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An Overview on Determinant Factors of Coastal Community Resilience at Bantul, Yogyakarta, Indonesia

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Abstract Indonesia is prominent for its resilience to natural disasters. This research aims to investigate the social resilience resulting from tsunami and its determining factors using one particular case study at Kretek Sub-District, Bantul, Yogyakarta, Indonesia. Based on its geological and geomorphological characteristics, Kretek Sub-District is considered potentially exposed to tsunami hazards, and a 2019 assessment classified the area particularly Mancingan and Baros villages as medium to high risk. This research collected data from 88 respondents selected through random sampling. The data collected represents indicators for livelihood assets comprising social, financial, physical, human, and natural capital and vulnerability comprising economic, physical, environmental, and social vulnerability. For the research method, a statistic-based mixed method was used to generate the asset pentagram and linear regression to predict the determining factor of resilience. The findings reveals that that the social capital was dominant asset owned by the locals, approaching 94%. This asset includes factors related to social engagement and leadership. Bonding was the primary form of social capital, involving cooperation among citizens in community services, groups, and events. The F-test results revealed that 45% of vulnerability contributed to resilience. Meanwhile, the T-test results indicated that four variables influenced the development of resilience, i.e., the number of stories, income, number of vulnerable groups within a household, and level of education.

Keywords: capacity, resilience, tsunami, coastal, Indonesia

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1. INTRODUCTION

The Special Region of Yogyakarta, abbreviated as DIY hereinafter, is geographically located in southern part of Java Island, adjacent to the Indian Ocean, where the Eurasian and Indo-Australian plates converge. The collision possibly leads to a potential tsunami occurrence. The DIY's south coast is divided administratively among three regencies, including Gunungkidul, Kulon Progo, and Bantul. The southern coastal area of DIY is a landform of marine origin characterized by strong wave and current activity (Sinambela et al., 2014). According to data from the National Disaster Management Agency (BNPB), three coastal villages in Bantul Regency, Indonesia—Srigading in Kapanewon Sanden, and Parangtritis and Tirtohargo in Kapanewon Kretek—were identified as high-risk tsunami zones in 2019 (Figure 1). These three villages are classified as **tsunami-prone areas**, meaning they are highly likely to be affected by tsunami waves.

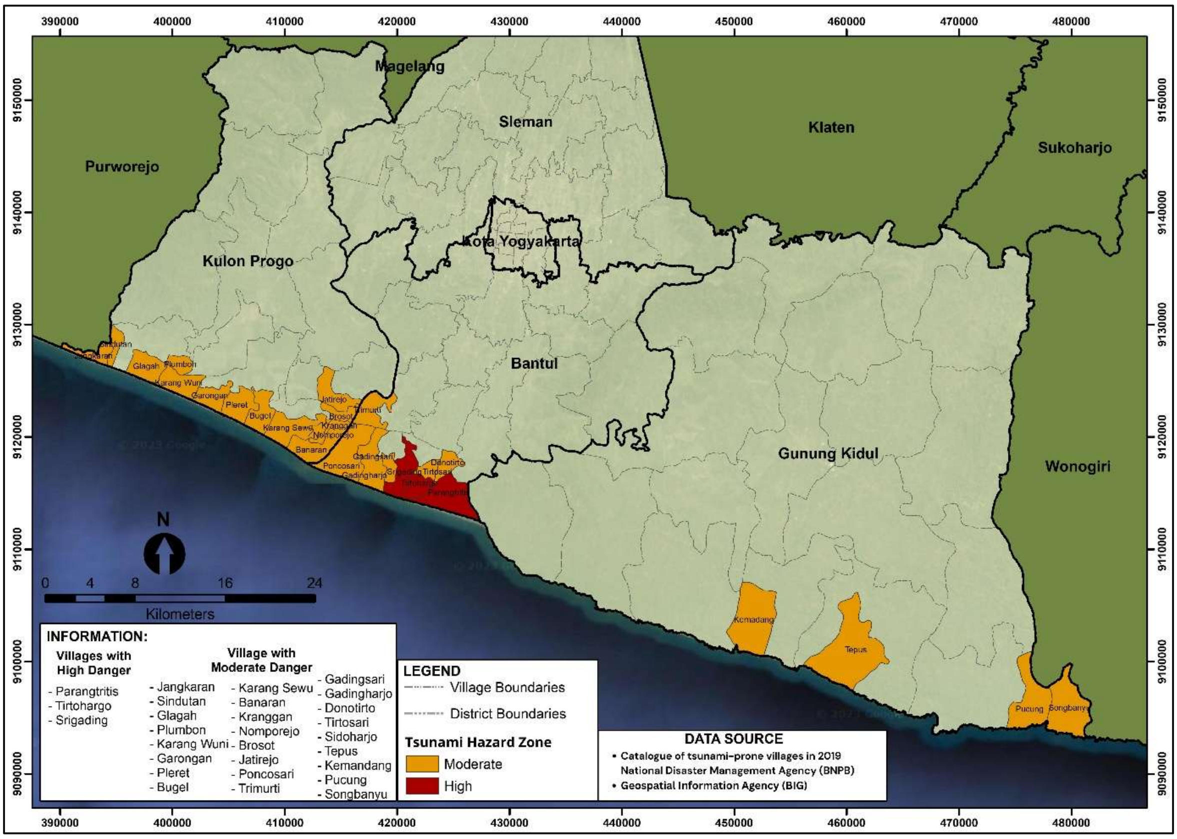

Figure 1. Tsunami hazard map for the DIY province
(Source: modified data from National Disaster Management Agency (BNPB), 2019)

