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IMPACT OF INFORMATION TECHNOLOGY, LEADERSHIP COMMUNICATION, PROTECTION FACILITY, AND LOCAL WISDOM PRACTICE ON SOCIAL READINESS FOR DISASTER IN KRAKATOA

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ABSTRACT

The purpose of this paper is to examine the effect of several variables determining the social preparedness in the "ring of fire" area. The survey was conducted on residents around the circle of Mount Krakatoa, Indonesia, with 287 respondents, and data processing used a structural equation model (SEM). The results show that the early warning system and information technology variables, local government communication leadership, citizen protection facilities, and consciousness of living in the ring of fire territory significantly affect social readiness for disaster. Likewise, the willingness to protect nature, community cohesiveness, and willingness to build local wisdom also significantly affect social readiness. This study implies the need for collaboration between communities and government to foster social readiness.

Keywords: *Environmental Communication, Government Communication Leadership, Information Technology, the Ring of Fire, Social Readiness*

1. INTRODUCTION

With world development, various aspects of human life are integrated to improve its quality. Still, disaster risk, especially in the ring of fire region countries, had less attention. The population's safety from disasters is one of the most critical concerns. For example, Indonesia, the archipelagic country, cannot be separated from the ring of fire regions that traverse the Asia Pacific. The series of volcanoes circling the Pacific starting from Latin America, from the Antarctic Plate, South American Plate, Nazca Plate, Caribbean Plate, Cocos Plate, North American Plate, Eurasian Plate, The Philippines, the India-Australia Plate, and the center of the ring is the Pacific Plate. The Japanese archipelago lies between the Eurasian Plate and the Philippine Plate, which is a dangerous area. The entire area traversed by the ring of fire is the center of active volcanoes both on land and at sea so that the threat of earthquakes and tsunamis is part of the people's daily lives.

In Indonesia, more than 1,000 islands are, in fact, a series of volcanoes. Therefore, people's daily life is accompanied by eruptions, earthquakes, and possible tsunamis. A series of earthquakes or small ash eruptions from one of Indonesia's hundreds of volcanoes do not cause immediate panic. The entire geographic area of Indonesia sits above an active subduction zone where the India-Australia Plate is forced under the Eurasian Plate. Some volcanic eruptions are dangerous and even deadly, but the volcanic ash they emit also provides fertile soil for growing crops, including rice, fruit, vegetables, and spices. The entire region is prone to earthquakes and volcanic activity. That is why—in the early summer of 1883—most people who had spent time in Indonesia were not the least bit worried when Krakatoa began to show signs of activity and culminated in a massive explosion [1][2].

When it erupted, Krakatoa produced a raft of pumice in the ocean and followed the current 21 months after the eruption. Thousands of pumice

rafts reached the coast of Africa in May 1885, and the world news noted that the rafts even reached a few acres with small pieces and remained that size for months. Some of the larger pieces of pumice provide shelter for crabs and small fish. The volcano also ejected large amounts of ash into the sky and sulfuric acid aerosols into the atmosphere. As a result, temperatures worldwide were colder than usual for the entire year following the eruption. Plus, sunsets have been alarmingly colored for months—and reports of suns setting incredibly colorful over the skies of Australia, Europe, Hawaii, North America, and Asia. The sunsets are so red on the east coast of the United States that people worry about a major fire [3][4]. After the massive eruption in 1883, Krakatoa erupted several times, although with a smaller scale. Simultaneously, the population in the Krakatoa region is relatively dense, and the capital city of the Republic of Indonesia is not far from the volcano. Various similar studies have been carried out from an engineering perspective to reduce the impact of disasters. However, research from social humanity and environmental point of view is still minimal. The studies we carry out in this article seek to complement previous research, especially from a social, communication, and technological perspective.

The research perspective on earthquakes and tsunamis was dominated by technical disciplines such as seismology for disaster prediction and prevention. Another previous research, for example, discusses Anak Krakatoa, which erupted in 2018 at the technical subaerial landslide source of the volcanic tsunami [6]. The other perspective discusses the discipline of Medicine or Public Health for post-disaster management and so on. It is essential to study the ring of fire in the Japanese Archipelago. The origin of the zone of concentrated formulations and the stress accumulation processes from intra-plate earthquakes were interested in the previous inquiry [7]. Their research illustrated how strong the ring of fire effect is in the Japanese Archipelago. Hence, harmful effects also occurred in Southeast Asia. Therefore, this study is critical. Residents living in areas close to volcanoes in the "ring of fire" have the knowledge, values, technology, and social learning passed down from generation to generation to coexist with disaster risk.

Several previous studies analyzed society and humanity's aspects to provide mental recovery assistance from a psychological perspective. However, the previous research focused only on the mental health and psychological impact of the Great East Japan Earthquake Disaster in 2011 [8]. This research was conducted through a systematic literature review and found that some residents were affected by the disaster significantly. Affected individuals exhibit a variety of mental and physical consequences. Therefore, this research proposal focuses more on efforts to increase the community's capacity to face disasters technically, socially, and culturally before and after a disaster and is more comprehensive in social and humanitarian relations related to disasters. It is the concern of risks of living in the ring of fire region with a multidisciplinary approach, including stakeholders [9]. Again, the previous attention focuses on the water-energy-food relationship to achieve environmental security in the Asia-Pacific Ring of Fire and not social readiness.

