p-ISSN 2460-0768 e-ISSN 2597-6044 *GeoEco, Vol. 9, No 1. January 2023 Page. 42-56*
https://doi.org/10.20961/ge.v9i1.59172 https://jurnal.uns.ac.id/GeoEco/article/view/59172

THE ESSENCE OF DISASTER EDUCATION AT THE JUNIOR HIGH SCHOOLS IN LANDSLIDE DISASTER PRONE-AREA, TAWANGMANGU, INDONESIA

Tri Indyastuti[1] , Safira Alfanisa[1] , Mifta Widya Ningrum[1], Rehan Permana Agung[1], Alif Akbar Kurniansyah[1], Yunus Aris Wibowo[1,2]*

[1]Department of Geography Education, Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta, Indonesia

[2]Center for Disaster Mitigation Study, Universitas Muhammadiyah Surakarta, Indonesia

*E-mail: yaw222@ums.ac.id

ARTICLE INFO

Article History
Received : 04/02/22
Revised : 07/04/22
Accepted : 01/02/23

Citation:
Indyastuti, T., Alfanisa, S., Ningrum, M.W., Agung, R.P., Kurniansyah, A.A., & Wibowo, Y.A., (2023) The Essence Of Disaster Education At The Junior High Schools In Landslide Disaster Prone-Area, Tawangmangu, Indonesia. GeoEco. Vol. 9, No. 1.

ABSTRACT

Disaster education is an effort that is expected to increase preparedness and reduce the risk posed by a natural disaster. One area that has a high risk of landslides is the Karanganyar Regency. This study aims to analyze the urgency of disaster education and the role of Junior High schools in supporting disaster education in landslide-prone areas, Tawangmangu Subdistrict. The approach used in this study is a quantitative approach using primary data obtained through questionnaires and interviews. The sampling technique in this study used a purposive sampling technique where the research samples were Social Science subject teachers at State Junior High School 01 of Tawangmangu, Junior High School of Amal Mulya Tawangmangu, and Junior High School of Penda Tawangmangu. The analytical technique used was descriptive statistical analysis. Based on the results, it can be concluded that schools were aware of the essence of disaster education. The Junior High Schools in Tawangmangu Subdistrict supports the urgency of disaster education, by realizing its role through several activities in schools that can increase the preparedness, capacity, and knowledge of students against potential hazards around their houses. With the existence of disaster education in schools, it is expected to be able to increase the capacity of students to reduce the risk posed by a landslide disaster.

Keywords: *Disaster education; Disaster Risk Reduction; Landslide; Tawangmangu*

INTRODUCTION

A natural disaster is an event that has a major impact on human life. Based on World Risk Report data, in 2018 Indonesia was ranked 36th with a risk index of 10.36 out of a total of 172 countries most prone to natural disasters worldwide (Hadi et al., 2019). Indonesia is a country that is prone to natural disasters such as earthquakes, tsunamis, volcanic eruptions, landslides, floods, and tornadoes (Sadewo et al., 2018). Indonesia is also often referred to as a

"disaster supermarket", because of the many potential natural disasters that exist in Indonesia (Puri & Khaerani Thalita Rifda, 2017). With the many natural disasters, resulting in many impacts on people's lives (Y. A. Wibowo et al., 2021). The impact of disasters can be death toll, disruption of the sociological and psychological structure of the community, unemployment, poverty, crime, underdevelopment and the destruction of the community's living environment (Sinaga, 2015).

The large number of potentials and impacts caused by natural disasters, it is necessary to increase disaster risk reduction in an integrated and directed manner (Rusilowati & Binadja, 2012). However, before entering into risk reduction activities, an important step that must be taken is to identify the characteristics and potential of disasters to increase disaster risk reduction (Desfandi, 2014). Therefore, with this, all elements of society are able to know and be aware of the potential hazards in the area where they live.

To minimize the impact of a disaster, it is necessary to have awareness from the community regarding disasters, so that here the education sector is one sector that has a vital function in disaster management efforts (Hafida, 2018). Disaster education is one of the important things, as an effort to reduce disaster risk in the long term, for that schools have a role in efforts to increase disaster awareness to students, teachers, and parents. However, currently there are no special disaster-related subjects in formal education, eventhough disaster-based education is very useful in reducing disaster risk in children (Widjanarko & Minnafiah, 2018).

