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RAPID VISUAL SCREENING OF BUILDING FOR POTENTIAL GROUND MOVEMENT IN KALIREJO, KULONPROGO, YOGYAKARTA

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Abstract: *Landslides are the biggest threat in Kalirejo area, the dynamics of land movements in the mountains often cause cracks and potentially collapse. Landslides due to land fractures caused victims of building damage to fatalities. The aim of this study is to analyze the condition of a simple building on the influence of land fracture. The method used is conducting a field survey of existing buildings in the Kalirejo area. The data surveys are the percentage of building damage and building categorization. From the results of the analysis, the percentage of building conditions and the category of building conditions obtained the percentage of buildings in the safe category there were 78 buildings or 54.17%, the buildings of the unsafe category were 51 buildings or 35.42% and buildings with the unsafe category there were 15 buildings out of 144 the surveyed building the percentage is 10.42%. Based on the results of the analysis using the RVS method that 15 buildings with unsafe conditions need to be relocated because the building does not use the minimum structure required for simple buildings, while in 51 buildings with unsafe conditions, repairs must be made to the structure according to the minimum requirements on buildings simple.*

Keywords: *Buildings, Evaluation, Fractures, Land, RVS*

INTRODUCTION

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Disasters that occur in the near future in Indonesia remind that Indonesia is a country that is very close to earthquakes, landslides (Rajindra et al., 2019), land movements, storms and various other natural disasters (Wekke, Sabara, Samad, Yani, & Umam, 2019). The disaster that occurred was caused by Indonesia's geographical location in the midst of changing natural conditions (Wekke, Rajindra, et al., 2019).A landslide is a process of moving the earth down and out of the slope-forming bodies including rocks (Pirttijärvi, Zaher, & Korja, 2015), soil, artificial fills, or a combination of both that move by falling, rolling (rotating), sliding, spreading, or flowing (Kasayanond, Umam, & Jermsittiparsert, 2019).

The landslide incident in February 2018 in Kulon Progo recorded 14 landslide locations and there were 5 worst points namely West Plono, Nglambur and Trayu located in Samigaluh District. Landslides re-occur and threaten about 30 lives due to continuous rain in March 2018 with a fracture length of 50 meters and a width of 30 meters and a total of 25 meters.

Rapid visual screening (RVS) is a method of assessing the vulnerability of a building to potential earthquake hazards based on visual observations from the building's exterior, interior if possible, so that its implementation is relatively fast (McNeill J. D. and Labson V. F, 1991). Buildings that have the potential for damage and in areas prone to land displacement result in a greater risk of the building being damaged (Harianto, Kushadiwijayanto, & Apriansyah, 2018). One way to find out the potential damage to a building is to conduct a building evaluation using a simple building evaluation form (typical of a wall)(Nissen, 1986).

The Research about the potential vulnerability of ground movement area Kalirejo, Kokap, Kulon Progo, Yogyakarta, of these studies found a map of the zone vulnerability of ground movement area of research that shows the zone vulnerability of ground movement (Harianto et al., 2018), a zone of

vulnerability of ground movement, a zone of vulnerability ground movement of low (Prastowo et al., 2019), medium and high (Mariyanto et al., 2018). Continuing this research, a mapping of the potential damage to buildings will be carried out as a result of a simple building evaluation (typical Tembokan) in the Kalirejo area, Kokap District, Kulon Progo Regency, Yogyakarta.

The aforementioned background makes the writer want to analyze the condition of a simple building in the Kalirejo area, Kulon Progo, Yogyakarta because the condition of the building that is in accordance with the rules will make the building during a land shift due to fractures of the land which is not so significant (Priadi & Hududillah, 2018). The current condition of the building also makes the building in the realm of safe (Sulaiman, Bambang, Purnaweni, Lutfi, & Mohammed, 2019), less secure and unsafe. The condition of the building which is called safe has a percentage of 70-100% condition, the condition of the building which is called unsafe has a percentage of condition 40-69%, and the condition of the building which is called unsafe has a percentage of condition of 0-39% (Rüpke, Phipps Morgan, & Dixon, 2006).

