

A Call for Inclusive Disaster Risk Financing in Indonesia: Addressing Vulnerabilities in High-Risk Areas

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Abstract. Earthquakes are a growing threat to Indonesia, with limited resources for risk mitigation. The current reliance on government relief is unsustainable. Despite Law No. 24/2007 on Disaster Management, inclusive disaster risk financing schemes have yet to be established. This study aims to provide evidence for disaster risk financing strategies in Indonesia, focusing on geological disasters in active fault areas with high population density. Aligned with the Sendai Framework for Disaster Risk Reduction (SFDRR) Priority 2, this study seeks to address the financial impact of disasters on governments and societies. By analyzing responses to risk financing following the November 21, 2022 earthquake in Cianjur Regency, this study examines emotional reactions, risk perceptions, and willingness to participate in risk insurance. The findings highlight low participation in insurance programs due to limited insurance literacy and low enrollment in micro earthquake insurance. Material losses from the Cianjur earthquake impose a significant financial burden on the government. There is a critical need for disaster insurance schemes, especially for homes and fixed assets at high risk of land loss due to landslides. Willingness to participate varies among different socioeconomic backgrounds. This article emphasizes the urgency of implementing disaster risk financing in Indonesia, with a focus on the vulnerability of poor and low-income households.

1 Introduction

A mounting body of evidence suggests a surge in the intensity of geological disasters worldwide, a trend attributed to factors like concentrated populations and valuable assets in vulnerable regions, coupled with heightened climate variability. This escalation poses escalating fiscal and economic hazards for developing countries, imperiling their long-term development endeavors. While risk mitigation has garnered significant attention, a burgeoning line of research focuses on governments' capacity to react to major disasters, specifically gauging their ability to provide financial support for relief and reconstruction post-events.

Between 2005 and 2017, disaster-related development assistance totaled \$137 billion, with a substantial portion, \$9.60 out of every \$10, directed toward emergency response, reconstruction, relief, and rehabilitation. Surprisingly, a mere fraction, less than 4% (\$5.2 billion), was allocated to disaster prevention, mitigation, and preparedness[1,2]. This disparity in investment towards disaster resilience arises from the misperception that it's politically risky, entailing costs for events that may not unfold during a single political term. This notion is exacerbated by the lack of tangible incentives and effective communication.

Consequently, disaster-prone regions are trapped in a harmful cycle where the financial toll of disasters rapidly escalates, constraining governments' ability to swiftly mobilize and provide crucial funds [3].

Despite strides in proactive risk reduction, a bias towards reactive response, reconstruction, and rehabilitation persists. Unfortunately, governments, businesses, and financial institutions often neglect integrating considerations of their exposure and vulnerabilities to various hazards outlined by the Sendai Framework into their financial decision-making processes (Ahn et al., 2021), thereby externalizing these risks. The ongoing reliance on short-term perspectives significantly contributes to the failure of policymakers, investors, corporations, and project developers to wholly acknowledge and address disaster risks [4]

Recent scrutiny of catastrophes reveals distinctive relief and reconstruction funding mechanisms for developing versus industrialized nations. Advanced economies usually leverage private risk financing arrangements and an efficient public revenue system, funded by broad taxation coverage, to cover natural disaster losses. In contrast, low and middle-income countries, facing lower tax ratios and ongoing fiscal

constraints, rely on diverse funding sources for post-disaster reconstruction, often resorting to borrowing and international aid. Middle-income countries heavily involve multilateral financial institutions, while low-income nations predominantly rely on bilateral donor support.

The mounting threat of natural disasters significantly endangers developing countries like Indonesia, which lack the financial and material means to effectively mitigate these perils. Current risk-transfer mechanisms in Indonesia hinge on ad-hoc government relief, an unsustainable approach. Despite the presence of Disaster Management Law No. 24/2007, inclusive disaster risk financing schemes have not materialized. Hence, a pressing need arises to establish insurance schemes through public-private partnerships to cope with Indonesia's frequent and intense disasters such as the 2004 Indian Ocean Tsunami, the Triple Disaster in Central Sulawesi, and the significant Lombok earthquake in 2018. Regrettably, no empirical study presently gauges households' and businesses' engagement in insurance programs aligned with regional disaster risks.