Zahara, (2019) statedd that there needs to be serious handling from various parties to form public awareness regarding disasters, one of which can be done by involving the education sector, because the education sector is very fundamental in shaping the character of students. This is also in line with what was conveyed by (Suarmika & Utama, 2017) which states that education is one of the effective means to reduce disaster risk, by incorporating learning materials related to disasters, especially in disaster-prone areas.

One area that is prone to disasters is Tawangmangu Subdistrict, Karanganyar Regency. (Hafida, 2018) states that the high disaster risk index in Karanganyar Regency is based on several disasters, including landslides, earthquakes, and

hurricanes, but the most common are landslides and hurricanes. Based on the 2020 Landslide Disaster Risk Index, Karanganyar Regency is ranked 127 with an index value of 24.00 which is in the high category. Based on Disaster Management Agency of Karanganyar Regency (BPBD), the last history of landslides in Tawangmangu Subdistrict occurred on November 16, 2021. The landslide occurred because it was triggered by heavy rain that lasted a long time, causing landslides.

Naryanto, (2011) stated that Karanganyar Regency is an area with a high potential for landslide natural disasters. This potential is formed because the topography is hilly with steep slopes, where the constituent rocks are young volcanic deposits resulting from the eruption of Lawu Volcano. In addition, the area has a fairly thick soil solum and a fairly high rainfall, so it has a very large potential for landslides. (Wati et al., 2010) stated that Tawangamangu District is located on the slopes of Lawu Volcano which has an altitude of 3,265 meters above sea level. This condition causes 65% of the area in Tawangmangu Subdistrict to have a slope level of more than 35% and this causes 85.1% of the area in Tawangmangu Subdistrict to be included in the category of moderate to high level of landslide susceptibility. Therefore, it is important to increase capacity for landslide disasters for the community and students. Thus, this is in line with research conducted by (Hayudityas, 2020; Hidayah et al., 2021) which states that the implementation of disaster mitigation programs in schools is able to improve student preparedness. In addition, the application of mitigation education is recommended to be applied in schools in order to increase students' knowledge regarding disaster mitigation so that they can reduce disaster risk (Hidayah et al., 2021).

The high landslide risk index in Karanganyar Regency is the basis for conducting studies related to the essence of disaster education in Tawangmangu Subdistrict. In addition, this research is important to study because there has been no previous research that has conducted studies related to the essence of disaster education at Junior High Schools in landslide-prone areas of the Tawangmangu region. This study focuses on analyzing the essence of disaster education at Junior High Schools located in landslide-prone areas and knowing how the role played by

schools in supporting the disaster education program. Therefore, it is hoped that when schools realize the essence of disaster education and schools support the program, they are expected to be able to form an attitude and spirit of disaster resilience in students.

MATERIALS AND METHODS

This research was conducted in Tawangmangu Subdistrict, which is astronomically located at 110˚ 40”-110˚ 70” East longitude dan 70˚ 28” – 70˚ 46” South latitude. Tawangmangu Subdistrict was chosen because it is the highest sub-district in Karanganyar Regency with an altitude of ± 2000 meters above sea level and has the potential to be hit by landslides. In addition, Tawangmangu Subdistrict has a very high slope which reaches 243-404% with steep and steep conditions so that it has a high potential for landslides (Putra et al., 2019). The approach used in this study was a quantitative approach, using primary data obtained based on the results of a questionnaire related to the essence of disaster education at Junior High Schools in landslide-prone areas, Tawangmangu Subdistrict.

The sample used in this study were Social Science (IPS) subject teachers who were in each Junior High School in Tawangmangu Subdistrict where the sampling technique in this study used a purposive sampling technique. In this study, school criteria were determined based on landslide disaster prone-area in Tawangmangu Subdistrict, namely State Junior High School 01 of Tawangmangu, Junior High School of Penda Tawangmangu, and Junior High School of Amal Mulya Tawangmangu. Data collection techniques were interviews and questionnaires that included indicators of mitigation, preparedness, emergency response, knowledge, recovery and rehabilitation, and the environment knowledge. The analytical technique used was descriptive statistical analysis techniques. The analysis in this study was carried out by determining the average score for each indicator, then adjusting it according to the interpretation guidelines. The interpretation guidelines in this study can be seen in **Table 1**.

