



Development of Instruments to Measure Disaster Preparedness

Hery Sumasto*, Nurwening Tyas Wisnu

Poltekkes Kemenkes Surabaya, Indonesia.

***Corresponding Author: Hery Sumasto**

Abstract

Objective: Indonesia is called a disaster supermarket due to any disaster exists. The community preparedness in Indonesia is still low. The university academic community needs to be prepared so that it has enough capacity during disasters. The purpose of this study was to develop an instrument to measure disaster preparedness at a university in Indonesia. **Method:** Research and Development method was used in this study. The participants were directorate officers, lecturers/staff, and students. The development of the instrument was carried out by literature study, Focus Group Discussions (FGD), and expert consultation. The instrument development steps were instrument assessment, formulating strategic problems, instrument trials, and analysis. **Results:** The instruments produced in this study had five parameters, including knowledge, attitude, and practice (KAP); the university policy; resource mobilization capacity; early warning system; and emergency response planning. The result of an instrument trial showed that the University had high disaster preparedness (97%). **Discussion:** The instruments produced in this study can be used to measure disaster preparedness in the University.

Keywords: *Research and development, Disaster preparedness, Disaster instruments.*

Introduction

As a country that has a high potential for natural disasters, it requires good community preparedness in order to minimize disaster victims. Many people die from disasters, requiring a paradigm shift in disaster management [1]. The preparation of preparedness instruments is very important in efforts to plan security and safety policies for University residents [2]. Disasters can create damage, occur suddenly, causing ecological imbalances, deteriorating public health, services, and livelihoods that are disrupted by health services, ecological damage, and disruption [3].

In Indonesia, there has been a paradigm shift to deal with disasters. The current disaster management paradigm emphasizes community empowerment, thus enabling the community to be a helper subject rather than an object that needs help [4]. Children need to be prepared to get prepared early. A learning curriculum about disaster preparedness needs to be prepared [5]. University preparedness is part of community preparedness.

The University plays an important role in preparing for disaster preparedness because disasters that occur in the community will also have an impact on the University [6]. The University's capacity to deal with disasters is related to its ability to plan, analyze, and disaster risk reduction activities. Therefore, the academic community must be given directly to the community to improve preparedness through various mitigation strategies. So far, there are no instruments to measure University preparedness in facing disasters. The impact is disaster safety standards; the University has not been met.

With this instrument, it is expected that all Universities can have disaster safety level scores so that it is expected to minimize casualties during disasters, due to proper management of disaster management policies [7]. Universities that are scattered in various regions have different characteristics of natural disasters. The University in Indonesia has the following potential

disasters: floods, winds, landslides, fires, and so on. For this reason, the stratification of natural disaster preparedness is needed.

Using instruments developed through this research, the level of preparedness for each location will be known by the potential for natural disasters [6]. The main difficulty in minimizing casualties during disasters is due to the lack of community disaster preparedness due to lack of knowledge [4].

Preparedness is a series of activities carried out to anticipate disasters, through organization and effective and efficient steps. Preparedness is one of the processes of disaster management because preparedness is an important element of risk reduction [8]. UNESCO considers the importance of preparedness so that in 2006 it developed a framework for community preparedness studies in dealing with disasters.

In Indonesia, cooperation has been developed to produce a measuring tool for community disaster preparedness. This is done by the central and regional governments to anticipate disasters [9]. College Management needs to make much effort in planning, analyzing, and disaster risk reduction activities. With this research instrument, it is then proposed to increase the capacity of each University citizen.

So that leaders, lecturers, security guards, drivers, education personnel, students, and all University residents, can have good resilience. So that it can help the wider community in dealing with the potential for natural disasters. University capacity in dealing with disasters related to its ability to plan, analyze, and disaster risk reduction activities. Therefore, the academic community should be given a briefing to improve preparedness through various mitigation strategies [10].

It is hoped that this instrument can also be developed to be used by the national and international community. So that it can measure the level of preparedness of University residents during a disaster [11, 12] this study aims to develop an instrument of academic community preparedness in dealing with disasters.

Materials and Methods

The method used in this research is research

and development because it will develop the preparedness instrument from UNESCO into the University preparedness instrument [13]. The instrument was carried out through two stages, namely the identification stage and the instrument development stage. Data collection was carried out by 1) literature study; 2) FGD to the staff of the University and students; 3) Expert consultation to a chief of Regional Disaster Management Agency (RDMA) and an expert of Consultant Research of Community (CRC).

