reactive approach towards a more preventative one through disaster risk reduction (Disaster risk reduction) , which subsequently led to the enactment of Law No. 24/2007 on Disaster Management.

4.2 The 2004 Rupture and Institutionalization of Preventive Mitigation

The tsunami that struck Aceh at the end of 2004 was an event that had far-reaching consequences for the direction of disaster management policy in Indonesia. The tragedy not only left an immense humanitarian impact, but also shook long-held assumptions about how the state views and manages disasters [23]. In the preceding period, disaster management policy had been largely focused on emergency response following the occurrence of a disaster. The success of the response was often

measured by how quickly aid could be delivered, how effectively the evacuation process was carried out, and the extent of the government's capacity to restore conditions in the aftermath of the disaster [24]. Within such a framework, risk was not yet treated as an issue that needed to be managed from the outset. The Aceh tsunami demonstrated that an approach overly focused on response alone was unable to address the complexity of the threats faced by Indonesia as a country with a high level of disaster vulnerability. It was this realisation that subsequently led to the enactment of Law No. 24 of 2007, which emphasises that disaster management must be carried out comprehensively from the pre-disaster stage, through the disaster itself, to the post-disaster phase. Initially, this change appeared more as a shift in policy orientation than a fundamental change in the way the nature of disaster risk itself is understood [25].

The transformation that emerged in the wake of the Aceh tsunami was subsequently realised through the establishment of a more systematic and structured institutional framework. The enactment of Law No. 24 of 2007 provided a clear legal basis for the management of disaster response whilst also marking the end of a previous approach to disaster management that tended to be sectoral and ad hoc. Through this legislation, the state began to position mitigation, preparedness and risk reduction as an integral part of governance [25]. The establishment of the National Disaster Management Agency (BNPB) stands as the most tangible symbol of this change. Indeed, the Act mandates that the BNPB must be established no later than six months after the Act's enactment, whilst regional disaster management agencies are required to be established within one year. The existence of this institution demonstrates that the state is beginning to shift its focus from managing the impacts of disasters towards sustainable risk management. In this context, mitigation is no longer viewed as an additional activity, but has become an integral part of the development process. The post-2004 period marked the institutionalisation of a preventative paradigm that had previously not been firmly established within the national disaster management system [24].

Although these institutional reforms represent a significant step forward, changes at the conceptual level have not progressed as rapidly as those at the institutional level. This can be seen from the basic framework used by the legislation to define the meaning of a disaster. In the General Explanation to Law No. 24 of 2007, disasters are classified into three broad categories: natural disasters, non-natural disasters and social disasters [25]. This classification indicates that disasters are still understood primarily in terms of the source of the threat that triggers them. Consequently, the focus remains on phenomena considered to be hazards, whether in the form of earthquakes, floods, volcanic eruptions, technological failures, or social conflicts. Such a perspective reveals that the paradigm underpinning policy remains closely aligned with the hazard-centred approach that has dominated disaster studies for several decades prior. In this approach, physical hazards are positioned as the primary factor explaining the occurrence of disasters. However, various recent studies indicate that the magnitude of a disaster's impact is determined not only by the hazard itself, but also by the level of social vulnerability, the quality of governance, community capacity, and development inequalities within a given region [26].

Therefore, the changes that have taken place since the Aceh tsunami are best understood as a process of transition rather than a fully completed transformation. The

reforms that have taken place have indeed succeeded in establishing a legal and institutional foundation that is far stronger than in the previous period. Disaster risk reduction has begun to be integrated into development planning, disaster education has received greater attention, and oversight of spatial planning and environmental management has begun to be positioned as part of disaster management strategies [27]. Indeed, the government is required to monitor various sources of threat, development policies, resource exploitation, and environmental management that have the potential to increase disaster risk. However, these successes have not yet been fully accompanied by a paradigm shift that places vulnerability at the heart of the issue. Consequently, structural factors such as poverty, social marginalisation, uneven development, and the community's low adaptive capacity are still often treated as secondary issues, rather than as the primary sources of risk [26]. From this perspective, the Aceh tsunami and the enactment of Law No. 24 of 2007 do indeed represent significant milestones in Indonesia's disaster history. However, this milestone reflects the state's success in establishing new institutional frameworks rather than its success in fundamentally changing perspectives on the causes and dynamics of disaster risk [25]. Consequently, a genuine paradigm shift remains an ongoing process that has not yet fully reached its final form.