Table 1. Interpretation Guidelines

No	Score	Percentage	Criteria	
1	4.21-5.00	83%-100%	Very Important	Very high contribution
2	3.41-4.20	69%-84%	Important	high contribution
3	2.61-3.40	53%-68%	Moderately Important	Moderate contribution
4	1.81-2.60	37%-52%	Slightly Important	Low contibution
5	1.00-1.80	20%-36%	Not Important	No contibution

Source: (Permatasari et al., 2021)

RESULTS AND DISCUSSION

Based on the data analysis, the essence of disaster education and the role of schools in supporting disaster education was measured using six indicators, namely mitigation, preparedness, emergency response, knowledge, recovery and rehabilitation, and the environment knowledge. The results of data collection are presented as follows.

The Essence of Disaster Education at Junior High Schools in Landslide Disaster-Prone Areas, Tawangmangu Subdistrict

Even though the Junior High School of Amal Mulya Tawangmangu, State Junior High School 01 of Tawangmangu and Junior High School of Penda Tawangmangu are located in landslide-prone areas of Karanganyar Regency, the school's perception of the urgency of disaster education is not the same. Some schools have integrated disaster materials in schools well, and some assume that disaster education is not too important because they have never directly felt the impact of a landslide disaster. The level of implementation of disaster education among the three schools varies in the aspects of mitigation, preparedness, emergency response, knowledge, recovery and rehabilitation, and environment (**Figure 1**).

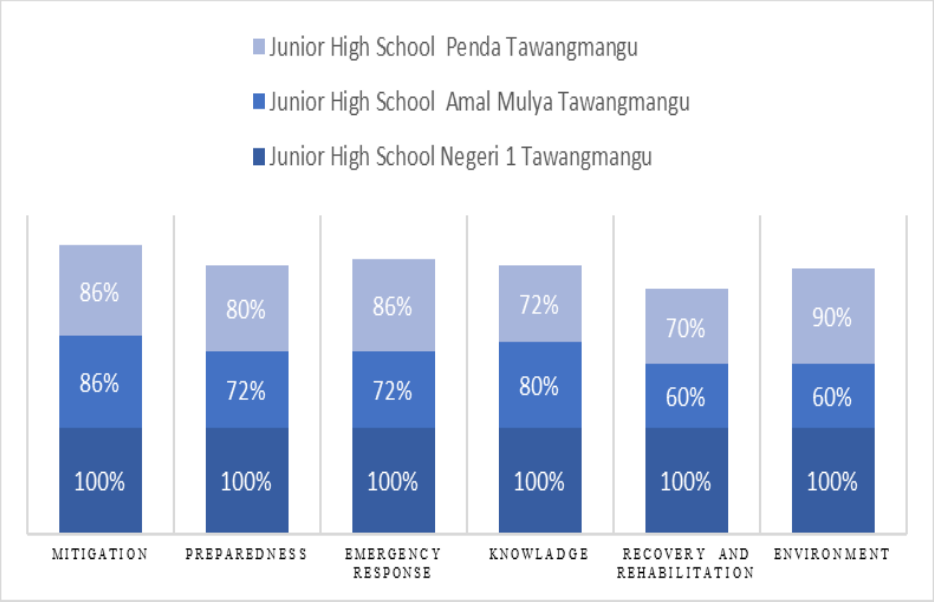

Figure 1. Essence of disaster education at Junior High Schools in Tawangmangu Subdistrict (Source: Questionaire and interview, 2021)

Junior High School 01 of Tawangmangu

Based on the results (**Table 2**), it can be seen that the essence of disaster education at State Junior High School 01 of Tawangmangu was classified as very high. This statement was proven in each indicator, namely for mitigation (5), disaster preparedness (5), emergency response (5), knowledge (5), recovery and rehabilitation (5), and the environment (5).

