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ANALYZING TSUNAMI DISASTER IN SUNDANESE STRAIT INDONESIA

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Abstract: The Tsunami disaster was the first and the biggest disaster in Banten Province, but preparedness in the response to the health crisis was still lacking, even though in an emergency response situation the management of disaster management carried out was quite good. The method of research based on data reports that include quantitative and qualitative methods. Analyzing health facilities and the impacts that occurred in the field during the tsunami period is the basis for this article and at the same time a discussion of describing problems that can be anticipated in the future.

Keywords: Sundanese strait, tsunami, emergency response, climate change, resilience

Introduction

Almost every year, based on observations by the Center for Volcanology and Geological Disaster Mitigation, there are volcanoes that blow volcanic material with different types of eruptions. Likewise, with the threat, it poses from one mountain to another. This is very much influenced by the type of eruption and the level of population density living near the location of the volcano.

After several decades since the eruption of Mount Krakatau which disappeared from the geological map of Indonesia, in 1927 a new active mountain emerged between Panjang Island, Sertung Island and Rakata Island (the volcanic complex of Mount Krakatau) which later was named Mount Anak Krakatau. Its location is between Banten Province at the end of Java Island and Lampung Province at the eastern of Sumatra Island. The appearance of Mount Anak Krakatau, which has a height of 338 m, has shown its activity in recent years, with incandescent lava bursts, and the peak of this activity occurred on December 21, 2018. This activity has the potential to pose a very large risk to the two provinces.

Tsunami risk is characterized by three elements: danger, vulnerability and capacity (UNISDR,2009; EM-DAT, 2020). Vulnerability analysis was determined by two variables: social and physical. Physical vulnerability has a strong impact on both monetary and social losses through the measurement of physical damage resulting from a given ground motion intensity level (FEMA, 2008). Measures that could be used to reduce the consequences of a tsunami are divided into two groups: structural and non-structural.

Various strategies can increase the extent of tsunami awareness. These strategies include government policy, infrastructure, education and training, and awareness campaigns (Esteban et al., 2013a,2013b). According to USAID IOTWS, 2007, the eight fundamental approaches towards coastal community resilience to tsunamis to reduce risk and adapt to change are governance, society and economy, coastal resources management, land use and structural design, risk knowledge, warning and evacuation, emergency response, and disaster recovery.

By analyzing previous disaster could be used for future emergencies to facilitate response. (Leone et al., 2018) One reason to reduce the quality of reducing disaster casualties is health

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facilities (Dogra et al., 2018). suggesting that older people in good health may contribute positively to building community resiliency for crisis (Cohen et al., 2016). Natural disaster is leading not only physical but also mental health and psychosocial problems (Kujawa et al., 2015; Lee et al., 2018). Possible implications and chances for the optimization of psychosocial services (Witteveen et al., 2015).

Material and Method

For the development of the research the type of descriptive, qualitative and quantitative study has been used, as such is based on an analysis of the community capacities and vulnerabilities. Data collection focuses on qualitative aspects related to how the health crisis task force's work system in tsunami management works. Quantitative data to determine the level of strength and interest in responding to manage of emergencies tsunami disaster.

The data from book report of review on health crisis 2018 was used to strength the evidence of analysis. This study is primarily based on secondary data sources. For the purpose of this study, we used several data analysis from secondary data sources that report in the special report of ministry of health 2019.

Results and Discussion

On Friday, December 21, 2018, the Geological Agency of the Ministry of Energy and Mineral Resources (ESDM) and the Center for Volcanology and Geological Disaster Mitigation (PVMBG) detected eruptive activity of Mount Anak Krakatau Lampung. The National Disaster Management Agency (BNPB) has provided an early warning of high waves which is valid from December 22, 2018 at 07.00 Western Indonesia Time (WIB) to December 25 2018 at 07.00 WIB in the water territory of Sunda Strait with a height of 1.5 - 2.5 meters. Then on Saturday, December 22, 2019 at 20.56 WIB, Mount Anak Krakatau erupted which triggered a landslide on the slopes of Mount Anak Krakatau covering an area of 64 hectares.

