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Original Article

The Influence Between Place of Residence and Disaster Adaptation Capacity Among Generation Z

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ABSTRACT
Lampung Province is categorized as a highly vulnerable area due to its proximity to the Indian Ocean, the Sunda Strait, and the volcanic activity of Anak Krakatau. This geographical setting poses significant adaptation challenges, particularly for Generation Z, a strategic age group in disaster mitigation. This study aims to examine the relationship between place of residence and tsunami disaster adaptation capacity among Generation Z, with a specific focus on geographical proximity to the Megathrust and Krakatau Volcano. A quantitative approach was employed through an online survey distributed to 261 students of the University of Lampung. Data were analyzed using descriptive non-inferential statistics and multiple linear regression. The results indicate variations in disaster literacy levels across regions, with the highest scores reported by respondents from Bekasi (100) and Prabumulih (98), while the lowest scores were observed in Musi Banyuasin (66.5) and Medan (69.67). However, regression analysis revealed that geographical distance from either the Megathrust or Krakatau had no significant effect on tsunami literacy (Sig. > 0.05). These findings highlight that distance is not the primary determinant; rather, disaster experience, access to information, education, and local policy play a more substantial role in shaping the preparedness of Generation Z. The study recommends integrating disaster literacy into higher education curricula and strengthening evacuation simulations as adaptive strategies.

Keywords
Disaster literacy; tsunami; Generation Z; residence; coastal distance; preparedness

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INTRODUCTION

Disasters are recognized as serious disruptions to the functioning of communities or societies at any scale, arising from hazardous events that interact with conditions of exposure, vulnerability, and capacity. Such interactions result in losses and impacts on human life, material assets, the economy, and the environment (Lapietra et al., 2024). Disasters can also be defined as events that cause severe harm to society. Natural

disasters may result in the loss of lives or damage to property and are often accompanied by significant economic losses (Chaudhary et al., 2021). Disasters are generally classified into two categories: natural disasters and those caused by technology or human activities (Gülsoy et al., 2025). In other parts of the world, such events typically occurred in the distant past, leading to a low perception of risk and a lack of collective memory, which in turn makes tsunami risk communication challenging and complex (Rafliana et al., 2022).

