PROCEEDING OF

AFRO - ASIAN UNIVERSITY FORUM (AAUF)

International Conference

on the Role of Afro-Asian Universities in Building Civilizations

Sunday, July 22 - Monday, July 23, 2018 / Dzulqa'dah 9 - Dzulqa'dah 10, 1439

Venue: University of Darussalam Gontor

22-23 JULY 2018 / 9-10 DZULQA'DAH 1439

UNIVERSITY OF DARUSSALAM GONTOR

http://aauf.unida.gontor.ac.id aauf@unida.gontor.ac.id

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International Conference of Afro-Asian University Forum (AAUF) on The Role of Afro-Asian Universities in Building Civilization

22-23 July 2018
University of Darussalam Gontor
Indonesia

International Conference of Afro-Asian University Forum (AAUF) on The Role of Afro-Asian Universities in Building Civilization 22-23 July 2018 University of Darussalam Gontor Indonesia

Editor:
Prof. Dr. Amal Fathullah Zarkasyi, M.A.
Prof. Dr. Ahmad Yousif Ahmed El-Draiwish
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Dr. Hamid Fahmy Zarkasyi, M.A., M.Phil.
Dr. Abdul Hafidz Zaid, M.A.
Dr. M. Kholid Muslih, M.A.
Khoirul Umam, M.Ec.

Layouter:
Moh. Ismail

First Publishing: July, 2018

ISBN:
(process)

Publisher:
UNIDA Gontor Press

Address:
Jl. Raya Siman, Km.6
Demangan - Siman - Ponorogo - 63471
East Java - Indonesia
email : rektorat@unida.gontor.ac.id
web : http://unida.gontor.ac.id

PREFACE

بسم الله الرحمن الرحيم

السلام عليكم ورحمة الله وبركاته

الْحَمْدُ لِلّٰهِ الَّذِيْ أَنْعَمَنَا بِنِعْمَةِ اْلإِيْمَانِ وَاْلإِسْلاَمِ. وَنُصَلِّيْ وَنُسَلِّمُ عَلَى خَيْرِ اْلأَنَامِ
سَيِّدِنَا مُحَمَّدٍ وَعَلَى آلِهِ وَصَحْبِهِ أَجْمَعِيْنَ أَمَّا بَعْدُ

Alhamdulillah, all praises and thanks be to Allah, the Most Gracious and the Most Merciful who have granted us the opportunity to organize the International Conference of Afro-Asian University Forum (AAUF).

I would like to extend a warm welcome to the distinguished delegations of AAUF, rectors, scholars, researchers, lecturers, experts, and participants of the conference. I really appreciate your attendance and contribution to this prestigious international conference.

Starting from the shared vision to enhance the quality of education at Afro-Asian universities, AAUF has advanced collaborative works among its members. One of those collaborative works is the international conference which is conducted annually. This year, the conference focuses on exploring the effort of AAUF members in advancing their role as the powerhouse of world civilizations. This is a sensible choice due to the fact that Asia and Africa were the center of civilization long before modern era. However, in the context of contribution to current civilization, a study on the role of Afro-Asian higher educational institutions has not been conducted. For that reason, UNIDA Gontor believes that Afro-Asian Universities Forum should enhance the role of Afro-Asian Universities in building world civilizations through sharing the ideas and experiences during this conference. Moreover, we do believe that this conference will contribute to the enhancement of collaborative works among AAUF members that will lead to advancement of their role in building civilization.

I would also like to express my gratitude to organizing committees for their sincere hard work. May Allah bless your invaluable effort in this overarching event. For our overseas guests and participants, I hope you have a productive discussion during the conference and memorable stay in UNIDA Gontor.

بالله التوفيق والهداية

والسلام عليكم ورحمة الله وبركاته

Prof. Dr. Amal Fathullah Zarkasyi, M.A.
Rector of UNIDA Gontor

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MEASUREMENT ACCURACY OF PAIMIN FORMULA TO LANDSLIDE PREDICTION IN PONOROGO EAST JAVA

[1] Sisca Mayang Phuspa, [2] Dihin Muriyatmoko
[1] Departement of Occupational Safety and Health
Universitas Darussalam Gontor, Indonesia
[2] Departement of Informatics, Universitas Darussalam Gontor, Indonesia
[1,2] Siman Street Km.6 Siman, Ponorogo, East Java, Indonesia
e-mail: siscamayang@unida.gontor.ac.id [1*] , dihin@unida.gontor.ac.id [2]