This study's objective is to offer empirical evidence guiding strategies for financing disaster risks in Indonesia, concentrating on geological disasters in active fault areas with high population density. The research aspires to aid policymakers in assessing the community's willingness and potential to partake in disaster risk financing schemes. To achieve this, the study conducted rapid assessments following the November 21, 2022, Cianjur earthquake in West Java, Indonesia. Field observations and respondents' immediate reactions to risk financing concepts were examined. Data from 50 respondents, collected a week post-quake, supplemented by discussions with the National Disaster Management Agency (BNPB), elucidated emotional responses, risk perceptions, and immediate inclinations towards risk insurance.

2. Disaster Impact on Socio-Economic

Disasters within a nation can have a burden for national budget, straining resources required for recovery and asset restoration. The absence of a quantitative framework for anticipating economic fallout from disasters can leave countries vulnerable, jeopardizing their economic capital. Inadequate readiness might compel nations to navigate emergency response, recovery, and reconstruction stages, resorting to budget allocation and unfavourable borrowing ([5,6]). Recognizing the socio-economic impact of disasters, countries should

institute Sovereign Disaster Risk Financing and Insurance (DRFI) tools to mitigate event consequences ([7]).

A notable example is Chile, which has successfully established an advance risk financial structure based on loss estimation criteria, encompassing diverse disaster financing mechanisms like public and private insurance, reserves, contingency credits, and investment in prevention and mitigation [8–10]. In the South America and Caribbean Islands region, vulnerable to disasters like Irma and Maria hurricanes, varying levels of disaster risk financing are crucial, especially for the financially vulnerable [11,12]. Such financing should align with preventive strategies and advanced strategies for social protection measures, particularly for the uninsured [13]. Indonesia boasts social protection and insurance programs, including BPJS-Kesehatan, BPJS-Ketenagakerjaan, and cash/non-cash transfers like family assistance (PKH) and educational assistance (BOS) [14,15]. These initiatives should be integrated into a holistic disaster financing scheme and an advanced strategies for social protection to address calamities and climate-related events.

Further enhancing program efficiency, Indonesia is developing a national social registry, offering foundational data for designing disaster insurance schemes. Determining whether this should be market-based, social insurance, or a hybrid requires consideration, with a focus on safeguarding physical assets susceptible to disaster-related destruction. This pertains to the resource-intensive rehabilitation and reconstruction phase, which strains national budgets due to cost estimation complexities, asset numbers, and resource demands[16]. Developing disaster insurance is needed to help Indonesia transferring risks associated with disasters, addressing the challenges experienced in the aftermath of these events.

3. Methodology

3.1. Overview of Research Location

Cianjur Regency stands as a vulnerable area susceptible to a range of natural disasters. Between 2019 and 2021, approximately 302 villages faced landslide risks, while 58 others grappled with flooding. Furthermore, around 126, 173, and 318 villages were exposed to earthquakes, forest fires, and droughts, respectively. Cugenang District, the epicenter of the November 2022 Cianjur earthquake, emerges as densely populated (1,561.62 per km²) compared to the overall regency (685.48 per km²). Its economic landscape is agriculturally centered,

signifying dependence on natural resource exploitation, thereby amplifying climate change vulnerabilities. Leading up to the 2022 earthquake, numerous villages in Cugenang had experienced prior seismic activities, floods, and landslides. By 2021, the availability of early warning systems, signs, and evacuation routes for disasters were solely accessible in Padaluyu Village, while safety equipment remained absent across all Cugenang District villages, hampering disaster preparedness [17]).

3.2. Participants

This study draws upon survey data collected from 50 individuals, seven days after the 22 November earthquake, by local volunteers in Cianjur. Using the data survey and combine with secondary data, this study is analyzed with descriptive statistics to explained the disaster event. The survey targeted the head of households who were earthquake survivors in the densely populated Cugenang Sub District, the most affected area. Prior written informed consent was obtained before administering survey questionnaires. While participants were earthquake survivors with some engagement with insurance companies, it's essential to acknowledge that the survey data may not entirely reflect the entire population, serving as an illustrative rather than fully representative dataset. Future research could aim for more comprehensive population-wide data to explore insurance market responses from the demand side. Data collection utilized Google Forms, chosen for its practicality and efficiency, especially given the need to move between shelters during data gathering.