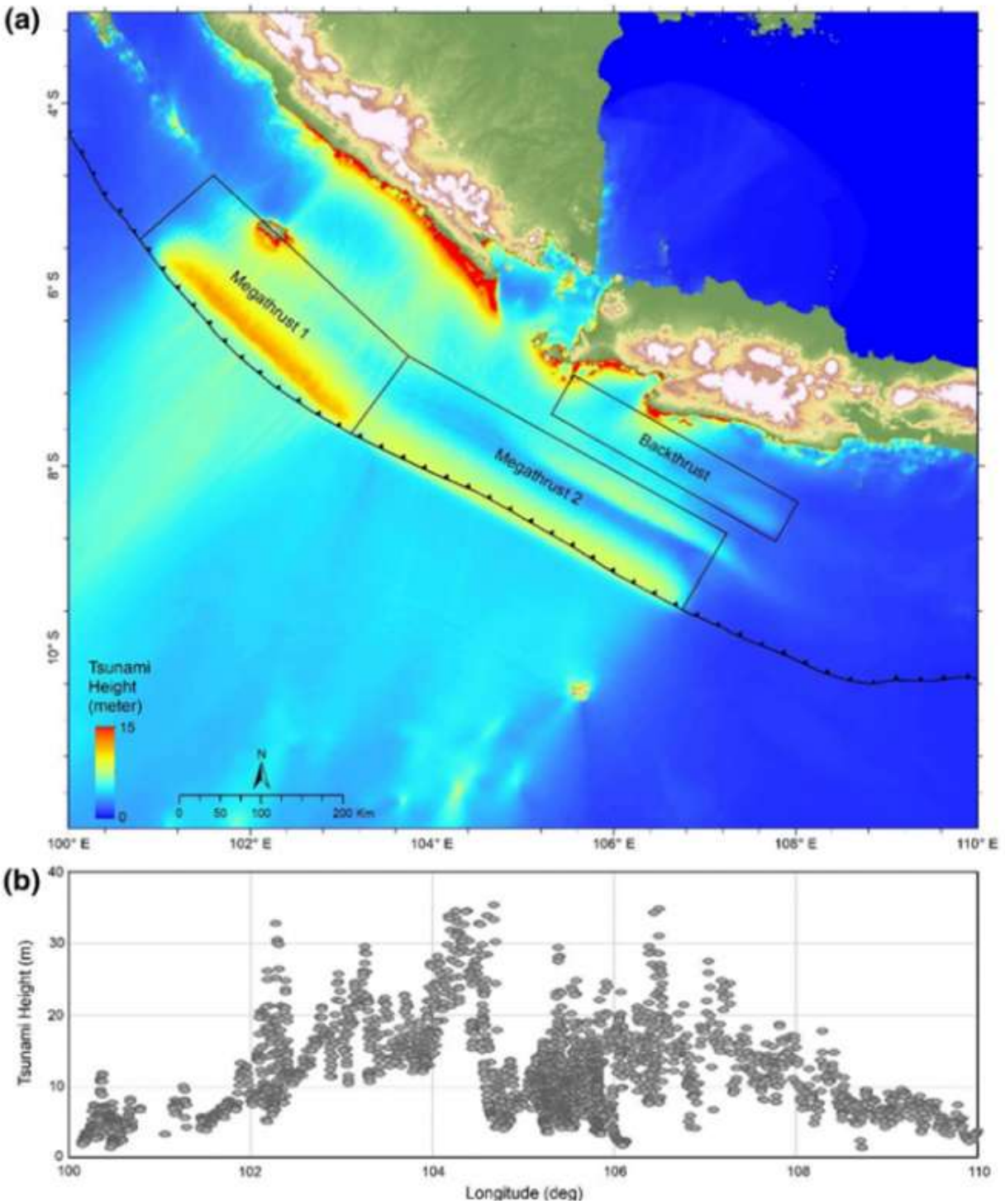

Figure 1. Map and Graph of Tsunami Wave-Height Simulation for the Western and Southern Coastal Regions of Sumatra Island Source: (Supendi et al., 2023)

Lampung Province directly borders the open sea to the west and the Indian Ocean to the southwest, while the southern part is adjacent to the Sunda Strait, and the southeastern and eastern parts border the Java Sea. This geographical setting places Lampung at significant risk of experiencing tsunami disasters, whether triggered by earthquakes or volcanic eruptions (Agustanti et al., 2022).

Nearly all subdistricts at the southern tip of Lampung Selatan are exposed to multiple natural hazards, including earthquakes, tsunamis, tidal flooding, landslides, tornadoes, and fires. This is largely due to the district's geographic location, which is surrounded by coastlines and mountains, categorizing the area as highly disaster-prone (Eridiana et al., 2021). However, the most frequent hazards affecting much of its coastal areas are near-field tsunamis (Pradana et al., 2022). This potential can be visually observed in Figure 1, which illustrates a tsunami wave-height simulation for the southern and western coastal regions of Lampung based on a megathrust scenario.

On the Figures 2 and 3 demonstrate the interrelationship between volcanic activity at Anak Krakatau and submarine geological dynamics, both of which are primary factors contributing to tsunami hazards along the coastal areas of Lampung. Figure 2 depicts changes in crater morphology, fumarole distribution, and the progression of volcanic activity throughout 2018, highlighting the potential for a major eruption capable of triggering slope instability. Meanwhile, Figure 3 presents bathymetric mapping around Anak Krakatau, including the identification of submarine channels and landslide block trains, which provide clear evidence of large-scale mass movement on the seafloor. The combination of high volcanic activity and unstable submarine morphology significantly increases the likelihood of tsunamis in the Sunda Strait, with the Lampung coastline being among the most vulnerable areas.

Given the geographical conditions of Kalianda District, which is highly prone to earthquakes and tsunamis, coupled with continuous population growth, land erosion will further expand, thereby increasing the risk of earthquakes and tsunamis as unpredictable disasters (Primastuti et al., 2024). Although most provinces in Indonesia are categorized as highly disaster-prone, public awareness of disaster risks remains relatively low (Juhadi et al., 2021). In recent decades, environmental risks and threats have further intensified human exposure to natural disasters, often affecting quality of life, particularly among vulnerable groups (Cabello et al., 2021). The frequency and intensity of natural disasters continue to rise due to climate change and other contributing factors, making it crucial to address the human dimension in disaster risk management (Fazeli et al., 2024).

Tsunami early warning systems face a dilemma between time and uncertainty, due to extremely short response windows and the limitations of current technology and scientific knowledge (Fernando et al., 2021). ystematic reviews highlight that the effectiveness of local-level tsunami early warning systems is strongly influenced by the final communication channels, evacuation routes, and regular drills, rather than the accuracy of the model alone (Nuwan et al., 2024). Reconfiguring the ocean–land observation and detection network in Indonesia, particularly in regions such as Lampung, could substantially enhance the reliability of near-field tsunami early warning systems (Purnama et al., 2025).

On the other hand, cultural and socioeconomic factors that significantly affect the success of disaster literacy education are often overlooked, despite each community having distinct contexts and characteristics (Kaniawati et al., 2025). This issue is becoming increasingly relevant as tsunamis pose complex challenges for modern societies (Rafliana et al., 2022). Nonetheless, Indonesia has committed to the 2030 Sustainable Development Goals (SDGs), with a focus on disaster management and risk reduction (Eko et al., 2022). This commitment provides a strategic foundation for strengthening the adaptive capacity of coastal communities in Lampung through the integration of national policies with local contexts within the disaster risk reduction framework.

Tsunamis are among the world's most devastating disasters, as seen in 2004 and 2011, which caused approximately 228,000 and 18,000 fatalities respectively, with many more injured across the Indian Ocean region and Japan. Historical events show that 90% of tsunamis in Indonesia are triggered by earthquakes (Salmanidou et al., 2021). (Benazir et al., 2024) emphasize the importance of estimating the tsunami Estimated Time of Arrival (ETA) to determine the extremely narrow post-earthquake window for life-saving evacuation. Tsunamis are long waves with periods ranging from a few minutes to about one hour and

wavelengths from tens to hundreds of kilometers, depending on the type and dimensions of the source (Nacházel et al., 2021). In this context, disaster literacy must be introduced to Generation Z to minimize disaster risks (Platini et al., 2022).