Other studies focus more on the technical aspects of disasters, such as the concern with transportation management for post-disaster recovery in local communities [10]. For example, the research on East Japan Earthquake and Tsunami in 2011 focuses on recovery, building conceptual and operational demand and supply models. Rebuilding public facilities is very important to speed up the distribution of social assistance and reduce the psychological impact of victims. Therefore, our research paper combines several essential factors, including the background of several researchers' expertise. The Asia-Pacific citizens must learn from the mega-disasters in Japan [11]. The earthquakes and tsunamis were not only the Great East Japan Earthquake in 2011, but this disaster was hazardous due to several things such as earthquakes, tsunamis, nuclear power plant accidents, power cuts, and large-scale supply disruptions-chain. Thus, disaster recovery management and improvement must be integrated to respond to a culture of prevention and resilience [5].

Research from various disciplines was directed at reducing the risk of volcano and tsunami disasters victims. This article discusses environmental communication, leadership and management communication, and the psychological and sociological aspects. It is essential to care for the social ability in managing people's lives amidst the risk of the ring of fire as a critical factor [12]. Residents cannot escape the "ring of fire" but must live side by side with nature, which sometimes shakes and causes disaster. Several deadly disasters constantly threaten the safety of residents, such as earthquakes, tsunamis, storms, hurricanes or typhoons, floods, and forest fires [13]. Therefore,

various scientific and technological efforts help humans reduce the damage caused by earthquakes and tsunami. Many engineering studies have been conducted and applied to detect and manage disasters. However, only a few studies have focused on communities with humanities related to the ring of fire. This study takes attention to applied environmental disaster prevention. Also, our article is closer to discussing environmental awareness, environmental education, communication, and community capacity building [14][15].

Another study paid attention to the human element and health recovery aspect for disaster victims. Two significant earthquakes, namely the 2008 Sichuan Earthquake and the 2011 East Japan Earthquake, facilitate the most effective disaster planning and action [16]. This strategic issue includes three crucial points, (1) all relevant agencies must formulate emergency plans and provide information to the public. (2) Every citizen must be educated and trained on minimizing disaster risk, and (3) the central government must establish one headquarters responsible for command, control, and coordination during a natural disaster emergency and must concentrate all power in a single authority. However, the perspective of this research is on post-disaster emergency medical assistance. These weaknesses do not include social and human perspectives. Also, it is essential to examine the perspective of treatment for disaster victims by collecting data while providing medication and counseling in the days following the Great East Japan Earthquake [17]. This area of research investigates community involvement and traumatic stress screening in post-disaster community mental health training. Similarly, the other studied social support for improving mental health among victims then relocated to temporary housing after the Great East Japan Earthquake and Tsunami [18]. Although it was enriched with social and behavioral sciences analysis, they are focused on the post-disaster period to deal with victims.

A more robust insight came from a social and humanitarian perspective on environmental care and disaster preparedness. The digitally networked society came through rural life, such as internet connectivity and civic participation after the Great East Japan Earthquake [19]. Their discussion was sourced from social science and communication by examining how networks tell the environment, which is conceptualized in communication theory and includes infrastructure, interpersonal media connectivity, organizations and communities, and the participation of individuals connected to the internet in the community activities. However, the previous research above only discussed post-disaster and did not discuss the level of preparedness before the earthquake and tsunami. The element of communication technology has been used as one of the measurable variables, namely internet connectivity. However, this study ignores the critical role of traditional technology owned by the community as socio-culture. This dimension is essential when the research proposal collects indigenous people's data on several Indonesia and the Philippines islands. Aspects of social preparedness, environmental communication involving traditional and modern technology are essential to building awareness of the people living around the volcano. Although many previous studies have discussed the issue of disaster, it is still lacking in empowering the capacity of citizens to build the socio-cultural readiness of their community in facing dangers that can occur at any time.

This study examines various factors that were thought to affect social preparedness in dealing with disasters. It then examines various variables to find the most substantial factors in determining social preparedness. Compared to previous studies, this paper puts forward an empirical investigation to find the determinant factors for building social preparedness for disasters in the "ring of fire" area.

2. LITERATURE REVIEW

2.1 Environmental Communication, Local Wisdom, and Community Cohesion

Ecosystem or environment is one of the contexts studied as environmental communication theory as a cross-discipline from social sciences. Therefore, this study was based on environmental communication theory, which focused on human interaction and the relationship with the environment. Previous researchers studying environmental communication focused on the way people communicate about the natural world because they believed that such communication had far-reaching effects in times of environmental crisis, which were primarily human-induced.

The essence of environmental communication theory is the following assumptions, first regarding how humans communicate, which significantly affects people's perceptions of the world of life [20]. Furthermore, these perceptions help shape how people define human relationships with nature

and how humans act toward nature. People or communities often speak of communication as a reflection and establishing, producing, and naturalizing individual human relationships with the environment.

Many environmental communication theories assume that human representations of nature, whether verbal or nonverbal, public or interpersonal or face-to-face or mediated communication, are intriguing. In part, this theory means that communication about nature was informed by social, economic, and political context and interests [21]. These contexts and interests help shape our communication, often in ways we are not aware of, and direct us to see nature through a particular lens while also obscuring other nature views.

Scholars' theories use to investigate these assumptions vary widely in their epistemological and methodological orientations. Human and natural interaction mean the relationship negotiated in cultural, mass media, public, interpersonal, popular culture, and other media. Environmental communication theory derives from cultural theory, media theory, rhetorical theory, social movement theory, pop culture theory, and many other areas. In this way, environmental communications researchers have accessed existing theories to serve as a conceptual framework for their inquiry and study.