There were five parameters in the preparation of instruments, namely: 1) knowledge and attitude (KAP); 2) Policy (PS); 3) emergency planning (EP); 4) Disaster Warning System (WS); 5) resource mobilization (RMC). The instrument trials were carried out on a university that had potential disasters. The development of the instrument was carried out in two-phase [14].

Phase 1 included: 1) Conducting Theoretical Studies. At this stage, empirically collect data and information by referring to the literature related to community preparedness assessments [15]; 2) Preparing Variables. At this stage, the product is designed by determining the Indicator variable, which is obtained from the parameters that have been found. At this stage, a referral was also made with experts in methodology; 3) Preparing Instrument Indicator Points. At this stage, tests, evaluations and revisions are carried out.

Validation is done with a disaster expert and conducts a FGD simultaneously; 4) Consulting Experts. The goal is to be easy in compiling instruments; 5) Trials. Instrument trials were conducted to assess deficiencies so that they could be corrected; 6) Formulating the Final Instrument. Including the analysis, revision and formulation of instruments [16]. University preparedness in facing disasters is analyzed from the scoring of respondents' answers [17]. Phase 2 includes 1) instrument socialization; 2) conduct an instrument feasibility analysis; 3) recommend instruments 4) propose instrument copyright [18]. This study has received permission from the University and accommodates ethical principles which include justice, beneficence, confidentiality, and non-maleficence

Results

Identification

Participants in this study were divided into three major parts, namely Focus Group Discussion (FDG) participants, experts, and trial participants.

Literature Study

From the literature study, five indicators are important regarding disaster preparedness. The indicators were: 1) knowledge, attitude, and practice (KAP), 2) Policies and Guidelines School (PS), 3) Resource Mobilization Capacity (RMC), 4) Warning System (WS), and 5) Emergency Planning (EP).

Focus Group Discussion (FGD)

The FGD participants in this study were divided into three groups. Group 1 consists of officials of the University, lecturers, and staff. The total participants were 27, and FGD was conducted two times. Group 2 consist of 20 students and conducted two

times. Group 3 consists of the RDMA team, RDMA volunteers, facilitator of disaster preparedness village, and team of disaster preparedness village (total participants were 11). The issues discussed during FGD were knowledge, attitude, policy, regulations, standard operational procedure, document storage, evacuation procedure, first aid kit, warning system, equipment, emergency planning, testing, task force, and training program, theory, and simulation.

During FGD, the participants were openly allowed to choose the priority variable by giving a sequence starting from the smallest score of 1 for important priorities, to the largest score of 5 for less important priorities. Furthermore, the sum is done; with the result, the smaller the acquisition score, the more priority and vice versa, the greater the acquisition score, the lower the priority. Conclusions from the FGD results are in this table:

Table 1: Priority Order Variable Research University Preparedness in Facing Disasters

S.No	Variable	Score Acquisition	Priority to
1	<i>Knowledge and Attitude (KAP)</i>	46	1
2.	<i>Policies and guidelines School (PS)</i>	62	2
3.	<i>Resourcemobilization Capacity (RMC)</i>	109	3
4.	<i>Warning System (WS)</i>	129	4
5.	<i>Emergency Planning (EP)</i>	164	5

The conclusion of this FGD result is the variable score, which becomes the priority order according to the level of importance. The priority in the sequence is KAP, PS, RMC, WS, and finally, EP. This means that knowledge and attitude instruments are the first priority in the preparation of the instrument

Expert Consultation

After knowing the priority variables, the next step consultations with experts. The results of the consultation obtained 45 items to be compiled into the instrument question items (Table 2).

Development of University Preparedness Instruments

Furthermore, to guarantee content validity in compiling items of research instruments, it is

expected to meet the rules of logic validity and face validity [18]. For this reason, at this stage, two activities were carried out, namely: 1) Arranging the draft instrument items; 2) Consult with experts. The first step is to ensure the maintenance of logic validity by drafting the instrument points. Then the draft prepared was consulted with experts. The total number of instrument statements was 77 items. Some input from experts, among others, as in the table below.