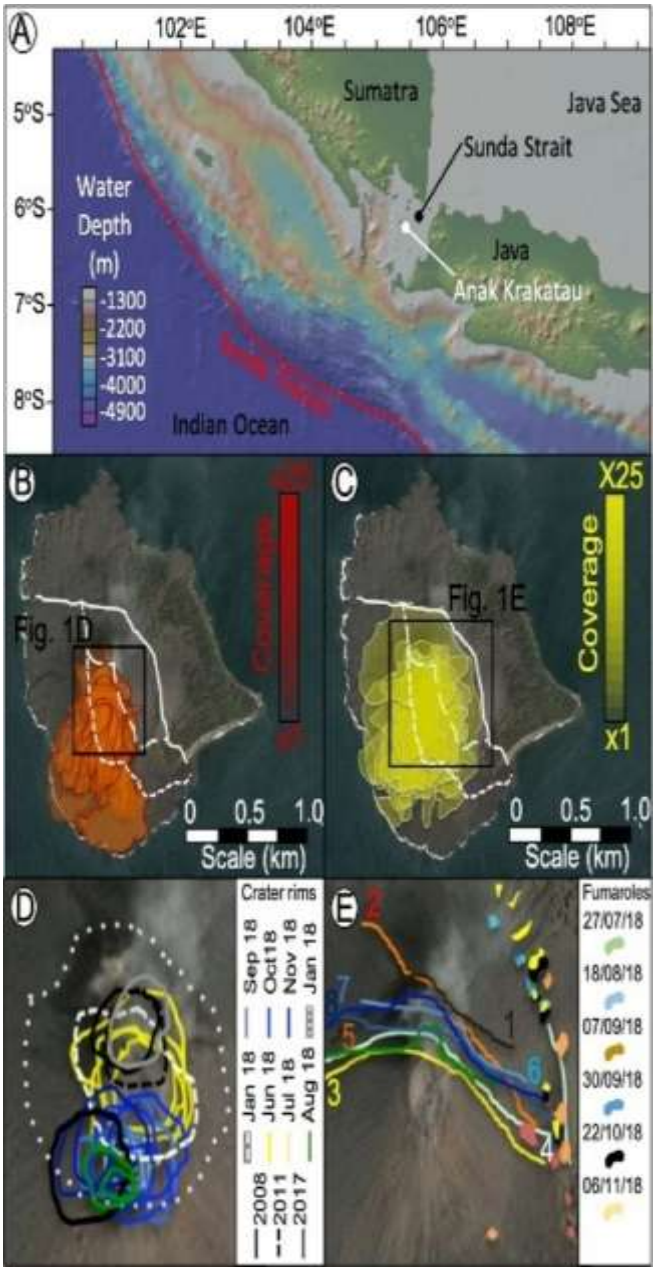

Figure 2. Scientific Map of Location, Geological Conditions, and Morphological Changes of Anak Krakatau in the Sunda Strait Source: (Hunt et al., 2021)