Viewed from the results of the BIG marigram tide gauge records, it is believed that this is a tsunami wave. Furthermore, at 22.30 WIB, BMKG immediately issued a press release that a tsunami had hit Banten and Lampung which was not triggered by a tectonic earthquake. On Sunday, December 23 2019 at 14:40 WIB BMKG confirmed that the center of vibration was on Mount Anak Krakatau, 115.46 East Longitude - 6.10 South Latitude, 1 km depth, equivalent to a magnitude of 3,4.

Analysis of population conditions

The analyses of the conditions of the population in facing tsunami disaster are respectively presented in Tables 1 and 2 below.

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Table 1: Total of population and density of districts/cities affected by the Sunda Strait tsunami In Banten and Lampung Provinces

No	Districts/Cities	Total population			
		Total men	Total women	Total populations	Population density Hab/km^2
Banten Province					
1	Serang District	757,089	1,493,591	2,250,680	861
2	Pandeglang District	615,297	1,205,203	1,820,500	439
Average Population Density of Banten Province (Hab/ km^2)					1288
Lampung Province					
3	South Lampung District	504,498	478,387	982,885	490
4	Tanggamus District	302,474	277,909	580,383	192
5	Pesawaran District	219,587	219 587	439,174	191
Average Population Density of Lampung Province (Hab/ km^2)					234

Source: BPS Lampung and Banten Provinces 2017

Table 2: Total of vulnerable populations in districts/cities affected by the Sunda Strait Tsunami in Banten and Lampung provinces

No	Districts/Cities	Vulnerable groups				
		Baby	Toddler	Pregnant women	Elderly	Proportion of vulnerable Groups
Banten Province						
1	Serang District	26,926	147,942	29,618	284,890	21.74%
2	Pandeglang District	23,266	51,012	25,028	81,349	9.92%
Lampung Province						
3	South Lampung District	10,875	45,370	12,394	22,467	9.27%
4	Tanggamus District	19,038	79,167	21,640	69,252	32.58%
5	Pesawaran District	7,816	33,320	9,065	29,640	18.18%

Source: Profiles of Lampung and Banten Provinces in 2015

Analysis of health facilities

Analyzing the availability of health services is vital for understanding the capacities and weaknesses of disrupted health systems during disaster but also to prepare for future natural disasters. Table 3 and Table 4 show the health situation and number of healthcare personnel affected by the Sunda Strait Tsunami.

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Table 3: Total of health service facilities in districts / cities affected by the Sunda Strait Tsunami in Banten and Lampung Provinces

No.	Districts/Cities	Community health center	Government hospital	Private hospital	Other health facilities	Total
Banten Province						
1	Serang District	31	1	1	17	50
2	Pandeglang District	36	1	1	20	58
Lampung Province						
1	Tanggamus District	23	1	1	1	26
2	South Lampung District	26	1	1	0	28
3	Pesawaran District	12	1	1	0	14

Source: Profiles of Lampung and Banten Provinces in 2015

All affected districts or cities have not met the minimum standard for the availability of health facilities. For the number of Community health center health, all affected districts have met the minimum requirement except for Serang district. For the needs of South Lampung and Pesawaran district hospitals, they have met the minimum standards while the 3 affected districts in Banten Province have not met the minimum standard. The number of health workers (specialist doctors, general practitioners, nurses and midwives) in all districts / cities has not met the minimum requirement for public health services.