The condition of the building can be assessed by conducting a simple building evaluation (Khalil & Santos, 2014), many ways to evaluate the building either by calculating the structure or just looking at it from the looks (Shiomi & Park, 2008). In this study the analysis of the condition of the building is evaluated by looking at and recording the condition of a simple house with a simple building evaluation form (typical of the wall)(Kim & Lee, 2007). From this form we know the current condition of the building by filling in 40 questions from 11 categories of buildings that are formatted.

The problem formulation of this research is how to analyze the condition of a simple building on the influence of the Kalirejo land fracture, Kulon Progo, Yogyakarta, so that from the formulation of the problem, the objective of this study is to analyze the condition of a simple building on the influence of the Kalirejo land fracture, Kulon Progo, Yogyakarta.

METHOD

The land use in the Kalirejo, Hargorejo and surrounding areas consists of 23% with a slope of 15-30º, most of the settler areas correspond to slope 42º with a pattern of surface displacement. The residential area in Kalirejo is above the andesite. In addition to Settlements, there is also an expansion of 57% in the slope 0^{o}-15^{o} (Prastowo, Trianda, & Novitasari, 2018)

The first step taken is conducting a field survey by looking at existing buildings and adjusting them to a simple building valuation form (Hadibarata & Rubiyatno, 2019). A simple building form contains the parts of a building that must be owned by a building to make the building structurally strong (Irsadi, Anggoro, Soeprobowati, Helmi, & Khair, 2019). On a simple building form, only check the "Yes" column if the building part is in accordance with the form or column "No" , if the building part does not exist as in the form, if the building has a part that matches the form but the size does not match then the bias can be filled at column "Less".

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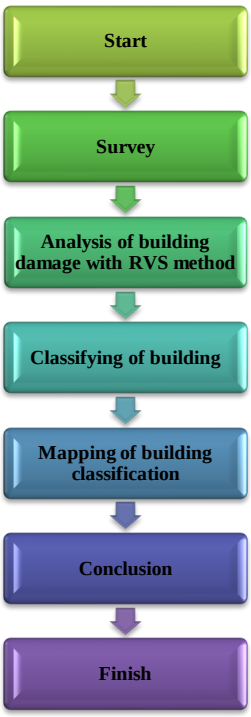

Figure 1. Step of research flowchart in this study

After the field survey was carried out, the condition of the existing buildings in the Kalirejo area was obtained, an analysis of building damage was carried out in accordance with the filling of simple building forms which were carried out at the time of the field survey (Taruna & Banyunegoro, 2018). How to analyze it by counting the answer "Yes" multiplied by the value of 1.0 and the answer "Less" multiplied by the value of 0.5. The value of the answer "Yes" and "less" is added divided by 40 (the number of building components simply) multiplied by 100%, then the percentage of simple buildings is obtained according to the simple building assessment form.

After getting a simple percentage of building damage from the analysis of existing forms, it can be classified into 3 categories of conditions namely safe percentage > 70%, less safe 40-69%, unsafe < 40% (Nakajima & Hasegawa, 2007). Percentage values can also be made on a condition index scale and their handling measures can be seen in table 1. From these percentages it can be seen the condition of simple buildings to the influence of the Kalirejo regional land fracture, KulonProgo, Yogyakarta.

RESULTS AND DISCUSSION

Rapid Visual Screening (RVS) is a method for facilitating, inventorying and classifying buildings that are approved to be prone to collapse in earthquake prone areas. Rapid Visual Screening was formulated in FEMA 154 (Lizundia et al., 2015). However, in this study, the RVS method is used in areas prone to ground movement (McNeill J. D. and Labson V. F, 1991).