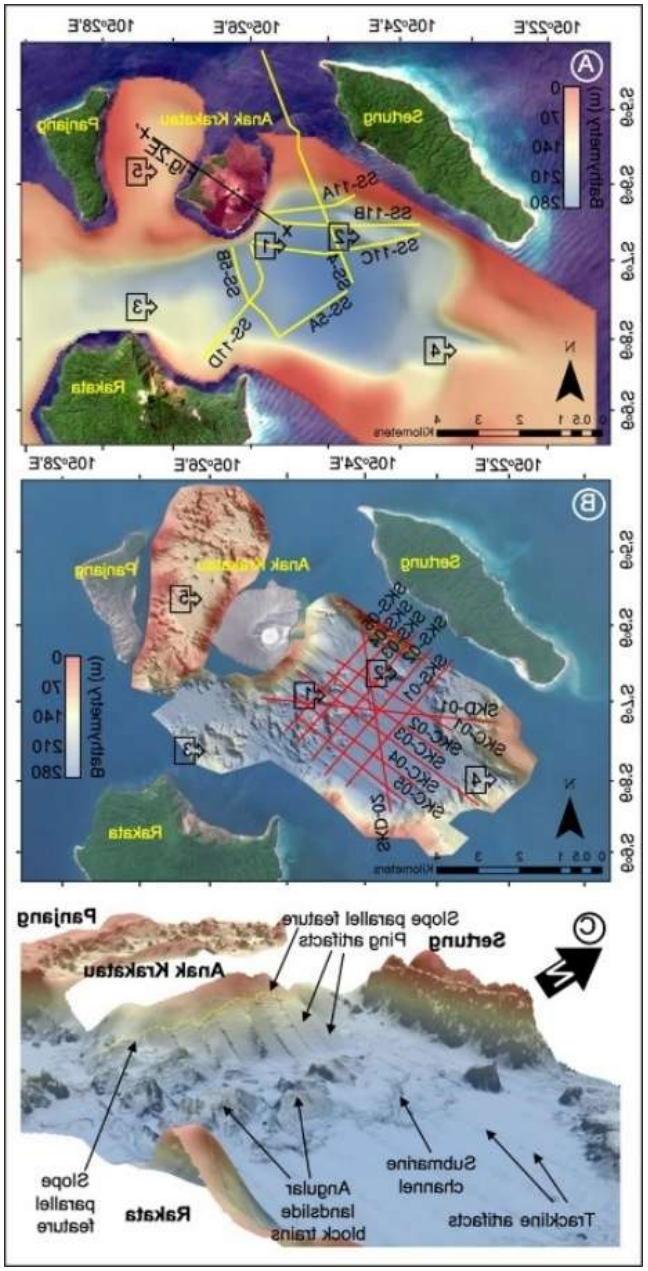

Figure 3. Bathymetric Map and Submarine Morphological Analysis of Anak Krakatau and Its Surrounding Islands (Sertung, Panjang, and Rakata) Source: Source: (Hunt et al., 2021)

Disaster literacy is defined as the ability of individuals to access, read, comprehend, and apply information required to make informed decisions and follow instructions in the context of disaster mitigation, preparedness, response, and recovery (Wahyuningtyas et al., 2021). ts objective is to minimize disaster impacts by providing knowledge, attitudes, and skills on disaster risk reduction (Logayah et al., 2022). Disaster literacy also serves as an entry point for reducing the losses suffered by communities (Lathifa, 2024). Moreover, it is a critical

competency, particularly for university students who are at risk of natural hazards and can make significant contributions to future preparedness (Prasetyaningsih et al., 2025).

From an early age, individuals can contribute positively to natural hazard mitigation, as evidenced by studies conducted in schools in countries such as Thailand, Vietnam, and Indonesia (Gouramanis et al., 2021). However, disaster mitigation knowledge has largely been directed toward adults and the general public, while schoolchildren and university students (Generation Z) often receive limited information (Bachri et al., 2024). Generation Z occupies a strategic position in addressing these challenges, as they represent the next generation responsible for shaping the nation's future. Nevertheless, many in Generation Z remain unaware of the hazards surrounding them or the mitigation measures that can be undertaken individually or collectively (Priangga dkk, 2025). Furthermore, Generation Z faces limitations in digital literacy, particularly in evaluating content, and requires disaster mitigation learning media that can be accessed both offline and online (Anindhita et al., 2024). According (Sagita & Tantri, 2024) Generation Z can maximize their contributions if guided to act as initiators in disaster risk reduction, taking into account their sensitivity and receptiveness to various forms of communication and information about natural hazards.

The place of residence of Generation Z, particularly in disaster-prone areas such as coastal regions or volcanic slopes, is assumed to influence their level of experience and preparedness in facing disasters. This is largely due to the intensity of disaster exposure in such areas, which fosters local knowledge, habits, and adaptive strategies that may not develop among individuals residing in relatively safe or low-risk regions.

Previous studies have examined adaptation capacity from the perspectives of knowledge, preparedness, and the role of education. For instance, (Priangga dkk, 2025) found that Generation Z's understanding of disaster risks remains limited, with most only recognizing disasters frequently covered by the media (e.g., earthquakes and floods), while lacking awareness of local risks in their own residences. Meanwhile, (Rusdanisari, 2025) highlighted that residence significantly influences adaptation capacity, noting that communities living along riverbanks developed physical, social, and economic adaptations to cope with disaster risks.

However, these studies have certain limitations. First, Priangga's research did not link young people's understanding with contextual factors such as place of residence, which may affect their adaptation strategies. Second, Rusdanisari's work emphasized communities in general without specifically addressing youth, who have distinct knowledge, experiences, and access to information compared to other age groups. In other words, studies that explicitly examine the relationship between residence and disaster adaptation capacity among young people, particularly Generation Z, remain limited. Therefore, this study seeks to fill that gap

METHODS

Research Location

The research was conducted at the University of Lampung, which served as the primary data collection site. The selection of this location was based on the consideration that the majority of students, classified as Generation Z, come from diverse residential backgrounds, both coastal and non-coastal areas. In addition, students at the University of Lampung are relatively accessible, possess adequate academic literacy, and can be regarded as a representative sample to illustrate disaster adaptation patterns among young people in the Lampung region. Figure 2 presents a map of the research location, showing the geographical position of the University of Lampung as the study site.

Research Approach

This study employed a quantitative method, focusing on the objective and structured measurement of data. A survey method was used to identify the disaster literacy capacity of students within the study area.

Participants

Table 1. Description of Participants

Indicator	Sub-Indicator	Frequency
Gender	Male	43
	Femael	218
Age	16 years old	1
	17 years old	28
	18 years old	59
	19 years old	99
	20 years old	67
	21 years old	7

Indicator	Sub-Indicator	Frequency
Level	2023	86
	2024	95
	2025	80

Source: Field Data

Data Collection Instrument

The data collection instrument in this study was designed to measure disaster adaptation capability among Generation Z, with domicile considered as a differentiating factor. The instrument took the form of a questionnaire distributed to respondents via an online platform (Google Form), enabling broader coverage across different regions. The questionnaire consisted of two main sections: respondent identity and items measuring disaster adaptation capability. The indicators encompassed three dimensions: pre-disaster adaptation, during-disaster adaptation, and post-disaster adaptation.