Associated with environmental, the definition of community cohesion includes one of several dimensions [21]. First, there is a shared vision and a sense of ecological belonging to all communities. Second, the diversity of people's backgrounds and circumstances is appreciated and positively valued for harmony in life with nature. Third, those from different backgrounds have similar life opportunities. Fourth, solid and positive relationships are being developed between people to environmental care.

2.2 Early Warning System and Information Technologies

This paper reviews and evaluates traditional and modern technology's involvement in building an early warning system related to the emergence of disasters in critical areas. The information and communication technology factor are critical in this regard [30], not only when a disaster is occurring but also in a long-term sustainable effort to unite the media and the public to improve environmental performance. Communities around Krakatoa produce local technology as a tradition; on the other hand, the adoption of internet technology facilitates an early warning system. In this communication technology era, coordination must be essential to build disaster response preparedness through social networks, mainly social media [31][32]. So, internet-based early warning is essential to be used as a basis for building social awareness and preparedness [33].

The early warning system is considered one vital factor to be built and integrated with social networks within and outside the community of residents around the volcano. Early warning and mitigation systems were usually used to detect tsunami inundation before it occurs so that vulnerable communities can be alerted, and damage can be minimized [34]. According to the United Nations, several things must be considered in the early warning system [35]: first, risk awareness in knowledge about the possible risks faced by the community. Second, monitoring and warning services in hazard monitoring and a fast and reliable decision-making process for early warning. Third, dissemination and communication are related to transferring understandable warnings and preparedness information to those at risk. Finally, the response capability is the knowledge and readiness of all information chain partners.

Based on the concept of explication, which was thought to have an essential role in building social preparedness for disaster, several hypotheses are put forward in this regard:

H_1: Early warning system and technologies have a significant effect on willingness to protect nature.

H_2: Early warning system and technologies have a significant effect on community cohesiveness.

H_3: Early warning system and technologies have a significant effect on willingness to build local wisdom.

2.3 Local Government Communication Leadership in Disaster Management

A disaster is defined as an event that disrupts normal conditions and causes a level of suffering that exceeds the adaptive capacity of the affected community. It is also defined as a destructive event that creates unfavorable social and economic conditions that interfere with daily activities [22]. The World Health Organization puts forward three conditions for an event categorized as a disaster [23]. First, the event must disrupt normal conditions, second, exceed the capacity of the local community; and third, the event dramatically

affects people's lives. Disaster situations must always involve humans; there will be no disasters without humans, only physical phenomena.

Furthermore, the government's role is central in leading disaster management at local and national levels. However, leadership should be viewed as a whole, starting from policies in preparedness, handling during and after disasters. All processes were reviewed from a leadership communication perspective in social networks related to nature. Government at the local or regional level is critical to the success of disaster management, especially how to manage heterogeneous elements of many stakeholders to develop a data fusion model for disaster management services [24]. Leaders must be competent in managing the situation to minimize damage to property and life [25]. So, from a management perspective, disaster management is synonymous with government coordination in planning, implementation, evaluation, and continuous improvement [26].

Several previous studies have shown attention to the role of local governments in dealing with eruption disasters in Indonesia. The role of local government includes government capability as the ability of local governments to organize assets, competencies, and knowledge to protect the community from the potential impacts of disasters [27]. Furthermore, transforming it into institutional policies and financial and human resources to implement them effectively. According to their relevance to situational contingencies in disasters that face the communities, technical and leadership factors are needed. Previous research has also discussed structural disaster management, focusing on the role of local governments in both the intergovernmental system and local power structures [28]. The activities that are the responsibility of local governments include comprehensive and integrated activities [29]. This paper highlights the role of the government from citizens' experiences when disasters occur and the assessment of citizens on the role they should play.

Based on the explication of local government leadership in disasters, several hypotheses in this investigation were put forward as follows:

H_4: The local government leadership has a significant effect on willingness to protect nature.

H_5: The local government leadership has a significant effect on community cohesiveness.

H_6: The local government leadership has a significant effect on the willingness to build local wisdom.

2.4 Citizen Protection Facility and Consciousness of Living in the Ring of Fire Territory

The existence of protection facilities for residents who live around the volcano coast hit by tsunami is a concern in this research. From various previous studies, especially from research in Japan which is often hit by earthquakes and tsunamis, protection facilities in various small towns and villages can reduce victims of disasters. The conditions at the research time did not indicate that the Mount Krakatoa surrounding already had building facilities as a shelter. However, the survey wanted to test the community's assessment of the importance of this protection facility.

Furthermore, the consciousness of living in the ring of fire territory is a social learning process that is passed down from generation to generation as local wisdom and general knowledge in inculcating cultural values. Community geography is formal and part of learning for the families and communities on every volcanic island in Indonesia. Social learning is actualized by developing community capacity [36]. The introduction of the risk of volcano and tsunami hazards to communities in the ring of fire must be built sustainably through community education by developing their capacity to coexist with potentially hazardous elements. Furthermore, adaptive capacity development and sustainability can be improved [37] by accommodating the complex interrelationships and characteristics of the cultural diversity of the people around the ring of fire and the multi-hazard nature of the environment. Disasters more broadly affect people, communities, functions, and social institutions [38].

