Caring for disaster victims: how important is socioeconomic status in geohazards?

Wahyu Endah Christiani Putri[1], Andrea Sumarah Asih[2], Akhmad Zamroni[3,4*], Saurina Tua Sagala[1]
{akhmadzamroni@itny.ac.id}

[1]Department of Mining Engineering, Institut Teknologi Nasional Yogyakarta, Indonesia
[2]Department of Civil Engineering, Institut Teknologi Nasional Yogyakarta, Indonesia
[3]Department of Geological Engineering, Institut Teknologi Nasional Yogyakarta, Indonesia
[4]School of Environmental Science and Management, University of the Philippines, Los Baños, Laguna, Philippines 4031

Abstract. Geohazards cause loss and dynamic community recovery in space and time. Socioeconomic status was evaluated based on household income and educational level. This study aims to examine the importance of knowing the communities' socioeconomic status in geohazards and provide suggestions for solutions that policymakers should take in solving problems related to socioeconomic status in geohazards. To conduct a literature review, we conducted some steps: 1) designing the review, 2) conducting the review, 3) analyzing, and 4) writing the review. It is essential to learn the communities' socioeconomic status in geohazards because poor people with low education levels tend to risk posed by geohazards more than middle-class families because of their limitation in understanding the information related to geohazards, families that live in a subsistence economy may struggle to adapt when loss and damage occur to the home. They have no savings, and sometimes insurance does not offer services to underprivileged communities, outcasts, and residents of remote places in geohazards. It is essential that the government should focus more on vulnerable populations, notably the elderly, who lack the education to inform about geohazards quickly and guarantee insurance for the poor to quickly recover from the effects of geohazards.

Keyword: Caring, Disaster Victims, Socioeconomic Status, Geohazards

1. Introduction

A geohazard is a potential geological source complex that can damage people, property, and the environment; it creates loss [1]. A broad category of environmental and geological phenomena that have an impact on human activities is referred to as geohazard. The vulnerability of civilization to such natural disasters, which eventually result in human and financial losses, has been proved by the lack of effective urban design paired with aspects relating to climate, vegetation cover, geology, and geomorphology [2]. Tsunamis, earthquakes, volcanic eruptions, seawater intrusion, water contamination, subsidence, liquefaction, floods, and landslides are examples of geohazards [3]–[9]. Many people live in areas prone to geohazards [10], and we must care for them if one day a disaster occurs and causes casualties.

SRICOENV 2022, October 05-06, Palembang, Indonesia

DOI 10.4108/eai.5-10-2022.2328299

The geohazard's effects include severe building damage in addition to the loss of functionality of linear and point infrastructures (deformations in the pipeline and road network, protrusion, well casing failures, etc) [11]. A geohazard can also lead to worldwide catastrophes that could damage a region's socioeconomic structure and impact its economy, food security, and political stability [6]. The effects of geohazards on local communities and single homes in risky places around the world are a major social issue. As a function of hazard awareness and acceptance, the effects of geohazards at local and regional levels differ. The risk culture, therefore, encompasses both concepts in a larger sense. Due to numerous societal influences and the psychological impacts of periodic unpredictability in danger exposure, this particular risk culture changes quickly over time [12].

Geohazards cause loss and dynamic community recovery in space and time [13]. Geohazards also cause communities to experience significant physical, social, and financial hardship. Additionally, geohazards contribute to serious environmental issues such as water poisoning, riverbank erosion, and mosquito infestation [14]. Socioeconomic status was evaluated based on household income and educational level [15]. One aspect that affects how geohazards affect people is their socioeconomic level. By being better prepared and more robust, more developed towns typically suffer less from geohazards and recover quicker than less established ones [16]. The socioeconomic position of the population was seen to be a key factor in coping with the post-disaster period and adequately planning for communities [17]. It is essential to learn the communities' socioeconomic status because policymakers can be more concerned about the different financial capabilities of each community. Therefore, this study aims to examine the importance of evaluating the communities' socioeconomic status in geohazards and provide suggestions for solutions that policymakers should take in solving problems related to socioeconomic status in geohazards.