Research Procedure

To clarify the direction and focus of this study, a conceptual framework was developed to illustrate the relationship among the variables examined. The underlying assumption is that differences in domicile may influence individual experiences, access to information, and preparedness in facing disasters. These contextual factors, in turn, have implications for the adaptive capacity of Generation Z, which encompasses pre-disaster, during-disaster, and post-disaster aspects. The relationships between these variables are visualized in the following conceptual framework of the study (Figure 5).

Figure 4. Map of the Research Location

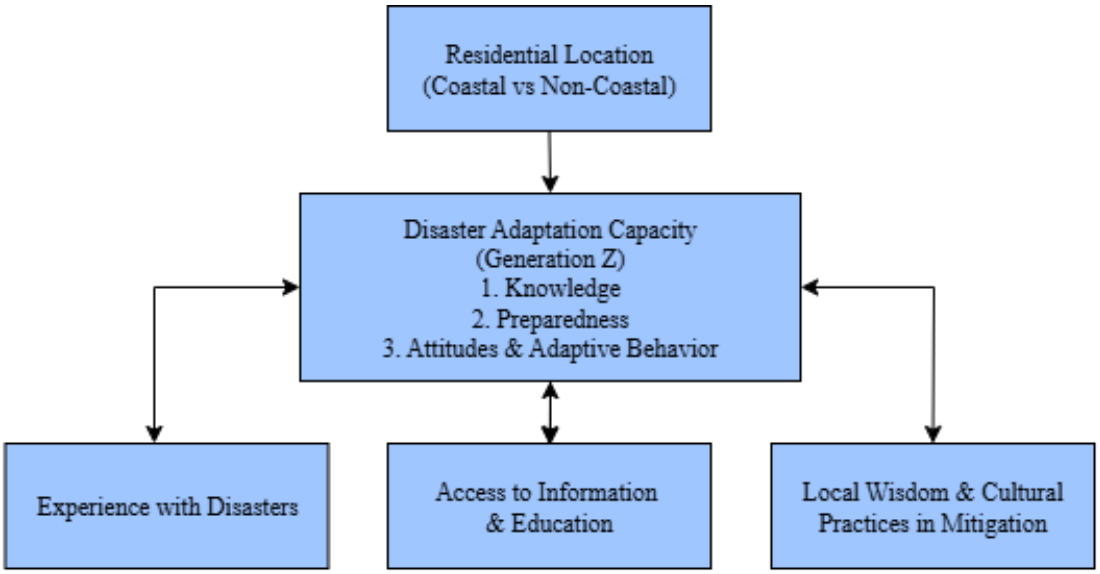

Figure 5. Research Framework

Data Analysis

The data obtained were analyzed using non-inferential statistics, a statistical approach that does not aim to generalize findings to a larger population but rather to describe and interpret the data based on the actual results. The measurements were presented in percentages, which were then classified into three main categories high, medium, and low to facilitate interpretation of respondents' capability levels or characteristics.

In addition to descriptive analysis, linear regression analysis was conducted to examine the effect of the distance from Mount Krakatau and the Megathrust on the tsunami disaster literacy of Generation Z. The research hypotheses were formulated as follows: (1) simultaneously, there is a significant effect of the distance from Mount Krakatau and the Megathrust on tsunami literacy among Generation Z; (2) partially, each distance variable has a significant effect on tsunami literacy.

Hypothesis testing was carried out at a significance level of $\alpha = 0.05$, with the following decision criteria: if the Sig. (p-value) < 0.05, H_0 is rejected, indicating that the independent variable has a significant effect; conversely, if Sig. ≥ 0.05, H_0 is accepted, indicating that the independent variable has no significant effect. Thus, the analysis results are not only descriptive but also provide empirical evidence of the relationship between the variables under study.

RESULTS AND DISCUSSION

The results and discussion section of this study presents the main findings regarding the relationship between domicile and disaster adaptation capability among Generation Z. The analysis aims to illustrate the performance patterns of respondents based on their region of origin while examining the extent to which geographical differences influence their ability to adapt to disasters. Variations in domicile are presumed to contribute to differences in experience, access to information, and individual preparedness in facing potential disasters, thus resulting in diverse outcomes among respondent groups.

To provide an initial overview, the data are presented in the form of mean values of disaster adaptation capability by respondents' region of origin. Figure 4 shows the distribution of average scores from each region, which serves as the basis for examining trends and potential interregional differences.

Based on the mean values of tsunami disaster literacy across regions, a significant variation in literacy levels is evident. In general, the mean values range from 60 to 100, with the overall tendency falling into the "good" category. A broader comparison reveals that major urban areas such as Bekasi, Serang, and North Jakarta tend to achieve higher mean values compared to some inland or rural districts located farther from urban centers. This indicates a relationship between regional accessibility levels and respondent outcomes. Overall, the analysis highlights that variations in mean scores are influenced

by geographical, social, and possibly educational infrastructure differences. These findings are important as a foundation for designing strategies to equalize the quality of learning and strengthen literacy capacity across regions.

