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The Impact of Flash Floods and Landslides in Sumatra on the Income of MSMEs in Aceh

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Abstract. *This study aims to examine the impact of flash floods and landslides in Sumatra on the income of Micro, Small, and Medium Enterprises (MSMEs) in Aceh, using a literature review. Flash floods and landslides can significantly reduce business income, especially in the agricultural and MSME sectors, through land damage, asset loss, and decreased productivity. Studies in similar regions show that household and business income can drop dramatically during and after a disaster, by as much as 80% compared to normal conditions. In addition, MSMEs face further challenges, including higher operating costs due to limited electricity supply, infrastructure damage, and restricted access to raw materials and markets. Factors such as income diversification, educational levels, and membership in social organizations can affect SMEs' vulnerability and their ability to adapt to disasters. The results of this review emphasize the importance of mitigation efforts, improving disaster literacy, and government policy support and access to financing to strengthen the resilience of SMEs in Aceh to the risks of flash floods and landslides.*

Keywords: *Aceh, Flash Floods and Landslides, Income, MSMEs*

1. Introduction

Flash floods and landslides are increasingly frequent threats in Sumatra, particularly in Aceh Province. The main factors triggering these disasters are the loss of tropical forest cover, the expansion of oil palm plantations, and high rainfall (Lubis et al., 2024). Between 2011 and 2018, there were more than 2,000 flood incidents in Aceh, causing damage to homes and agricultural land and forcing hundreds of thousands of people to flee. Areas with high poverty rates and low population density are the most vulnerable to these disasters (Lubis et al., 2024).

The impact of flash floods and landslides is not only felt physically but also causes significant socio-economic losses. One of the most affected groups is Micro, Small, and Medium Enterprises (MSMEs). Disasters cause environmental problems, damage to business assets, disruption to the distribution of raw materials, a decline in market demand, loss of production factors, and even the cessation of production activities. The subsequent impact on MSMEs is the difficulty of recovery and the need for assistance to clean up business locations and restart operations (AcehNews, 2025). Studies in various tropical regions show that household and business income can decline dramatically after a disaster, and efforts to diversify income are often unable to cover the losses incurred (Asiyah, 2018; Mertens et al., 2016)

The decline in MSME income due to disasters is also exacerbated by limited access to capital, information, and social protection. Many MSME actors are forced to seek capital loans or even change professions to survive (Badoc-Gonzales et al., 2022). Efforts to empower MSMEs in disaster-prone areas cannot rely solely on charitable assistance

but require strategies that can revive entrepreneurial spirit and strengthen local economic resilience (Asiyah, 2018).

In addition, research in Aceh shows that environmental damage in upstream areas, such as the conversion of forests into agricultural or plantation land, increases the risk of flooding and significantly reduces farmers' incomes (Azzahra et al., 2021). During flood periods, farmers' income in Aceh can fall by up to 80% compared to non-flood periods, thereby increasing the economic burden on communities and MSMEs in the agricultural sector. (Lubis et al., 2024; Pirngadi et al., 2025). Based on this background, this article aims to systematically examine the impact of flash floods and landslides in Sumatra on the income of MSMEs in Aceh through a literature review method. This analysis is expected to provide a comprehensive overview of the problems faced by MSMEs and policy recommendations that can support local economic recovery and resilience after disasters.

2. Method

This study uses a narrative literature review method to analyze the impact of flash floods and landslides in Sumatra on the income of MSMEs in Aceh. The literature review approach was chosen because it provides a comprehensive understanding of the empirical and conceptual findings from previous studies on natural disasters and their impact on MSMEs and helps formulate policy recommendations to protect and restore MSME income in Aceh after disasters.

2.1 Data Collection Procedure

The data collection process was carried out by reviewing scientific articles, research reports, and relevant documents discussing the impact of natural disasters, particularly flash floods and landslides, on MSMEs in Indonesia and the Southeast Asian region. The primary data sources were reputable international journal databases such as Scopus, Web of Science, and Google Scholar, as well as relevant national publications. (Badoc-Gonzales et al., 2022; Bharti, 2021; Hossain et al., 2022). The keywords used in the search included ‘flash floods’, ‘landslides’, “SMEs”, ‘economic impact’, and ‘Aceh’.