4.3 Disaster Education Enters the School System

Disaster education, or disaster risk reduction, has developed rapidly alongside the emergence of international agreements. From the Hyogo Framework for Action (HFA) to the Sendai Framework for Disaster Risk Reduction, adopted by UN member states, education is recognised as a key cross-sectoral issue and a primary means of reducing disaster risk. This paradigm has shifted from post-disaster response to pre-disaster prevention and preparedness, as well as building economic, social, health and environmental resilience [28]. Indonesia, as one of the signatory states to these frameworks, has subsequently responded to this shift in stages through a series of regulations.

Legislation in Indonesia reflects a regulatory development that is gradually expanding the legal framework relating to disaster education. Regulations such as Law No. 24 of 2007 and Ministry of Education and Culture Regulation No. 72 of 2013 have begun to integrate the principles of safety and disaster risk mitigation into the education system, defining a disaster as an event that threatens and disrupts community life, caused by natural, non-natural or human factors, resulting in environmental damage, loss of life, and property loss, thereby having a psychological impact. More recent regulations, such as Ministry of Education and Culture Regulation No. 33 of 2019 on the Implementation of the Disaster-Resilient Educational Institutions Programme (SPAB), have been introduced as part of efforts to prevent and mitigate the impact of disasters within educational institutions. The aim is to enhance the capacity of educational institutions to manage and reduce disaster risks, as well as to provide protection and safety for students, teachers and educational staff from the impacts of disasters. Although the definition of a disaster in these regulations identifies human factors as one of the causes, no regulation designates an understanding of anthropogenic root causes as a learning objective that needs to be achieved.

The integration of disaster education into the 2013 curriculum employs an approach known as the "nested paradigm", which means that disaster education is not taught as a separate subject. It is not taught in isolation, but is incorporated in a tiered (layered) manner into various other subjects such as Geography, Science, Religious Education and Citizenship Education. This layered approach within the curriculum means that the connection to disaster education is indirect and structured progressively across various different learning contexts. The nested paradigm approach aims to make disaster education more relevant and contextual for students by linking it to existing subject matter. However, a weakness of this approach is that disaster education often does not receive sufficient attention within the curriculum, which can result in a lack of in-depth understanding amongst students [8]. This nested paradigm model indirectly leaves the depth of the subject matter entirely in the hands of individual teachers.

Although Indonesia is one of the most disaster-prone countries in the world, disaster education is not compulsory in Indonesia [8]. The integration of disaster education in schools is very limited and is generally only incorporated (nested) within specific subjects such as Geography, Science or Social Studies, and is often relegated to extracurricular activities [8]. Subjects such as Geography cover topics including earthquakes, tsunamis, floods and erosion. This extends to Civic Education, which addresses the issues of safe and child-friendly schools, as well as several other subjects [8]. Disaster education content is also often inconsistent with the government's key messages, with its implementation often reduced to mere evacuation simulation drills and basic awareness campaigns [17].

In terms of policy, the government has drawn up a framework. Amri et al note that, since 2009, the Indonesian government has initiated the Disaster-Ready Schools (SSB) project [17]. A 2013 government report indicates that more than 25,000 schools have implemented the programme. However, this has focused solely on non-structural measures, limited to the delivery of education on disaster risk reduction and the development of disaster management plans in schools. The same pattern is evident in the implementation of the Safe Schools roadmap for the period 2015–2019, where, according to data in the book Disaster-Resilient Education, 83 per cent—or 36 out of 46 activity indicators—have been achieved. Technical guidelines, learning modules, teaching materials, standard operating procedures (SOPs), and supporting applications such as InaRISK and STEP-A are already available. The SPAB programme's performance indicators are heavily focused on physical and technical aspects; for example, educational institutions must have evacuation maps and routes, be equipped with facilities such as portable fire extinguishers and disaster warning signs, and conduct regular drills at least twice a year [29]. However, only around 10 per cent of schools actually implement disaster education in its entirety [8]. This is because the factors determining the adoption of disaster education into the school curriculum depend on school leadership, teachers' discretion, incentives and encouragement, as well as other factors. This means that although government regulations and policies are in place, their implementation on the ground does not proceed automatically or uniformly.