Abstract

Since 2012 to 2017, in Ponorogo East Java, Indonesia, suffered 53 times the occurrence of landslides and caused 7 people died, 23 missing, 1 injured and 996 people evacuated. There are several methods to know the parameters of landslides vulnerability areas, one of them is the Paimin formula. The purpose of this research is applied Paimin formula to predict landslides was occurred in Ponorogo from 2012 to 2017 and measuring the accuracy of Paimin formula using Linear Regression. The prediction result of Paimin formula proves that Ponorogo has an average of landslides vulnerability area with five categories: very low 0.5912%, low 52.4465%, medium 46.0119%, high 0.9503%, and very high 0.0002%, while the average occurrence of landslides per year is 8.83 times with the percentage of landslides vulnerability areas of 16.4881 %. The accuracy of Paimin formula using linear regression resulted in value of Multiple R = 70.70%, it is including a high correlation and value of R Square = 0.4999, indicates that the parameter and or percentage was used by Paimin formula has accuracy 49.99%, while 50.01% is influenced by other percentage and or parameters. The Paimin formula is ably applied to predict for possible landslides occurrence elsewhere and the prediction of landslide not only used linear regression but also for others algorithms.

***Keywords**: Paimin formula, linear regression, Ponorogo, landslide, prediction*

1. Introduction

Landslide was one of the biggest disaster threats in Indonesia. According to statistics from the National Disaster Management Agency (BNPB), landslide was top three the highest occurrence frequency after flood and tornado.

Landslide or landslide is the movement of slope material that descends and exits due to the influence of gravity [1]. The thing that actually happens is the loss of the initial balance and to achieve the balance of the new soil structure then there is a landslide. Some researchers say landslides are not the same as landslides, as are mass movement or slope failure. But Guzzetti called these four terms / terminology a synonym [2].

Landslides are caused by a combination of 3 main factors, namely pre-condition factor, preparatory factor and trigger factor [3]. Precondition factor is an inherent static factor affecting not only the stability limit but also the catalyst factor that reduces the stability more effectively. Preparatory factor is a dynamic factor that changes the stable limit over time without initiating the occurrence of slope glitch [4]. For example, weathering, deforestation, or environmental change. While the triggering factor is a variable that directly leads to slope failure [3]. For example, prolonged rain, earthquakes, slope cuts and excessive load on the slopes.

The high number of landslide events in Indonesia is caused by the high rainfall potential in some areas, the geological condition, the weathered rock, the thick depth of the soil solum, the slope of the impermeable layers in the soil, and a slope of more than 30 ° [5]. Particularly in Java, geological conditions, topographic characteristics and climatic characteristics lead to high landslide exposure [6].

BNPB has published predictions on landslide events in some parts of Indonesia (Figure 1), but Kabupaten Ponorogo has not been a study of BNPB. In fact, the district of Ponorogo is also vulnerable to landslides.