Table 2: Results of Discussion with Experts and Blueprint to Determine the Instrument and Question Items

No	Priority Variable	Element	Isu Strategic/Pre Instrument		Item Statement Questions
			Expert consul	Additional Expert Advice	
1	<i>Knowledge and Attitude (KAP)</i>	Knowledge	Knowledge about the disaster. Types of disasters Disaster Cycles (Emergency Pre-Response and Post-	Efforts to increase the capacity of University residents	No 1,2 3,4,5,6,7,8,9,10,11,12,13,14,15,16

			Disaster)		
		Attitude	Potentially disastrous behavior. Concern for the environment. Environmental readiness.	Destructive behavior. Personality / mental disorders	17, 18,,19,20,21, 22
2.	Policies and guidelines School (PS)	Policies	Green/garden area policy Destruction of specimens		23,24 25,26
		Regulations	Formal evidence supporting mitigation Rules from University leaders		27,28 29,30
		SOP	Pre-disaster SOP SOP for Preparedness SOP Capacity building Emergency Response SOP SOP Initial assessment SOP Emergency assistance Post-Disaster SOP Recovery SOP	SOP The rehabilitation phase Reconstruction Phase SOP	31 32,33 34 35 36 37,38,39 40,42 42
3.	<i>Resource mobilization Capacity (RMC)</i>	Taskforce	Pre-disaster Team:	<ul style="list-style-type: none"> • Center/place of education and training • Control team 	43
			• Facilitator		44
			• Coach		
			During a disaster:		45
			• Rapid reaction team		
			• Evacuation team		46
			• Medical team.		47
			• Public Kitchen Team		48
			• Logistics team		49
			Post-Disaster:		50
• Trauma healing team	51				
• Public kitchen logic	52				
• Rehabilitation and reconstruction.	53				
		Training	Continuous training program.		54
		Theory	Academic learning material		55
			Learning material for non-academics		56
		Simulation	Continuous field rehearsal		57
4.	<i>Warning System (WS)</i>	Warning	Warning type	Warning technical agreement	58
		Equipment	Loudspeaker	Utilization of information technology	59
			Siren		60

			Security officer Evacuation Route Early warning sign agreement Means of communication	systems/android	61,62,63,64, 65 66
		Planning	Manuscripts in the context of the disaster		67
		Testing	simulations at least once a year	comprehensive simulation	68
5.	Emergency Planning (EP)	Document Storage	Command center of the Secretariat Media Center		69,70
		Permanent Evacuation Procedure	Contingency		71
			Planning script		72
		First aid	Clinic	Increased first aid capacity	73
			Health workers		74
			Emergency infrastructure		75,76
			Health communication		77

Instrument Testing

The next activity after the development of the instrument is to take several steps, namely: 1) conducting a trial of the research instrument; 2) test the validity and reliability of the instrument; 3) conduct analysis; 4) conducting consultations; 5) provide recommendations. Forty-four people, namely, followed the trial: 1) a total of 26 students; 2) lecturers and educational staff totaling 14 people; 3) elements of leadership four people.

Selected students are Diploma 3 students who have received disaster management lecture material. The University preparedness level is cumulative from the five levels of preparedness parameters: Knowledge and Attitude, University Policy, resource mobilization, early warning systems, and emergency response planning.

By referring to the Ministry of Education and Culture, the formula for determining the University preparedness index is as follows (9):

$$IK=35(KAP)+10(PS)+15(RMC)+25(WS)+15(EP)$$

IKK= University Preparedness Index

KAP = Knowledge, and Attitude

PS = School Policies and guidelines

RMC = Resource mobilization Capacity

WS = Warning System

EP = Emergency Planning

The combined index of several parameters is calculated using a weighted composite index, where each parameter has a different weight. The combined index in this study includes the index of students, lecturers/education personnel, and officials in the Study Program [19].

