Readiness Assessment of the Sleman Regional Disaster Management Agency in Handling and Managing the Mount Merapi Disaster

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Abstract

Disaster readiness management is the main thing that the government must pay attention to in order to obtain methods as material for evaluating regional disaster management and management. The Regional Disaster Management Agency, hereinafter referred to as BPBD is one of the stakeholders who play an active role and is fully responsible for disaster preparedness in the region, so the Sleman BPBD readiness is crucial in handling and managing the eruption of Mount Merapi. So far, no assessment regarding this readiness has been carried out. This study aims to measure and map BPBD Sleman's readiness to handle and manage Mount Merapi's eruption in Yogyakarta Province. The variables used in this study are variables from the Sendai Framework and the National Disaster Management Plan. This study uses the Nominal Group Technique method for variable validation and the Analytic Hierarchy Process for variable weighting. It then changes the scale from ordinal to interval using the Method of Successive Interval. The next step is to calculate the readiness index by multiplying the results of the indicator assessment by weight. Data processing is carried out using 11 main criteria and 43 indicators. The results of the calculation of the readiness index show that the readiness index value of the Sleman BPBD is 55.362. Based on the index categorization and readiness status, the readiness of Sleman BPBD is in the ready category. Recommendations for improvement are made to indicators with assessment results that have low scores or indexes.

Keywords

Disaster Management, Nominal Group Technique, Analytic Hierarchy Process, Method of Successive Interval and Readiness Index.

1. Introduction

Indonesia is one of the countries located on the pacific ring of fire. The ring of fire is a term for a series of active volcanic trails formed by endogenous forces. One of the mountains that are still active and require intensive monitoring is Mount Merapi, which is in four areas, namely Klaten, Magelang, Boyolali, and Sleman Regency. Mount Merapi is one of the active volcanoes and is even categorized as one of the most active volcanoes in the world because the period and intensity of its eruptions tend to be short, which is 3-7 years (Zamroni, 2011). An enormous eruption of Mount Merapi occurred in 2010, with the eruption's power three times greater than in previous years, with hot clouds sliding up to a radius of 14.5 km. According to a volcanologist from Center of Volcanology and Geological Hazard Mitigation, Mount Merapi's eruption type is cyclical and will be repeated every certain period. Therefore, Mount Merapi is a potential disaster that may occur periodically. Suppose the government does not actively handle this, and there is a lack of support from the community. In that case, the potential for disasters can create dangers that will continue to be repeated in the following years. In handling this matter, of course, it cannot be separated from the government's role in the disaster management of Mount Merapi, one of which is the Regional Disaster Management Agency, hereinafter referred to as BPBD in the Sleman regency Yogyakarta Province.

Efforts to overcome or mitigate in readiness to face the eruption of Mount Merapi by BPBD Sleman are still experiencing quite a several obstacles during implementation. This can be seen from 2010 – 2018; the Sleman BPBD still faces problems in its efforts to prepare for disaster management. In the 2010 eruption, the readiness of the Sleman BPBD was still considered lacking; this was based on the fact that there were around 280,000 refugees who still lacked refugee barracks. So many residents were displaced because of this (BNPB, 2018). Not only that, but the shortage of evacuation points also occurred again in 2015 during the effusive eruption of Mount Merapi. This year, the existing evacuation points cannot accommodate a large number of refugees, around 30,000 people, so other evacuation points are needed to accommodate the displaced residents. In 2018 another phreatic eruption occurred. Phreatic eruptions are eruptions caused by the contact of water with magma. Phreatic eruptions consist primarily of gas or water vapor. However, in the 2018 eruption, many residents panicked and flocked to evacuate to areas that were felt to be safe. Efforts to handle residents during this eruption were also slightly hampered due to the lack of volunteers to help handle displaced residents (BNPB, 2018).

In this regard, the community's knowledge of Merapi is still minimal. Therefore, mitigation efforts carried out by BPBD in educating residents are not practical; this can be seen from the number of residents who still lack good knowledge of the eruption of Mount Merapi. In addition, in the 2018 phreatic eruption, it was known that from 30 tools, ten early warning systems were scattered and died and were not functioning as they should. Therefore, the readiness of the Sleman BPBD is crucial in tackling and handling the eruption of Mount Merapi. Moreover, according to the Head of the Prevention and Preparedness Division, there has never been a readiness assessment of the Sleman BPBD in handling and managing the Mount Merapi disaster. Therefore, seeing the problems that BPBD Sleman in disaster management often faces, it is necessary to assess and map related preparedness in disaster management.