Although this SPAB framework has been comprehensively developed with technical safety in mind, its primary focus remains on physical emergency response and has not yet addressed the analytical aspects of why disasters are occurring with

increasing frequency as a result of human activity. In terms of learning design, the integration of disaster mitigation education into the curriculum is also being implemented through a more operational model. One example is the KIDA (Knowledge, Interest, Desire, Action) model, which maps disaster mitigation learning based on four components: knowledge of disaster hazards and risks; interest in preparedness; the desire to participate actively; and concrete actions to be taken when a disaster occurs [30]. This model is then integrated into the four core competencies of the 2023 Curriculum, namely spiritual attitudes, social attitudes, knowledge and skills [30]. One form of this integration is the use of local wisdom as a means of learning about disaster mitigation, such as the Smong tradition in Simeulue, which has functioned as a hereditary tsunami early-warning system; the Jogo Tonggo concept in Central Java; and the various customary rules of the Baduy, Dayak and Karampuang communities regarding the management of forests, land and river flows [30]. A number of these forms of local wisdom actually contain knowledge that has the potential to provide a causal-structural understanding of the causes of disasters. For example, the Baduy community's prohibition on altering river courses or managing land with pesticides is, in essence, a form of understanding of how human activities within the environment can trigger landslides and floods.

The reality of implementation is also illustrated by initial observations of two senior secondary schools in West Java, namely SMAN 7 Bandung and SMA Al-Musyawarah Lembang, which have each integrated disaster mitigation content into their Biology and Geography curricula. At SMAN 7 Bandung, for example, flood mitigation learning within the Biology curriculum is delivered through a three-month community-based project. During this process, students engage directly with their local neighbourhoods (RT/RW), identifying issues such as blocked drains, and contribute to environmental solutions through community service and public education. Interestingly, the results of a survey conducted by the students amongst the community revealed an understanding of human contributions to flooding; the students concluded that daily waste, although seemingly trivial, is actually the largest contributor compared to deforestation, on the grounds that not everyone engages in deforestation, but everyone disposes of waste every day. Teachers interviewed reported observable behavioural changes, such as the habit of sorting waste. The lessons designed incorporated social and practical dimensions, though the material remained limited to the 'Environmental Change' chapter in Year 10. This aligns with the pattern of the nested paradigm. This project has had an impact on the school; the teacher in question stated that the school is currently designing a school-wide waste management programme for the next academic year as a continuation of the initiative, which had previously been confined to the classroom.

In contrast, at AL-Musyawarah High School in Lembang, disaster mitigation is taught as a separate chapter in the Year 10 Geography curriculum, with further application in Year 11. A teacher at this school expressed concern about students' tendency to take disasters for granted, so they deliberately explored the students' initial understanding of disasters. Lessons are designed to encourage students to explore how development in a particular area can transform a region that had previously never experienced flooding. Students are invited to discuss development policies, including debates on the conversion of land into tourist areas, as well as role-play simulations in which they take on the roles of policy-makers. The lesson

utilises a Geographic Information System (GIS) to analyse changes in land use over time and link these to disaster events in a particular region. A small-scale simulation using an aquarium is also carried out to demonstrate the flow of water from mountainous areas to lowlands. In Year 11, students are involved in a debate on the conversion of land into tourist and accommodation areas, with the majority expressing opposition to this policy.

These two cases demonstrate that elements of critical ecological awareness have already emerged in educational practice in the field. The capacity to teach the anthropogenic causes of disasters does indeed exist and can be achieved, although it is not always consistently replicated across the entire education system. The gap between technical-procedural learning and critical ecological awareness is not absolute, but depends heavily on the initiative and individual capacity of teachers. Consequently, the SPAB framework, which is comprehensively designed for technical safety, has not yet addressed the analytical aspect of why such disasters are occurring with increasing frequency as a result of human activity.