2.2 Data Analysis Process

The analysis was conducted systematically by identifying, grouping, and synthesizing the main findings from each article. This process included: (1) reading the abstract and content of the article to assess its relevance, (2) grouping articles based on central themes such as direct impact, indirect impact, and MSME adaptation strategies, and (3) conducting thematic analysis to identify patterns, trends, and research gaps. (Badoc-Gonzales et al., 2022; Hossain et al., 2022; Miklian & Hoelscher, 2021). The analysis results were then presented narratively to provide a comprehensive overview of the impact of disasters on SME income in Aceh.

2.3 Validity and Limitations

To enhance validity, this review prioritized peer-reviewed articles with high citation counts. However, limitations remain, such as the possibility of publication bias and limited access to primary data in Aceh. Therefore, the results of this literature review are interpreted in light of the context and limitations of the data sources (Eckhardt et al., 2019; Hossain et al., 2022)

3. Results and Discussions

3.1 Result

The findings show that flash floods and landslides in Aceh in 2025 caused extensive damage to public facilities and private assets, resulting in substantial losses of productive land, housing, and business infrastructure for MSMEs, particularly in the agriculture and plantation sectors.

Deputy Governor of Bank Indonesia, Aida S. Budiman, stated that the overall impact of the disasters in Aceh, North Sumatra, and West Sumatra is projected to reduce the national Gross Domestic Product (GDP) by around 0.017 per cent. Although this seems small at the national level, the effect is much more pronounced in the affected areas, including Aceh (AcehNews, 2025). The agriculture and plantation sectors have been the most severely affected in Aceh. Floods and landslides have inundated and damaged rice fields, oil palm plantations, and smallholder plantations in Central Aceh, Bener Meriah, North Aceh, Bireuen, and Aceh Tamiang. Disruptions in the harvesting and distribution of agricultural products can reduce farmers' incomes and trigger local price increases. Key commodities such as Gayo Arabica coffee have also been disrupted due to road access being cut off and supply chain disruptions from the highlands to ports and export markets. These delivery delays risk weakening the cash flow of farmers and coffee businesses. The damage to facilities caused by flash floods and landslides is shown in the following chart:

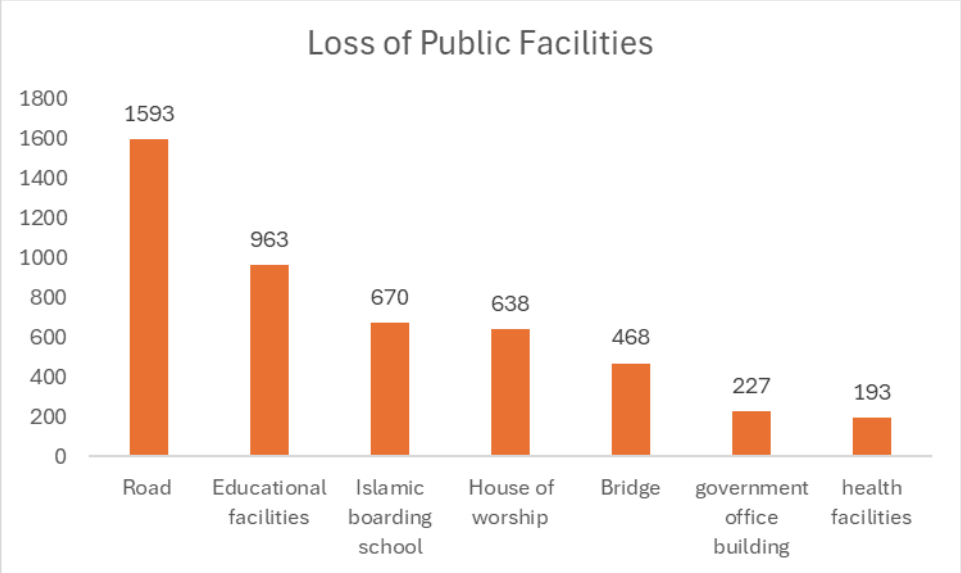

Figure 1. Facilities damaged by flash floods and landslides in Aceh in 2025

Based on data released by the Provincial Emergency Response Command Centre (ACEH, 2025), flash floods and landslides have caused widespread damage to public facilities, including 1,593 roads, 468 bridges, 638 places of worship, 963 schools, and 193 hospitals and health centers. Additionally, 670 Islamic boarding schools and 227 government offices have also been affected.