Orencio and Fujii (2013) regarding the readiness and resilience of an area resulted in an analysis of the regional readiness index but focused only on local readiness in implementing disaster mitigation. In addition, this study emphasizes that regional readiness in disaster management and management is an essential factor for a region in carrying out disaster risk management. Adam (2014) explained that disaster preparedness management is the main thing that the government must pay attention to obtain methods for evaluating regional disaster management and management. Adam (2014) analyzed flood disaster preparedness and risk based on his research. The result is the development of models for managing and accessing specific risks of flood disasters. Rañeses et al. (2017) explain that disaster preparedness is often referred to as actions taken before events that reduce or can help reduce and eliminate disaster severity by preparing communities to develop emergency plans for response and recovery. The research he did was to calculate the readiness and resilience of earthquake measuring instruments in the city of Auckland; this was intended to check the validity and robustness of the earthquake measurement tools used.

Based on several considerations from previous research, this research does not only assess readiness in one aspect but also relates to readiness for handling and overcoming, which includes broader aspects, namely the Sleman BPBD in the context of dealing with the eruption of Mount Merapi. Previous studies only researched certain aspects without conducting a readiness assessment on other aspects, so research is needed that measures readiness assessment on other aspects. Regional preparedness for disasters is one of the responsibilities that regions must carry out in disaster risk management. BPBD is one of the stakeholders who play an active role and is fully responsible for disaster

preparedness. Therefore, BPBD readiness in implementing disaster management is an important parameter to determine the success of disaster risk reduction.

1.1 Objectives

This study aims to identify the criteria and sub-criteria used in the BPBD's readiness efforts, determine the importance of each criterion and sub-criteria, calculate the Sleman BPBD readiness index, and finally determine suggestions and improvement steps from the evaluation of each indicator.

2. Literature Review

Readiness in disaster management and management is one of the essential factors that each region must consider, but research on this readiness is still minimal. The research conducted by Orencio and Fujii (2013) regarding the readiness and resilience of an area produced an analysis of the regional readiness index but focused only on local readiness in implementing disaster mitigation. In addition, this study emphasizes that regional readiness in disaster management and management is an essential factor for a region in carrying out disaster risk management. Adam (2014) explained that disaster preparedness management is the main thing that the Government must pay attention to obtain methods for evaluating regional disaster management and management. Adam (2014) analyzed flood disaster preparedness and risk based on his research. The result is the development of models for managing and accessing specific risks of flood disasters. Rañeses et al. (2017) explain that disaster preparedness is often referred to as actions taken before an event that reduces or can help reduce and eliminate the severity of natural disasters by preparing communities to develop contingency plans for response and recovery. The research he did was to calculate the readiness and resilience of earthquake measuring instruments in the city of Auckland; this was intended to check the validity and robustness of the earthquake measurement tools used.

Based on several considerations from previous studies, this research is expected to be a pioneer for further research and to provide a mapping of preparedness for handling and handling, which covers broader aspects of the Sleman BPBD in the context of dealing with the eruption of Mount Merapi. Previous studies only researched certain aspects without conducting a readiness assessment on other aspects. This study uses the main criteria based on the 2015-2019 National Disaster Management Plan and the Sendai Framework, where the priority indicators are used to cover essential aspects of disaster management and management. In addition, by calculating the preparedness index, it can be seen at which level the condition of the Sleman BPBD and what improvements are needed to increase the preparedness index.

2.1 Sendai Framework and National Disaster Management Plan

The Sendai Framework is an agreement for 15 years, recognizing that the state has an essential role in tackling disaster risk. This role can be shared with local government, private divisions, and others. Sendai Framework is a continuation of the Hyogo Framework for Action, which was prepared from 2005-2015. The Sendai Framework has a goal to produce: a reduction of the risk of loss from disasters in life, livelihoods, health, economic assets, physical, social, cultural, and environmental, businesspeople, and the country. The Sendai Framework has four main criteria for action: understanding disaster risk, strengthening risk management, disaster risk management (DRR) investment for resilience, and improving risk management (The United Nations Office for Disaster Risk Reduction, 2015).

Action plans are activities derived from the disaster management program, main criteria, and targets to be achieved in the 2015-2019 National Disaster Management Plan implementation period. This action plan is a commitment of ministries/agencies and non-ministerial/institutions that are development partners of the Government for disaster management implementation. Specifically, the action plan for disaster management is regulated in Government Regulation No. 21 of 2008 concerning the implementation of disaster management (PP No. 21/2008). Article 8 paragraph 1 PP No. 21/2008 states that an action plan for disaster risk reduction is carried out to carry out efforts to reduce disaster risk. Some of the things that become the basis for consideration in the preparation of an action plan for disaster risk reduction include:

1. An action plan for disaster risk reduction is prepared at the national and regional levels.
2. At the national level, action plans for disaster risk reduction are prepared comprehensively and integrated into a forum that includes elements from Government, non-government, community, and business institutions coordinated by BNPB.