3.3. Data Analysis

Our analysis focused on respondents' data encompassing housing recovery type, age, household size, and economic situation. This Participants reported their age and household size, alongside indicating their housing status at the time of the survey, including emergency temporary housing, public disaster housing, private chartered housing, repaired housing, reconstructed housing, undamaged home, or other options. The economic situation variable encompassed income, expenses, alternative livelihoods, participation in insurance programs, and disaster-related awareness, aiming to capture diverse financial aspects and engagement with insurance and disaster-related information. Some main questions in the survey related to insurance are asked such as the willingness of household to participate in the insurance, willingness to pay the premium, and reasoning why they refused to participate and pay the premium of disaster insurance.

The survey data analysis comprises two segments. The primary segment, presenting the central survey findings, involves simple descriptive analysis. This approach straightforwardly demonstrates changes in insurance demand-related variables post-earthquake [18]. Where appropriate, a chi-square test of independence gauged differences in participant responses. It's essential to acknowledge that insurance decisions, including coverage changes, intertwine with insured asset value and supply-side policy conditions, influenced by variables such as property value, age, gender, income, education, or risk perception. Isolating and investigating individual variable effects usually calls for robust statistical techniques. However, considering survey questions and potential demand-supply determinant interactions, this study recognizes the statistical constraints when applying regression analysis. The survey analysis's second segment focuses on a tractable statistical approach: correlation analysis of demand determinants and associated variables, addressing inherent statistical limitations including endogeneity[19].

4. Results & Discussion

4.1. Vulnerability and Economic Impact of the Cianjur Earthquake

The rapid assessment undertaken by the research team illuminated the significant socio-economic ramifications of the Cianjur earthquake. Households reported adverse effects on their lives, encompassing loss of lives, income, employment, and assets. Correspondingly, data from the National Disaster Management Agency (BNPB) disclosed extensive material losses, with 67,504 homes damaged, spanning heavy (21,465 units), moderate (16,413 units), and light damage (29,626 units) (BNPB, 2023). The government, burdened by the housing repair assistance distribution, required a substantial budget of at least Rp 2.22 trillion, exclusive of emergency response costs [20]

The immaterial toll featured 602 fatalities, 593 severe injuries, 2 ongoing hospital treatments, 5 missing individuals, and 114,683 evacuees due to home damage. Most heartrendingly, children bore the brunt of collapsed structures during sleep or play, underscoring immense risks and losses (interview with AA, January 2023). The disaster further ravaged public and social infrastructure, including 18 offices, 281 places of worship, and 18 healthcare facilities across 16 districts and 180 villages, hampering crucial public services.

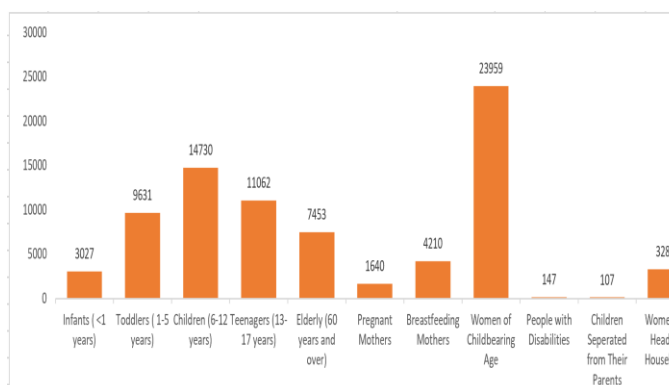


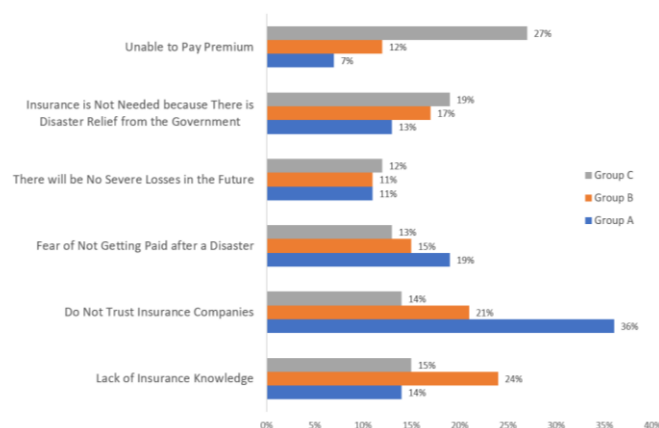
Figure 1 Number of Refugees by Age and Vulnerable Groups (BNPB, 2023)