Table 4: Health profiles in 4 districts / cities affected by the tsunami in Banten and Lampung provinces

No.	**Districts/Cities**	**IPM**	**IPKM**	**AHH**	**AKI**	**AKB**
Banten Province						
1	Serang District	70.44	0.5859	69.28	221	8.8
2	Pandeglang District	62.78	0.5503	66.28	199	3
Lampung Province						
1	Tanggamus District	64.41	0.6155	67.61	241	2,4
2	South Lampung District	66.19	0.6517	68.49	180	0.9
3	Pesawaran District	63.47	0.5913	68.05	128	0.8

Source: Health Profile. Banten and Lampung Provinces in 2015. Infant Mortality Rate(AKB); Maternal Mortality Rate (AKI); Life Expectancy Rate (AHH); Human Development Index (IPM); Public Health Development Index (IPKM)

Analysis of vulnerabilities

The disaster risk assessment portal of the National Disaster Management Agency (Ina RISK BNPB) 2019 reported that all affected districts/cities are considered at high risk areas, except for Tanggamus district which is at moderate risk. Based on health profile data, population density in the 3 affected districts, namely Serang, Pandeglang and South Lampung, are classified as very dense.

Serang and Tanggamus districts have a high proportion of vulnerable groups. All affected districts have not met the minimum standard for availability of health facilities. Those affected districts have met the minimum requirement for the number of Community health center except Serang district and for the needs of hospitals, South Lampung and Pesawaran districts have met the minimum standards while the 3 affected districts / cities in Banten Province have not met the minimum standard. The number of health workers (specialist doctors, general practitioners, nurses

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and midwives) in all districts / cities has not met the minimum requirement for public health services. Two districts have an upper middle Human Development Index (IPM), namely Serang and South Lampung, while the other 3 affected districts have a lower middle IPM.

Social and Physical vulnerability to tsunami

Figure1: Social vulnerability to tsunami

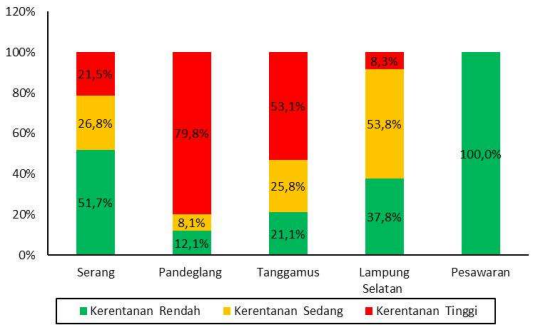

Figure 2: Physical vulnerability to tsunami

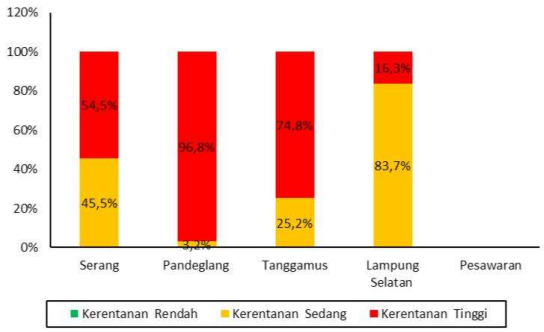

Figure 1 shows that the most vulnerable population to tsunamis is in Pandeglang district (high vulnerability: 79.8%), followed by Tanggamus district (high vulnerability: 51.1%), and South Lampung district (moderate vulnerability: 53.8%), while for Pesawaran district, the level of the population vulnerability to tsunami is low. Besides, figure 2 shows that most of the buildings in Pandeglang and Tanggamus districts have a high physical vulnerability. Most of the buildings in South Lampung district have a moderate level of vulnerability, while Pesawaran district has no physical vulnerability to tsunami.

Local Capacity

The data indicates that all affected districts have disaster management plan documents. Tanggamus District has good achievements in policy / regulatory indicators related to health /disasters crisis, early warning, mitigation and preparedness efforts. For Serang district, the early warning indicator has reached 100%, while other indicators are still below 40%. For Pandeglang district, the achievement of all indicators is still below 40%. Regarding to the community empowerment, all districts/cities have formed active, prepared and resilient villages to disaster proclaimed by the National Disaster Management Agency (BNPB).

Health problems

Earthquake, tsunami and liquefaction disasters cause health problems due to the loss of victims as shown in the Table 5 below.