2. Methodology

To conduct a literature review, we follow the method from [18], which includes designing the review, conducting the review, analyzing, and writing the review. During the designing the review, the first step we take is to make a research outline. The first step is to determine the research objectives and gaps. The next stage is to think about what needs to be written in each research part: Introduction, Methodology, Results and Discussion, and Conclusion. In conducting the review, we searched for literature related to the research outline using the Google Scholar journals database. With Google Scholar, researchers may quickly find pertinent publications from the Web's billions of pages (and, in many cases, directly retrieve the full text of those papers). Each professional searcher should use it because it is highly respected and helpful [19]. Through a digital snowball for literature retrieval, Google Scholar offers academics a structured and quick technique to expand on [20]. “Geohazards”, “disaster” or keywords related to geohazards like tsunamis, earthquakes, volcanic eruptions, liquefaction, floods, and landslides were used, followed by words AND "socioeconomic status", for example, "Geohazards" AND "socioeconomic status", "landslides" AND "socioeconomic status", etc. The keyword technique was used in this study to answer the research objectives. The use of the word "AND" in Google Scholar aims to reduce the number of search results so that it is only focused on those two words. The literature material used in this study only focuses on the latest research results, namely from 2012 to 2022.

In the analysis, we make a more detailed outline of what should be presented in the Results and Discussion. The analysis was carried out in-depth to answer the research

objectives. In this phase, we attempted a full data search utilizing those keywords while considering all study-related factors. Publication titles and abstracts were examined to weed out records that weren't necessary. To choose references, read abstracts to understand the basic idea of the prior work that has been done. To gain a deeper understanding, it is essential to read the entire paper [21]. To fully understand this study, it is required to review comparable earlier research [22]. Finally, writing the review stage is carried out by combining the required pieces of literature into this study. The critical thinking process must be conducted at this step to achieve the research objectives.

3. Results and Discussion

3.1 The importance of evaluating the communities' socioeconomic status in geohazards

We have summarized why knowing the communities' socioeconomic status in geohazards is essential.

3.1.1 Understanding the dangers of geohazards

Due to their understanding of the risks posed by geohazards, middle-class families tended to migrate more frequently. While poor families move in search of work rather than safety [23]. Knowledge of geohazards and public awareness was crucial for geohazards' risk communication [24]. Education provided by the relevant institutions is vital, especially for local communities near areas with geohazards [25]. The amount of education is a crucial determinant of a person's income, the standard of living, career opportunities, and other things. Twenty percent of the total variation in social risk is explained by education. A society's potential for development can be determined by its average educational level. Higher education improves the capacity to respond to, deal with, and recover from geohazards [26]. Understanding and interpreting early warning and evacuation decisions is easier the more knowledgeable one is [27]. In addition, a lack of experience may make it more challenging to comprehend warnings and acquire recovery information [28]. In two instances, education and monthly income affect awareness, advocacy, and social capacity. This demonstrates how socioeconomic status and educational empowerment raise awareness of, knowledge of, and potential for recovering from geohazards [29]. People with better socioeconomic status tend to have easier access to better education, mainly formal education. Having better access to formal education makes it easier for them to access knowledge about the dangers of geohazards and how to mitigate disasters. Meanwhile, people with low socioeconomic status will find it difficult to access formal education and understand information technology. This makes it difficult for them to learn about geohazards' dangers and how to mitigate disasters. They also may not fully understand the information related to hazards and geohazards mitigation the government provides.