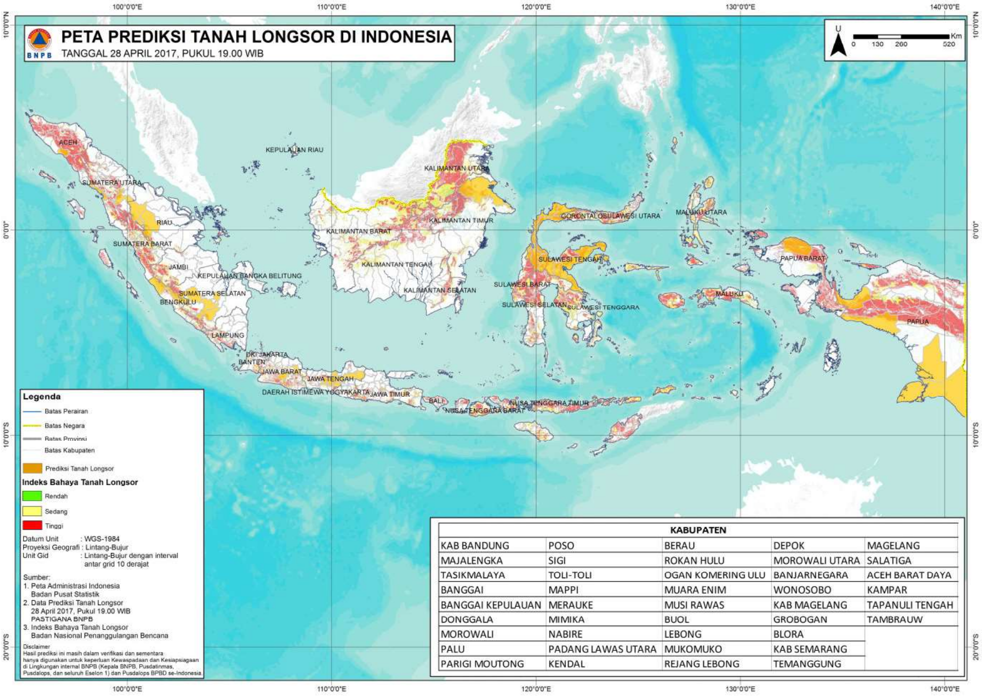

Figure 1. Map of Landslide Prediction in Indonesia
Source : BNPB (2017)

The Ministry of Health of the Republic of Indonesia recorded 53 landslide incidents during 2012 to 2017 at Ponorogo. The landslide caused 7 people dead, 23 missing, 1 injured, 996 displaced [7]. One of the landslide events that occurred on April 1, 2017. Landslide disaster occurred in the Village Banaran, Pulung District, Ponorogo District with casualties of more than 20 people. The area covered by the Banaran landslide covers 2 RW (Figure 2). After a while, there were reports of landslides in different villages. Judging from the topographic character of several places reported landslides with casualties or not, it has similarities. Sehigga that is feared is Ponorogo regency is an emergency landslide.

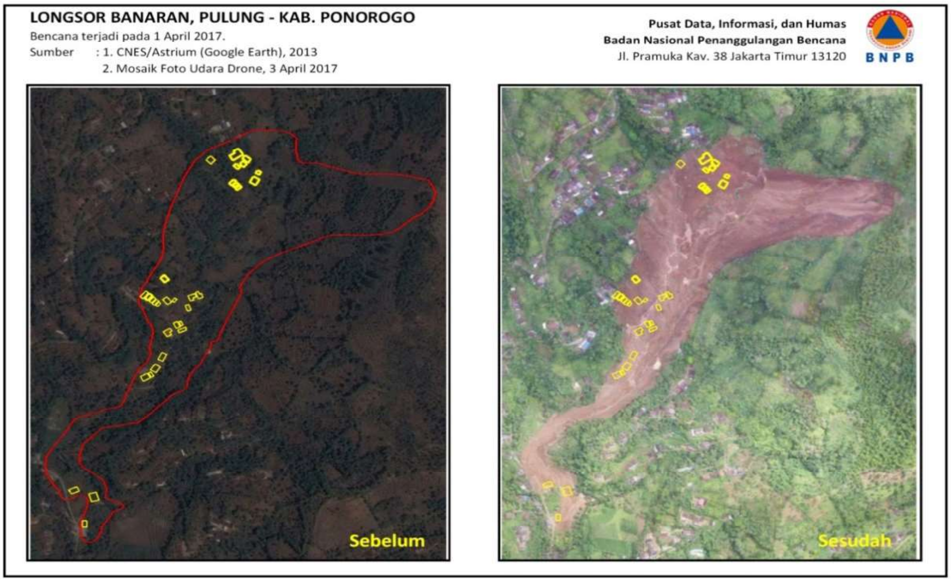

Figure 2. Landslide Banaran, Ponorogo

According to the results of research, Ponorogo regency can be categorized as a vulnerable area of landslide disaster rather vulnerable in hilly and mountainous areas, in the lowlands can be categorized as an area where the vulnerability of landslides is a bit vulnerable [8]. Other research indicates that there is still land used not yet in accordance with the direction of its utilization. Land use directives are intended to be compatible with land capability and environmental strength [9].

Several factors that influence the occurrence of landslide in Banaran Village, Pulung District, Ponorogo Regency from the results of rapid analysis of the fingerprints, among others:

1. the occurrence of extreme rain for five consecutive days before the occurrence of landslides,
2. the topography of landslide generator is very steep with slope of more than 40 degrees,
3. Litologi in the form of soil weathered quartz volcanic rock (andesite lava, volcanic breccia) is very thick and water-absorbing, and
4. intensified land use (in the vicinity of landslide zones) with seasonal crops that increase soil infiltration capacity, accelerate water accumulation and

soil saturation (beyond the ability of soil to bind water) [10].