Kapanewon Kretek is geographically situated at coordinates 110°19'06,8" E and 07°59' 20,4" S. The subdistrict comprises five villages, including Parangtritis, Tirtohargo, Donotirto, Tirtosari, and Tirtomulyo (Regional Statistics (BPS) of Bantul Regency, 2022). Two villages, Parangtritis and Tirtohargo, are directly adjacent to the sea. Based on the modelling by Widiyantoro et al. (2020), the tsunami hazard in Bantul Regency's coastal area reaches five meters. According to Subardjo and Ario's analysis (2016), the tsunami hazard levels in Parangtritis and Tirtohargo are extremely high. Additionally, Sinambela et al. (2014) reported that regional tsunami vulnerability in Kapanewon Kretek, across physical, social, environmental, and economic factors, was dominated by the quite vulnerable and very vulnerable groups. The coastal area of Kapanewon Kretek includes a highly vulnerable group at Parangtritis Beach and a vulnerable group in the Opak River area in Tirtohargo, Parangtritis, and Donotirto. Given the existing tsunami hazard, significant vulnerabilities are present in the study area. Previous studies have examined community preparedness for tsunami disasters, focusing on attitudes and knowledge measured through the readiness of communities in Kretek District (Cahya, 2018). However, there is still limited research that incorporates **resilience** and **vulnerability** to analyze the influence of vulnerability on community resilience. This study aims to assess the community's capacity and resilience to disasters, thereby informing adaptation and mitigation efforts in the research area. Additionally, it offers insights into vulnerability variables that may affect the community's **capitals** in facing tsunami disasters.

Herein, the research aims to identify the determinant factors contributing to the community's resilience in Kapanewon Kretek, Yogyakarta, in response to tsunamis. This aligns with the 13th goal of the SDGs, which focuses on climate action, where one of the targets is to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters. Community-based disaster risk reduction is one of the key components that supports SDG indicators in reducing disaster risks caused by climate change and natural hazards (Sugiyana et al, 2024). Resilience in this research refers to an attempt to develop a survival skill in a dynamic environment (Folke, 2016). Resilience is essential in environmental research due to the significant ecosystem changes during disaster situations (Fauziyanti & Hizbaron, 2020; Hizbaron et al., 2018a, 2021; Holling, 1973). Folke (2016) argued that resilience is often treated as a practical ideology within planning, development, and sustainability rather than being fully theorized and conceptualized. Other scholars view resilience as a process that leads to a condition in which individuals or systems survive or even improve following a disaster. Still others frame resilience as the outcome of a long-term process in which social, physical, human, and environmental capacities are strengthened to confront unprecedented events. The Sendai Framework for Disaster Risk Reduction 2015 – 2030 states that its four pillars focus on the concept of "building back better" and on enhancing disaster preparedness for efficient responses. The community must have the ability to respond to disasters effectively and independently, as well as the capacity to recover and become resilient after a disaster occurs (Djalante et al., 2011, 2020; Hizbaron et al., 2018b). The question raised here is: how can an individual or a community survive a tsunami? And what are the determining factors? According to Ma'arif (2012), resilience can also be conceptualized in term of capability and risk distribution. Efforts to enhance resilience include improving preparedness for disaster recovery (Sim, 2021; Fauziyanti & Hizbaron, 2020; Djalante et al., 2011). A resilient community can effectively manage disruptions in infrastructure and adapt to changing circumstances to ensure survival (UNDP, 2020). One approach to building resilience is to reduce a community's susceptibility to disasters (Graveline, 2022). Resilience can be examined by identifying the components of capacity and vulnerability, as well as susceptibility. Community resilience is supported by various forms of capital—including social, physical, environmental, financial, and human—that collectively contribute to achieving the Sustainable Development Goals (SDGs). (Figure 2).

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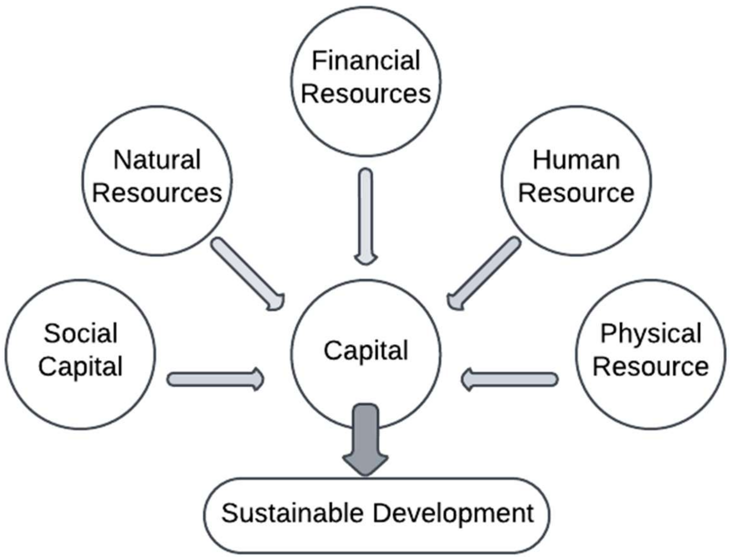