In addition to analyzing variations in the mean values of disaster adaptation capability, it is also important to consider the distribution of respondents by region of origin. This ensures more proportional data interpretation, as differences in average outcomes may be affected by the number of students contributing from each region. The distribution of students by region of origin is illustrated in Figure 5.

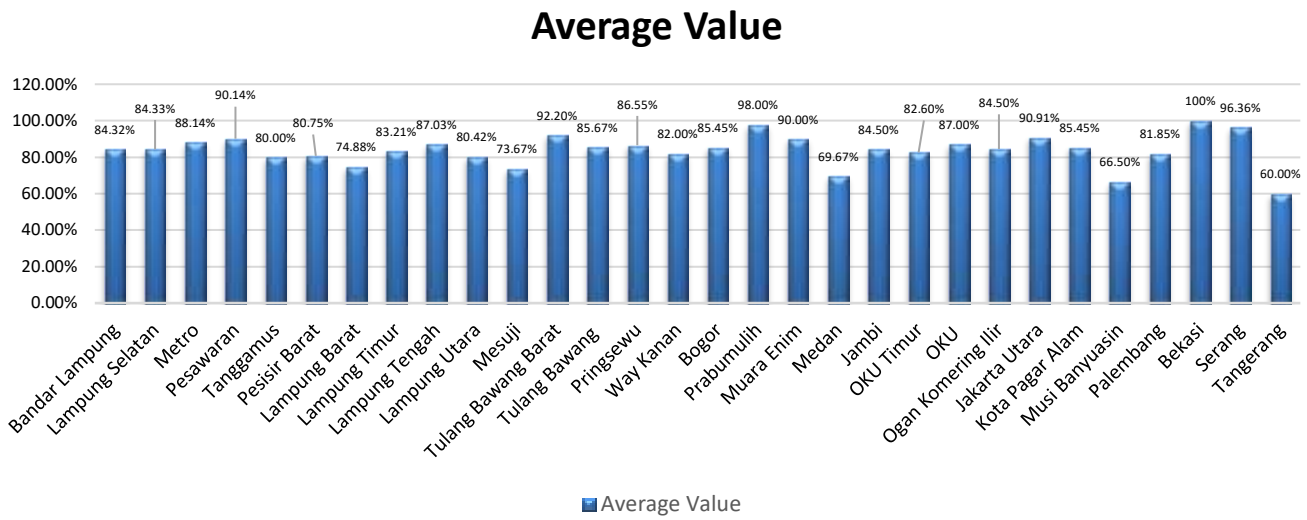

Figure 6. Literacy Score Chart by Region of Origin
Source: Data Processing Results (2025)

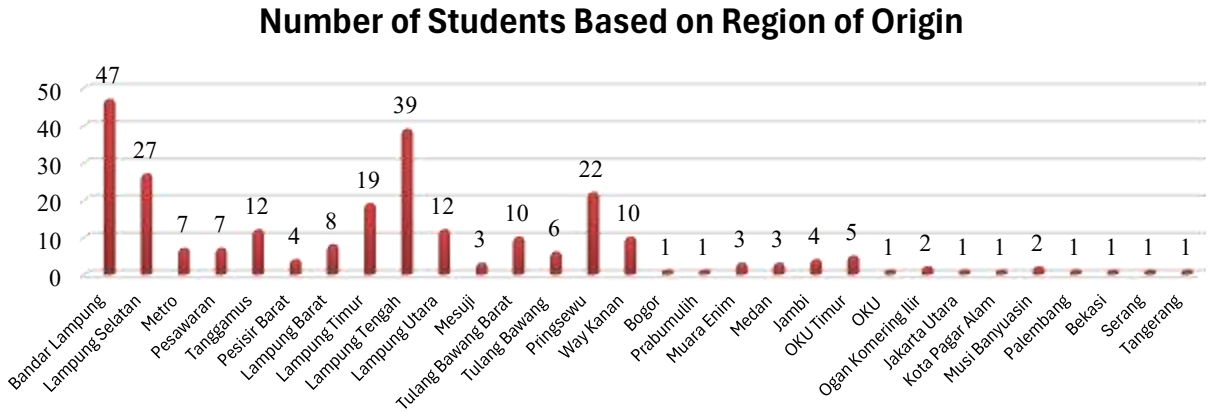

Figure 7. Number of Students by Domicile of Origin
Source: Data Processing Results (2025)

Figure 5 illustrates the distribution of students by region of origin, showing considerable variation across different areas. Overall, there is a tendency for regions with larger populations or more advanced educational access to contribute a higher number of students compared to other regions. However, this pattern does not apply to areas outside Lampung Province, such as Bogor, Jambi, North Jakarta, Bekasi, Prabumulih, Tangerang, and Medan, which recorded only a very small number of students ranging from just 1 to 5 per region. This limited representation is primarily due to the presence of individual students from outside the province, often driven by personal reasons, such as university preferences. Thus, it can be concluded that the majority of students originate from Lampung Province, particularly from highly accessible areas such as Bandar Lampung and Central Lampung. This distribution pattern reflects the concentration of students in regions near the provincial center and underscores the importance of educational accessibility, infrastructure, and the distribution of high schools in influencing the number of students by region of origin.