The field survey was conducted in the Kalirejo area where potential land fractures are in accordance with previous research, which obtained the coordinates and the potential land fracture area. The 146 buildings in the existing condition survey were randomly assessed according to a simple building form, with 40 questions of the condition of the buildings (Saehana, Ali, & Supriyatman, 2019). The condition of the existing buildings surveyed looks like the picture 1. The field survey is done by going to the house one by one and then matching with the contents of the existing forms, is the building part of the building mentioned formatted then checked in the column "Yes" but if the form is not in the existing building then check the column "No", if the building is in accordance with the form but the size is different then check the column "less" (Reinout W. van Bemmelen, 1970) and write what the shortcomings are seen in Figure 2 .

The survey was carried out in accordance with the agreed coordinates with the reference coordinates using a map

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of potential building strength in the Kalirejo area as shown in Figure 3. Survey or start building appraisal by filling out a simple building appraisal form following the coordinates agreed upon previously (Sjaifuddin, Hidayat, Fathurrohman, Ardie, & El Islami, 2019). How to analyze it by looking at the answer Yes with a value of 1, the answer Less with a value of 0.5, and the answer is not the value of 0. How many questions are the answer Yes times the value of 1 and how many answers are less times the value of 0.5. All previous product results are added together to get the total value. To get a Building Score obtained by the formula. Building Score = total score / 40 x 100%.

Then the building score will be obtained in the form of a percentage of building conditions. Building scores will be divided into three zones, namely zone 1 for safe buildings with a percentage of 70-100%, zone 2 for unsafe buildings with a percentage of 40-69% and zone 3 for unsafe buildings with a percentage of 0-39%.

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Table 1. Condition Index Scale

Zone	Condition Index	Condition Description	Handling Measures	Building Categorization
1	70-100	Well	Immediate action is still not needed	Secure
2	40-69	Intermediate	It is necessary to make an alternative economic analysis of improvements to determine the appropriate action	Unsafe
3	0-39	Bad	Detailed evaluation is needed to determine repair, rehabilitation and reconstruction actions, in addition to evaluating safety	Not safe

Source: (Smith, 2019)

Table 2 . Results of Kalirejo Regional Building Condition Analysis

POINT NAME	UTM COORDINATES Northing	Easting	Percentage of Building Conditions (%)	Building Conditions
B61	397598	9133444	72.5	Secure
B62	397592	9133430	62.5	Unsafe
B63	397517	9133603	72.5	Secure
B64	397666	9133714	73.75	Secure
B65	397565	9134167	41.5	Unsafe
B66	398699	9135405	58.75	Unsafe
B67	398712	9135379	5	Not safe
B68	397754	9134204	77.5	Secure
B69	397770	9134120	77.5	Secure
B610	397819	9134177	65	Unsafe
B611	397659	9134144	61.25	Unsafe
B612	397660	9134187	62.5	Unsafe
B614	397693	9133661	40	Unsafe
B615	397701	9133638	62.5	Unsafe
B616	397698	9133640	62.5	Unsafe
B617	397703	9133631	75	Secure
B618	397709	9133613	63.75	Unsafe
B619	397730	9133490	72.5	Secure
B620	397772	9133456	70	Secure
B621	397785	9133436	73.75	Secure
B71	398682	9135194	63.75	Unsafe
B72	398612	9135419	68.75	Unsafe
B73	398407	9135270	80	Secure
B74	398574	9135480	77.5	Secure
B75	398363	9135354	82.5	Secure