Table 2. Essence of disaster education at Junior High School 01 of Tawangmangu

No	Indicator	Average	Percentage	Interpretation
1	Mitigation	5.0	100%	Very Important
2	Preparedness	5.0	100%	Very Important
3	Emergency Response	5.0	100%	Very Important
4	Knowledge	5.0	100%	Very Important
5	Recovery and Rehabilitation	5.0	100%	Very Important
6	Environment	5.0	100%	Very Important

Source: Questionaire and interview, 2021

Junior High School of Amal Mulya

Based on **Table 3.** it can be seen that the essence of disaster education at Junior High School of Amal Mulya Tawangmangu had not become a top priority. This statement was proven by the results of each indicator, namely for mitigation (4.3), disaster preparedness (3.6), emergency response (3.6), knowledge (4.0), recovery and rehabilitation (3.0), and the environment (3.0).

Table 3. Essence disaster education at Junior High School of Amal Mulya

No	Indicator	Average	Percentage	Interpretation
1	Mitigation	4.3	86%	Very Important
2	Preparedness	3.6	72%	Important
3	Emergency Response	3.6	72%	Important
4	Knowledge	4.0	80%	Important
5	Recovery and Rehabilitation	3.0	60%	Moderately important
6	Environment	3.0	60%	Moderately important

Source : Questionaire and interview, 2021

Junior High School of Penda Tawangmangu

Based on **Table 4.** it can be seen that at the Junior High School of Penda Tawangmangu, the priority of disaster education was focused on mitigation, emergency response, and environmental knowledge. The statement showed the results for each indicator, namely for mitigation (4.3), disaster preparedness (4.0), emergency response (4.3), knowledge (3.6), recovery and rehabilitation (3.5), and the environment. (4.5).

Table 4. Essence disaster education at Junior High School of Penda Tawangmangu

No	Indicator	Average	Percentage	Interpretation
1	Mitigation	4.3	86%	Very Important
2	Preparedness	4.0	80%	Important
3	Emergency Response	4.3	86%	Very Important
4	Knowledge	3.6	72%	Important
5	Recovery and Rehabilitation	3.5	70%	Important
6	Environment	4.5	90%	Very Important

Source: Questionaire and interview, 2021

The Role of Schools in Supporting Disaster Education

In addition to analyzing perceptions about the urgency of disaster education at the Junior High School of Amal Mulya Tawangmangu, State Junior High School 01 of Tawangmangu and Junior High Schools of Penda Tawangmangu, this study also analyzes the role of the three schools in supporting the implementation of disaster education in schools. It is crucial because, without an optimal role from schools, implementing disaster education in schools is difficult to realize. However, it seems that not all schools in the landslide-prone areas of Karangnyar Regency fully support the implementation of disaster education in their schools (**Figure 2**).

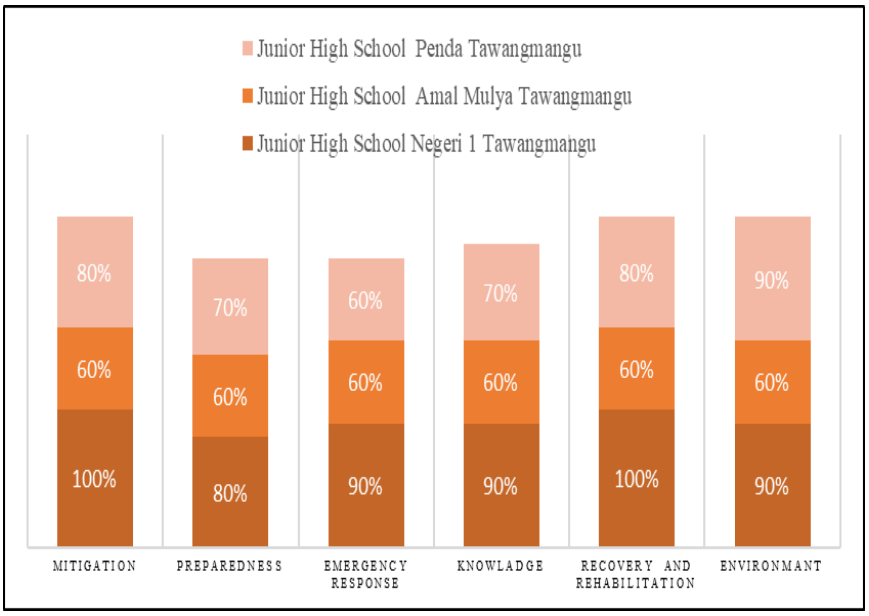

Figure 2. The role of schools in supporting disaster education (Source: Questionaire and interview, 2021)