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Table 5: Total of tsunami victims in Banten and Lampung provinces

No	Districts/Cities	Death	Serious injury hospitalization	Minor injury /outpatient care	Missing	Refugees
1	Serang District	21	122	3,184	0	1,227
2	Pandeglang District	296	766	15,946	3	7,972
1	Tanggamus District	1	0	92	0	0
2	South Lampung District	118	483	11,402	7	6,999
3	Pesawaran District	1	2	21	0	0
	Total	437	1,373	30,645	10	16,198

Pandeglang and South Lampung districts are the worst affected areas with the highest number of victims and refugees. The highest number of died, seriously injured, minor injuries, missing and refugees' victims was in Pandeglang district, while minimal number in Pesawaran district. The number of Community health center affected is only one with moderate level of damage and no hospital was affected by the tsunami. The Community health center affected are in South Lampung district. Two sub-health centers and Village health posts affected by moderate damage are also found in South Lampung district.

Efforts and Barriers

The Health Sub-cluster Efforts: In the effort to overcome health problems caused by the Sunda Strait tsunami, it is carried out in accordance with existing health problems, the efforts made by the health program. Efforts made across sectors include: operational funding support during the emergency response period from APBD, Koperasi KPRI Bhakti Husada and Community Assistance. Operations during the disaster response period have been proposed to BNPB through ready-to-use funds.

There are several barriers such as: Resources: the basic sanitation is very limited at the shelter; The roads in some evacuation locations are difficult for 4-wheeled vehicles to access; Limited medical supplies and consumables, especially for handling wounds and limited health service tents (Posyankes); The number of evacuation points that spread out caused uneven health services; The health services in Sebesi and Sebuku Islands are not maximal because the transportation access is not every day, there are ships that dare to cross because of the activity of Mount Anak Krakatau which has the status of Alert Level III; Health workers / volunteers who provide assistance do not report and register to the health office, making it difficult to control and coordinate; Health workers / volunteers who come to help in the disaster area are not optimal in providing assistance to the community; Relocation of health facilities is constrained by land availability and most people in the red zone are still reluctant to be relocated.

Data and Information: the health information system has not been developed; There is no early warning system for a tsunami event; Communication was hampered at the Cugung Posyankes evacuation site due to signal constraints. Health Crisis Management: The coordination function does not work, never conducts regular cluster / sub-cluster coordination meetings; There

is no policy regulating disaster management at the district / city level; There is still a lack of regional preparedness in overcoming health crises; Analysis of existing risk assessments is not used by both the local government and the community including health agencies with many settlements and health service facilities in the tsunami red zone; Coordination during the first day of the emergency response until the issuance of the emergency response Decree has not yet been carried out due to the absence of an Incident Commander (IC); There was no follow-up to the RHA results from across sectors; The role of other clusters is less than optimal in supporting the health cluster and the health crisis response efforts undertaken by the Health Office of the affected districts have not been carried out systematically and structurally through the health cluster system, this is because they do not have an understanding of the management of health crisis response.

Financing: the need for health care costs for disaster victims during the emergency response period using ready-to-use funds (DSP) is difficult to obtain because applications are limited by time, while health services for victims cannot be limited by time, so that the required documents for administrative completeness of DSP applications cannot be fulfilled. Health Promotion: there is no study and risk analysis regarding local diseases, so that refugees are affected by snake bites.

Conclusion

The above discussion can be summarized as follows: the Tsunami disaster is the first and the biggest disaster in Banten Province, but the preparedness in the response to the health crisis is still lacking, even though in an emergency response situation the management of disaster management has been quite good; and regulations governing disaster management have not been established, including health clusters, SOPs regulating health crisis management during the emergency response period.

The availability of facilities and medicines in the regions has not been planned for a disaster, even though the support for the facilities and medicines to deal with the impact of the tsunami is fulfilled. Disaster management financing does not take advantage of the existing unexpected costs (BTT), due to a complicated accountability process. The mobilization of health personnel is still spontaneous. There is no specific policy that regulates team mobilization during the emergency response. The Information systems that have not been centralized, causing the difference in information.

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