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POINT NAME	UTM COORDINATES		Percentage of Building Conditions (%)	Building Conditions
	Northing	Easting		
B76	398285	9135248	80	Secure
B77	398197	9135185	63.75	Unsafe
B78	398178	9135200	65	Unsafe
B79	398183	9135211	68.75	Unsafe
B710	398095	9135118	78.75	Secure
B711	398094	9135114	61.25	Unsafe
B712	398319	9135245	63.75	Unsafe
B713	398307	9135207	66.25	Unsafe
B714	398300	9135007	70	Secure
B715	398294	9134938	66.25	Unsafe
B716	398382	9134964	66.25	Unsafe
B717	397926	9134485	73.75	Secure
B718	397938	9134522	80	Secure
B719	397938	9134536	58.75	Unsafe
B720	397827	9134203	61.25	Unsafe
B721	397873	9134225	65	Unsafe
B722	397940	9134245	62.5	Unsafe
B723	398171	9134842	65	Unsafe
B724	398178	9134763	63.75	Unsafe
B725	398148	9134744	62.5	Unsafe
B726	398110	9134735	25	Not safe
B727	398292	9134807	65	Unsafe
B728	398286	9134803	65	Unsafe
B729	398053	9134744	67.5	Unsafe
B730	398002	9134654	80	Secure
B731	397884	9134524	78.75	Secure
KB1-1	399781	9135099	78.75	Secure
KB1-2	399561	9135187	66.25	Unsafe
KB1-3	399568	9135094	77.5	Secure
KB1-4	399646	9135081	88.75	Secure
KB1-5	399735	9135097	63.75	Unsafe
KB1-6	399738	9135074	83.75	Secure
KB1-7	399730	9135047	78.75	Secure
KB1-9	399799	9135085	27.5	Not safe
KB1-10	399847	9135098	75	Secure
KB1-11	399916	9135361	77.5	Secure
KB1-12	399940	9135329	87.5	Secure
KB1-13	400009	9135340	76.25	Secure
KB1-14	400109	9135207	77.5	Secure
KB1-15	400103	9135209	80	Secure
KB2-1	398971	9134660	68.75	Unsafe
KB2-2	398940	9134551	77.5	Secure
KB2-3	398995	9134464	87.5	Secure
KB2-4	399057	9134437	37.5	Not safe
KB2-5	399076	9134761	43.75	Unsafe
KB2-6	399049	9135153	78.75	Secure
KB2-7	399092	9135140	97.25	Secure
KB2-8	399080	9135056	15	Not safe
KB2-9	399064	9135016	78.75	Secure
KB2-10	398855	9134699	8.75	Not safe
KB2-11	399219	9134980	75.25	Secure
KB2-13	399172	9134372	5	Not safe
KB2-14	399129	9134385	77.5	Secure
KB2-15	399164	9134414	41.25	Unsafe
KB2-16	399215	9134379	75	Secure
KB2-17	399251	9134405	10	Not safe
KB2-18	399179	9134328	82.5	Secure