State Junior High School 1 Tawangmangu

State Junior High School 01 of Tawangmangu is one of the most prominent junior high schools in the Tawangmangu subdistrict. Therefore, they need to integrate disaster material into the learning process properly.

Table 5. The role State Junior High School 01 of Tawangmangu in supporting disaster education

No	Indicator	Average	Percentage	Interpretation
1	Mitigation	5.0	100%	Very high contribution
2	Preparedness	4.0	80%	High contribution
3	Emergency Response	4.5	90%	Very high contribution
4	Knowledge	4.5	90%	Very high contribution
5	Recovery and Rehabilitation	5.0	100%	Very high contribution
6	Environment	4.5	90%	Very high contribution

Source: Questionaire and interview, 2021

Based on data analysis related to the role of schools in supporting disaster education at Junior High Schools in landslide-prone areas, Tawangmangu Subdistrict (Table 5), at State Junior High School 01 of Tawangmangu, it can be seen that the average for each indicator was for mitigation (5.0), disaster preparedness (4.0), emergency response (4.5), knowledge (4.5), recovery (5.0), and environment (4.5). Based on the results obtained, the State Junior High School 01 of Tawangmangu plays

an important role in supporting disaster education.

Junior High School of Amal Mulya of Tawangmangu

Based on data related to the role of schools in supporting disaster education which has been presented in Table 6, the average results for each indicator at Amal Mulya Junior High School Tawangmangu were for mitigation (3.0), disaster preparedness (3.0), emergency response (3.0), knowledge (3.0), recovery (3.0), and environment (3.0).

Table 6. The role Junior High School of Amal Mulya in supporting disaster education

No	Indicator	Average	Percentage	Interpretation
1	Mitigation	3.0	60%	Moderate contribution
2	Preparedness	3.0	60%	Moderate contribution
3	Emergency Response	3.0	60%	Moderate contribution
4	Knowledge	3.0	60%	Moderate contribution
5	Recovery and Rehabilitation	3.0	60%	Moderate contribution
6	Environmant	3.0	60%	Moderate contribution

Source: Questionaire and interview, 2021

Of all the schools that were the subject of the research, the Junior High School of Amal Mulya became the school with the lowest contribution to supporting disaster education. Based on these results, it can be seen that the Amal Mulya Junior High School Tawangmangu school had not focused on supporting disaster education. Suppose it is related to the school's location, which is in a landslide-prone area. In that case, it is necessary to increase the integration of disaster materials at the Junior High School of Amal Mulya.

Junior High School of Penda Tawangmangu

Based on data related to the role of schools in supporting disaster education at Junior High Schools in landslide-prone areas, Tawangmangu Subdistrict, as presented in **Table 7.** the average results for each indicator in Junior High School of Penda Tawangmangu were for mitigation (4.0), disaster preparedness (3.5), emergency response (3.0), knowledge (3.5), recovery (4.0), and environment (4.5).

Table 7. The role Junior High School of Penda Tawangmangu in supporting disaster education

No	Indicator	Average	Percentage	Interpretation
1	Mitigation	4.0	80%	High contribution
2	Preparedness	3.5	70%	High contribution
3	Emergency Response	3.0	60%	Moderate contribution
4	Knowledge	3.5	70%	High contribution
5	Recovery and Rehabilitation	4.0	80%	High contribution
6	Environment	4.5	90%	Very high contribution

Source: Questionaire and interview, 2021

Based on this, it can be concluded that at Junior High School of Penda Tawangmangu also plays a role in supporting disaster education. Junior High School of Penda Tawangmangu has properly supported disaster education. However, several aspects of emergency response need to be improved because the emergency response is one of the crucial stages in disaster mitigation. If the emergency response can be carried out properly, potential losses can be minimized.