The importance of public protection facilities and efforts to build public awareness of the risks of living in the ring of fire environment are the concerns of this research. Community experiences are used as knowledge in a continuous social learning process because of the importance of social perception and their awareness [39] from generation to generation, both in urban, suburban, and rural communities.

Based on the arguments and evaluation of the availability of physical facilities for the protection of residents against disasters, the following hypotheses were put forward:

H_7: Citizen protection facilities have a significant effect on willingness to protect nature.

H_8: Citizen protection facilities have a significant effect on community cohesiveness.

H_9: Citizen protection facilities have a significant effect on willingness to build local wisdom.

H_{10}: Consciousness of living in the ring of fire territory has a significant effect on willingness to protect nature.

H_{11}: Consciousness of living in the ring of fire territory has a significant effect on community cohesiveness.

H_{12}: Consciousness of living in the ring of fire territory has a significant effect on willingness to build local wisdom.

2.5 Social Readiness (Preparedness) for Disaster

Social Readiness is the readiness of families and surrounding communities to anticipate and face the onset of disasters, particularly earthquakes and tsunamis. This dependent variable uses the social-cognitive arrangement model [37][41]. This notion includes three stages. The first stage is a motivator or precursor that includes critical awareness about the hazard, risk perception, and danger anxiety. The second phase is the intention-building stage, which includes self-efficacy, problem-focused understanding, response efficacy, and intention. The third stage connects intention and preparedness, covering perceptions of responsibility, a sense of togetherness, timing of hazard activities, normative factors such as empowerment of trust, and efficacy of responses.

Measurement of social readiness (preparedness) for disaster must examine various sides to obtain a significant relationship between independent, intervening, and dependent variables. Therefore, the hypothetical model is essential to build multidimensional coordination in sustainable disaster management now and in the future. A social network-based coordination model was proposed to explore the state of readiness of organizational actors in extreme conditions in the field. Moreover, the changes in the interconnection of nodes in the network have implications for the coordination potential in building disaster preparedness and response [41].

Natural disasters or risks are inherent but are often overlooked or taken for granted when assessing potential risks. In contrast, the human community can interact with nature and manage the risk factors as part of the ecosystem. Many safety professionals' efforts to broaden their field of view when assessing potential risks include analyzing and appropriately assessing the potential natural risks in the ring of fire locations. However, it often requires a substantial multidisciplinary study to build sustainable social readiness and environmental communication. The natural risks that can occur due to volcanoes in the ring of fire area are earthquakes, volcano eruptions, fires and explosions, hurricanes, tornados, floods, avalanches, and tidal waves [42]. Also, there can be man and nature risks such as oil spills, aircraft crashes, dams, shipwrecks, mine explosions, and railroad accidents.

Social readiness is a dependent variable that is important to develop comprehensively in a human community and its environment. Every generation that grows up in the ring of fire area must be aware of disasters. It must be regarded as cultural values passed down from generation to generation. Therefore, social learning and formal (school) learning variables are also very decisive. The social readiness or disaster preparedness includes the component of the social-cognitive model presented to describe reasoning processes that raise additional issues regarding the conceptualization and assessment of adjustment items [37]. For example, the inclusion of response efficacy suggests that people's judgments about preparation include reasoning about their permanence and adoption case.

Community resilience is thus a goal that must be achieved in developing the ecosystem and placed the concept of community resilience as a basis of building ecosystem capacity for disaster readiness [43][44]. The resilience of the human community must be built as the first step to a sustainable environment by considering the risks in the ring-of-fire area. Therefore, an integrated approach is needed, including natural resources and the surrounding diversity for economic development because this factor is significant social vulnerability.

Based on the argument of the social readiness (preparedness) factor above, the following hypotheses were proposed to be proven in this study:

H_{13}: Local government leadership territory has a significant effect on social readiness for disaster.

H_{14}: Willingness to protect nature has a significant effect on social readiness for disaster.

H_{15}: Early warning system and technologies has a significant effect on social readiness for disaster.

H_{16}: Community cohesiveness has a significant effect on social readiness for disaster.

H_{17}: Citizen protection facility has a significant effect on social readiness for disaster.

H_{18}: Willingness to build local wisdom has a significant effect on social readiness for disaster.

H_{19}: Consciousness of living in the ring of fire territory has a significant effect on social readiness for disaster.

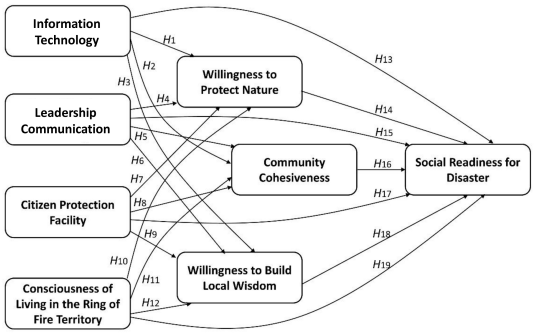

Figure 1: Hypothesized Model

3. RESEARCH METHODOLOGY

3.1 Sample Profile

This study uses a quantitative empirical approach to explain the effect of several variables on social readiness. Quantitative data collection was conducted by surveying the 12 sub-district cities located around Mount Krakatoa. The population in that area is around 20 million who inhabit three provinces: Lampung, Banten, and DKI Jakarta. The sampling technique was purposive based on the distance of residence from the epicenter of Mount Krakatoa as the epicenter of the volcano and tsunami disaster. In each city, a sample of 25 people was taken so that the total sample was 300 adolescents to adults (aged 17-60 years old). Of all the filled-out questionnaires, only 287 respondents filled out entirely and deserved to be processed. Respondents received questionnaires conventionally printed on paper (210 respondents or about 70 percent of total respondents) and digitally via a link to Google Form (90 respondents or about 30 percent of respondents). Respondents were first given a link via their smartphone number to access Google Form, and the research team guided the filling.