POINT NAME	UTM COORDINATES		Percentage of Building Conditions (%)	Building Conditions
	Northing	Easting		
KB2-19	399189	9134294	10	Not safe
KB2-20	398817	9134659	80	Secure
KB2-21	398833	9134555	97.5	Secure
KB2-22	399089	9135272	65	Unsafe
KB2-23	399135	9135225	52.5	Unsafe
KB2-24	399183	9135268	61.25	Unsafe
KB2-25	399235	9135282	71.25	Secure
KB2-26	399289	9135235	78.75	Secure
KB2-27	399308	9135210	90	Secure
KB2-28	399311	9135205	87.5	Secure
KB2-29	399330	9135178	76.25	Secure
KB2-30	399087	9135345	81.25	Secure
KB2-31	399123	9135444	15	Not safe
KB2-32	399116	9135477	82.5	Secure
KB2-33	399069	9135529	17.5	Not safe
KB2-34	399061	9135574	75	Secure
KB2-35	398978	9135663	85	Secure
KB2-36	398933	9135692	77.5	Secure
KB2-37	398913	9135759	77.5	Secure
KB2-38	399248	9135449	96.25	Secure
B2-01	9134314	398277	65	Unsafe
B6-01	9133724	398185	56.25	Unsafe
B6-02	9133651	398060	67.5	Unsafe
B6-03	9133562	398275	85	Secure
B6-04	9133456	397799	95	Secure
B6-05	9133431	397939	85	Secure
B6-06	9133426	397935	87.5	Secure
B6-07	9133383	397790	75	Secure
B6-08	9133381	397790	77.5	Secure
B6-09	9133674	398174	68.75	Unsafe
B6-10	9133732	398218	66.25	Unsafe
B6-11	9133594	398022	80	Secure
B6-12	9133483	398023	65	Unsafe
B6-13	9133410	397585	77.5	Secure
B6-14	9133365	397762	90	Secure
B6-15	9133439	397777	85	Secure
B6-16	9133437	397787	82.5	Secure
B6-17	9133446	397806	72.5	Secure
B11-01	9133094	397353	72.5	Secure
B11-02	9133104	397256	65	Unsafe
B11-03	9132953	397152	53.75	Unsafe
B11-04	9132877	397055	67.5	Unsafe
B11-05	9132857	397038	65	Unsafe
B11-06	9132751	397092	62.5	Unsafe
B11-07	9132551	396779	57.5	Unsafe
B11-08	9132554	396850	66.25	Unsafe
B11-09	9132522	396765	75	Secure
B11-10	9132539	396845	37.5	Not safe
B11-11	9133182	397473	37.5	Not safe
B11-12	9133154	397394	75	Secure
B11-13	9133149	397341	22.5	Not safe
B11-14	9133150	397343	12.5	Not safe
B11-15	9133120	397321	82.5	Secure
B11-16	9133111	397299	78.75	Secure
B11-17	9132953	397112	86.25	Secure
B11-18	9132827	397007	85	Secure
B11-19	9132736	397070	82.5	Secure

POINT NAME	UTM COORDINATES		Percentage of Building Conditions (%)	Building Conditions
	Northing	Easting		
B11-20	9132673	396913	80	Secure
B11-21	9132593	396865	83.75	Secure
B11-22	9132538	396852	92.5	Secure
B11-23	9132539	396851	82.5	Secure
B11-24	9132530	396786	85	Secure

From the results of the calculation of the building score (Table 2), obtained the value of the condition of the entire building that has been surveyed, then in table 2 is a recapitulation of building score results (and the coordinates of his home field) from the evaluation of simple buildings in the four hamlets in the Kalirejo area. Building conditions are obtained by following the conditions index scale according to table 1 and giving color to each building category. Green color for safe building conditions with building conditions index value is 70-100%, yellow for unsafe building conditions with building condition index values 40-69%, and red for unsafe building conditions with building condition index values 0-39 %.

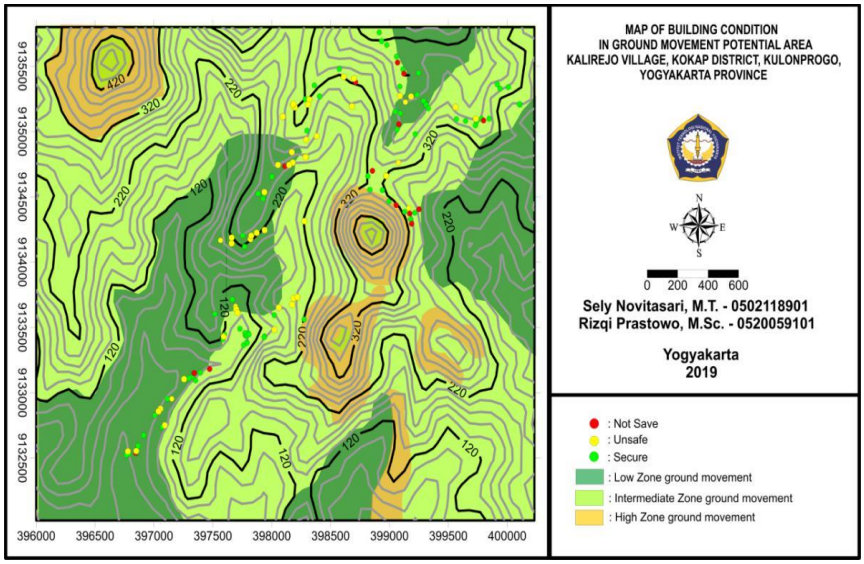

Figure 2. Map of building condition

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Figure 3. Existing of building