Tragically, deaths and injuries echo through economic disruptions, impacting households and businesses. These non-material effects cascade into losses on various fronts, encompassing lives, work, education, and productivity. Evacuation-related costs, *Figure 2 Reluctance to Become an Insurance Participant. Source: BRIN Disaster Financing Research Team (2022)*

injury expenses, and constrained access to vital services during evacuation exacerbate the ordeal. Figure 1 displays the demographics of refugees during the Cianjur earthquake, accentuating the pronounced vulnerability of the majority (69.11%) over the less vulnerable (30.89%). This starkly underscores the extensive impact of disaster-induced losses. While government efforts seek to aid affected populations, the journey toward restoring pre-earthquake conditions necessitates persistent actions over time. The study explored respondents' reluctance toward disaster insurance, categorized hesitation into socio-economic groups: higher background distrusts insurance companies (36%), middle group lacks insurance knowledge (24%), and lower group struggles with premium payments (27%). This underscores the necessity for comprehensive disaster risk transfer to effectively mitigate risks.

The challenges in transitioning disaster risk to market mechanisms via insurance are compounded by factors like aid compensation, infrastructure development, and government subsidies. Government involvement in various aspects of community life provides a certain comfort zone. Survey findings reveal the Cianjur earthquake's impact on people's expectations of government assistance. Those affected, even without house damage, anticipate government compensation (42%-55%), while only 5%-11% expect insurance program subsidies.

Limited awareness of subsidized insurance's direct impact may explain this. However, continuous government compensation is unsustainable due to fiscal strain on national and regional levels. Expectations hinder post-disaster recovery due to fiscal constraints. Enhancing literacy across socio-economic strata becomes pivotal, mitigating financial risks. Public awareness of disaster risk mitigation expedites economic recovery, focusing fiscal efforts primarily on the emergency response phase.



Note: Group A is a community that has high purchasing power with the criteria being entrepreneurs, farmers, and traders with higher education and graduated; Group B is a community that has moderate power with the criteria of entrepreneurs, farmers, and traders who have attended higher education but did not graduate; Group C is a community that has low power with the criteria of entrepreneurs, farmers, and traders who have studied five to nine.

Challenges in integrating disaster risk into market mechanisms through insurance are also linked to factors like aid compensation, infrastructure development, and government subsidies. Notably, government involvement in various community aspects creates a sense of comfort for many. Figure 4 illustrates the expectations of Cianjur earthquake-affected individuals regarding government assistance. Survey data reveals that those who experienced house collapse, alongside those who didn't suffer damage, anticipate government compensation as disaster aid (42%-55%). However, expectations of government subsidies for insurance programs are relatively low (5%-11%).

This gap may stem from limited information on the direct impact of subsidized insurance, potentially explaining the few who hold this view. Yet, continuous government compensation and assistance in the aftermath of earthquakes isn't sustainable due to its fiscal impact on national and regional levels[21,22]. This, in turn, hampers post-disaster recovery due to fiscal constraints. Hence, bolstering

literacy across diverse socio-economic backgrounds proves crucial in mitigating financial risks linked to natural disasters. Improving public awareness of disaster risk mitigation could potentially expedite economic recovery, with fiscal resources being efficiently directed, particularly during the emergency response phase.

4.2. Vulnerability and Social Impacts of Disaster Events

Disaster risk, shaped by hazard incidence, exposure level, and vulnerability, is a complex interplay of physical, socioeconomic, and environmental factors that dictate sensitivity and resilience. Markers of vulnerability include poverty, inequality, age, disability, gender bias, and psychological elements, influencing the ability to cope with natural calamities (UNDRR).

Mitigating risk involves social protection programs, disaster insurance, livelihood enhancement, awareness campaigns, and preparedness initiatives. Education, occupation, income source, gender, and location also influence vulnerability[23]. Vulnerability influences the direct and indirect impact on living situations and encompasses tangible and intangible effects

In addition to physical and economic impacts, disasters have social implications for health, culture, tourism, and social order[24]. Social impacts manifest psychosocially, demographically, and socio-politically [25]. Refugees, homelessness, housing aid, community morale, and psychological distress are linked to social disturbances [26] Intangible losses encompass stress-related social consequences and weakened social cohesion [27,28].