3. The Head of BNPB determines the national action plan after coordination with the agency/institution responsible for the field of national development planning.
4. National and regional action plans for disaster risk reduction are set for 3 (three) years and can be reviewed as needed.

The 2015-2019 National Disaster Management Plan has seven main criteria consisting of strengthening the legal framework for disaster management, mainstreaming disaster risk reduction in development, increasing multi-stakeholder partnerships in disaster management, fulfilling good governance in the field of disaster management, increasing the effectiveness of disaster prevention and mitigation, increasing disaster emergency preparedness and handling, and increasing disaster recovery capacity (BNPB, 2015).

2.2 Analytic Hierarchy Process (AHP)

One of the excellent multi-criteria decision-making (MCDM) approaches is the Analytic Hierarchy Process (AHP) method (Saaty, 1980), which can obtain the relative weights of the factors and can assess alternatives based on these weights (Torfi et al., 2010). Compared with other MCDM methods, the AHP method has been widely used in MCDM problems, and its application has succeeded in many decision-making problems (Saaty, 1988). The AHP developed by Saaty (1980) explains how to determine the relative importance of a set of activities in MCDM problems. The AHP method makes it possible to combine opinions in qualitative criteria that are intangible and also quantitative criteria that are tangible (Badri, 2001). Furthermore, the AHP method uses the procedure to make weights and scores obtained from alternatives based on the calculation of pairwise comparisons between existing criteria and options, tangible and intangible (Alberto, 2000).

2.3 Performance Assessment

Performance in an organization is an essential thing in the organization to achieve its goals, so the organization must carry out various activities to improve it. One of them is performance appraisal. Performance appraisal is a process within the organization to assess the performance of employees and the organization in achieving its targets. According to Dessler (1997), *performance appraisal* can be defined as a procedure that includes setting work standards, evaluating the actual employee concerning these standards, and providing feedback to the employee to motivate the person to eliminate a slump or spark an even higher performance. *Performance Rating* is an assessment based on a scale from low to high.

2.4 Method of Successive Interval (MSI)

Method of Successive Interval is the process of converting ordinal data into interval data. Ordinal data is qualitative data or not real numbers. The data requires interval scale data in many statistical procedures such as regression, Pearson correlation, t-test, and so on. Therefore, if we only have ordinal scale data, then the data must be converted into interval form to meet the requirements of these procedures. Unless we use a procedure, such as Spearman correlation which tests data on an ordinal scale, then there is no need to change the existing data. The steps of data transformation from ordinal to interval with the Method of Successive Interval following Badrullah and Asdar (2016).

3. Methods

The method used in this research is the Nominal Group Technique (NGT), Analytic Hierarchy Process (AHP), Method of Successive Interval (MSI), and index calculation. The variables used in this study are variables derived from the Sendai Framework and the National Disaster Management Plan.

The variables containing the criteria and indicators are then validated using the NGT method, namely by giving questionnaires to respondents with competence in the problem (Handayani et al., 2020). The respondents were the Head of Disaster Prevention and Preparedness Division, Head of Emergency and Logistics Division, Head of Disaster Mitigation Division, and Head of Disaster Preparedness. After obtaining the criteria and sub-criteria used in this study, the next step is to determine the weight of importance of the criteria and indicators using the AHP method, which uses a second questionnaire related to pairwise comparisons of the main criteria and indicators. The steps in the AHP are as follows (Saaty & Luis, 1994):

1. Distribute pairwise comparison questionnaires of criteria and sub-criteria that affect the respondents who have been determined.
2. Estimating relative weights. The relative weight is obtained by calculating the eigenvalue (w) according to

the largest eigenvalue ($\boldsymbol{\lambda}_{max}$)

$$A_w = \lambda_{max}.w \quad \text{.....(1)}$$

3. Evaluate by calculating and checking the consistency ratio. If the pairwise comparisons are consistent, then the matrix *A* has rank one and $\boldsymbol{\lambda}_{max}$ = n.
   If so, the weights can be obtained by normalizing all rows and columns of matrix *A*. AHP must satisfy the condition that matrix *A* is consistent. The consistency value is the relationship between *A:* $a_{ij} \, x \, a_{jk} = a_{ik}$. The consistency index (CI) formula is:

$$CI = \frac{(\lambda_{max}-n)}{n-1} \quad \text{.....(2)}$$

Next is the assessment stage, where at this stage is using a rating scale using scale of 1 – 5 (ordinal) to characterize the condition of each indicator contained in Table 1. Furthermore, after obtaining the achievement characterization value of each indicator, then proceed with making changes to the scale used from ordinal to interval using the MSI method (Badrullah and Asdar, 2016). This scale change is done so that the data obtained can be continued for statistical processing, namely the performance rating method. The following is the equation used in calculating the Performance Rating (Sugiyono, 2012):

$$PR = \frac{f}{n} \, x \, 100 \quad \text{.....(3)}$$

where PR stands for Performance Rating, *f* is the frequency or value of the questionnaire answers (the result of the indicator characterization assessment), *n* is the number of ideal scores (maximum), and the last 100 is a fixed number. The next stage is the calculation of the index, which is multiplying the results of the indicator assessment with the weights obtained from AHP processing. Calculations are carried out on each indicator in the main criteria before finally adding the values from the main criteria globally to produce a total index value. After obtaining the total value, proceed with mapping the assessment results in Table 2 (Farhi et al., 2012).

Table 1. *Rating Scale*

Rating scale	Description
1	Unsatisfactory Performance
2	Improvement Desired
3	Meet Expectation
4	Exceeds Expectation
5	Outstanding Performance

Table 2. Categorization of Readiness Index

No	Index Value	Category
1	76 - 100	Very Ready
2	50 - 75	Ready
3	26 - 50	Almost Ready
4	0 - 25	Not Ready

4. Data Collection

This section describes the stages in the development of the Sleman BPBD readiness assessment framework in handling and managing the Mount Merapi disaster and describes each of the main criteria and indicators used. The reference framework is selected by studying relevant literature on disasters. In addition, it is also adjusted to the references used by BPBDs in carrying out their duties to see the completeness of the main criteria and indicators. The 2015-2030 Sendai Framework for Disaster Risk Reduction and the 2015-2019 National Disaster Management Plan were chosen as references because these frameworks represent a unique opportunity for all regions where this framework can be used as one of the primary references for capacity building or readiness (BNPB, 2015). Determining the components

of the readiness assessment includes the main criteria and indicators to develop a reference framework, namely the Sendai Framework and the National Disaster Management Plan as the reference framework. This reference framework is developed by combining each reference's main criteria and indicators.

The data collection of the questionnaire variables was carried out by joint discussion (consensus), which was prepared based on the agreement of three experts, namely by using the Nominal Group Technique method. The process of giving agreement is done by giving a questionnaire that explains the main criteria and indicators used as research variables. Experts were asked to rank or assess the suitability of each variable on a scale of 1 to 5. A scale of 5 indicates a high suitability value to a scale of 1 indicates a low suitability value for each of the main criteria and indicators. In addition, experts are also allowed to discuss with other experts and are allowed to add variables that need to be added (Delbecq, 1975). The experts used in this research are the Head of Prevention and Preparedness, Head of Disaster Mitigation Section, and Head of Disaster Preparedness Section. The following is the validation results recapitulation from each expert for the main criteria and indicators in Table 3. There are 11 factors for assessing regional readiness in natural disaster management, namely: strengthening the legal framework for disaster management, mainstreaming disaster risk reduction in development, enhancing multi-party partnerships in disaster management, implementing Good Governance in disaster management, increasing the effectiveness of disaster prevention and mitigation, improving preparedness and handling disaster emergencies, increasing disaster recovery capacity, understanding disaster risk, strengthening risk governance, DRR investment for resilience, and improving risk management (Handayani et al., 2020).

Table 3. Variables and Indicators of Validation Results

No	Main Criteria	Code	Indicator	Code
1	Strengthening the legal framework for disaster management	A	Completion of Technical Regulations for Disaster Management	A1
			Improved implementation of the legal framework for disaster management	A2
2	Mainstreaming disaster risk reduction in development	B	Mainstreaming disaster risk reduction and climate change adaptation related to disasters in the context of development	B1
3	Increasing multi-stakeholder partnership in disaster management	C	Development of community empowerment strategies and implementation for disaster resilience that considers local wisdom and is adaptive to climate change, gender, and vulnerable groups.	C1
			Strengthening partnerships for the independence and sustainability of disaster management.	C2
			Strengthening National, regional and thematic DRR forums as a medium for sharing in the implementation of disaster management	C3
			Utilization and strengthening of educational institutions and expert associations in disaster as a medium of education and development of a culture of disaster awareness (safety culture).	C4
			Strengthening and increasing the role of volunteers in disaster management	C5
4	Fulfillment of Good Governance in the field of disaster management	D	Fulfillment of Minimum Service Standards related to disaster management	D1
			Capacity building of human resources in institutions related to disaster management	D2
			Improvement of facilities and infrastructure that supports institutions for disaster management	D3
			Management support and accountability for the technical implementation of disaster management	D4
5	Increasing the effectiveness of disaster prevention and mitigation	E	Institutional and community capacity building in disaster prevention and mitigation	E1
			Optimization of resource management and spatial and land management for disaster prevention and mitigation efforts	E2