An area that has experienced landslide can then be projected to landslide again. This is called a landslide vulnerability. The landslide vulnerability is a field susceptibility to produce slope failure and is usually indicated through cartographic paths [11]. Landslide vulnerability is a classification, volume and spatial distribution that occurs and has the potential to re-occur in an area [12]. Detection of landslide potential is important to be done to minimize loss of loss of life, damage to public infrastructure and loss of property.

Regression modeling can be applied to detect landslides by synthesizing contextual, spectral and geometric features. Among the test images, the F-measure of landslide detection has a range between 0.771 and 0.998, validating high resistance and efficiency [13]. The predicted results are then compared with those obtained by stability analys based on infiltration results from numerical analysis. The results show that the proposed method can be used to predict landslides due to efficient infiltration of rainfall by considering the movement of saturated regions with shallow shallow basalt rocks [14].

There are several methods to detect the causes of landslides. The first method refers to PU NO.22 / PRT / M / 2007 Permen PU, there are 14 causes of landslide parameter [15], where the weakness of this method is not giving value. The second method mentioned there are four factors causing landslides including geological factors, morphological factors, physical factors and factors associated with human activities. The disadvantage of this method also does not provide a percentage value [16]. The third method is the deterministic method of landslide hazard, landslide factor caused by DEM, geology, soil, hydrology [17]. This method provides a percentage but in the rainfall parameter uses the annual number. Fourth, Paimin Formula, the parameters used in Paimin Formula are cumulative 3-day daily rainfall (25%), slope of land (15%), geology (10%), depth of soil to layer of impermeable (5%), 5%), land use (20%), infrastructure (15%), and settlement density (5%) [18]. These values make Paimin a more applicable formula used in landslide prediction modeling.

The introduction above served as the basis for the purpose of this research which is to predict the landslide with Paimin Formula by data in Ponorogo regency from 2012 to 2017 and measure the accuracy of the formula with linear regression.

2. Research Method

2.1. Paimin Formula Identification

Table 1. Paimin Formula [18]

No.	Parameter (% Weight)	Inventory Technique	Explanation	Classification	Category	Score
A	NATURE (60 %)					
a.	Cumulative daily rain 3 consecutive days (mm / 3 days) (25%)	• Daily rainfall dataof stations in the watershed. • The selected-highest 3-day rainfall	• The last 10 th data. •.Calculated average, if> 1 st rain.	• < 50 • 50 - 99 • 100 - 199 • 200 - 300 • > 300	• Very low • Low • Moderate • High • Very High	• 1 • 2 • 3 • 4 • 5
b.	Slope (%) (15 %)	• Manually-contour map delineation (RBI) with uniform distance between contour lines -> polygon map unit. Slope (S) = h / l x 100% • Automatically with digital RBI maps & ArcView programs.	• h = total contour height difference in map unit. • l = horizontal distance of map unit.	• < 25 • 25 - 44 • 45 - 64 • 65 - 85 • > 85	• Very low • Low • Moderate • High • Very High	• 1 • 2 • 3 • 4 • 5

c.	Geology (Rocks) (10%)	Type of rock / main rock.	Watershed geology map.	• Alluvial plain • Lime hills • The granite hills • Sedimentary rock-hill • Basal hill - Clay shale	• Very low • Low •Moderate • High • Very High	• 1 • 2 • 3 • 4 • 5
d.	The existence of a fault (5%)	Identification of faults on the geological map.	• Watershed geology map. • Field survey.	• None • Exist	• Low • High	• 1 • 5
e.	The depth of the soil (regolit) toimper meable layer (5 %)	Identification of the depth of the regolit (m) on the type of soil present in the watershed.	• Land type map. • Land profile. • Land drill.	• < 1 • 1 - 2 • 2 - 3 • 3 - 5 • > 5	• Very low • Low • Moderate • Hig • Very High	• 1 • 2 • 3 • 4 • 5