Disaster-affected families adapt daily routines to new conditions, incurring stress and energy expenditure[29,30]. Post-disaster, anxiety or damaged infrastructure may impede recreation, slowing emotional recovery. Data from the Cianjur earthquake illustrates both material and non-material losses, affecting education and housing (e.g., 701 damaged educational facilities). Residents, like AB and AC, stress the importance of education, despite challenges in relocating or accessing aid .

Yet, relocations face obstacles, including schooling and employment distances, with hesitations tied to aid certainty. The government struggles to find suitable land for second relocations. The multifaceted social impacts of disasters underline the need for holistic approaches to mitigation and recovery.

4.3. Enhancing Disaster Risk Financing Strategies in Indonesia

The occurrence of earthquakes has imparted invaluable insights to communities. These experiences underscore the significance of evacuation, awareness of accessibility limitations, and fostering economic independence to manage prolonged disaster aftermath. Additionally, the event has triggered a heightened recognition of safeguarding assets, financial planning, and preparedness for unforeseen disaster-related expenses. It has also accentuated the necessity of constructing earthquake-resistant structures. Some residents acknowledge the role of disaster insurance in alleviating disaster impacts. However, economic constraints impede participation in insurance schemes due to unaffordable premiums. Complex insurance processes and limited literacy levels further contribute to low insurance coverage, with only 12.1% of households benefiting from the disaster risk transfer scheme.

The gap in understanding subsidized insurance stems from insufficient information on its direct benefits. Nevertheless, continuous government compensation and assistance are unsustainable due to fiscal strains on both national and regional levels. Consequently, enhancing literacy across diverse socio-economic backgrounds is pivotal in mitigating financial risks. Improved public awareness of disaster risk mitigation can expedite economic recovery, with fiscal resources strategically allocated, particularly during the emergency response phase.

To address these challenges, disaster risk financing can be integrated into existing initiatives like Savings-Based Housing Financing Assistance (BP2BT). This could consider income limits, house types, and insurance payment schemes incorporated into mortgage installments. The premium calculation could range from IDR 20,000 to 50,000 per year, covering IDR 600,000 to 3,000,000. Adjusting insurance premiums based on property values and income could lead to more substantial coverage. However, translating community awareness of disaster risk into financial commitment remains a complex task, as they continue relying on government and charitable assistance post-disaster.

Disaster illiteracy compounds the issue, hindering community readiness. Interviews revealed that residents sought earthquake information only after experiencing the 2022 event. Public outreach efforts by the government highlight early warning systems,

evacuation routes, and mitigation strategies, emphasizing the imperative of proactive disaster preparedness [31,32]. Despite past seismic events, the lack of knowledge underscores the critical need for heightened disaster literacy to enhance risk mitigation and resilience.

5. Conclusion

In conclusion, this article delves into the aftermath of the November 2022 Cianjur earthquake, offering insights from rapid assessments and observations. It spotlights the vulnerability and socio-economic impacts experienced by affected communities, while also examining the implications for risk protection schemes through disaster insurance. The Cianjur earthquake case underscores Indonesia's susceptibility to disaster risks and the weighty socio-economic burdens borne by its people.

From this analysis, four pivotal conclusions emerge, illuminating the urgency of disaster risk financing. Firstly, the earthquake has exposed the vulnerability of various societal segments, particularly underserved households, grappling with subpar housing conditions. This has led to substantial tangible and intangible losses, from asset destruction and structural damage to income loss and health issues in evacuation areas. Secondly, disaster risk financing capacity remains constrained, relying heavily on government budgets that are susceptible to fiscal risks. Even existing insurance schemes, primarily safeguarding State-Owned Assets, haven't effectively shielded community assets. Climate change, population growth, and spatial planning intricacies further compound these challenges.

To address these concerns, several recommendations surface. They encompass refining disaster risk financing governance, testing the efficacy of insurance schemes through pilot projects, and fostering public-private partnerships and community engagement. By heeding these recommendations, a more resilient society can emerge, better equipped to mitigate and navigate the socio-economic repercussions of natural disasters. Moreover, these efforts will pave the way for sustainable and comprehensive mechanisms, ultimately safeguarding the well-being and livelihoods of affected communities. As we forge ahead, addressing disaster risk financing becomes pivotal in ensuring the safety and prosperity of nations against an ever-changing landscape of environmental challenges.

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