No	Main Criteria	Code	Indicator	Code
			Disaster mitigation management that synergizes with climate change adaptation and considers vulnerable groups and local wisdom	E3
6	Improving disaster emergency preparedness and handling	F	Integration of disaster risk reduction efforts with emergency management	F1
			Development of a multi-hazard early warning system	F2
			Expanding the reach of the disaster early warning system	F3
			National and regional disaster preparedness capacity building	F4
			Accelerate the construction of infrastructure and logistics facilities and distribution in handling emergencies.	F5
			Strengthening the Rapid Response Unit for disaster management	F6
			Strengthening and assisting regions to strengthen disaster emergency management mechanisms based on operating target priorities (saving lives, localizing the area of exposed areas, and saving viral assets)	F7
			Capacity building for disaster emergency management	F8
7	Disaster recovery capacity building	G	Strengthening recovery support mechanisms at the national and regional scale	G1
			Optimization of Rehabilitation and Reconstruction in all fields	G2
			Character building and community resilience for disaster preparedness	G3
8	Understanding disaster risk	H	Encourage the collection, management, and access to risk information.	H1
			The primary use of location-based data	H2
			Optimization of statistics in handling damage and losses	H3
			Increase public awareness regarding DRR understanding	H4
9	Strengthening risk management	I	Prioritizing & integrating DRR in all sectors	I1
			Adopt strategies and implement disaster risk reduction strategies and plan according to targets.	I2
			Empowering regions through regulations and finance to coordinate with civil society, communities, and residents to manage risk.	I3
			Formulate applicable public policies, which aim to address issues of prevention or relocation of residents' settlements in areas that have a disaster risk	I4
10	Disaster Risk Management (DRR) Investment for Resilience	J	Allocate necessary resources, including finance and logistics at all levels of government for the development and implementation of strategic disaster risk reduction policies, planning, and regulations in all relevant sectors	J1
			Improve critical infrastructure.	J2
			Integrating DRR in fiscal instruments & risk sharing and transfers.	J3
			Increase business resilience, both from community livelihoods and businesses from various parties.	J4
			Protect and support the preservation of cultural institutions, collected objects, and other historical, cultural, and religious heritage sites.	J5
11	Improve risk management	K	Readiness and policies, plans, and programs in disaster risk management.	K1
			Improving community resilience and infrastructure services.	K2
			Assistance and restoration of funding, coordination, and procedures for disaster risk management.	K3
			Develop laws, guidelines, procedures, and mechanisms for disaster risk management.	K4

The AHP method in this study was used to determine the weight of each criterion and indicator used. The input data processing using the AHP method results from a pairwise comparison questionnaire, where each criterion and sub-criteria on the same criteria are compared. The processing of the AHP method is carried out using Expert Choice software. Here is the result of the weighting. After getting the weight of each indicator, the next stage is the assessment or characterization of its. At this stage, a scale of 1-5 is used, and the explanation for each level is based on Table 1. The Readiness Assessment was carried out by distributing assessment questionnaires to stakeholders at BPBD Sleman.

They were the Head of Emergency and Logistics Division, Head of Disaster Prevention and Preparedness, Head of Disaster Mitigation Section, and Head of Disaster Preparedness Section. The results of the distribution of the Sleman BPBD readiness questionnaire are in Table 4.

5. Results and Discussion

The readiness index value of the Sleman BPBD in disaster management calculation is done by multiplying the global weight obtained from the AHP method and multiplying by the assessment result or characterization of each indicator with the data type converted by the MSI method into an interval scale. (Table 4) Finally, the total index calculation is done by adding the calculation results of each indicator to the main criteria. Table 5 shows the calculation processing result for the readiness index value.