Figure 2. The indicators of resilience analysis in sustainable development

(Source: Goodwind, 2003)

Social capital is seen through the lens of groups and organizations within a community (Fauziyanti & Hizbaron, 2020). Physical capital comprises the fundamental infrastructure and amenities necessary to support community livelihoods (Prihandini, 2017). Natural capital includes land, water sources, forest products, etc. (The Resilience Alliance, 2010). Human capital consists of knowledge, skills, and experience (Marfai et al., 2015). Financial capital refers to financial sources used to accomplish life goals (Prihandini, 2017). Using these indicators, the resilience is somewhat measurable using two sets of temporal observations.

2. METHOD

The resilience was analyzed by identifying the capacity and vulnerability of the community. The capacity and vulnerability analysis adopts the determinant multi-factors (Fauziyanti & Hizbaron, 2020). Figure 2 outlines the factors functioning as guidelines, i.e., social, physical, natural, and human capitals, considered in terms of capability and susceptibility as dealing with disasters (Fauziyanti & Hizbaron, 2020; Marfai & Hizbaron, 2011; Yoga et al., 2020). The Regulation of the Head of the National Disaster Management Agency Number 2 (National Disaster Management Agency, 2012) on General Guidelines of Disaster Risk Assessment states that “vulnerabilities encompass physical, social, economic, and environmental aspects”.

The analysis techniques used ranged from qualitative to quantitative. This study employed **quantitative primary data collection** through **survey methods using sampling techniques**. The research employed both primary and secondary data, as shown in Table 1.

Table 1. Table of research data collection based on data types and sources

Data Type	Data	Data Source
Secondary Data	– Tsunami Hazard Map in 2019 – Final Report of the Review of Document Preparation of Disaster Management Plan of Bantul Regency	Regional Disaster Management Agency (BPBD) of Bantul Regency, 2019
	Catalogue of tsunami-prone villages in 2019	National Disaster Management Agency (BNPB)
	Administration Map of Kapanewon Kretek	Geospatial Information Agency (BIG)
Data Primary	Number of residents per village	Interview with the head of the village
	Condition of community resilience 1. Social capital 2. Financial capital 3. Natural capital 4. Human capital 5. Physical capital	Interviewing community using questionnaires
	Condition of community vulnerability 1. Physical vulnerability with variables of house type, number of stories, building hydrodynamics, and building orientation 2. Economic vulnerability with variables of job type and income 3. Environmental vulnerability with variables of distance between house and coastline and between house and river 4. Social vulnerability with variables of age, sex, number of households, number of vulnerable household members, length of stay, and level of education	

Source: Authors' Analyses (2023)

The data were collected through surveys conducted in several locations using questionnaires. The questionnaire used in this study was a **mixed-format questionnaire**, consisting of two types of questions: **closed-ended** and **open-ended** questions. In the closed-ended questions, respondents were asked to select one answer from two predefined alternatives, namely "yes" or "no". Meanwhile, in the open-ended questions, respondents were required to provide explanations or arguments based on their actual conditions or personal experiences. This approach aimed to obtain standardized quantitative data while also capturing more in-depth qualitative insights related to perceptions and social realities. The questionnaires were distributed to the head of the family or one of the representatives. The information gathered from the filled questionnaires focused on the resilience capital (Table 2), which was determined by the building, economic, social, and environmental attributes.

The population was selected by classifying them according to the villages situated in high-risk areas. Therefore, the selected samples consisted of individuals at high risk of encountering tsunami hazards, characterized by the factors outlined in Table 3.

Table 2. Indicators of resilience capital applied in the research

Variable	Indicator
Social capital	Factor of local leadership
	Participation in a village organization or event
Financial capital	Availability of assets in the form of savings
	Availability of assets in the form of emergency funds
	Migration ability
Natural capital	Land ownership
	Agriculture and plantation land ownership
Human capital	Participation and skill in resource management
	Work skill
Physical capital	Capital of workplace improvement
	Capital of infrastructural improvement

Source: Goodwind (2003), Marfai et al. (2015), & Prihandini (2017)

Table 3. Matrix of selection of research sample locations in Kapanewon Kretek's coastal area