B	LAND MANAGEMENT (40 %)					
a	Land use (20%)	• Data on the type & extent of land cover in the watershed. • Land Use Map.	• Land use / RBI map. • Satellite Imagery / Aerial Photo.	• Natural forest • Bush / Grass • Forest / Plantation • Garden / yard • Rice / Settlement	• Very low • Low • Moderate • High • Very High	• 1 • 2 • 3 • 4 • 5
b	Infrastructure (If slopes <25% = score 1) (15%)	Identification of the type & distribution of existing infrastructure in the watershed.	• Landuse map / RBI. • Field survey.	• No road • Cut slope off road	• Low • High	• 1 • 5
c	Density of settlement (person / km2) (If slopes <25% = score 1) (5%)	• Mapping of residential areas. • Population density data per village / sub-district in the watershed.	• Landuse map (RBI). • Aerial photo/ satellite imagery • Statistical Data of Ponorogo • Field survey	• < 2000 • 2000 - 5000 • 5000 - 10000 • 10000 - 15000 • > 15000	• Very low • Low • Moderate • High • Very High	• 1 • 2 • 3 • 4 • 5

2.2. Data Source and Paimin Formula Assesment

The model used to analize landslides vulnerability refer to table 1

Total Score = 0,25A + 0,10B + 0,10C + 0,05D + 0,05E + 0,20F + 0,15G + 0,05H (1) dengan:

A: Daily Daily Rain Factor maximum of 3 daily, data source [19], [20]
B: Land Slope Factor, data source[20], [22]
C: Geological Factors, data source [20], [22]
D: Soil Type Factor, data source [20], [22]]
E: Fault Existance Factor, data source [20], [24]
F: Landuse Factor, data source [20], [25]
G: Infrastructure Factor, data source [20], [26]
H: Residential Density Factor, data source [20], [27]

From total score per item we can analize the result is categorized in five type, refer to table 2.

Table 2. Assessment score of landslides vulnerability and categories [18]

No.	Score Landslides Vulnerability	Categories
1	> 4.3	Very High
2	3.5-4.3	High
3	2.6-3.4	Moderate
4	1.7-2.5	Low
5	<1.7	Very Low

The result assessment has total of landslides vulnerability area per district on Ponorogo and a number of landslide per district on Ponorogo

2. Predict landslide base on Paimin Formula Assessment Data using Linear Regression

The data were analyzed using Microsoft Excel 2016 (Microsoft Inc. USA). All collected data were tested using ANOVA for knowing the differences between total of landslides vulnerability area and number of landslide on 2012 to 2017. If there any significance difference, it would be analyzed by regression linear. The data was analyzed based on confidence level 5%, which placed total of landslides vulnerability area as X factor and a number of landslide on 2012 to 2017 as Y factor.

3. Results and Analysis

Paimin Formula Result refer to table 3

Table 3. Paimin Formula Resut of Ponorogo Regency per District [18], [20]

No.	District	Landslide Area Categories (km^2)					Totalof Vurnerability Landslide Area	Number of Landslide on 2012 to 2017
		Very Low (<1.7)	Low (1.7-2.5)	Moderate (2.6-3.4)	High (3.5-4.3)	Very High (> 4.3)		
1	Ngrayun	0.0000	4.2502	91.8986	3.8489	0.0023	19.97	11
2	Slahung	0.4137	36.8601	60.0482	2.6779	0.0001	17.67	6
3	Bungkal	0.1470	55.8656	43.2912	0.6960	0.0002	16.30	2
4	Sambit	0.1684	39.7127	59.8811	0.2378	0.0000	17.35	1
5	Sawoo	0.3351	16.5552	81.6648	1.4448	0.0000	18.95	3
6	Sooko	0.1792	21.7835	76.0362	1.9999	0.0012	18.66	2
7	Pudak	0.0000	9.0372	89.6612	1.3016	0.0000	19.48	6
8	Pulung	0.0158	32.8954	64.1932	2.8956	0.0000	18.00	3
9	Mlarak	0.0004	44.0095	55.7793	0.2107	0.0000	17.08	1
10	Siman	0.3304	78.0839	21.5852	0.0005	0.0000	14.75	1
11	Jetis	0.8713	99.0913	0.0374	0.0000	0.0000	13.28	1
12	Balong	0.2955	70.7696	28.7986	0.1363	0.0000	15.25	1
13	Kauman	0.7287	95.7784	3.4904	0.0026	0.0000	13.52	1
14	Jambon	0.1846	64.7283	35.0370	0.0502	0.0000	15.66	1
15	Badegan	1.4391	58.0475	39.8621	0.6514	0.0000	15.98	2
16	Sampung	2.2339	79.5250	18.1074	0.1338	0.0000	14.41	1
17	Sukorejo	0.8859	96.5629	2.5512	0.0000	0.0000	13.44	1
18	Ponorogo	0.9259	76.3148	22.7593	0.0000	0.0000	14.79	1
19	Babadan	0.6122	78.6226	20.7653	0.0000	0.0000	14.68	1
20	Jenangan	0.4219	32.1395	66.8492	0.5894	0.0000	17.84	1
21	Ngebel	2.2253	10.7440	83.9524	3.0783	0.0000	19.19	6
Total Area (km^2)		**0.5912**	**52.4465**	**46.0119**	**0.9503**	**0.0002**	**16.4881**	**53**
Landslide Per Year								**8.83**