4.4 Flood as the Critical Case: Where the "Natural" Framing Breaks Down

Floods provide the clearest empirical test of whether Indonesia's disaster education has moved beyond a hazard centered understanding of disaster. Unlike earthquakes or volcanic eruptions, floods are recurrent, historically traceable, and closely tied to human decisions regarding land-use change, spatial planning, watershed management, and urban development. Precisely because flood vulnerability is socially produced, it exposed the conceptual gap within disaster education: schools predominantly teach students how to respond to flood hazards, while the structural decisions that generate flood risk remain pedagogically invisible.

Natural disasters are commonly understood as natural hazards caused by geophysical, hydrological, climatological, meteorological or biological events. However, the scope of disaster causes extends to include disasters resulting from 'human activity' or technology, such as environmental pollution, accidents, and population explosions. Some people view disasters as consequences arising from natural hazards that affect human life. Disasters rooted in natural factors are generally considered more dangerous than those resulting from violent conflict, disease outbreaks, or famine. A number of social factors, such as poverty and inequality, often lead to vulnerability to disasters. Regarding disaster vulnerability, there is a commonly overlooked aspect: the understanding that disasters do not occur solely due to natural events, but also due to the social, political and environmental factors within which communities live in social groups within a particular region [31].

Wisner's sociological approach emphasises that disasters are rooted and socially constructed . This suggests that an understanding of disasters can be viewed through two layers of explanation: firstly, vulnerability is constructed through a series of social decisions that take into account access to power and resources, proximity to hazards, the environment, political decisions and social relationships. Secondly, this process is filtered through cultural and other networks, which ultimately determine how people perceive and respond to events that affect them. Furthermore, disaster vulnerability develops through three components: root causes, dynamic pressures and precarious conditions. The root causes of a disaster are historically and structurally

embedded within society due to limited access to power, structures, resources, and the ideologies of the political and economic systems. This gives rise to a number of dynamic pressures within society. Consequently, these dynamic pressures result in unsafe conditions, which are the outcome or product of the vulnerability thus created [14].

Following the major tsunami disaster in Indonesia in 2004, the Indonesian government introduced Law No. 24 of 2007 on disaster management. This legislation sets out systematic and comprehensive guidelines for dealing with disasters caused by natural, non-natural and human factors. Under this legislation, the government divides the disaster management process into three stages: pre-disaster, emergency response, and post-disaster. The pre-disaster stage is defined as comprising prevention, mitigation, preparedness and early warning (Law No. 24 of 2007, 2007). In this context, efforts are being made to raise awareness of the pre-disaster phase. However, the discourse on the pre-disaster phase should not be viewed merely as a form of mitigation once a disaster has occurred; it is also necessary to understand the reasons why a disaster might occur in the first place.

In the context of global issues, disasters can generally be caused by climate change. Greenhouse gas emissions are considered to be a more specific cause of hazards such as floods, fires and storms. In Asian countries, deteriorating weather conditions, coupled with 'projections' of rapid population growth and high urban density, suggest that disasters are likely to become more severe [31]. As part of the Asian region, these factors are also evident in the context of disaster vulnerability in Indonesia. According to Frankenberg et al, the recurring, predictable nature of disasters—which are linked to human decisions—exacerbates disaster vulnerability, thereby causing widespread impacts [32]. This highlights the distinction between disasters that are predictable or foreseeable and those that are unforeseeable. Meanwhile, this category of predictable or foreseeable disasters involves early warning systems, such as for storms, tornadoes or floods. Floods fall into the known risk category, which tends to be anticipated in terms of timing, location and frequency of recurrence. As floods are disasters with a recurring pattern, both individual and collective mitigation strategies are required within communities [14].