DISSCUSSION

Disaster education is education that integrates disaster-related materials in formal education, so that students are able to play a role in building the knowledge, skills, and attitudes needed to prepare for and cope with disasters, as well as a normal life after a disaster (Septikasari & Ayriza, 2018). It can be understood that disaster education is important so that individuals are able to deal with a disaster, both pre-disaster, emergency response, and post-disaster. The results showed that the responses of each school in landslide disaster prone-areas of Tawangmangu related to the essence of disaster education varied.

The response related to the essence of disaster education was also in line with the role played by schools in supporting disaster education, which was measured based on six indicators. The first indicator is mitigation, where mitigation is basically to reduce the risks and impacts caused by a disaster and increase public knowledge in dealing with and reducing impacts/risks so that people can work/live safely (Nuraeni et al., 2020). In this mitigation-related indicators, the Junior High Schools in Tawangmangu conducted training/disaster simulations taught to students, as was done by State Junior High School 01 of Tawangmangu which

provides disaster simulation exercises during the orientation of students. However, during a pandemic it cannot be re-implemented. Apart from increasing knowledge, disaster mitigation can also be expressed in the resilience of a building against disasters, based on the results obtained by State Junior High School 01 of Tawangmangu, Junior High School of Amal Mulya, and Junior High School of Penda Tawangmangu already had a fairly good building structure.

The second indicator is related to preparedness, basically preparedness is an activity carried out before a disaster occurs, which aims to develop operational capacity and facilitate an effective response when a disaster occurs (Husna, 2012). Regarding preparedness, the Junior High School in Tawangmangu Subdistrict implements it in the form of providing insight into preparedness and in learning materials, for example in social studies subjects the teachers were able to explain the potential hazards/threats in the area where students live.

The third indicator was related to emergency response, the Junior High School in Tawangmangu Subdistrict provided emergency response training to students, as explained in the mitigation indicators section. In this emergency response, schools were also can collborate with other stakeholders/agencies, at State Junior High School 01 of Tawangmangu prior to the pandemic to collaborate with Indonesian Red Cross (PMI) and Public health center (PUSKESMAS) in providing emergency response training to students. Synergy between schools and agencies that have competence in disaster management is very important to realize disaster safe schools.

The fourth indicator was knowledge, basically disaster knowledge is needed by people living in disaster-prone areas, because of various information about threatening disasters, estimates of disaster-affected areas, self-rescue procedures, and other information needed by the community to minimize disaster risk (Adiwijaya, 2017; Musiyam, 2020). Disaster knowledge at Junior High School in Tawangmangu Subdistrict was implemented in disaster education activities, where students were given training related to disaster simulations. Disaster simulations are generally carried out with what and how to do when a disaster occurs (Wihyanti, 2020). With the disaster simulation

activity, students have the knowledge and ability to save themselves and others in the event of a disaster, so as to reduce the risk of landslides.

The fifth indicator was related to recovery and rehabilitation, Junior High School in Tawangmangu Subdistrict, it was conducted by building the safe schools that are resillience against the disasters. Where each school provided a large evacuation gathering point with easy access, besides that, the layout of the building in the school was also well considered. Therefore, it can reduce the risk of landslides disaster.

The sixth indicator was related to the environment, community knowledge regarding the history of the environment around where they live was very necessary as an educational effort to reduce disaster risk (B. Wibowo & Agus Dendiansyah, 2020). Disaster education based on environmental indicators at State Junior High School 01 of Tawangmangu was implemented by improving students' awareness for the surrounding environment. Every Friday at State Junior High School 01 of Tawangmangu there was a Clean Friday activity, where students are invited to clean up the surrounding environment. school. In addition, at State Junior High School 01 of Tawangmangu, students were also invited to plant trees, so that students realize that the area around their residence was an area that has a risk of landslides, so that by planting this tree it was hoped that it can reduce disaster risk. Meanwhile, at Junior High School of Amal Mulya Tawangmangu and Junior High School of Penda Tawangmangu also stated in the preservation of the surrounding environment, namely by planting trees around the school.