3.2 Constructs

The questionnaire composition is arranged based on explaining each factor and variable measured. The Likert scale used for all variables is the same, starting from number 1 (Strongly Disagree) to number 7 (Strongly Agree). Several factors and measurable variables that may be influential and interrelated will also be explored to find significant relationships further developed through government policies. All measurable factors would be hypothesized and examined. Early Warning System and Technology (EWARN), determines social disaster preparedness from a technical and communication technology perspective. This aspect is essential to evaluate and position the communication process and media involvement to send warning messages vertically and horizontally. Some of the constructs compiled [35][47][48][49] [50][51][52] are “monitoring and announcements,” “use of traditional media,” “use of social media,” “speakers of public facilities,” and “tsunami sirens.” For all variables, the Likert scale used starts from 1 (Strongly Disagree) to 7 (Strongly Agree).

The following variable, the Local Government Leadership (GLEAD) variable is critical because in the hands of the government lies the success of disaster management that occurs as the state's responsibility to its people. Some of the constructs that were measured [26][29][46] were “SAR assistance,” “government command post,” “assistance distribution and logistics,” “medical care,” and “control and coordination.”

The following independent variable, Citizen Protection Facility (CPFAC), reflects the community's readiness to use the infrastructure built by the government in the form of public buildings for shelter and road infrastructure for evacuation. The facility meets the criteria for the type of disaster expected to occur in the volcano circle. The test of this variable is to get the opinions and beliefs of citizens about the importance of public protection facilities [53][54][55]. Indicators include "availability of public buildings," "safe shelter locations," "disaster-accounting infrastructure," "self-supporting family protection buildings," and "effective evacuation routes."

The Consciousness of Living in the Ring of Fire Territory (CRING) is a fundamental variable in the socio-cultural context because awareness to coexist in harmony with nature is the key to the survival of every generation in the "ring of fire" area. The constructs compiled for the questionnaire considered keywords from previous studies [2][9] [37][39][41][56][57][58]. The constructs arranged in the questionnaire such as "understanding the consequences of living in the ring of fire," "willing to live in harmony with nature," "providing

knowledge of the ring of fire to family and others," "dare to take risks," and "aware of disasters and have insurance."

This study also examines the commitment of residents around Krakatoa to pay attention to and protect the environment. Willingness to Protect Nature variable (WPNAT) refers to concepts and indicators proposed by several relevant previous researchers [59][60][61][62]. Some of the constructs compiled in the questionnaire include "willingness to pay insurance for disasters," "willingness to contribute to protecting nature," "participating in monitoring actions that damage the environment," "participating in educating children, youth, and adults about the environment," and "willing to contribute to sustainable environmental sustainability."

Communities living around the volcano and the coast affected by the tsunami must be measured for their cohesiveness. The community consists of people living and having a livelihood around the same environment by utilizing natural resources. Therefore, the collaboration between individuals, families, and between cities or villages was shown in the Community Cohesiveness (CCOHE) variable. Several constructs related to this variable consider concepts and indicators from previous research [13][63][64][65]. The indicators proposed in the questionnaire include "having a spirit of community cohesion," "caring about other people who are victims," "carrying out community agreements," "fighting behaviors that damage the environment," and "proactively tackling disasters."

The Willingness to Build Local Wisdom (WLWIS) variable reflects the existence of cultural values created, grown, and maintained on an ongoing basis from generation to generation in the community. Local wisdom was seen as social knowledge maintained to sustain harmony with nature [27] [66] [69]. Some indicators were put forward in the questionnaires, such as "the family teaches to live in harmony with nature," "the community has customs to protect nature," and "the community respects Mount Krakatoa figure." Also, in other questionnaires such as "schoolteachers tell stories about Krakatoa," and "community has moral values to protecting the environment."

Social Readiness for Disaster (SREAD) is a condition that becomes a strategic goal for the development of social humanity, environment, and geological aspects in volcanic circles. This study aims to test various independent and previous intervening variables on social preparedness by considering concepts and indicators from various previous studies [13][40][41][43][67][68][70][71]. Based on the concept of explanation, constructs were compiled in the questionnaire regarding "the family is ready in case of a disaster," "the community feels prepared when a disaster strikes," "try not to panic if a disaster strikes," "the community feels friendly with nature," and "standby with protection and evacuation."

Data processing was carried out using a structural equation model (SEM), which facilitates discovering and confirming the relationship between several variables. SEM was used to analyze the relationships among many latent constructs to be examined to reduce errors in the model. SEM analysis uses AMOS software version 16 covariance-based structural equation modeling (CB-SEM) to analyze the proposed hypothesis. AMOS 16.0 is easier to use by following several analytical procedures [82] suggested. The measurement model was evaluated first, and then the structural model was analyzed.

4. RESULTS AND DISCUSSION

4.1 Measurement Model

Confirmatory factor analysis (CFA) was performed to check the model's fit shown in Table 1. In all variables, the internal reliability of Cronbach alpha shows a relatively high number. This score means that all variables in each statement item are reliable for use in the survey. Next, the convergent validity calculated by factor loading, composite reliability, and average variance extracted is intended to measure the extent to which the theoretically related scale items are correlated. *Convergent validity* is defined as the degree to which a particular set of indicators for a construct meet or share a high proportion of variance. The composite reliability of 0.70 or higher and average variance extracted more than 0.50 are considered acceptable [71].