Determinant factor \ Location	**Villages directly facing south coast**				
	Tirtohargo	**Parangtritis**			
	Baros	**Depok**	**Grogol X**	**Grogol IX**	**Mancingan**
Located in high tsunami danger zone (Regional BPBD Bantul, 2019)	Yes	Yes	Yes	Yes	Yes
Special location with tsunami hazard (BPBD, 2019)	Opak estuary	Depok, Opak estuary	Dune, Pelangi, Cemoro Sewu	None	Parangdog, Parangtritis, Parangkusumo
Area of settlement/building in high danger zone	1.2 Ha	16.5 Ha	5.3 Ha	1.1 Ha	51 Ha
Ecosystem area as natural protection	Mangrove forest	None	Dune, coastal forest	Dune, coastal forest	None
Tourism potential (BPBD, 2019)	Baros Mangrove	Depok Beach, lagoon	Pelangi Beach, Cemoro Sewu Beach, Dune	Dune	Parangtritis Beach, Parangkusumo Beach
Number of Family	197	176	119	154	545
Selection of Sample Location	Baros	Mancingan			

Source: Authors' Analyses (2023)

In detail, the research units were selected based on the determinant factors, including the location of the hazard zone, affected locations, settlement sizes, ecological areas acting as natural protectors, tourism potential, and the number of families. The areas in Parangtritis that have residential areas or buildings located in the high tsunami hazard zone are the villages of Depok and Mancingan. Mancingan has a larger number of households compared to Depok, and based on direct field surveys, many of the buildings in Depok that lie within the high tsunami hazard zone are fish markets, restaurants, food stalls, and only a few are residential houses.

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Therefore, Mancingan was selected as the sample location in Parangtritis, while Baros was chosen as the sample location in Tirtohargo. Mancingan and Baros villages, having a combined population of 742 families, were chosen using this approach. The samples were calculated using the Slovin formula, resulting in a total of 88 samples. Proportionally, based on the population per village, 65 samples were selected from Mancingan and 23 from Baros. The respondents were selected using *simple random sampling.* Figure 3 illustrates the sample distribution in each village.

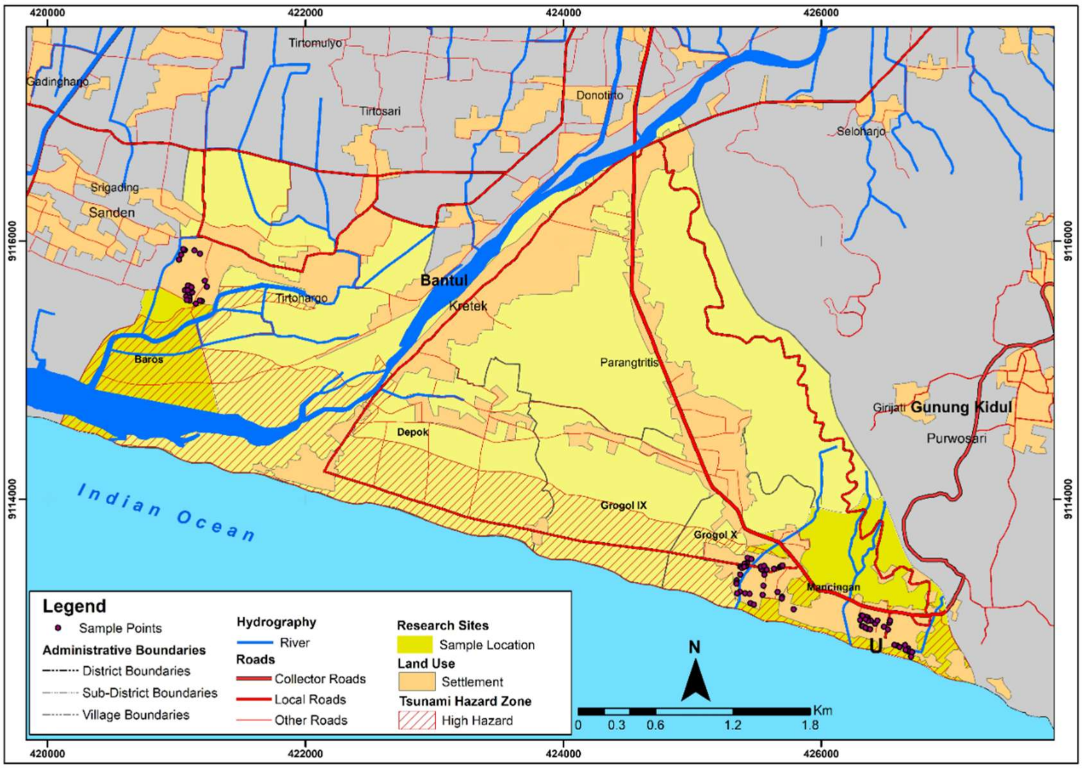

Figure 3. Sample distribution map in the research location
(Source: Processed Data, 2023)[1]

This research employed a quantitative approach. The quantitative-descriptive method is used to test certain theories through correlation between variables (Creswell, 2013). The survey results were tested for validity and reliability to examine the questions applied during the data collection using *SPSS software.* The validity test was performed using the formula of *Corrected Item Total Correlation*; meanwhile, the reliability test was conducted using the method of *Cronbach's Alpha.* The analysis of community resilience was conducted on each variable. Each variable underwent an investigation of community resilience. The four variables were standardized to a general index ranging from zero to 100 using the approach of general index standardization (Cutter, et al., 2010) due to their differing quantities of items. The asset pentagon in Figure 4 illustrates the outcomes of processing social, financial, natural, human, and physical data.