3.1.2 Financial condition after geohazards

Geohazards have a variety of adverse effects on both human health and economic growth. Human casualties, direct harm to infrastructure or private property, a reduction in household income, alterations in consumer behavior among groups with varying economic

levels, and a decrease in life satisfaction are a few examples [30]. Families that live in a subsistence economy may struggle to adapt. For instance, when loss and damage occur to the home, the family's savings or capital for survival may be wiped out. Barriers prohibit these people and communities from accessing sufficient adaptation alternatives to manage the risks posed by geohazards, which erodes their means of subsistence, food security, and asset bases [17]. Housing styles and social status seemed to be related. For instance, people with more excellent socioeconomic positions had their homes rebuilt after the earthquake with concrete, while those with lesser quality had their homes reconstructed with wood. Recognize that these populations have lower socioeconomic status and reside in hazardous areas. They were most severely affected by earthquakes and depended on these dangerous extremes for survival [31]. People lost their properties but had to carry on with their lives for daily meals and repairing damaged houses. Rich people may quickly take their savings to buy daily food or even repair their homes. However, poor people will tend to surrender and expect help from the government because they do not have savings. Meanwhile, they may not be able to work because the building they work in has also been damaged, so they do not get a salary.

3.1.3 Insurance before and after geohazard

Insurance for health, homes, flood, or cars can lessen a household's susceptibility to geohazards. The serious illness of a family member affects the other members of the home since it lowers their spirits and morale. Because illnesses are unwelcome and have a significant impact on consumption and wages, they also have an impact on a family's financial situation. It has two significant negative economic effects: increased costs for medical care and other services and decreased income from labor shortages. Due to unexpected costs, illnesses force the members of low-income households into bad health and raise their poverty levels. Due to these implications, households in underdeveloped nations are exposed to natural hazards because these households essentially do not have health insurance [32]. For instance, we discuss health insurance. Health insurance is related to better health outcomes and increased use of preventive healthcare. Uncertainty persists regarding the relationship between variations in preventative treatment and health behaviors and variations in health insurance coverage [33]. It is critical to remember that health insurance is not the same as medical care. A financial tool for financing medical care is health insurance. It is not a care guarantee or the care itself [34]. Health insurance is crucial to help people pay for healthcare expenses and maintain their health [35], particularly in geohazards. Health insurance is a calculated political move to close the healthcare access and quality gap between the wealthy and the poor [36]. However, there is a problem with the health insurance payment gap between the wealthy and the poor. The decision to sign up for health insurance must consider the issue of poverty. Poor people don't have access to the financial resources needed for a better standard of living. When people don't have access to resources or have low incomes, it becomes more difficult for them to enroll in health insurance. Anecdotal data suggests that certain district officials of the scheme are reluctant to sign up non-paying clients even though health insurance is free for the poor in several nations. It has been extremely difficult to define who the poor are. Additionally, concerns about inadequate health infrastructure are sometimes attributed to the unfair and unequal distribution of national resources, which makes such disadvantaged groups more vulnerable [37].

Death rates are disproportionately greater for those with lower incomes. Numerous vulnerability studies demonstrate that marginalized individuals are less able to defend themselves against geohazards, return to their homes or places of employment after geohazards, and utilize social support nets before and after. Insurance affects sensitivity and adaptability, whereas mandatory insurance directly affects exposure. Low-income and minority groups (i.e., vulnerable populations) are disproportionately impacted by policy changes to the national insurance program, which may aggravate already-existing vulnerabilities [38]. Therefore, insurance should offer services to underprivileged communities, outcasts, and residents of remote places [39]. So that the poor can protect their health, homes, and vehicles before and after geohazards occur.