Table 4. Indicator Characterization Assessment Results

Indicator		Responden				Indicator		Responden			
		1	**2**	**3**	**4**			**1**	**2**	**3**	**4**
A	A1	4	5	5	4	G	G1	2	3	2	2
	A2	3	4	5	3		G2	4	4	5	4
B	B1	3	4	2	2		G3	2	2	2	2
C	C1	4	5	5	4	H	H1	2	2	1	2
	C2	2	2	3	2		H2	3	4	4	4
	C3	2	3	2	2		H3	4	4	4	3
	C4	3	2	2	2		H4	2	2	2	2
	C5	5	4	4	3	I	I1	4	3	4	4
D	D1	5	4	4	5		I2	5	5	4	4
	D2	4	4	4	3		I3	4	4	3	4
	D3	4	4	5	4		I4	5	4	4	3
	D4	4	5	4	5	J	J1	4	4	4	3
E	E1	3	2	2	2		J2	2	2	2	2
	E2	4	4	4	3		J3	3	4	4	4
	E3	4	3	4	4		J4	2	3	2	2
F	F1	3	5	5	5		J5	2	2	2	1
	F2	2	2	2	2	K	K1	4	3	4	4
	F3	3	2	2	2		K2	2	2	2	3
	F4	3	4	4	4		K3	4	4	4	4
	F5	4	5	5	4		K4	5	5	4	5
	F6	3	4	5	4						
	F7	5	5	5	4						
	F8	3	4	4	4						

Table 5. Index Calculation Processing

Indicator		Skala MSI				AVG	PR	%	Weight	Index	
		1	2	3	4					Indicator	Criteria
A	A1	2.764	3.697	4.739	3.953	3.788	0.757649	75.76	0.0153	1.16	1.574
	A2	1.956	2.537	4.739	3.158	3.098	0.619507	61.95	0.0067	0.42	
B	B1	1.956	2.537	2.356	2.356	2.301	0.460223	46.02	0.0400	1.84	1.841
C	C1	2.764	3.697	4.739	3.953	3.788	0.757649	75.76	0.0082	0.62	2.499
	C2	1.000	1.000	2.976	2.356	1.833	0.366592	36.66	0.0034	0.12	
	C3	1.000	1.802	2.356	2.356	1.878	0.375672	37.57	0.0180	0.68	

Indicator		Skala MSI				AVG	PR	%	Weight	Index	
		1	2	3	4					Indicator	Criteria
	C4	1.956	1.000	2.356	2.356	1.917	0.383348	38.33	0.0096	0.37	
	C5	3.849	2.537	3.581	3.158	3.281	0.656269	65.63	0.0109	0.72	
D	D1	3.849	2.537	3.581	5.154	3.780	0.756090	75.61	0.0141	1.07	5.729
	D2	2.764	2.537	3.581	3.158	3.010	0.602020	60.20	0.0272	1.64	
	D3	2.764	2.537	4.739	3.953	3.498	0.699668	69.97	0.0363	2.54	
	D4	2.764	3.697	3.581	5.154	3.799	0.759822	75.98	0.0064	0.49	
E	E1	1.956	1.000	2.356	2.356	1.917	0.383348	38.33	0.0217	0.83	9.355
	E2	2.764	2.537	3.581	3.158	3.010	0.602020	60.20	0.0856	5.15	
	E3	2.764	1.802	3.581	3.953	3.025	0.605020	60.50	0.0557	3.37	
F	F1	1.956	3.697	4.739	5.154	3.887	0.77731	77.73	0.0127	0.99	9.471
	F2	1.000	1.000	2.356	2.356	1.678	0.335556	33.56	0.0133	0.45	
	F3	1.956	1.000	2.356	2.356	1.917	0.383348	38.33	0.0196	0.75	
	F4	1.956	2.537	3.581	3.953	3.007	0.601377	60.14	0.0068	0.41	
	F5	2.764	3.697	4.739	3.953	3.788	0.757649	75.76	0.0335	2.54	
	F6	1.956	2.537	4.739	3.953	3.296	0.659266	65.93	0.0151	1.00	
	F7	3.849	3.697	4.739	3.953	4.059	0.811899	81.19	0.0160	1.30	
	F8	1.956	2.537	3.581	3.953	3.007	0.601377	60.14	0.0340	2.04	
G	G1	1.000	1.802	2.356	2.356	1.878	0.375672	37.57	0.0467	1.75	5.371
	G2	2.764	2.537	4.739	3.953	3.498	0.699668	69.97	0.0181	1.27	
	G3	1.000	1.000	2.356	2.356	1.678	0.335556	33.56	0.0701	2.35	
H	H1	1.000	1.000	1.000	2.356	1.339	0.267778	26.78	0.0236	0.63	5.006
	H2	1.956	2.537	3.581	3.953	3.007	0.601377	60.14	0.0120	0.72	
	H3	2.764	2.537	3.581	3.158	3.010	0.602020	60.20	0.0333	2.00	
	H4	1.000	1.000	2.356	2.356	1.678	0.335556	33.56	0.0491	1.65	
I	I1	2.764	1.802	3.581	3.953	3.025	0.605020	60.50	0.0172	1.04	6.394
	I2	3.849	3.697	3.581	3.953	3.770	0.754009	75.40	0.0513	3.87	
	I3	2.764	2.537	2.976	3.953	3.058	0.611518	61.15	0.0128	0.78	
	I4	3.849	2.537	3.581	3.158	3.281	0.656269	65.63	0.0107	0.70	
J	J1	2.764	2.537	3.581	3.158	3.010	0.602020	60.20	0.0441	2.65	4.152
	J2	1.000	1.000	2.356	2.356	1.678	0.335556	33.56	0.0135	0.45	
	J3	1.956	2.537	3.581	3.953	3.007	0.601377	60.14	0.0077	0.46	
	J4	1.000	1.802	2.356	2.356	1.878	0.375672	37.57	0.0100	0.37	
	J5	1.000	1.000	2.356	1.000	1.339	0.267778	26.78	0.0077	0.21	
K	K1	2.764	1.802	3.581	3.953	3.025	0.605020	60.50	0.0115	0.69	3.967
	K2	1.000	1.000	2.356	3.158	1.878	0.375656	37.57	0.0134	0.50	
	K3	2.764	2.537	3.581	3.953	3.209	0.641778	64.18	0.0190	1.22	
	K4	3.849	3.697	3.581	5.154	4.070	0.814072	81.41	0.0190	1.55	
									Index Total	55.362	55.362