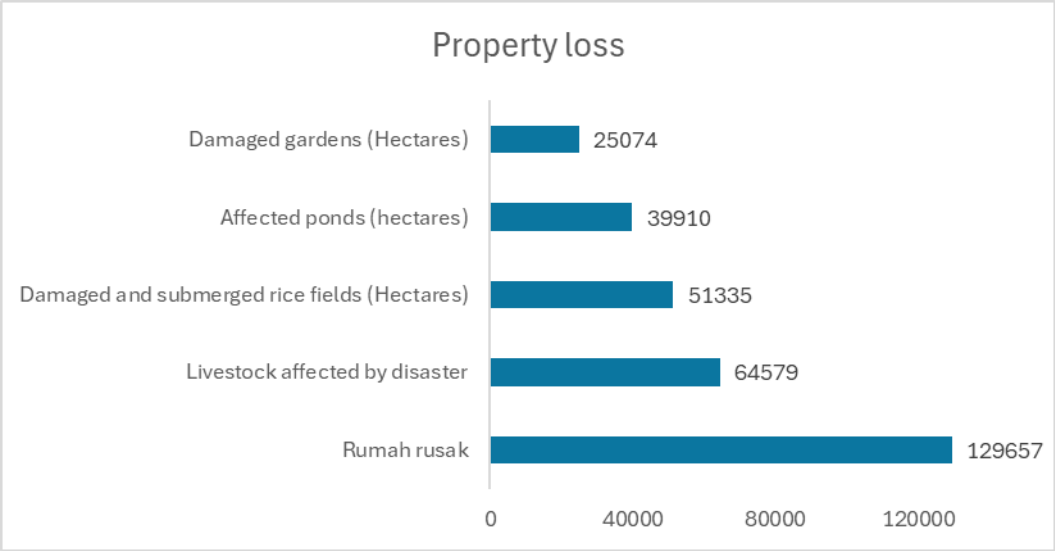

Figure 2. Property loss by flash floods and landslides in Aceh 2025

Data shows that many people have lost their homes and businesses. 129,657 houses were damaged, 51,335 hectares of rice fields were destroyed or submerged, 39,910 hectares of fishponds were affected, 25,074 hectares of gardens were damaged, and 64,579 livestock were affected by the disaster.

The trade and transport sectors in Aceh are also feeling similar pressure. The disruption of the Bireuen–Bener Meriah–Takengon national road and several provincial roads has hampered the distribution of goods and the flow of logistics. Market activity has declined, transport costs have risen, and travel times have lengthened, ultimately burdening traders and consumers.

3.2 Discussion

Research in Krueng Kluet, Aceh, found that farmers' income during the flood period fell dramatically, from an average of Rp26,027,000 to only Rp5,529,000 per hectare per planting season. These losses prompted the majority of farmers (71%) to be willing to pay for environmental restoration efforts in the upstream area, indicating an awareness of the importance of disaster mitigation for maintaining income sustainability (Pirngadi et al., 2025).

In addition to Aceh, studies in other regions of Indonesia and Southeast Asia show similar patterns. MSMEs, particularly in the agriculture and food sectors, experience declines in income, damage to assets, and disruptions to distribution due to disasters. In Yogyakarta, agricultural MSMEs exhibit relatively low economic sensitivity to landslides, but disaster response capacity at the village level remains moderate, and mitigation planning is not yet optimal (Ngadisih et al., 2025). Meanwhile, in Vietnam, flash floods and landslides have caused a decline in productivity, an increase in living costs, and a decline in income, especially among poor communities in mountainous areas (N. T. T. Pham et al., 2020).

The impact of disasters is also felt by MSMEs outside the agricultural sector. Studies in Sri Lanka and Kerala, India, show that flooding causes a decline in income, damage to business assets, and disruption to supply chains. MSMEs operating in disaster-prone areas tend to find it more difficult to recover, especially if there is no adequate insurance support or recovery policies (Prakash, 2020; Samantha, 2018).