3.2 Solutions for policymakers in solving problems related to socioeconomic status in geohazards

Knowing about geohazards can help us assess how willing people are to take precautions and pinpoint the leading causes of the inadequate performance of the current disaster management systems. It is essential to explore the causes of such catastrophes by considering the built environment's susceptibility and how such reasons are seen to fully appreciate and manage the risks associated with geohazards [40]. One of the socioeconomic problems is the high poverty rate [41]. The creation of policies can be used to reduce the risk of geohazards. The government needs to focus more on vulnerable populations, notably the elderly, who lack education and use a variety of channels to quickly inform the public of all geohazards while ensuring the accuracy, timeliness, and transparency of information delivery. Most people answered that they do not actively learn or understand information on geohazards. Thus, the government should improve health education about the associated risks to enhance residents' risk response capacities. To successfully increase locals' awareness, knowledge, and abilities about relevant types of geohazards, the government should frequently undertake disaster prevention exercises [42]. Prioritizing education initiatives will help residents and authorities change how they view the dangers of significant geohazards. Authorities should make more transparent decisions about what to build and reduce the vulnerability of existing structures to catastrophes by disseminating geohazard information to relevant governmental entities and locals [43]. When a community's capacity to deal with geohazards is limited, government support becomes the primary source of resilience. In such circumstances, the government's financial investment and allocation will directly impact the tenacity of personnel and resources related to relief assistance, which might enhance authorities' emergency response capabilities in terms of public health care and expertise. As a result, the quantity of government financing available has become crucial to meeting a substantial need for assistance [44]. According to local socioeconomic conditions, it is also necessary to address the pertinent laws, regulations, and organizational frameworks for reducing geohazard consequences. Appropriate risk reduction techniques should be provided, such as paying more attention to vulnerable people’s design. Regional planners can use master, comprehensive, and implementation plans to reflect the outcomes of their efforts in land-use planning [45]. Socioeconomic perspectives are needed for geohazard management. From a socioeconomic perspective, the following elements can be considered during the post-geohazards recovery and reconstruction process: (1) the compatibility and adaptation of the industrial and employment structures in the geohazards-affected area, and (2) the pace of economic development there. A critical factor in macroeconomic growth and development is the distribution and utilization of regional labor

resources, represented by the employment structure [46]. In addition, the government must guarantee insurance for the poor so that they can quickly recover from the effects of geohazards.

4. Conclusion

Evaluating a community's socioeconomic status is crucial when dealing with geohazards because low-income families are more vulnerable to risk than middle-class families are due to their limited ability to understand information about geohazards; subsistence-based families may find it difficult to adjust when their homes are damaged or destroyed and they have no savings, and occasionally, insurance did not provide services to underprivileged communities. It is suggested that the government must guarantee insurance for the underprivileged to quickly recover from the effects of geohazards. The government should concentrate more on vulnerable groups, especially the elderly, who lack the education to swiftly alert the public to all geohazards. The right risk reduction measures should be offered, and it is also required to address the relevant laws, regulations, and organizational structures for decreasing geohazard implications.

5. Acknowledgments

We thank "Direktorat Riset, Teknologi, dan Pengabdian Kepada Masyarakat, Direktorat Jenderal Pendidikan Tinggi, Riset, dan Teknologi, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia" for the research funding of this study.

References

[1] E. Cauquil and T. S. A. France, “Gap analysis for the development of a Geohazard Monitoring and Warning System OTC 25103 Gap analysis for the development of a Geohazard Monitoring and Warning System,” no. May 2014, 2015, doi: 10.4043/25103-MS.

[2] Hamza, O., De Vargas, T., Boff, F. E., Hussain, Y., & Sian Davies-Vollum, K. (2020). Geohazard assessment of landslides in South Brazil: case study. *Geotechnical and Geological Engineering*, *38*(1), 971-984.

[3] Asih, A. S., Zamroni, A., Alwi, W., Sagala, S. T., & Putra, A. S. (2022), “Assessment of Heavy Metal Concentrations in Seawater in the Coastal Areas around Daerah Istimewa Yogyakarta Province, Indonesia,” *Iraqi Geol. J.*, vol. 55, no. 1, pp. 14–22, 2022, doi: 10.46717/igj.55.1B.2Ms-2022-02-18.

[4] Geertsema, M., Menounos, B., Bullard, G., Carrivick, J. L., Clague, J. J., Dai, C., ... & Sharp, M. A. (2022). Landslide , Tsunami , and Outburst Flood – A Hazard Cascade Associated With Rapid Deglaciation at Elliot Creek , British Columbia , Canada,” 2022, doi: 10.1029/2021GL096716.