This measurement model shows that all-composite reliability values are above 0.70, so all constructs show convergent validity. Likewise, the average variance extracted is all above 0.50. Thus, confirmatory factor analysis shows that convergent validity has been determined as a measurement model. The criteria were considered to assess discriminant validity between constructs [72][73]. Discriminant validity is the extent to which a construct indicator represents one construct, and the construct indicator is different from other

constructs in the model. Therefore, we conclude that the model construction is reliable and valid, so the next step is to test the structural model results, as shown in Figure 2.

Table 1: Result of Confirmatory Factor Analysis (CFA) for Measurement Model

Construct	Item	Internal reliability Cronbach α	Convergent validity		
			Factor loading	Composite reliability	Ave. variance extracted[b]
Information Technology (EWARN)	EWARN-1	0.937	0.67	0.81	0.67
	EWARN-2		0.75		
	EWARN-3		0.85		
	EWARN-4		0.87		
	EWARN-5		0.73		
Government Communication Leadership (GLEAD)	GLEAD-6	0.821	0.68	0.74	0.59
	GLEAD-7		0.81		
	GLEAD-8		0.79		
	GLEAD-9		0.62		
	GLEAD-10		0.77		
Citizen Protection Facility (CPFAC)	CPFAC-11	0.697	0.63	0.73	0.68
	CPFAC-12		0.59		
	CPFAC-13		0.68		
	CPFAC-14		0.82		
	CPFAC-15		0.78		
The Consciousness of Living in the Ring of Fire Territory (CRING)	CRING-16	0.952	0.89	0.89	0.74
	CRING-17		0.91		
	CRING1-8		0.82		
	CRING-19		0.79		
	CRING-20		0.69		
Willingness to Protect Nature (WPNAT)	WPNAT-21	0.878	0.77	0.78	0.77
	WPNAT-22		0.87		
	WPNAT-23		0.79		
	WPNAT-24		0.82		
	WPNAT-25		0.85		
Community Cohesiveness (CCOHE)	CCOHE-26	0.798	0.67	0.72	0.75
	CCOHE-27		0.66		
	CCOHE-28		0.83		
	CCOHE-29		0.80		
	CCOHE-30		0.76		
Willingness to Build Local Wisdom (WLWIS)	WLWIS-31	0.824	0.79	0.85	0.79
	WLWIS-32		0.89		
	WLWIS-33		0.74		
	WLWIS-34		0.72		
	WLWIS-35		0.75		
Social Readiness for Disaster (SREAD)	SREAD-36	0.791	0.70	0.79	078
	SREAD-37		0.82		
	SREAD-38		0.73		
	SREAD-39		0.85		
	SREAD-40		0.89		

Note Composite reliability = (square of the summation of the factor loadings) /{(square of the summation of the factor loadings) + (square of the summation of the error variances)} b Composite reliability = (summation of the square of the factor loadings)/{(summation of the square of the factor loadings) + (summation of the error variances)}

4.2 Descriptive Statistics

Descriptive statistics for all relevant variables are presented in Table 2. All variables show an average variation that tends to the correct distribution with the media at number 5. While the Standard Deviation varies, it is also not too far from one variable to another in each variable.

Table 2: Descriptive Statistics for Variables

	Min.	Max.	M	SD

Information Technology (EWARN)	1	7	4.62	0.792
Government Communication Leadership (GLEAD)	2	7	5.23	0.787
Citizen Protection Facility (CPFAC)	1	7	4.03	0.789
The Consciousness of Living in the Ring of Fire Territory (CRING)	1	7	4.23	1.271
Willingness to Protect Nature (WPNAT)	2	7	5.30	0.819
Community Cohesiveness (CCOHE)	2	7	5.26	0.696
Willingness to Build Local Wisdom (WLWIS)	3	7	5.14	0.766
Social Readiness for Disaster (SREAD)	2	7	5.17	0.719

The lowest SD is on the Community Cohesiveness (CCOHE) variable, and the highest is on the Willingness to Protect Nature (WPNAT) variable. The standard deviation for all variables is in the add-least one data area so that it is categorized around 68.2 percent on the normal distribution curve that describes the probability.

4.3 Structural Model

The next step that shows the structural model is shown in summary in table 3. Inter-correlations between variables are the results of the SEM analysis in the form of a structural model was estimated using the maximum likelihood method (MLE) illustrated in Figure 2. The match statistics are shown in Table 3 for each -each variable. This table shows that all the fit measures from this study are above the recommended values suggesting a good model fit. All the paths are significant at the 0.01 level and the 0.05 level.

Living in the Ring of Fire Territory (CRING) consciousness has the most substantial effect on Social Readiness for Disaster (SREAD). Also, Early Warning System and Technology (EWARN) strongly affect Social Readiness for Disaster (SREAD). In contrast, Citizen Protection Facility (CPFAC) has the weakest effect on Social Readiness for Disaster (SREAD). Thus, the structural model results have established support for H_1, H_2, H_3, H_4, H_5, H_6, H_7, H_8, H_9, H_{10}, H_{11}, H_{12}, H_{13}, H_{14}, H_{15}, H_{16}, H_{17}, H_{18}, and H19. Not all cell inter-correlations between variables were counted because the study only proposed 19 hypotheses to prove their influence.