Composite Index based on the assessment score interval

$$IKM = KAP (22) + PS (20) + RMC (15) + WS (11) + EP (9)$$

$$\text{Maximum score} = 35 (22) + 10 (20) + 15 (15) + 25 (11) + 15 (9)$$

$$= 550 + 200 + 225 + 275 + 135$$

$$= 1385$$

$$\text{Minimum Score} = 35 (0) + 10 (0) + 15 (0) + 25 (0) + 15 (0)$$

$$= 0$$

$$\text{Range} = 1385 - 0 = 1385$$

$$\text{Interval} = 1.385 : 3 = 461.66$$

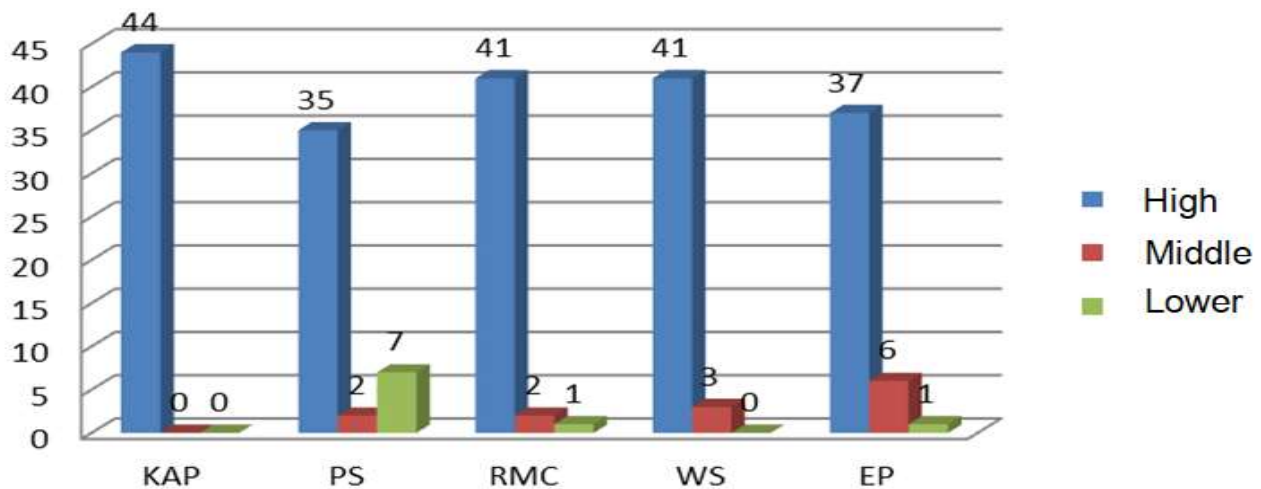


Figure 1: Instrument trial results based on each variable

From the test results, the instrument shows the variable KAP (Knowledge and Attitude),

which has the highest good preparedness, which is 44 respondents.

Table 5: Test Results of University Preparedness Instruments in Dealing with Disasters

Interval Score	Class	Criteria	%
0 – 461.66	1. Low / Not ready	1	2.27%
461.67- 923.33	2. Medium / Almost Ready	0	0%
923.33 – 1.385	3. Height / Ready	43	97.7%

The results of the trial of the instrument showed that cumulatively 97.7% of respondents had good preparedness. The results of the trial of the instrument were then consulted with experts again. some inputs include: instrument formulation with a closed statement with yes and no answers, the mindset of the instrument items that were originally spread, became a mindset grouped according to the theme of similar instrument indicators, some instrument item statements also experience changes so that the content of statement items is more easily understood by respondents, instrument items that are easily understood by respondents allow no difference in content perception.

The occurrence of bias is also possible if there is a difference in perception of the content statement. The results of the analysis of the validity and reliability test showed that the KAP variable was 86% invalid and not reliable; all University policies are valid and reliable; resource mobilization capacity: 73% valid and reliable; early warning system: 54.5% valid and reliable; Emergency response planning: 88.9% valid and reliable.

Discussion

Disasters can have serious repercussions on society, both psychological changes and property losses. Another form of emotional change that occurs in the affected community

is the emergence of feelings of inferiority, interference in dealing with the conditions of daily life. This requires handling in the basic concept of mental health maintenance for disaster victims [20]. Disaster resilience University preparedness is empirically influenced by five variables: *Knowledge and Attitude (KAP) Policies and guidelines School (PS) Resourcemobilization Capacity (RMC) Warning System (WS) Emergency Planning (EP)* [21]. Magetan Midwifery Study Program since 2017 has involved all parties on University to be actively involved in disaster activities. So it is hoped that if all elements at University are involved, they can have good preparedness in facing disasters. Participants in phase 1 research were: Focus Group Discussion (FDG) participants and experts. FGD participants in this study were divided into 3 schemes, namely target 1, target 2 and target 3. Participants in this study were divided into 3 major parts, namely lecturers and staff 31.9%, structural officials 9% and students 59%. The size of the participants is in accordance with the original distribution plan.