[5] Hung, C., Pang, X., Lin, G. W., Yang, K. H., & Uzuoka, R. (2019). “ The Role and Impact of Geofluids in Geohazards,” *Geofluids*, *2019*.

[6] Kundu, S. N. (2017), “Geohazard Modeling Using Remote Sensing and GIS,” In *Modelling Trends in Solid and Hazardous Waste Management*, pp. 127–139, 2017, doi: 10.1007/978-981-10-2410-8.

[7] Petterson, M., Wangchuk, S., & Konchok, N. (2019), “A multiple natural hazard analysis , SECMOL College region , near Leh , Ladakh , North India , with applications for community-based DRR,” 2020, doi: 10.1108/DPM-02-2019-0064.

[8] Prastowo, R., Ipmawan, V. L., Zamroni, A., Umam, R., Permanasari, I. N. P., & Siregar, R. N. (2020, July). "Identification of ground motion prone areas triggering earthquakes based on microtremor data in Jati Agung district , South Lampung Regency , Lampung , Indonesia Identification of Ground Motion Prone areas Triggering Earthquakes Based on Microtremor Data," vol. 020003, 2020.

[9] Zamroni, A., Sugarbo, O., Trisnaning, P. T., Sagala, S. T., & Putra, A. S. (2021), "Geochemical Approach for Seawater Intrusion Assessment in the Area around Yogyakarta International Airport, Indonesia," *Iraqi Geol. J.*, vol. 54, no. 1F, pp. 1–11, 2021, doi: 10.46717/igj.54.1f.1ms-2021-06-21.

[10] Prasetya, H. N. E., Aditama, T., Sastrawiguna, G. I., Rizqi, A. F., & Zamroni, A. (2021, June), "Analytical landslides prone area by using Sentinel-2 Satellite Imagery and geological data in Google Earth Engine (a case study of Cinomati Street, Bantul Regency, Daerah Istimewa Yogyakarta Province, Indonesia)," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 782, no. 2, 2021, doi: 10.1088/1755-1315/782/2/022025.

[11] Kaitantzian, A., Loupasakis, C., Tzampoglou, P., & Parcharidis, I. (2020), "Ground Subsidence Triggered by the Overexploitation of Aquifers Affecting Urban Sites : The Case of Athens Coastal Zone along," vol. 2020, 2020.

[12] Klose, M., Maurischat, P., & Damm, B. (2016), "Landslide impacts in Germany: A historical and socioeconomic perspective," *Landslides*, vol. 13, no. 1, pp. 183–199, 2016, doi: 10.1007/s10346-015-0643-9.

[13] Miles, S. B. (2014, July), "MODELING AND VISUALIZING INFRASTRUCTURE-CENTRIC," no. 1538747, 2017, doi: 10.1061/9780784413234.004.

[14] Rahman, M. A., & Islam, S. (2019). *Climate Change Adaptation in Urban Areas : A Critical Assessment of the Structural and Non-structural Flood Protection Measures in Dhaka*. Springer International Publishing.

[15] Jiang, Y., Zilioli, S., Rodriguez-Stanley, J., Peek, K. M., & Cutchin, M. P. (2020). Socioeconomic status and differential psychological and immune responses to a human-caused disaster," *Brain Behav. Immun.*, vol. 88, no. May, pp. 935–939, 2020, doi: 10.1016/j.bbi.2020.05.046.

[16] Besiou, M., Pedraza-Martinez, A. J., & Van Wassenhove, L. N. (2021), "Humanitarian Operations and the UN Sustainable Development Goals," vol. 30, no. 12, pp. 4343–4355, 2021, doi: 10.1111/poms.13579.

[17] Sapkota, B. K. (2017), "Landslide Loss and Damage in Darbung Village, Gorkha District, Nepal," *Clim. Chang. Res. Univ. Addressing Mitig. Adapt. Challenges*, pp. 1–561, 2017, doi: 10.1007/978-3-319-58214-6_10.

[18] Snyder, H. (2019), "Literature review as a research methodology: An overview and guidelines," *J. Bus. Res.*, vol. 104, no. July, pp. 333–339, 2019, doi: 10.1016/j.jbusres.2019.07.039.