Several studies show that flash floods and landslides consistently reduce the income of MSMEs in Aceh, both directly through physical damage and indirectly through disruption to distribution and a decline in market demand. The agricultural sector is the most vulnerable, with a significant decrease in income during the disaster period. (Azzahra et al., 2021; Pirngadi et al., 2025). Several factors, including adaptive capacity, access to information and capital, and institutional support, influence the vulnerability of MSMEs to disasters. In Aceh, low adaptive capacity and limited access to resources exacerbate the impact of disasters. This is consistent with findings in other regions, where MSMEs with strong social networks and government support tend to recover more quickly. (Ngadisih et al., 2025; N. Pham et al., 2020; Samantha, 2018).

Mitigation and adaptation efforts are essential to improve the resilience of MSMEs in Aceh. Farmers' willingness to pay for environmental improvements indicates an opportunity to develop community-based financing schemes to support conservation and disaster risk reduction efforts (Pirngadi et al., 2025). In addition, increasing adaptation capacity through training, access to capital, and institutional strengthening is key to minimizing the economic impact of disasters in the future (Azzahra et al., 2021; Ngadisih et al., 2025)

Environmental restoration is also the government's responsibility to prevent the recurrence of such disasters, which harm communities and small- and medium-sized enterprises (SMEs). Law enforcement must start upstream: routine raids, heavy sanctions for illegal palm oil companies, and a moratorium on logging in vulnerable areas. Without this, emergency response efforts alone will be futile, disasters will recur, claiming lives, destroying agricultural land, and disrupting the supply chain of Gayo Arabica coffee and other leading commodities. Small communities, especially farmers and MSMEs, are the most affected, with plummeting incomes due to crop failures, disrupted market access, and inflated logistics costs. Coffee farmers in Takengon have lost their export market due to landslides that have blocked roads. Small traders in Bireuen have gone bankrupt because their stock has not arrived. The Aceh and central governments have a moral and constitutional responsibility for this. Allocate the APBD-APBN budget for sustainable reforestation. Only by addressing the root causes of deforestation upstream can Aceh rise stronger and prevent trillions of rupiah in losses, saving thousands of SMEs.

Overall, the literature emphasizes the importance of collaboration among the government, businesses, and the community in building an economic resilience system that withstands disasters. Experience across regions shows that integrated, community-based interventions can accelerate recovery and sustain MSME income after a disaster (Prakash, 2020; Samantha, 2018).

Thus, the results of this study highlight the need for comprehensive mitigation and adaptation strategies to protect MSME income in Aceh from the threat of flash floods and landslides, as well as the importance of government policies on environmental protection, strengthening adaptation capacity, and institutional support at the local level.

4. Conclusions

Flash floods and landslides in Sumatra, particularly in Aceh, have had a significant impact on the decline in MSME income, especially in the agriculture and plantation sectors. Research in Krueng Kluet, Aceh, shows that farmers' income can drop dramatically during the flood period, from an average of Rp26,027,000 to only Rp5,529,000 per hectare per planting season, causing substantial economic losses (Pirngadi et al., 2025). This vulnerability is also experienced by Gayo coffee farmers in

Central Aceh, where limited adaptive capacity and dependence on a single commodity make them highly vulnerable to the impacts of disasters (Azzahra et al., 2021).

Most MSME actors in Aceh demonstrate awareness and a willingness to contribute to environmental improvement efforts as part of disaster risk mitigation, but these efforts still need stronger government policies and institutional interventions (Azzahra et al., 2021; Pirngadi et al., 2025) Strengthening adaptation capacity, diversifying income sources, and improving literacy and access to disaster information are key to minimizing future economic impacts (Azzahra et al., 2021; N. T. T. Pham et al., 2020).

Thus, the protection and empowerment of MSMEs in Aceh requires comprehensive mitigation and adaptation strategies, cross-sector collaboration, and sustainable policy support to build local economic resilience to the threats of flash floods and landslides (Azzahra et al., 2021; N. T. T. Pham et al., 2020; Pirngadi et al., 2025)

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6. References

ACEH, P. K. T. D. B. H. (2025). *INFORMASI BENCANA HIDROMETEOROLOGI ACEH TAHUN 2025*. https://bencana.acehprov.go.id/

AcehNews. (2025). *BI Sebut Bencana Tekan Sektor Pertanian, Perdagangan, dan UMKM Aceh*.