To obtain a more detailed understanding of the relationship between tsunami disaster literacy levels and geographical location particularly the distance of respondents' regions of origin from potential tsunami sources data are presented on the distribution of Generation Z students by region of origin, their average literacy levels, and relative distances from several reference points. This dataset includes information on proximity to Mount Krakatau, the Megathrust, and the Lampung coast, which serve as critical indicators for analyzing the relationship between geographic proximity and disaster literacy levels. Complete details are presented in (Table 2).

Table 2. Proximity of Respondents' Regions to Geographic Distance of Vulnerability Potential

Code	Place of Origin	Distance to the Coast	Mean
1	Lampung Selatan	8 Km	84.33
2	Bandar Lampung	35 Km	84.32
3	Pesawaran	42 Km	90.14
4	Metro	61 Km	88.14
5	Lampung Timur	62 Km	83.21
6	Pringsewu	71 Km	86.55
7	Serang	83 Km	80.00
8	Tanggamus	90 Km	80.00
9	Lampung Tengah	93 Km	87.03
10	Lampung Utara	115 Km	80.42
11	Jakarta Utara	125 Km	90.91
12	Tulang Bawang	142 Km	85.67
13	Tulang Bawang Barat	144 Km	92.20
14	Bogor	145 Km	85.45
15	Tangerang	146 Km	60.00
16	Pesisir Barat	147 Km	80.75
17	Lampung Barat	155 Km	74.88
18	Way Kanan	166 Km	82.00
19	Bekasi	175 Km	100
20	Mesuji	181 Km	73.67
21	OKU Timur	200 Km	82.60
22	OKU	235 Km	87.00
23	Ogan Komering Ilir	260 Km	84.50
24	Muara Enim	297 Km	90.33
25	Kota Pagar Alam	298 Km	85.45
26	Palembang	300 Km	81.85
27	Prabumulih	310 Km	98.00
28	Musi Banyuasin	426 Km	66.50
29	Jambi	545 Km	84.50
30	Medan	1.115 Km	69.67

Source: Data Processing Results (2025)

Table 2 presents the disaster adaptation capacity across respondents' regions of origin, showing considerable variation. Certain regions stand out with notably high scores, such as Bekasi (100), Prabumulih (98.00), and West Tulang Bawang (92.20), indicating relatively strong literacy and preparedness levels. Meanwhile, most regions in Lampung such as South Lampung (84.33), Bandar Lampung (84.32), Pesawaran (90.14), and Central Lampung (87.03) fall within the intermediate category, with average scores ranging between 80 and 90. This reflects a fairly good level of understanding and readiness among communities, although further reinforcement through disaster education and more intensive evacuation training is still needed. Conversely, several regions show lower scores, including Tangerang (60.00), Musi Banyuasin (66.50), Medan (69.67), West Lampung (74.88), and Mesuji (73.67). This pattern may reflect limited access to disaster-related information, minimal direct experience with tsunamis, and socio-economic factors influencing

preparedness.

From a distance perspective, respondents from areas closest to the Lampung coast, such as South Lampung (8 km), did not record the highest values but instead remained in the intermediate category (84.33). In contrast, respondents from the farthest region, Medan (1,115 km), registered relatively low scores (69.67). This finding underscores that geographic proximity to the coast does not necessarily guarantee higher adaptive capacity, as regions relatively distant, such as Bekasi (175 km), recorded the highest average score (100). Thus, community adaptation levels are more strongly influenced by a combination of education, disaster experience, local culture, and policy support rather than distance alone.

Furthermore, the Graph of Distance from the Coast and Tsunami Disaster Literacy Levels in Figure 6 illustrates the relationship between residential distance from the coast and tsunami disaster literacy levels. The data indicate that students residing closer to the coast tend to have relatively higher tsunami literacy compared to those living farther inland. Although the differences in average scores are not substantial, the geographic factor appears to shape students' awareness and knowledge of tsunami disasters.

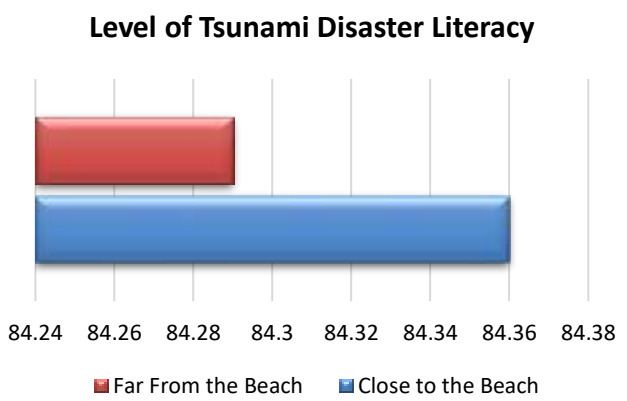

Figure 8. Graph of Distance from the Coastline and Tsunami Disaster Literacy Levels.