[1] Processed Data (2023) is data resulting from observations, research, and data processing carried out by the author

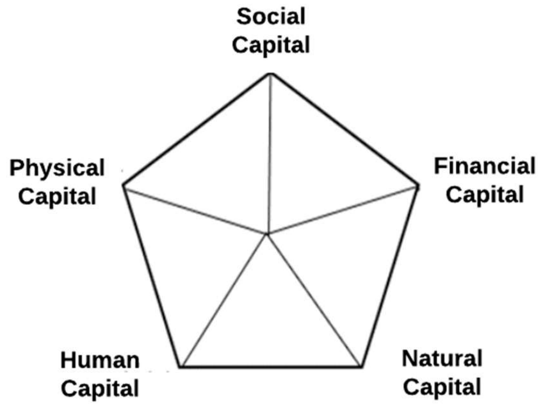

Figure 4. Diagram of asset pentagon
(Source: DFID, 1999)

The determinant factors affecting community resilience were analyzed using multiple linear regression. Classical assumption tests, such as normality test, multicollinearity test, and heteroscedasticity test, were conducted before the analysis. Normality test was used to assess whether the residual variable in regression model has a normal distribution. The data were tested using the Kolmogorov Smirnov test. If the significance value is more than 0.05, the distribution data is considered normal according to the test results criterion. Multicollinearity test assessed the correlation among independent variables. An optimal regression model exhibited no multicollinearity. If the VIF value is less than 10 or the tolerance value is greater than 0.01, multicollinearity is not present. The heteroscedasticity test was used to assess the discrepancy in variability between the observed data and the residual values. Regression models need the lack of heteroscedasticity. The heteroscedasticity test was performed using the Glesjer test. If the significance value is greater than or equal to 0.05, there is no heteroscedasticity according to the test results criterion.

Multiple linear regression analysis is applicable when there are a minimum of two variables (Sugiyono, 2008). The analyses were conducted both partially using t-test and simultaneously using F-test. The multiple linear regression model is as follows.

$$Y = a + b_1X_1 + b_2X_2 + \cdots . + b_bX_n$$

Notes:

Y = dependent variable

a = constant

b = regression coefficient

X = independent variable

The schematic illustrating the research flow can be found in Figure 5.

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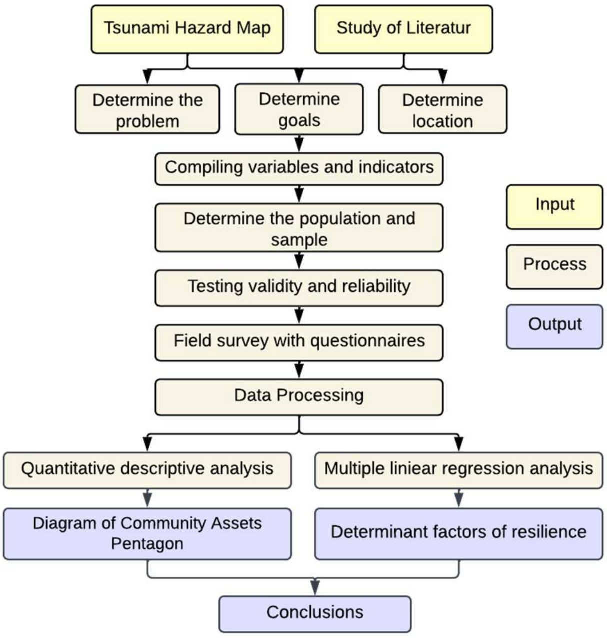

Figure 5. Diagram of research flow

3. RESULTS AND DISCUSSION

3.1 Community Resilience Capitals

Community resilience was measured through the five capitals present in the community of Kapanewon Kretek Coast in preparing for tsunami hazards. The five capitals incorporate social, financial, natural, human, and physical aspects. The research findings indicated that the percentage of each resilience capital varied, as indicated in the following Table 4.

Table 4. Percentage of resilience capital

Variable	Indicator	Percentage (%)
Social capital	Local leadership factor	93
	Participation in a village organization or event	94
Financial Capital	Availability of assets in the form of savings	56
	Availability of assets in the form of emergency funds	51
	Migration ability	39
Natural capital	Residential land ownership	60
	Land ownership in other area	61
	Agriculture and plantation land ownership	42
Human capital	Participation and skill to manage clean water resources	18
	Participation and skill to build temporary shelters	18
	Work skill	28
Physical capital	Capital for improving the workplace	34
	Capital for improving access and infrastructure	28

Source: Processed Data (2023)

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Social capital is identified through togetherness and collaboration within a community to overcome specific issues. A community with significant social capital typically exhibits extensive engagement. Table 4 displays that 93% of the community exhibited a local leadership factor, and 93% of them participated in village organizations and events. This high percentage suggests that social status and economic diversity had no impact on the community. During a disaster, society typically views local leaders as role models and relies on them to verify information about the situation. Engagement in community organizations or events helps enhance the relationship among members. In the dynamics of a situation during a disaster, individuals will offer mutual support and develop solicitude so as to restore the environment after the event. Folke (2016) asserted that resilience encompasses not just theoretical concepts but also identifiable signs. Here, the research picked up the idea to be solid proven in the research area that social leadership and extensive social engagement sign as prior identifier during emergency situation.