[19] Giustini, D., & Boulos, M. N. K. (2013), "Google Scholar is not enough to be used alone for systematic reviews," vol. 5, no. 2, pp. 1–9.

[20] Zientek, L. R., Werner, J. M., Campuzano, M. V., & Nimon, K. (2018). The use of Google Scholar for research and research dissemination. *New Horizons in Adult Education and Human Resource Development*, *30*(1), 39-46.

[21] Suprapto, N., Zamroni, A., & Yudianto, E. A. (2017), "ONE DECADE OF THE ' LUSI ' MUD VOLCANO : PHYSICAL , CHEMICAL , AND GEOLOGICAL," vol. 26, no. 4, 2017.

[22] Zamroni, A., Kurniati, A. C., & Prasetya, H. N. E. (2020), "The assessment of landslides disaster mitigation in Java Island, Indonesia: a review," *J. Geosci. Eng. Environ. Technol.*, vol. 5, no. 3, pp. 139–144, 2020, doi: 10.25299/jgeet.2020.5.3.4676.

[23] Penning-Rowsell, E. C., Sultana, P., & Thompson, P. M. (2013), "The ' last resort '? Population movement in response to climate-related hazards in Bangladesh," *Environ. Sci. Policy*, vol. 27, pp. S44–S59, 2012, doi: 10.1016/j.envsci.2012.03.009.

[24] Pan, A. (2016), "Study on mobility-disadvantage group' risk perception and coping behaviors of abrupt geological hazards in coastal rural area of China," *Environ. Res.*, vol. 148, pp. 574–581, 2016, doi: 10.1016/j.envres.2016.04.016.

[25] Rachmawati, Y., & Zamroni, A. (2020), "How Indonesian Governments Care for Local People's Education in the Mining Area: Experiences from other Countries," *Psychol. Educ. J.*, vol. 57, no. 9, pp. 5924–5934, 2020.

[26] Chen, W., Cutter, S. L., Emrich, C. T., & Shi, P. (2013), "Measuring Social Vulnerability to Natural Hazards in the Yangtze River Delta Region , China," vol. 4, no. 4, pp. 169–181, 2014, doi: 10.1007/s13753-013-0018-6.

[27] Ainuddin, S., & Routray, J. K. (2012), "Earthquake hazards and community resilience in Baluchistan," pp. 909–937, 2012, doi: 10.1007/s11069-012-0201-x.

[28] Martins, V. N., & Cabral, P. (2012), "Social vulnerability assessment to seismic risk using multicriteria analysis : the case study of Vila Franca," pp. 385–404, 2012, doi: 10.1007/s11069-012-0084-x.

[29] Cerchiello, V., Ceresa, P., Monteiro, R., & Komendantova, N. (2018). Assessment of social vulnerability to seismic hazard in Nablus, Palestine. *International journal of disaster risk reduction*, *28*, 491-506.

[30] Zhao, L., & Zhu, B. (2022), "How do Geohazards Affect Household Consumption : Evidence From China," vol. 10, no. July, pp. 1–9, 2022, doi: 10.3389/feart.2022.941948.

[31] Spoon, J., Gerkey, D., Chhetri, R. B., Rai, A., Basnet, U., & Hunter, C. E. (2021), "Progress in Disaster Science Understanding short-term household recoveries from the 2015 Nepal earthquakes : Lessons learned and recommendations," *Prog. Disaster Sci.*, vol. 10, p. 100169, 2021, doi: 10.1016/j.pdisas.2021.100169.

[32] Huq, M. E., Shao, Z., Al Dughairi, A. A., Sarker, M. N. I., Bowen, C., Al Mamun, A., ... & Rahman, M. M. (2022)., *Measuring Vulnerability to Flash Flood of Urban Dwellers*. Springer Singapore, 2022.