CONCLUSIONS

The Junior High Schools in Tawangmangu Subdistrict supports the essence of disaster education, by realizing its role through several activities in schools that can increase the preparedness, capacity, and knowledge of students against potential hazards around their houses. With the existence of disaster education in schools, it is expected to increase the capacity of students so as to reduce the risk of landslides. This study had not examined the essence of disaster education in all schools in Tawangmangu Subdistrict. Therefore, for further research, it is expected to be able to conduct studies by covering all schools in Tawangmangu

Subdistrict, so that later a more comprehensive disaster mitigation study can be compiled. With a more thorough study and more comprehensive steps, it is hoped that it will be able to increase the capacity of the community, especially students, in dealing with landslides in Tawangmangu Subdistrict.

ACKNOWLEDGMENTS

We would like to thank State Junior High School 01 of Tawangmangu, Junior High School of Amal Mulya, and Junior High School of Penda Tawangmangu for supporting this research.

REFERENCES

Adiwijaya, C. (2017). Pengaruh Pngetahuan Kebencanaan dan Sikap Masyarakat Terhadap Kesiapsiagaan Menghadapi Bencana Tanah Longsor (Studi di Kelurahan Lawanggintung, Kecamatan Bogor Selatan, Kota Bogor). *Jurnal Prodi Manajemen Bencana*, *3*(2), 81–101.

Desfandi, M. (2014). Urgensi Kurikulum Pendidikan Kebencanaan Berbasis Kearifan Lokal di Indonesia [The urgency of disaster education curriculum based on local wisdom in Indonesia}. *Sosio Didaktika Sosial Science Education Journal*, *1*(2), 191–198.

Hadi, H., Agustina, S., & Subhani, A. (2019). Penguatan Kesiapsiagaan Stakeholder dalam Pengurangan Risiko Bencana Alam Gempabumi. *Geodika: Jurnal Kajian Ilmu Dan Pendidikan Geografi*, *3*(1), 30. https://doi.org/10.29408/geodika.v3i1.1476

Hafida, S. H. N. (2018). Urgensi pendidikan kebencanaan bagi siswa sebagai upaya mewujudkan generasi tangguh bencana. *Jurnal Pendidikan Dan Ilmu Sosial*, *28*(2), 1–10.

Hayudityas, B. (2020). Pentingnya Penerapan Pendidikan Mitigasi Bencana Di Sekolah Untuk Mengetahui Kesiapsiagaan Peserta Didik. *Jurnal Edukasi Nonformal*, *1*(2), 94–102.

Hidayah, K., Azizah, N. N., Hamid, F. R., & Alfa, M. (2021). *Landslide Vulnerability-Based Disaster Mitigation Planning In The Elementary School Environment Of Boyolali Regency*. *21*(April), 38–49.

Husna, C. (2012). Faktor-Faktor Yang Mempengaruhi Kesiapsiagaan Bencana Di Rsudza Banda Aceh. *Idea Nursing Journal*, *3*(2), 1–19. https://doi.org/10.52199/inj.v3i2.15178

Musiyam, M. (2020). Analysis of Flood-Affected Areas Due to Extreme Weather In Pacitan, Indonesia. *International Journal of GEOMATE*, *19*. https://doi.org/10.21660/2020.75.25688

Naryanto, H. S. (2011). Analisis Risiko Bencana Tanah Longsor Di Kabupaten Minahasa. *Jurnal Dialog Penanggulangan Bencana*, *2*(3), 21–32.

Nuraeni, N., Mujiburrahman, M., & Hariawan, R. (2020). Manajemen Mitigasi Bencana pada Satuan Pendidikan Anak Usia Dini untuk Pengurangan Risiko bencana Gempa Bumi dan Tsunami. *Jurnal*

Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika, *4*(1), 68. https://doi.org/10.36312/e-saintika.v4i1.200

Permatasari, D., Amirudin, & Sititika, A. J. (2021). Persepsi Mahasiswa terhadap Pembelajaran Daring Mata Kuliah Pendidikan Agama Islam di Masa Pandemi Covid-19. *EDUKATIF: Jurnal Ilmu Pendidikan*, *7*(2), 150–161.