When a community has sufficient social capital, its members or families should accumulate financial resources to be ready for challenging situations during a crisis and the subsequent recovery period. Table 4 of the research findings revealed that certain community members lack financial capital. 56% of the members had savings that would assist them in restoring their means of living following the calamity. Furthermore, 51% of members possessed emergency money, whereas only 39% had the ability to migrate. Emergency cash would assist them in meeting their demands in the event of a disaster. Financial constraints, safety concerns, and the proximity of the current settlement to sources of income contributed to the inability to relocate to other regions.

Despite the lack of financial capital, the members possessed multiple pieces of land along the coastline. Table 4 displays that 60% of the community resided on their own properties. Residents who do not own land reside on land owned by the Sultan (Sultan Ground). Furthermore, 61% of the community possessed lands in different areas, enabling them to swiftly recover from the calamity. 45% of the community owned agricultural and plantation lands as investments. Newly productive and tsunami-free areas may serve as alternative sources of income if the primary ones were impacted by the disaster.

In addition to the previously listed capitals, the community’s abilities to meet their demands were also enhanced by their participation in government-sponsored training programs. They could enhance their knowledge and skills to effectively respond to events during and after a crisis. Survey results indicated that 18% of the community took part in the training for clean water source management, 18% in temporary settlement construction training, and 28% in work skills training (Table 4). These abilities would aid the community in addressing post-disaster problems and helping them through the recovery process. Declined post-disaster job prospects necessitated the acquisition of supplementary skills.

Individuals facing restricted job prospects would attempt to work again in the same way they did before the disaster. Workplace reconstruction was considered essential in reaction to the disaster aftermath. The findings showed that only 34% of the community had the financial resources to rebuild their workplace following the disaster. The reconstruction might include

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kiosks, lodging facilities, and land recoveries affected by high salinity. In addition, the community also had the resources to fix the infrastructure surrounding their settlements, including access to clean water, telecommunications, and roadways.

The diagram of the pentagon asset (Figure 6) displays the percentages of the five capitals. On Kapanewon Kretek coastline, social capital exceeded 90% of all capital types, the largest percentage compared to others. The high percentage reflects the community's involvement in all local events and organizations. Moreover, the factor of local leadership contributed to the community's obedience and faith in the local authorities.

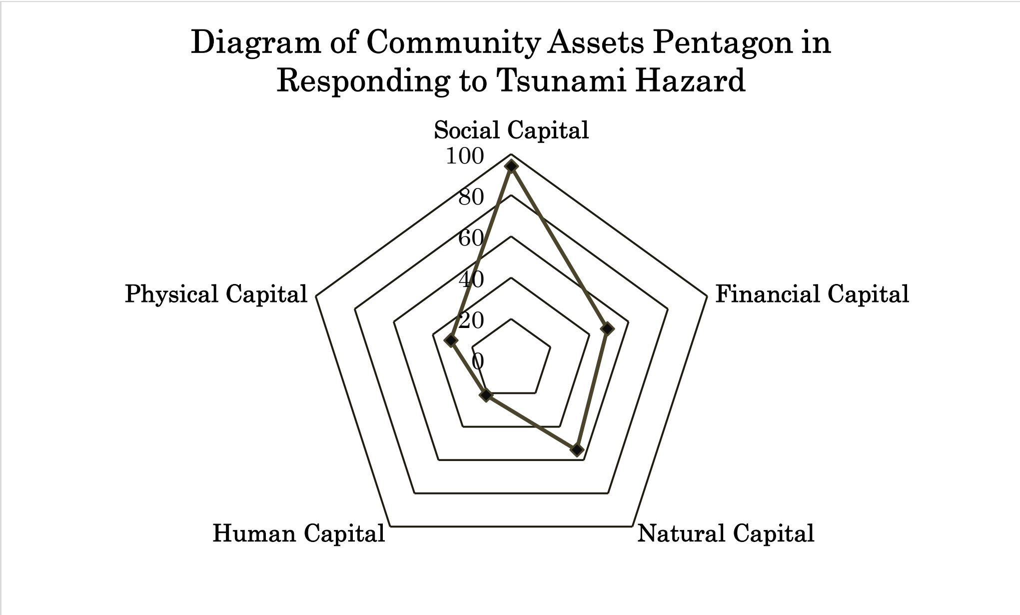

Figure 6. Diagram of Community Assets Pentagon in responding to tsunami hazards (Source: Processed Data, 2023)

The social capital in this coastline was dominated by strong connections in community services, mangrove and cypress planting, social gatherings, communal Quran readings, and Family Welfare Movement (PKK) meetings. In terms of linking social capital, there was a correlation between the community, BPBD of Bantul, and local authorities in reducing disaster risk through activities such as mangrove or coast forest planting, dissemination, and disaster simulation. The interaction among community members was homogeneous. They have adapted to the coastline condition, despite the tsunami hazards.