CONCLUSION

Based on the results of research that has been done, the percentage of building conditions and building condition categories obtained the percentage of safe buildings there are 78 buildings or 54.17%, buildings less secure categories there are 51 buildings or 35.42% and buildings with unsafe categories there are 15 buildings from 144 buildings surveyed then the percentage is 10.42%. Then there are about 10.42% of buildings that have to be considered because in conditions of insufficient building resilience and are in areas prone to landslides.

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REVIEWERS GUIDE

Information		
Reviewer's Code	:	
Manuscript Number	:	5190
Title	:	RAPID VISUAL SCREENING OF BUILDING FOR POTENTIAL GROUND MOVEMENT IN KALIREJO, KULONPROGO, YOGYAKARTA
Date Sent to Reviewer	:	
Date Expected from Reviewer	:	
Comments Per Section of Manuscript		
Title	:	enough
Abstract	:	Difficult to understand (the language need to improve)
Introduction	:	Not clear what problem need to be solve
Method	:	Not clear, need more details about RVS
Result and Discussion	:	Need to modified the table 2, I cannot found the discussion/ reason, I just read a report without explanation. Need more improvement and more details
Conclusion	:	Good, but I hope the authors can add some recommendation
References	:	Good
General Comment	:	Need improvement in language and quality of articles. Please ask the journal about English proof reading
Please Rate the Following: (4=Excellent) (3=Good) (2=Fair) (1=Poor)		
Originality	:	2
Contribution to the Field	:	2
Technical Quality	:	2
Clarity of Presentation	:	2
Depth of Research	:	2
Recommendation: (Kindly Mark with an X)		
Accept as Is	:	
Requires Minor Corrections	:	
Requires Moderate Revision	:	
Requires Major Revision	:	X
Rejected	:	
Additional Comments		
Simple and informative word or sentence is important in writing articles, so please make or improve your articles to readable articles, you can ask the journal editor. Quality, this		

articles will useless if you not add recommendation. Actually, interesting article, but I just read the articles as simple report without any deep discussion

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Information		
Reviewer's Code	:	
Manuscript Number	:	5190
Title	:	**RAPID VISUAL SCREENING OF BUILDING FOR POTENTIAL GROUND MOVEMENT IN KALIREJO, KULONPROGO, YOGYAKARTA**
Date Sent to Reviewer	:	March 18, 2020
Date Expected from Reviewer	:	March 28, 2020
Comments Per Section of Manuscript		
Title	:	Ok
Abstract	:	- Please write the full name of the RVS method (Rapid visual screening) at least for its first mentioning in the article. - The sentences "From the results of the analysis, the percentage of building conditions and the category of building conditions obtained the percentage of buildings in the safe category there were 78 buildings or 54.17%, the buildings of the unsafe category were 51 buildings or 35.42% and buildings with the unsafe category there were 15 buildings out of 144.....". What is the difference between the two categories holding the same name "unsafe"? You may use the same categories used in the CONCLUSION section (i.e. safe buildings, less secure, unsafe).
Introduction	:	- The authors mentioned "there were 5 worst points namely West Plono, Nglambur and Trayu located in