Puri, D. P., & Khaerani Thalita Rifda. (2017). Strategi Mitigasi Bencana Tanah Longsor di Kabupaten Purworejo. *Journal Of Public Policy And Management Review*, *6*, 1–14.

Putra, M. N. R., Chatria, A. B., Tilova, U. D. N., & Anggana, A. F. (2019). Teknologi sistem informasi geografi untuk pemetaan daerah kawasan rawan longsor di kecamatan tawangmangu. *Prosding Seminar Nasional Geotik*, 269–278.

Rusilowati, A., & Binadja, A. (2012). Mitigasi Bencana Alam Berbasis Pembelajaran Bervisi Science Environment Technology and Society. *Jurnal Pendidikan Fisika Indonesia*, *8*(1), 51–60. https://doi.org/10.15294/jpfi.v8i1.1994

Sadewo, M. G., Windarto, A. P., & Wanto, A. (2018). Penerapan Algoritma Clustering Dalam Mengelompokkan Banyaknya Desa/Kelurahan Menurut Upaya Antisipasi/ Mitigasi Bencana Alam Menurut Provinsi Dengan K-Means. *KOMIK (Konferensi Nasional Teknologi Informasi Dan Komputer)*, *2*(1), 311–319. https://doi.org/10.30865/komik.v2i1.943

Septikasari, Z., & Ayriza, Y. (2018). Strategi Integrasi Pendidikan Kebencanaan Dalam Optimalisasi Ketahanan Masyarakat Menghadapi Bencana Erupsi Gunung Merapi. *Jurnal Ketahanan Nasional*, *24*(1), 47. https://doi.org/10.22146/jkn.33142

Sinaga, S. N. (2015). Peran Petugas Kesehatan Dalam Manajamen Penanganan Bencana Alam', Jurnal ilmiah "INTEGRITAS. *Jurnal Ilmiah "INTEGRITAS," 1*(1), 1,2.

Suarmika, P. E., & Utama, E. G. (2017). *Pendidikan Mitigasi Bencana di Sekolah Dasar*. *September*, 18–24.

Wati, S. E., Hastuti, T., Widjojo, S., & Pinem, F. (2010). Landslide susceptibility mapping with heuristic approach in mountainous area a case study in Tawangmangu Sub District, Central Java, Indonesia. *ISPRS Technical Commission VIII Symposium on Networking the World with Remote Sensing*, *38*, 248–253.

Wibowo, B., & Agus Dendiansyah. (2020). Sejarah Lingkungan sebagai Pendidikan Kalimantan Barat Basuki Wibowo , Agus Dediansyah Dosen Pendidikan Sejarah IKIP PGRI Pontianak , email : PENDAHULUAN Bencana alam tidak dapat di predikasi kedatangannya . Banjir dan kebakaran hutan lahan (Karhutla) m. *Jurnal Ilmiah Kependidikan*, *XIV*(1), 68–77.

Wibowo, Y. A., Marfai, M. A., Hadi, M. P., Ronggowulan, L., & Indra, P. (2021). *Vulnerability analysis toward river flooding in the Comal Watershed , Indonesia*. *01022*.

Widjanarko, M., & Minnafiah, U. (2018). Pengaruh Pendidikan Bencana Pada Perilaku Kesiapsiagaan Siswa. *Jurnal Ecopsy*, *5*(1), 1. https://doi.org/10.20527/ecopsy.v5i1.4878

Wihyanti, R. (2020). Analisis Inovasi Pendidikan Kebencanaan di Sekolah di Indonesia. *Prosiding Seminar Nasional: Jaringan Penelitian (JARLIT) Cilacap "Menuju Cilacap 4.C (Creativity, Critical Thingking, Communication And Colaboration)*, *1*, 16–21.

Zahara, S. (2019). Peran sekolah dalam pendidikan migitasi bencana di sekolah menengah atas. *Jurnal Pencerahan*, *13*(2), 144–155.