Officials know about University policies that have been implemented, lecturers know the work system in disaster activities. Students in the filling of this instrument have more honesty in expressing their opinions. The results of the FGDs were obtained in the

order of priority, namely: Knowledge and Attitude (KAP), School Policies and Guidelines (PS), Resourcemobilization Capacity (RMC), Warning System (WS) and Emergency Planning (EP). Knowledge and attitude have an important role in dealing with life's difficulties [22].

Leadership policies related to important leadership regulations in University residents' preparedness for disasters [23]. The development of preparedness instruments is carried out with FGDs, expert consultants, trials and analysis tests. The results of the development of the instrument obtained 22 items of knowledge and attitudes (KAP), 20 items of policy (PS), 15 items of capacity mobilization (RMC); 11 warning system items (WS) and 9 emergency planning items (PE).

The total number of instrument items was 77 items. From the trial results, the instrument shows the knowledge and attitudes of the citizens, as a priority in compiling the instrument. So it needs to be given greater weight. The knowledge of University residents will determine the capacity and preparedness for disasters. University residents who have high knowledge have relatively better capacities than ordinary citizens [6]. Knowledge and attitudes of University residents determine their capacity, as well as being an indicator of University vulnerability variables [24].

The attitude of University residents who do not care about the environment can be a trigger for disaster. Therefore we need an education program both formally and informally to improve the knowledge and attitudes of University residents to be even better. Several program activities that can be

carried out to improve the preparedness of University residents, among others, need to do a field rehearsal/simulation to face a disaster at least once a year. Simulation activities can involve all elements involved in the University, be it officials, lecturers, education staff, student parkers, security guards, drivers and all involved in University life.

This is important considering that in the event of a disaster, those who are considered unimportant in the role of University life are actually the key to saving many people [25]. Disaster risk faced depends on how severe the natural disasters that befall and the preparedness of the community during pre-disaster. The University community needs to be prepared so that it has enough capacity during disasters.

The knowledge of university residents largely determines the capacity and preparedness for disasters [16]. The knowledge and attitudes of University residents determine their capacity, while at the same time making them an indicator of University vulnerability variables [17]. The attitude of University residents who do not care about the environment can be a trigger for disaster. This research has received recommendations and permits in writing from various related parties, including the government and leaders of universities.

Conclusion

The disaster preparedness instrument that was produced of this study could be used as valid instruments to measure the readiness of a university regarding disaster preparedness. Thus, the instruments could be used for another institution to manage the preparedness in facing the disaster.

References

1. Renatama PB, Suryono Y (2015) Evaluasi Pelaksanaan Program Pelatihan Wajib Latih Dan Gladi Lapang Bagi Masyarakat Kawasan Rawan Bencana Merapi. *J Pendidik dan Pemberdaya Masy.*, 2(2):192-202.
2. Aurizki GE, Efendi F, Indarwati R (2019) Factors associated with post-traumatic stress disorder (PTSD) following natural disaster among Indonesian elderly. *Work with Older People*, 24(1):27-38.
3. Fitria D, Mustikasari M, Panjaitan RU, Nursing F, Indonesia U, Java W (2020) The Psychological Capital and Anxiety Felt by Post-Market Fire Disaster Victims, 15: 1.
4. Sukasada DIK, Buleleng K (2015) Analisis Risiko Bencana Tanah Longsor.
5. Fathoni M, Yusuf A, Christrijogo Sumartono W (2019) The relationship of the role of teachers in the implemented curriculum of school-based disaster preparedness in vulnerability in school teachers with disabilities in Malang city, Indonesia. *Indian J. Public Heal. Res. Dev.*, 10(8):2762.