		Samigaluh District", these are only three. - For international reader(s) who are not familiar with your studied area, it is recommended to display some localities (e.g., Kalirejo, Kulon Progo, Yogyakarta, West Plono, Nglambur, Trayu, Harianto, Kushadiwijayanto, ...etc.) on location map(s). - The sentences "The Research about the potential vulnerability of ground movement **area** Kalirejo, Kokap, Kulon Progo, Yogyakarta, of these studies found a map....." area or areas? Please reformulate it. - In page 2 "The condition of the building which is called safe has a percentage of 70-100% condition, the condition of the building which is called unsafe has a percentage of condition 40-69%, and the condition of the building which is called unsafe has a percentage of condition of 0-39% (Rüpke, Phipps Morgan, & Dixon, 2006). For each category, what do you mean by the expression “condition” after the percentage? The category unsafe was repeated two time, I think the first one is less safe. The same is in the last paragraph, page 4 before Table 1 "Building scores will be divided into three zones, namely zone 1 for safe buildings with a percentage of 70-100%, zone 2 for unsafe buildings with a percentage of 40-69% and zone 3 for unsafe buildings with a percentage of 0-39%."

Method	:	- Page 2. first paragraph, the sentences " In addition to Settlements, there is also an expansion of 57% in the slope 0º-15º (Prastowo, Trianda, & Novitasari, 2018). Please correct it to “In addition to settlements, there is also an expansion of 57% in the slope 0º-15º (Prastowo et al., 2018).” - Page 2. second paragraph, the sentences " On a simple building form, only check the "Yes" column if the building part is in accordance with the form or column "No" , if the building part does not exist as in the form, if the building has a part that matches the form but the size does not match then the bias can be filled at column "Less".” Could you illustrate samples of the used building forms? - There is no citation for Figure 1 in the text. If you cite it in page 3 in the sentence “The condition of the existing buildings surveyed looks like the picture 1.", please change picture 1 > Figure 1 and move the flowchart (Figure 1) after its citation in the section “RESULTS AND DISCUSSION" In the flowchart (Figure 1) building > buildings
Result and Discussion	:	1- In the legend of Figure 2 "Not Save" > Not safe. Please rewrite the categories as Not safe, moderately (or less safe), and safe

Conclusion	:	Please Rewrite it (You have to read many international papers)
References	:	references in the whole article needs careful attention. Examples: - The reference (Pirttijärvi, Zaher, & Korja, 2015), please cite it as (Pirttijärvi et al., 2015), because the authors are more than two. The same for the reference (Kasayanond, Umam, & Jermsittiparsert, 2019), please cite it as (Kasayanond et al., , 2019). - The reference (McNeill J. D. and Labson V. F, 1991), cite it as (McNeill and Labson, 1991), please use the family names (only) of the two authors. - Please consider these rules in the whole manuscript.
General Comment	:	
Please Rate the Following: (4=Excellent) (3=Good) (2=Fair) (1=Poor)		
Originality	:	3
Contribution to the Field	:	3
Technical Quality	:	2
Clarity of Presentation	:	2
Depth of Research	:	2
Recommendation: (Kindly Mark with an X)		
Accept as Is	:	
Requires Minor Corrections	:	
Requires Moderate Revision	:	x
Requires Major Revision	:	
Rejected	:	

Additional Comments

1. The manuscript needs carful English revision.
2. Keywords: Please modify "Land" to "landslides" or "ground movements".
3. The captions of Figures 2 &3 and Table 1 are short and relatively uninformative.
4. It is recommended adding a column “Number” to Table 2 is the left.

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Assalamualaikum wr wb

Acceptance Letter for the Manuscript ID #5190

Dear Sely Novita Sari

I would like to say Congratulation!
After going through a series of peer reviews and double blind reviews, I am pleased to inform you that your manuscript (5190) entitled "Rapid Visual Screening of Building for Potential Ground Movement in Kalirejo, Kulonprogo, Yogyakarta" is accepted. Your manuscript is scheduled to be published in Volume 9 Issue 1 of "Jurnal Ilmiah Pendidikan Fisika Al-Biruni".

Please send the receipt after payment. Furthermore, you are responsible for any error in the published paper due to your oversight. Thank you very much for submitting your article to "Jurnal Ilmiah Pendidikan Fisika Al-Biruni". We welcome your contributions in future.

Bandar Lampung, April 18, 2020
Editor In Chief JIPF Al-Biruni,

Antomi Saregar

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