Table 3. Inter-Correlations between Variables

	EWARN	GLEAD	CPFAC	CRING	WPNAT	CCOHE	WLWIS	SREAD
EWARN					.589**	.426**	.486**	.852**
GLEAD					.713**	.566**	.517**	.680**
CPFAC					.492**	.472**	.544**	.387**
CRING					.460**	.688**	.655**	.868**
WPNAT								.754**
CCOHE								.681**
WLWIS								.736**
SREAD								

Note Local Government Leadership (GLEAD); Early Warning System and Technology (EWARN); Citizen Protection Facility (CPFAC); Consciousness of Living in the Ring of Fire Territory (CRING); Willingness to Protect Nature (WPNAT); Community Cohesiveness (CCOHE); Willingness to Build Local Wisdom (WLWIS); Social Readiness for Disaster (SREAD).
*p < .05, **p < .01

Each independent variable's direct and indirect effect on Social Readiness for Disaster (SREAD) is proven to be significant. Meanwhile, all independent variables such as GLEAD, EWARN, CPFAC, and CRING significantly affect WPNAT, CCOHE, and WLWIS. EWARN and CRING variables have the most significant influence among all variables. This result shows that the technological factor will determine the success of developing social readiness to the possibility of a disaster (SREAD). However, when viewed from all the inter-Correlations between variables, the Citizen Protection Facility (CPFAC) are two independent variables whose inter-correlations are lower than some other variables. These little inter-relations may be due to the lack of attention from volcano supervisors to early warning technology facilities and the absence or lack of protection facilities for residents in the event of a disaster. The attention of decision-makers in determining

development policies and development actions in the field is significant to consider all variables because all variables significantly influence social readiness for natural disasters.

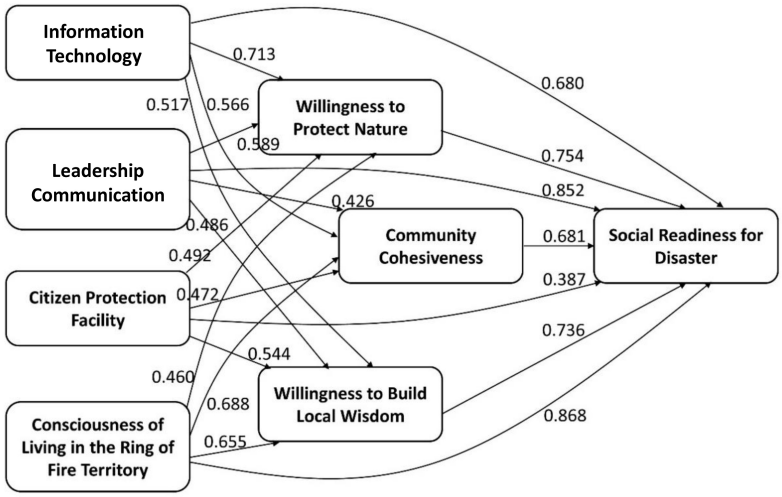

Figure 2: The Structural Equation Model for the Hypothesized, Note. All the paths are significant at $p < .05$.

4.4 Discussion and Implication

This study was compared mainly with community and government disaster management in several countries. Socio-culturally different characteristics of societies and government models may vary with different results. However, local government leadership is always determined locally in Indonesia, although the central government influences the leadership climate. The control of the regional government around the Krakatoa volcano, which includes Banten, Lampung, West Java, South Sumatra, and DKI Jakarta, always follows the central government's policy. The local government then did much improvisation to achieve the success of disaster management. Knowledge transfer was essential to support the disaster management model, especially for local and central governments [74].

Lack of knowledge and awareness in regional leadership will lead to problems in dealing with disasters. If a disaster occurs, the regional leadership should be robust to minimize the impact of damage and recover victims. Weak leadership in the vision of the environment will also bring trouble in the future. The central government and local governments are at the forefront of controlling and recovering from the impact of disasters [75]. The policy must involve all stakeholders in society, and government's capability must always be strong on an ongoing basis. The previous research noted the importance of resource capability for local government in managing the disaster [46]. However, leadership is an essential milestone for disaster area recovery and better long-term planning. In addition to playing a role in bridging the gaps by reducing the number of victims, the leadership of the central and local governments must understand the fundamental issues in the ring of fire environment [27].

There are four layers of local government performance covering pre-disasters. First, mitigation and preparedness planning; second, an emergency which includes immediate pre- and post-impact, short-term recovery around up to two years; finally, the long-term recovery with a duration of up to 10 years [28]. Leadership must also pay attention to the dominant role of women in emergency response programs and the fact that women are the most vulnerable group in disasters [76]. The previous research also supports the results of this study that leaders must be competent in managing disaster situations to minimize disaster damage [25]. This leadership includes mitigation measures, crisis preparedness, communication skills, and all entities involved in government and community collaboration [29].

The early warning system is the most critical phase of disaster management to reduce hazard risk during the eruption. It is necessary for public officials to better inform public policymakers by adopting the early warning systems and disaster preparedness [77]. The household networking for social capital directly affects the early warning

phase of both volcanoes [48]. Several factors indirectly affect early warning capacities: human capital, natural capital, physical capital, and financial capital. However, it takes a process of transformation and structure or institutionalization. The early warning system must be emphasized at the institutional level, especially capacity building for disaster planning and response [78].