6. Sumasto H, Suparji, Wisnu NT, Ngestiningrum AH, Setiawan, Sugito BH, et al (2019) Trauma healing during the earthquake disaster emergency response phase in Lombok, Indonesia. *Indian J. Forensic. Med. Toxicol.*, 13(4):1745-8.
7. Sumasto H, Wisnu NT, Surtinah N (2018) Health Notions , Volume 2 Number 2 (February 2018) Development of Instruments to Detect Disaster Risk in Children Under Five 279 | Publisher: Humanistic Network for Science and Technology Health Notions , Volume 2 Number 2 (February 2018) 280 | Publi. 2(2):279-83.
8. Devi Riskianingrum (2013) Penanganan Bencana dan Transformasi Pengetahuan Tentang Kegempaan Di Masa Kolonial. *Paramita.*, 23(1):1-13.
9. Dhuha Ginanjar D (2016) Analisis Penentuan Zonasi Resiko Bencana Tanah Longsor Berbasis Sistem Informasi Geografis (Studi Kasus: Kabupaten Banjarnegara). *Sist Inf Geogr.*, 5(Sist. Inf. Geogr.):326-35.
10. Ana Nadhya Abrar (2016) Memberdayakan Masyarakat Lewat Penyiaran Berita Bencana Alam. *J ugm.*, 11: 3.
11. Nursalam (2003) Konsep dan Penerapan Metodologi Penelitian Keperawatan. Jakarta: Salemba Medika.
12. Tyas Wisnu N, Surtinah N, Sumasto H (2018) Development of Instruments to Detect Disaster Risk in Children Under Five. *Humanist Netw Sci. Technol.*, 2: 2.
13. Imam Sufriandi Fatra, Pemetaan Risiko Bencana di Kampus I Universitas Muhammadiyah Surakarta Dwi Astuti MA (2015) Pemetaan Risiko Bencana di Kampus I Universitas Muhammadiyah Surakarta. Naskah Publ Prodi Kesmas FIK UMS.
14. Kusumaningrum T, Nastiti AA, Dewi LC, Lutfiani A (2019) The correlation between physical activity and primary dysmenorrhea in female adolescents. *Indian J. Public Heal. Res. Dev.*, 10(8):2559-63.
15. Susilaningrum R, Utami S, Nursalam N, Tristiana RD (2018) Analysis of factors related to behavior cognition and effects on pregnant women in maternal and child health (Mch) handbook utilisation. *Indian J. Public. Heal. Res. Dev.*, 9(11):492-7.
16. Kana Hayati EL (2010) Pengembangan Instrumen Kemandirian Belajar Mahasiswa. *J Penelit dan Eval. Pendidik.*, 14(1):84-99.
17. Arifin Muhamad Hadi (2007) Kesiapsiagaan Bencana Berbasis Masyarakat Strategi dan Pendekatan. I. Enna Sudartama, editor. Jakarta: Markat PMI Pusat.
18. Airlangga U (2019) Caring Respect Integrity Innovation Teamwork Excellence. Available from: <https://e-journal.unair.ac.id/jners/article/view/4640/pdf>
19. Arikunto (2013) Panduan Mengukur Tingkat Kesiapsiagaan Masyarakat dan Komunitas Sekolah. (January 2011):53.
20. Martono M, Satino S, Nursalam N, Efendi F, Bushy A (2019) Indonesian nurses' perception of disaster management preparedness. *Chinese J. Traumatol - English Ed.*, 22(1):41-6.
21. Kemendikbud DPPK dan LKMD (2016) Petunjuk Teknis Penerapan Sekolah/Madrasah Aman Dari Bencana (SMAB) Bagi Anak Berkebutuhan Khusus.
22. Ellina AD, Kusnanto, Adiutama NM, Sismulyanto, Rusmawati (2019) Evaluation of patient satisfaction and nurse caring behaviour: Based on swanson's theory. *Indian J. Public Heal. Res Dev.*, 10(8):2698-702.
23. Rohman, Nursalam, Sukartini T, Abdullah RA (2019) The relationship between knowledge and spirituality with the prevention behavior of infection transmission in PLWHA. *Indian J. Public Heal. Res. Dev.*, 10(8):2817-22.
24. Sumasto H, Wisnu NT Instrument to measure disaster preparedness at the Poltekkes Surabaya * Health Polytechnic of Ministry of Health in Surabaya , Indonesia, (6):6-8.
25. Ati Astuti (2015) Pelaksanaan Program Sekolah Siaga Bencana di SMA Negeri 1 Karanganom Klaten.