Based on Figure 8, it can be observed that there is a difference in tsunami disaster literacy levels between Generation Z living in coastal areas and those living farther inland. Generation Z residing in coastal regions shows an average literacy score of 84.36, whereas those living farther from the coast only reach 84.29. Although the difference in average scores appears relatively small, this phenomenon still provides an important indication regarding the influence of proximity to disaster-prone areas on literacy levels.

Geographical proximity to the coast, which is considered a high-risk area for tsunami impacts, tends to encourage individuals to develop higher levels of knowledge, awareness, and preparedness. Thus, even though the difference in average literacy between the two groups is not highly significant quantitatively, these findings reinforce the tendency that distance from the coast is a contextual factor that can influence tsunami disaster literacy. Generation Z living closer to the coast are generally more concerned, vigilant, and possess higher levels of knowledge regarding potential tsunami threats compared to those living farther from hazard-prone areas.

These findings are consistent with previous research emphasizing that geographical proximity to hazard sources plays an important role in shaping risk awareness and community preparedness. After obtaining a descriptive overview of tsunami disaster literacy levels in relation to hazard-prone areas, the next stage involves conducting a multiple linear regression analysis. This analysis aims to determine the extent to which the variables of distance from the Megathrust and distance from Mount Krakatau influence tsunami disaster literacy among Generation Z. The regression test results are presented in Table 3.

Table 3. ANOVA Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	215.477	2	107.739	1.488	.244[b]
	Residual	1955.069	27	72.410		
	Total	2170.546	29			

Source: Data Processing Results (2025)

In the ANOVA table, the F-value obtained is 1.488 with a significance level (Sig. = 0.244). Since the significance value is greater than 0.05, the regression model is not significant simultaneously. This means that the combination of the variables distance to the Megathrust and distance to Mount Krakatau does not have a meaningful influence on the dependent variable, namely the mean value of tsunami literacy. In other words, these two distance variables cannot yet be considered strong predictors in explaining the variation in tsunami literacy levels. Although the simultaneous test results indicate that the regression model is not significant, the analysis proceeds by examining the partial effect of each independent variable. The partial test

results are presented in Table 4.

Tabel 4. Uji ANOVA

ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	215.477	2	107.739	1.488	.244[b]
	Residual	1955.069	27	72.410		
	Total	2170.546	29			

Source: Data Processing Results (2025)

Based on Table 4, the variable distance to Mount Krakatau has a significance value of Sig. = 0.954 (> 0.05), indicating that it does not have a significant effect on tsunami literacy. Its regression coefficient is 0.001, meaning that every additional 1 km in distance from Mount Krakatau increases the literacy score by only 0.001 points; however, this increase is not statistically significant. Meanwhile, the variable distance to the Megathrust has a significance value of Sig. = 0.115 (> 0.05), which also indicates no significant effect on tsunami literacy. Its regression coefficient is negative (-0.013), suggesting that the farther the distance from the Megathrust, the literacy score tends to decrease by 0.013 points. Nevertheless, this relationship is also not statistically significant.

Both simultaneously and partially, neither the distance to Mount Krakatau nor the distance to the Megathrust show a significant influence on the tsunami literacy level of Generation Z. This indicates that distance is not the sole determinant of disaster literacy; rather, other factors play a more dominant role, such as disaster experience, educational level, exposure to information, and local mitigation policies.

CONCLUSION

This study confirms that although Indonesia is one of the most tsunami-prone countries in the world, geographical distance both from the Megathrust and Mount Krakatau does not significantly influence the tsunami disaster literacy level of Generation Z. The findings indicate that disaster literacy is more strongly shaped by other aspects, such as direct disaster experience, access to education, exposure to information, and local mitigation policies. Thus, domicile or geographical proximity to the source of hazards may serve as a contextual factor, but it is not the sole determinant of disaster adaptation capacity.

This research has several limitations that need to be noted. First, the variables used remain limited, namely geographical distance from the Megathrust and Mount Krakatau as the main predictors of tsunami disaster literacy. Second, the distribution of respondents is uneven, with the majority coming from the Lampung region, while respondents from outside Lampung are relatively few. This condition may reduce the representativeness of the relationship between domicile and disaster literacy for regions farther away. Third, this study employed only a quantitative approach through questionnaires, which was unable to deeply explore socio-cultural factors influencing disaster literacy.

Based on these limitations, several recommendations can be proposed for future research. First, subsequent studies are expected to broaden the scope of variables by including non-geographical factors, such as disaster experience, participation in evacuation simulations, digital literacy, and media exposure. Second, the use of a mixed-methods approach is recommended so that quantitative data can be enriched with in-depth interviews or focus group discussions, thereby providing a more comprehensive understanding of the social, cultural, and psychological factors shaping disaster literacy. Third, the research sample should be expanded to cover various provinces across Indonesia to enhance representativeness and generalizability. Fourth, future studies may examine the role of both formal and informal education in improving disaster literacy, for instance through the integration of disaster-related materials into school and university curricula.

Conflict of Interest The author has no competing interests to declare that are relevant to the content of this article.

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