The issue of disasters in Indonesia can also be understood as a natural response that has implications for human activities. A case study of flooding in the Bandung basin reveals a historical process involving socio-political decisions within the local community. The relocation of the administrative centre of Bandung Regency from the Karapyak area (now Dayeuhkolot) to the banks of the Cikapundung River marked the beginnings of the city of Bandung. However, industrialisation in Bandung, in particular, developed rapidly in the 1980s; this was accompanied by the ineffectiveness of a balanced spatial planning concept, whilst the expansion of development increased the intensity of land-use change [33]. The development of the Bandung basin, within the framework of the chain of explanation by Piers Blaikie and Harold Brookfield (1987), demonstrates that environmental change proceeds through hierarchical relationships. It begins with decisions by land managers to change land use, driven by capital owners and market mechanisms that accelerate industrialisation and urbanisation, culminating in state policies on spatial planning [15]. This sequence of decisions at various levels forms the (root causes) of vulnerability, as explained in Wisner's Pressure and Release (PAR) model, which can generate dynamic pressures

in the form of urbanisation and environmental degradation [14]. This has implications for safety, leading to reduced water infiltration and an increase in flood-prone areas. Consequently, the flooding in the Bandung Basin is not merely a consequence of heavy rainfall, but also an anthropogenic disaster brought about by a series of social, political and economic decisions that have created the community's vulnerability to hydrometeorological hazards.

Awareness of hydrometeorological hazards, as demonstrated by the case study of the floods in Bandung, shows that anthropogenic disasters need to be reflected in disaster mitigation education in schools. Learning that focuses on responsive actions—such as evacuation procedures, self-rescue and preparedness when floods occur—has not yet fully addressed the structural root causes of flooding. Critical awareness (Freire regarding spatial planning changes and policies, the economic-political relationships in decision-making, and environmental degradation within water catchment areas has scarcely been made a subject of learning. This disparity highlights the gap between the nature of the flooding problem and the orientation of the disaster mitigation education that has been developed. This has implications for an education system that reproduces an approach focused on symptoms, without providing learners with the opportunity to understand the structural root causes that give rise to vulnerability. From a critical pedagogy perspective, this situation renders the causes of flooding invisible, meaning that flood mitigation education risks merely encouraging adaptation to disasters rather than fostering critical ecological awareness of their root causes.

5 Conclusion

Since colonial times, disasters have always been regarded as natural phenomena. The 2004 Aceh tsunami brought about significant changes through policy and institutional reforms, following the enactment of Law No. 24 of 2007 and the establishment of the National Disaster Management Agency (BNPB). This legislation marked an official shift from a reactive to a preventative paradigm. Nevertheless, an old way of thinking persists, viewing disasters as external threats rather than the result of human governance and activities. Consequently, when this approach was developed into disaster education, the materials produced focused solely on how to cope with such threats, rather than on understanding why they are occurring with increasing frequency. Ultimately, this all converges on a common thread. From the colonial era through to the early years of independence, disasters were understood as events beyond human control, dealt with on an ad hoc and reactive basis without institutional frameworks. The 2004 Aceh tsunami did indeed mark a turning point that led to the enactment of Law No. 24 of 2007 and the establishment of the National Disaster Management Agency (BNPB); however, this transformation is better understood as an institutional change, whereby the classification of disasters in that law remains centred on the source of the hazard (hazard-centred), rather than on the socio-structural vulnerabilities that allow such hazards to develop into disasters.

This hazard-centric perspective is then inherited to the classroom. Disaster education is integrated through a nested paradigm approach that entrusts disaster material to other subjects. Meanwhile, the SPAB framework and its various derivative

learning models are consistently oriented towards technical preparedness. Initial observations of the two secondary schools show that the capacity to teach anthropogenic causality actually exists in individual teachers, but it has not been supported by mechanisms that allow this achievement to be reproduced consistently throughout the education system. Unlike earthquakes or tsunamis, which are more easily accepted as purely natural phenomena, floods are recurrent, predictable, and closely related to human actions such as upstream deforestation, land conversion, and weak spatial planning. Because of this, the flood disaster should be the beginning to teach causality as an anthropogenic disaster.

Disaster education needs to shift from simply forming technical preparedness to fostering a critical awareness of the relationship between humans and the environment as offered through critical pedagogy and ecopedagogy by understanding that disasters do not only occur due to the will of nature, but are also part of the consequences of social, political, and economic decisions that can be analyzed and criticized. This approach demands a reflective, participatory, and cross-disciplinary learning space, inviting students to understand why disasters occur and how the relationship between humans and the environment can be built in a more balanced way.

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