3.2 Determinant Factors of Resilience

Community resilience is determined by aspects such as physical, economic, environmental, and social vulnerabilities. The physical vulnerability was determined by considering the house type, number of stories, hydrodynamics of the building, and house orientation. Economic vulnerability was determined by analyzing the individual's income and occupation. Furthermore, environmental vulnerability was determined by analyzing the proximity of houses to the sea and rivers. Meanwhile, social vulnerability was determined by considering

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factors such as age, gender, family size, number of vulnerable family members, length of stay, and education level. Table 5 shows the characteristics of the respondents with variables of vulnerability.

Table 5. The Characteristics of the respondents with variables of vulnerability

Variable	Percentage (%)
House type	
Not permanent (materials made of wood and bamboo)	7
Semi-permanent (materials made of wood, planks, and cement)	24
Permanent (materials made of cement and concrete)	69
Number of house stories	
One-story house	97
Two-story house	2
Three-story house	1
House orientation	
House parallel to the coastline	30
House perpendicular to the coastline	70
Hydrodynamics of the ground floor	
Without ground floor opening	5
Ground floor opening with movable objects (cars and other movable assets)	14
Ground floor opening without movable objects	81
Distance between the house and the coastline	
Distance of 0-500 meters between the house and the coastline	66
Distance of 500-1000 meters between the house and the coastline	28
Distance of > 1000 meters between the house and the coastline	6
Distance between house and river	
Distance of 0-500 meters between house and river	74
Distance of 500-1000 meters between house and river	0
Distance of > 1000 meters between house and river	26
Age	
Nonproductive/Elderly (age of > 64)	9
Productive (age of15-64)	91
Sex	
Female	75
Male	25
Level of education	
Elementary school	13
Junior high school	28
Senior high school	47
Diploma I/II/II	5
Diploma IV/Undergraduate/Master/Doctoral	7
Length of stay	

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0-15 years	28
16-31 years	39
32-47 years	17
> 48 years	16
Number of vulnerable family members (toddlers, children, pregnant mothers, elderly, and disabled members)	
0 vulnerable member	45
1 vulnerable member	33
2 vulnerable members	17
3 vulnerable members	3
4 vulnerable members	1
Number of family members	
1 family member	7
2 family members	18
3 family members	27
4 family members	27
5 family members	14
> 5 family members	7
Type of job	
Housewife/unemployed	19
Farmer/farm laborer	18
Private employee	7
Entrepreneur	52
Medical personnel	1
Civil servant/retiree	3
Income	
0-1.250.000 per month	49
1.250.000-2.500.000 per month	22
2.500.000-3.750.000 per month	17
3.750.000-5.000.000 per month	10
> 5.000.000 per month	2

Source: Processed Data (2023)

After obtaining the results, the researchers conducted classical assumption tests, including normality, multicollinearity, and heteroscedasticity. To perform multiple linear regression, the data must be normally distributed and free from multicollinearity or heteroscedasticity. If the conditions are met, the multiple linear regression analysis using the F-test is applicable, as indicated in Table 6.

Table 6. Multiple linear regression results (F Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.892	14	2.778	4.264	$.000^b$
	Residual	47.559	73	.651		
	Total	85.451	87			

a. Dependent Variable: Capital
b. Predictors: (Constant), education, sex, hydrodynamics, distance to a river, number of vulnerable family members, orientation, number of stories, length of stay, type, income, age, number of family members, job, distance to a coastline

Source: Processed Data (2023)

The calculated F-value of 4.264, as illustrated in Table 6, exceeded the critical F-table of 1.83. Additionally, the significance value (Sig.) < 0.05 is 0.000. This result showed that all independent variables (vulnerabilities) simultaneously and significantly affected the dependent variables (capitals). Table 7 describes the determinant coefficient results.

Table 7. Determinant Coefficient Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	$.671^a$	.450	.344	.807

a. Predictors: (Constant), education, sex, hydrodynamics, distance to a river, number of vulnerable family members, orientation, number of stories, length of stay, type, income, age, number of family members, job, distance to a coastline

Source: Processed Data (2023)

The determinant coefficient indicated a correlation coefficient of 0.671 and a determinant coefficient (R Square) of 0.450, as shown in the test results of capital as a dependent variable to an independent variable (Table 7). The findings indicated that vulnerability had a 45% simultaneous impact on capital. Meanwhile, the remaining 55% was influenced by other irrelevant variables. A partial t-test was performed to analyze the impact of each vulnerable factor, as displayed in Table 8.