Asiyah, U. (2018). The survival mechanism of Home Industries (UMKM) of poor families after a disaster. *Masyarakat, Kebudayaan Dan Politik*, *31*, 94–106. https://doi.org/10.20473/mkp.v31i12018.94-106

Azzahra, S., Hamid, A., Nugroho, A., Zulkarnain, & Wahyuni, W. (2021). Assessing the vulnerability of Gayo coffee households towards floods and landslides in Central Aceh-Indonesia. *IOP Conference Series: Earth and Environmental Science*, *686*. https://doi.org/10.1088/1755-1315/686/1/012016

Badoc-Gonzales, B., Mandigma, M., & Tan, J. (2022). SME resilience as a catalyst for tourism destinations: a literature review. *Journal of Global Entrepreneurship Research*, *12*, 23–44. https://doi.org/10.1007/s40497-022-00309-1

Bharti, S. (2021). Socio-Economic Impact of COVID-19 Pandemic on Small and Medium-scale Enterprises (SMEs) in India. *Annals of Management and Organization Research*. https://doi.org/10.35912/amor.v3i2.1260

Eckhardt, D., Leiras, A., & Thomé, A. (2019). Systematic literature review of methodologies for assessing the costs of disasters. *International Journal of Disaster Risk Reduction*. https://doi.org/10.1016/j.ijdrr.2018.10.010

Hossain, M. R., Akhter, F., & Sultana, M. M. (2022). SMEs in Covid-19 Crisis and Combating Strategies: A Systematic Literature Review (SLR) and A Case from Emerging Economy. *Operations Research Perspectives*, *9*, 100222.

Lubis, M., Linkie, M., & Lee, J. (2024). Tropical forest cover, oil palm plantations, and

precipitation drive flooding events in Aceh, Indonesia, and hit the poorest people hardest. *PLOS ONE*, *19*. https://doi.org/10.1371/journal.pone.0311759

Mertens, K., Jacobs, L., Maes, J., Maes, J., Kabaseke, C., Maertens, M., Poesen, J., Kervyn, M., & Vranken, L. (2016). The direct impact of landslides on household income in tropical regions: A case study from the Rwenzori Mountains in Uganda. *The Science of the Total Environment*, *550*, 1032–1043. https://doi.org/10.1016/j.scitotenv.2016.01.171

Miklian, J., & Hoelscher, K. (2021). SMEs and exogenous shocks: A conceptual literature review and forward research agenda. *International Small Business Journal: Researching Entrepreneurship*, *40*, 178–204. https://doi.org/10.1177/02662426211050796

Ngadisih, N., Purwantana, B., Susanti, D., Puspitaningrum, I., Samodra, G., Strauss, P., Arif, S., Murtiningrum, M., Rahayoe, S., W.K., J. N., Sutiarso, L., Bintoro, N., Radi, R., Nugroho, A., Maftukhah, R., M., R. E., Setyawan, C., Nugroho, B. D. A., & Lestari, P. (2025). Landslide Disaster Risk for Small and Medium Agricultural Enterprises (SMAEs). *Environment and Natural Resources Journal*. https://doi.org/10.32526/ennrj/23/20240340

Pham, N., Nong, D., & Garschagen, M. (2020). Natural hazard's effect and farmers' perception: Perspectives from flash floods and landslides in remotely mountainous regions of Vietnam. *The Science of the Total Environment*, 142656. https://doi.org/10.1016/j.scitotenv.2020.142656

Pham, N. T. T., Nong, D., Sathyan, A. R., & Garschagen, M. (2020). Vulnerability assessment of households to flash floods and landslides in the poor upland regions of Vietnam. *Climate Risk Management*. https://doi.org/10.1016/j.crm.2020.100215

Pirngadi, R., Rahmawaty, Ayu, S. F., & Rauf, A. (2025). ANALYSIS OF FARMERS' INCOME AND WILLINGNESS TO PAY FOR UPSTREAM WATERSHED IMPROVEMENT IN KRUENG KLUET ACEH INDONESIA. *PLANNING MALAYSIA*. https://doi.org/10.21837/pm.v23i36.1700

Prakash, K. (2020). A Study of the Impact of Recent Floods on the Micro, Small, and Medium Business Enterprises of Kerala. *Indian Journal of Science and Technology*, *13*, 686–695. https://doi.org/10.17485/ijst/2020/v13i06/149831

Samantha, G. (2018). The Impact of Natural Disasters on Micro, Small and Medium Enterprises (MSMEs): A Case Study on 2016 Flood Event in Western Sri Lanka. *Procedia Engineering*, *212*, 744–751.