Based on Table 5, it can be seen that the main criteria that has the most significant importance weight is increasing the effectiveness of disaster prevention and mitigation with a weight of 16.3%, followed by increasing disaster emergency preparedness and handling with a weight of 15.1%, increasing disaster recovery capacity with a weight of 13.5%, understanding disaster risk with a weight of 11.8%, strengthening risk management with a weight of 9.2%, the fulfillment of good governance in the field of disaster management with a weight of 8.4%, DRR investment for resilience with a weight of 8.3%, improve risk management with a weight of 6.3%, an increase in and multi-stakeholder partnerships in disaster management with a weight of 5%, the mainstreaming of disaster risk reduction in development with a weight of 4%, and the last is strengthening the legal framework for disaster management with a weight of 2.2%. Meanwhile, for the Sleman BPBD readiness assessment results, the assessment index value is 55.362. Based on Table 2, the readiness level of BPBD Sleman is in the readiness level in the *ready* phase. However, from several assessment results, several assessment results show poor results, so it has an impact on low index values, including indicators B1, C2, C3, C4, E1, F2, F3, G1, G3, H1, H4, J2, J4, J5, and K2.

Indicator B1 is the mainstreaming of disaster risk reduction and adaptation to climate change related to disasters in the context of development. Based on the results achieved, BPBD Sleman is almost ready for implementation. BPBD Sleman's efforts in mainstreaming disaster risk reduction in development focus on capacity building and community and business participation. In implementing the program, namely the Disaster Resilient Village, until now, only 46 villages have been formed out of a total of 86 villages around Mount Merapi, so further optimization is needed regarding the addition of villages in the Mount Merapi area. In indicators C2, C3, and C4, respectively, namely strengthening partnerships for independence and sustainability of disaster management; strengthening regional and thematic DRR forums as a medium for sharing in the implementation of disaster management; and the utilization & strengthening of educational institutions and expert associations in the field of disaster as a medium of education and development of a culture of disaster awareness (safety culture). BPBD, the agency that handles disaster management, often cooperates with several other parties in disaster management efforts. Concerning independence partnerships with non-government parties for BPBD Sleman, until now, there has been no cooperation, either with the disaster community or other non-governmental institutions involved in disaster management. In addition, based on the Strategic Plan from BPBD Sleman, related to the partnership assets of supporting and operational facilities and infrastructure that are recorded to be owned by BPBD Sleman, there is still no such thing.

Regarding the forum implemented by the Sleman BPBD as a medium for sharing in the implementation of disaster management, it has been carried out several times but still has little intensity. BPBD Sleman has a work program for improving and strengthening educational institutions, namely the Disaster Preparedness School, launched in 2013. Up to now, about 36 schools have implemented the Disaster Preparedness School. However, this number is still tiny compared to the total number of schools in Sleman, around 700 schools from elementary to high school. BPBD Sleman targets yearly to increase the 21 schools implementing Disaster Preparedness Schools. E1 indicator, namely increasing institutional and community capacity in disaster prevention and mitigation. Based on an interview with the Head of Preparedness for BPBD, Sleman has not established sustainable relationships with communities related to disaster management. Cooperation with the community is limited to volunteers when a disaster occurs, so efforts to increase capacity and community institutions for BPBD Sleman have not been carried out correctly.