Table 8. Multiple linear regression results (t test)

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	2.360	1.291		1.828	.072
	Type of house (X_1)	-.009	.118	-.007	-.073	.942
	Number of stories (X_2)	.532	.225	.225	2.365	.021
	Floor hydrodynamics (X_3)	-.117	.119	-.092	-.977	.332
	House orientation (X_4)	.013	.135	.010	.093	.926
	Income (X_5)	.333	.118	.302	2.833	.006
	Job (X_6)	-.020	.125	-.018	-.160	.873
	Distance between the house and the coastline (X_7)	-.266	.162	-.199	-1.639	.105
	Distance between the house and the river (X_8)	.255	.142	.209	1.801	.076
	Age (X_9)	.000	.197	.000	.001	.999
	Sex (X_{10})	.159	.138	.118	1.147	.255
	Number of family members (X_{11})	-.133	.114	-.130	-1.162	.249
	Number of vulnerable family members (X_{12})	.228	.111	.236	2.049	.044
	Length of stay (X_{13})	-.088	.114	-.083	-.775	.441
	Education (X_{14})	.242	.109	.228	2.210	.030

Source: Processed Data (2023)

After conducting the t-test between the dependent variable of resilience and the independent variable of vulnerability in Table 8, several variables showed significance values of less than

0.05. These variables include the number of stories (0.021), income (0.006), number of vulnerable family members (0.044), and level of education (0.030). Meanwhile, other variables had significance values greater than 0.05. Accordingly, four variables that significantly impacted community resilience were the number of stories, income, number of vulnerable family members, and level of education. Thus, the regression model obtained was:

$$Y = 2.360 + 0.532X_2 + 0.333X_5 + 0.228X_{12} + 0.242X_{14}$$

The positive regression coefficient indicated a favorable impact on the resilience capitals. Therefore, the greater the number of stories the buildings in the neighborhood have, the stronger their resilience capitals become. As community income increases, resilience capitals also increase. Greater vulnerability among family members in a community led to increased resilience capitals. Moreover, the greater the degree of education among the population, the higher the resilience capitals become.

Single-story houses were the predominant kind of building in the research area, as shown in Table 5. The area, along with the settlements, was susceptible to flooding. Only a small number of members tried to raise their residences. Residents with multi-story residences were able to evacuate as the seawater flooded the area. They promptly reacted throughout the accident and the subsequent recovery. Nevertheless, the number of stories reflected the community's financial resources to restore houses. Individuals living in single-story houses typically had limited physical capital, suggesting a lack of preparedness in building sustainable livelihoods prior to the tragedy. Community members with single-story houses generally had lower or moderate economic status compared to those with multi-story houses, limiting their ability to accumulate natural and financial capitals.

Income is a measure of the community's economic potential. Most community members earned between 0 and IDR2,500,000, as shown in Table 5. Income impacted the ability to prepare for emergency needs both before and after the disaster. A low-income community facing growing demands struggled to make investments. Income impacted the community's ability to build resilience across financial, physical, and natural resources. Disasters can cause significant disruptions, making it challenging for a community to recover if they did not prepare their resources beforehand (Fauziyanti & Hizbaron, 2020; Hizbaron et al., 2018a, 2021; Holling, 1973). High-income individuals were more likely to be prepared for future disasters by preparing savings, setting up emergency funds, and investing in properties in other areas. They promptly reacted throughout the accident and the subsequent recovery. Income was a factor associated with education. Individuals with little financial resources had access to education of a lower caliber. Low education was directly correlated with low income.

The community's socioeconomic status impacted knowledge accessibility. A strong economy leads to increased education levels and, therefore, more knowledge within the population (Notoatmodjo, 2007). Furthermore, a high degree of education enhances the likelihood of acquiring and comprehending knowledge. Higher levels of education in the community led to increased capacity to respond to disasters, as well as better awareness, knowledge, and activities towards building a disaster-resilient community. Capacity is essential for effectively responding to disasters, since it involves the ability to respond and recover independently when a disaster occurs (Djalante et al., 2011, 2020; Hizbaron et al., 2018b). Education impacted the community's capital in reacting to disasters.

Social vulnerability, which encompasses vulnerable groups within the family, is the final aspect. These groups often have reduced capacity in disaster management. The physical and mental skills of young and old individuals are lower compared to middle-aged individuals, making them more vulnerable to disasters due to their limited ability to respond (Ma'arif & Hizbaron, 2015). The vulnerable groups in this study, including elderly individuals, toddlers, and children, significantly affect the family's needs and therefore require the accumulation of varying types of capital to adequately meet those needs.

4. CONCLUSIONS

The research findings concluded that the community's social capital had the highest proportion among other capitals, reaching 94%, as depicted in the assets pentagon diagram. Social capital in Kapanewon Kretek Coastal mostly consisted of strong social bonds, involving collaboration in community services, community groups, and social events. A multiple linear regression analysis was performed to assess the impact of community resilience based on markers of physical, economic, social, and environmental vulnerabilities. The F-test indicated that the vulnerability impacted community resilience by 45%. The t-test results showed that four variables affected community resilience, *viz.* the number of stories, income, the number of vulnerable family members, and level of education.

LIMITATION

This study has several limitations. First, the research area was limited to only two coastal villages in the Kretek District, which restricts the generalizability of the findings to other coastal areas with different characteristics. Second, some of the questions in the questionnaire did not provide sufficient space for the community to convey a more comprehensive picture of their actual capacities.

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