The government's concern was also reflected in the construction and provision of protection facilities, especially from earthquakes, volcanic eruptions, hot smoke, and tsunamis. Having adequate evacuation facilities, shelter buildings, and road infrastructure are critical around the Krakatoa Mountain circle. Observations made by researchers show that the available facilities are ordinary infrastructure as built-in non-hazardous areas. However, this survey has shown how essential protection facilities are for communities in the ring of fire location. The previous research emphasized the importance of evacuation facilities in coastal areas with the potential for a tsunami [53]. Protection facilities also include convenience in the distribution system of aid logistics to affected areas [54].

In comparison, other researchers emphasize the importance of managing all connected infrastructure as protection against disasters [55]. Finally, these results are like the previous research suggesting applying the new technology of construction structures and disaster protection management based on spatial information [79]. The results of this research indicate that decision-makers should pay attention to the availability of human and animal protection facilities in the face of disasters.

This study takes a perspective from psychology by examining the consciousness of living in the ring of fire territory. Cognitive, feeling, attitude, and behavioral aspects are fundamental to building the Krakatoa community. Building awareness from within the population is essential and has a significant effect. This finding shows that because disaster impacts people, communities, and societal functions and institutions, multiple levels of analysis are needed, including psychological aspects [37]. Psychology has often fallen foul of the minimization error context when examining complex socio-environmental processes and failed to adequately address how the social context in which people's lives influences their thoughts and actions [38]. In the aggregate, individual and community awareness will foster attitudes and actions to preserve nature and live-in harmony with dangerous nature.

The community's commitment to the willingness to protect nature has been explored in this study. The collaboration of the community, government, and non-governmental organizations (NGOs) are essential to ensure nature and sustainable development. This study found a significant effect on social preparedness in the event of a disaster. Some researchers found the same concerning the public's willingness to contribute to disaster relief in China and Australia for long-term natural disaster mitigation [59][60]. There are also similar findings of willingness to pay for disaster preparedness [61]. Factors influencing willingness to participate in disaster reduction are the education level, professional skills, and family size influence one dimension of disaster reduction [62]. A similar finding in this study was that traditional families in the community teach to be close to nature and help other families affected by disasters. The community around Krakatoa has a willingness to protect nature.

The community cohesion factor is significant to build human, geographical, biological, and economic aspects of life around Krakatoa. This study shows a significant positive relationship to the achievement of social readiness for disaster. The findings are the same as previous research that explored community cohesion in rural Canada in post-extreme weather [80], which stated that as social capital evolves, people need to address better how to assess the social capability in terms of community connection and involvement. The community cohesion factor is also concerned with mutually supportive findings that examined the wildfire preparedness, community cohesion, and social-ecological systems [63][65]. The government policy and stakeholders aim to minimize disaster risk by strengthening communities through systematizing community-based disaster risk management in urban flood-prone communities in Thailand's upstream areas [64].

Willingness to build local wisdom by the community around Krakatoa is an exploration of efforts to inculcate wisdom values that are created, maintained, and passed on to generations on an ongoing basis. This concept is essential to ensure the continuity of a lifestyle that is in harmony with nature. Local wisdom becomes part of the social learning process informally and is taught formally as part of the curriculum or in storytelling by schoolteachers. The findings of this study have a significant effect on social readiness for a disaster,

which was reinforced by several other researchers, that reviewed disaster mitigation curriculum based on local wisdom [66]. In another specific case study in Indonesia regarding local wisdom in Javanese society [81], to the community is familiarized to live in harmony with disaster [69] and produce a disaster recovery model [27].

The central concept in this paper puts forward social readiness (preparedness) for disaster as the umbrella of all the concepts in the previous variables. Development as a sustainable human activity and life in the region along the Pacific ring as a "ring of fire" is a spotlight that must be voiced non-stop. Humans must live in harmony with nature and be friendly with the possibility of disaster. This study has proven that this variable is influenced by all the variables tested in the hypothesis. However, this article supports several other previous studies [13][41][40], which focused on the psychological aspects of preparedness and recovery. The other also highlight the disaster readiness gap beyond preparedness for survival [67]. In addition, this paper also supports previous findings which focus on household disaster readiness [68]. Therefore, the findings concluded the need for a set of capacities and a strategy for disaster readiness [43]. The community and nature need disaster readiness in all aspects, including planning and training for post-disaster support work [71]. Further, this article also emphasizes the importance of education on public preparation and mitigation for earthquakes and tsunamis [70].

5. CONCLUSION

This study proves that several independent variables significantly affect social readiness (preparedness) for disaster, either directly or indirectly. Variables such as local government leadership, early warning system and technology, citizen protection facilities, and consciousness of living in the ring of fire territory significantly affect social readiness for disaster. Then, the willingness to protect nature, community cohesiveness, and willingness to build local wisdom also significantly affect social readiness for disaster. All factors have contributed to building social readiness for people inhabiting the area around Krakatoa or the "ring of fire" in general.

The findings provided by this study can enable all elements of stakeholders to think seriously about the factors that will affect social readiness so that they are formulated into an integrated development strategy by involving the community through the communication process in the environmental context. The people's awareness of living in the ring of fire area must be built through participatory leadership, including strengthening local wisdom to maintain harmony in life. Self-warning systems and technology, and social media must be in place and accompanied by informal and formal education on environmental sustainability. The community's goodwill to protect nature and revive local wisdom has proven significant in building self-confidence to live in harmony with nature in the ring of the fire area.

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