F2 and F3 indicators are the development of a multi-hazard disaster early warning system and the expansion of the regional reach of the disaster early warning system. However, there is still no tool or system for detecting multi-hazard disasters. This result is also reinforced by a statement from the Head of the BNPB Information and Public Relations Center that on a national scale, BNPB does not yet have a multi-hazard or multi-hazard early warning system. In addition, for the Sleman BPBD, regarding the expansion of the regional reach, the disaster early warning system has not run optimally where in its implementation, the system only focuses on priority zones, and there have not been any expansions of coverage.

The indicators G1 and G3 are character building and community resilience for disaster preparedness. This result is because many people still lack a good understanding of disasters. On the other hand, BPBD Sleman has many program activities to build character and resilience in disaster-prepared communities such as villages, schools, and soon. However, their understanding of disasters is still lacking in anticipation or practice. Like what happened in the Merapi eruption in May 2018, this eruption is a type of phreatic eruption where the eruption is at a level that is not yet dangerous, but many residents feel panicked and afraid so around 388 residents evacuated. In connection with the displaced residents, which impacted the Sleman BPBD, where this was one of the unexpected events, sudden

preparations were needed to deal with the number of evacuated residents due to the eruption. If residents have a good understanding of disaster preparedness, this will likely not happen.

The indicators H1 and H4 encourage the collection, management, and access to risk information; and improve risk understanding in the community. However, BPBD Sleman in this implementation is still lacking due to the limited resources concerning information systems, making it difficult to develop management and access to risk information. In Indicators J2, J3, and J4, namely improving critical infrastructure; increasing business resilience, both from community livelihoods and businesses from various parties; and protecting and supporting the preservation of cultural institutions and collected objects and other historical, cultural, and religious heritage sites. The critical infrastructure of the Sleman BPBD is still lacking; this is related to the limited existing facilities and infrastructure. There are quite several protected areas and cultural heritage along with objects of cultural heritage in Sleman Regency. However, quite a few are still implementing their maintenance, so protection and protection are needed preservation and improvement of the preparedness in disaster management in protected areas and cultural heritage. The value of the protected area's function and cultural heritage's historical value cannot be calculated when a disaster damages it.

In the K2 indicators, it is namely increasing community resilience and infrastructure services. This result is because BPBD Sleman has implemented several disaster mitigations programs, but many people still lack an understanding of disaster risk. Therefore, improvement efforts are always launched by BPBD Sleman related to disaster risk mitigation to increase the community's resilience.

6. Conclusion

There are eleven main criteria for assessing the readiness of BPBD Sleman in the context of the disaster management efforts of Mount Merapi. There are also indicators in each of these main criteria, whereas in this study, there are 43 indicators. The main criteria and indicators used are frameworks derived from the Sendai Framework and the 2015-2019 National Disaster Management Plan.

Based on calculations using the AHP method on the main criteria and indicators in the framework for assessing the readiness of the Sleman BPBD in disaster management for Mount Merapi, it was found that the essential priorities carried out by the Sleman BPBD on the main criteria are increasing the effectiveness of disaster prevention and mitigation with a weight of 16.3%, followed by increasing disaster emergency preparedness and handling with a weight of 15.1%, increasing disaster recovery capacity with a weight of 13.5%, understanding disaster risk with a weight of 11.8%, strengthening risk management with a weight of 9.2%, the fulfilment of good governance in the field of disaster management with a weight of 8.4%, DRR investment for resilience with a weight of 8.3%, improve risk management with a weight of 6.3%, an increase in and multi-stakeholder partnerships in disaster management with a weight of 5%, the mainstreaming of disaster risk reduction in development with a weight of 4%, and the last is strengthening the legal framework for disaster management with a weight of 2.2%. The results of the calculation of the readiness index show that the readiness index value at BPBD Sleman is 55.362. The position is in the “ready” category based on index categorization and readiness status.

Suggestions and recommended corrective steps are increasing the role of communities and communities, cross-city synchronization related to disaster risk studies, and strengthening the implementation of disaster curriculum in schools. In addition, integrating information dissemination systems (technology) with local wisdom, strengthening institutional regulatory systems, risk management socialization, and strengthening coordination with the tourism office.

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