[33] Jerant, A., Fiscella, K., Tancredi, D. J., & Franks, P. (2013), "Health Insurance Is Associated With Preventive Care but Not Personal Health Behaviors," vol. 95817, pp. 759–767, 2013, doi: 10.3122/jabfm.2013.06.130054.

[34] Katz, M. H. (2014), "Health Insurance Is Not Health Care," vol. 174, no. 6, pp. 2014–2015, 2022, doi: 10.1001/jamainternmed.2014.588.5.

[35] Pekkurnaz, D. (2021), "How is Health Insurance Associated with Obesity in Women in Turkey ? Türkiye ' de Kadınlarda Sağlık Sigortası Obezite ile Nasıl İlişkili ?," vol. 56, no. 4, pp. 2808–2823, 2021, doi: 10.15659/3.sektor-sosyal-ekonomi.21.11.1723.

[36] Christmals, C. D., & Aidam, K. (2020), "Implementation of the National Health Insurance Scheme (NHIS) in Ghana : Lessons for South Africa and Low- and Middle-Income Countries," pp. 1879–1904, 2020.

[37] Fenny, A. P., Kusi, A., Arhinful, D. K., & Asante, F. A. (2016), "Factors contributing to low uptake and renewal of health insurance: a qualitative study in Ghana," *Glob. Heal. Res. Policy*, vol. 1, no. 1, pp. 1–10, 2016, doi: 10.1186/s41256-016-0018-3.

[38] Frazier, T., Boyden, E. E., & Wood, E. (2020), "Socioeconomic implications of national flood insurance policy reform and flood insurance rate map revisions," *Nat. Hazards*, vol. 103, no. 1, pp. 329–346, 2020, doi: 10.1007/s11069-020-03990-1.

[39] Mishra, S. R., Khanal, P., Karki, D. K., Kallestrup, P., & Enemark, U. (2015), "National health insurance policy in Nepal: challenges for implementation," vol. 9716, 2015, doi: 10.3402/gha.v8.28763.

[40] Roder, G., Ruljigaljig, T., Lin, C. W., & Tarolli, P. (2016), "Natural hazards knowledge and risk perception of Wujie indigenous community in Taiwan," *Nat. Hazards*, no. 418, 2015, doi: 10.1007/s11069-015-2100-4.

[41] Nolos R. C., Zamroni A., & Evina K. Faith P. (2022), "DRIVERS OF DEFORESTATION AND FOREST DEGRADATION IN PALAWAN , PHILIPPINES : AN ANALYSIS USING SOCIAL-ECOLOGICAL SYSTEMS (SES) AND INSTITUTIONAL ANALYSIS AND DEVELOPMENT (IAD) APPROACHES," no. Smith 2012, pp. 44–56, 2022.

[42] Huang, H., Wang, R., Xiao, Y., Li, Y., Zhang, Q. F., & Xiang, X. (2022), "Determinants of People ' s Secondary Hazards Risk Perception : A Case Study in Wenchuan Earthquake Disaster Areas of China," vol. 10, no. January 2017, pp. 1–15, 2022, doi: 10.3389/feart.2022.865143.

[43] Plag, H. P. (2014), "Foreword : extreme geohazards — a growing threat for a globally interconnected civilization," pp. 1275–1277, 2014, doi: 10.1007/s11069-014-1223-3.
[44] Gao, Z., Ding, M., Huang, T., & Hu, X. (2021), "Geohazard vulnerability assessment in Qiaojia seismic zones, SW China," *Int. J. Disaster Risk Reduct.*, vol. 52, no. September, p. 101928, 2021, doi: 10.1016/j.ijdrr.2020.101928.
[45] Amini Hosseini, K., & Ghayamghamian, M. R. (2012)., "A survey of challenges in reducing the of geological hazards associated with earthquakes in Iran," pp. 901–926, 2012, doi: 10.1007/s11069-012-0123-7.
[46] Liu, B., Han, S., Gong, H., Zhou, Z., & Zhang, D. (2020), "Disaster resilience assessment based on the spatial and temporal aggregation effects of earthquake-induced hazards," 2020.