The prediction result of Paimin formula proves that Ponorogo regency has an average of landslides vulnerability area with five categories: very low 0.5912%, low 52.4465%, medium 46.0119%, high 0.9503%, and very high 0.0002%, while the average occurrence of landslides per year is 8.83 times with the percentage of landslides vulnerability areas of 16.4881 %.

Table 4. Regression statistics analyzed of landslide prediction in Ponorogo Regency

Regression Statistics	
Multiple R	0.7070
R Square	0.4999
Adjusted R Square	0.4736
Standard Error	1.900
Observations	21

Refer to table 4. Result showing any correlation between total of landslides vulnerability area and number of landslide on 2014 to 2017 and give Multiple R in 70.70% impact to landslide accured count. The impact actually was going positively and high rate (Table 4). Following Guilford [28], the Multiple R are high correlation, marked relationship. The value of R Square = 0.4499 indicates that the parameter and percentage was used by Paimin formula has accuracy 49.99% while 50.01% is influenced by other percentage and parameters.

Paimin formula have able applied to predict vulnerability landslide for possible landslides occurrence elsewhere, it proved by some research applied by Paimin Formula [27]–[29]. The prediction of landslide not only used linear regression but also for others algoritm [12], [13].

4. Conclusion

The prediction result of Paimin formula proves that Ponorogo regency has an average of landslides vulnerability area with five categories: very low 0.5912%, low 52.4465%, medium 46.0119%, high 0.9503%, and very high 0.0002%. The average occurrence of landslides per year is 8.83 times with the percentage of landslides vulnerability areas of 16.4881 %. The accuracy of Paimin formula using linear regression resulted in value of Multiple R = 70.70%, it is including a high correlation and value of R Square = 0.4999, indicates that the parameter and percentage was used by Paimin formula has accuracy 49.99% while 50.01% is influenced by other percentage and or parameters.

References

Van Westen, C.J., Alkema, D., Damen, M.C.J., Kerle, N., dan Kingma, N.C. 2011. Multihazard risk Assessment : Distance Education Course, Guidebook, United Nations – ITC School on Disaster Geo-information Management

Guzzetti, F., Mondini, A.C., Cardinali, M., Fiorucci, F., Santangelo, M, dan Chang, K.T. 2012. Landslide Inventory Maps : New Tools for and Old Problem. Earth Science Reviews (hal 42-66)

Hadmoko, D.S., dan Mauro, S.E.D. 2012. Landslide and Other Mass Movements, dalam The Routledge Handbook of Hazards and Disaster Risk Reduction (hal 297-309)

Thiebes, B. 2012. Landslide Analysis and Early Warning Systems: Local and Regional Case Study in The Swabian Alb Germany. Germany : Springer –Verlag Berlin Heidelberg

Sudibyakto. 2011. Manajemen Bencana di Indonesia ke mana?. Yogyakarta : Gadjah Mada University Press

Christanto, N., Hadmoko, D.S., Westen, C.J., Lavigne F., Sartohadi, J., dan Setiawan, M.A. 2009. Characteristic and Behavior of Rainfall Induced Landslide in Java Island, Indonesia : an Overview. Geophysical Research Abstracts. Vol 11. EGU General Assembly

Kementerian Kesehatan Republik Indonesia, "Pusat Krisis Kesehatan Kementerian Kesehatan Republik Indonesia," *http://pusatkrisis.kemkes.go.id/pantauan_bencana/*, 2018. [Online]. Available: http://pusatkrisis.kemkes.go.id/. [Accessed: 11-Jun-2018].

H. Yuniarta, A. P. Saido, and Y. M. Purwana, "Kerawanan Bencana Tanah Longsor Kabupaten Ponorogo," *Jurnal Matriks Teknik Sipil*, vol. 3, no. 1, pp. 194–201, 2015.

R. Wirosoedarmo, J. B. R. Widiatmoko, and Yoni Widyoseno, "Rencana Tata Ruang Wilayah (RTRW) Berdasarkan Daya Dukung Lingkungan Berbasis Kemampuan Lahan," *Jurnal Agritech*, vol. 34, no. 04, p. 463, 2014.

H. Suryatmojo and Arigusantita, "Bencana Longsor dan Aliran Debris di Banaran, Ponorogo – Konservasi DAS," *http://konservasidas.fkt.ugm.ac.id/*, 2017. [Online]. Available: http://konservasidas.fkt.ugm.

ac.id/2017/04/04/bencana-longsor-dan-aliran-debris-di-banaran-ponorogo/. [Accessed: 12-Jun-2018].

Yalcin, Ali. 2008. GIS-Based Landslide Susceptibility Mapping Using Analytical Hierarchy Process and Bivariate Statistic in Ardesen (Turkey) : Comparison of Results and Confirmation. Catena Journal (hal 1-12)

Van Westen, C.J., Alkema, D., Damen, M.C.J., Kerle, N., dan Kingma, N.C. 2011. Multihazard risk Assessment : Distance Education Course, Guidebook, United Nations – ITC School on Disaster Geo-information Management

F. Chen, B. Yu, C. Xu, and B. Li, "Landslide detection using probability regression, a case study of Wenchuan, northwest of Chengdu," *Applied Geography*, vol. 89, no. October, pp. 32–40, 2017.

S. E. Cho, "Prediction of shallow landslide by surficial stability analysis considering rainfall infiltration," *Engineering Geology*, vol. 231, pp. 126–138, 2017.

Departemen Pekerjaan Umum, *Pedoman Penataan Ruang Kawasan Rawan Bencana Longsor*, no. 22. Indonesia: Menteri Pekerjaan Umum Republik Indonesia, 2007, p. 148.

B. O. Ubechu and O. . Okeke, "Landslide: Causes, Effects and Control," *International Journal of Current Multidisciplinary Studies*, vol. 3, no. 03, pp. 647–663, 2017.

M. R. Amri *et al.*, *Risiko Bencana Indonesia*. Jakarta: Badan Nasional Penanggulangan Bencana, 2016.

Paimin, Sukresno, and I. B. Pramono, *Teknik Mitigasi Banjir dan Tanah Longsor*. Balikpapan: Tropenbos International Indonesia Programme, 2009.

Badan Meteorologi Klimatologi dan Geofisika Stasiun Klimatologi Malang, "Data Curah Hujan Harian Stasiun Curah Hujan Ponorogo," Malang, 2013.

H. Yuniarta, "Vulnerability to Landslides Ponorogo District," Universitas Negeri Sebelas Maret Surakarta, 2014.

[Badan Geologi, "Peta Kemiringan Lahan Kabupaten Ponorogo," Ponorogo, 2001.

Badan Geologi, "Peta Geologi Kabupaten Ponorogo," Bandung, 2001.

Badan Penanggulangan Bencana Daerah Ponorogo, "Peta Jenis Tanah Kabupaten Ponorogo," Ponorogo, 2018.

Badan Penanggulangan Bencana Daerah Ponorogo, "Peta Formasi Batuan Kabupaten Ponorogo," Ponorogo, 2018.

Badan Informasi Geospasial, "Peta Rencana Tutupan Lahan Kabupaten Ponorogo 2011-2031," Ponorogo, 2001.

Badan Informasi Geospasial, "Peta Rencana Pola Ruang Kabupaten Ponorogo 2011-2031," Ponorogo, 2001.

Badan Perencanaan Pembangunan Daerah Ponorogo, "Pembangunan Ponorogo Dalam Angka 2014," Ponorogo, 2014.

J. P. Guilford, *Fundamental statistics in psychology and education*, 5th editio. New York [etc.]: McGraw-Hill Book Company, 1973.