Knowledge and participation of geography teachers toward flood disaster risk reduction in Sampang Indonesia

A K Putra*, Sumarmi, L Y Irawan, I Deffinika, A Fahmi, A Tanjung
Department Geography, Faculty of Social Science, Universitas Negeri Malang, Jalan Semarang 5, Malang, Indonesia
*alfyananda.fis@um.ac.id

Abstract. Floods occur in Sampang Indonesia every year, due to overflowing Kemuning rivers and rising sea levels during spring tide. The morphological conditions which are hills in the middle and syncline valleys in the south with trellis flow patterns with weak and resistant bedrock exacerbate Sampang conditions. This condition increases the threat of urban flooding and rob flooding. One of strategic effort is to know the characteristics and reduce the threat of flooding through Geography subjects in school. Geography teachers as responsible people, act as facilitators and informers who provide knowledge and shape students psychology about flood disasters. Knowledge and participation of geography teachers are very important in flood disaster risk reduction because the teachers are a source of knowledge that is trusted by students. This is a survey research with univariate and multivariate analysis using a quantitative descriptive approach (single frequency and crosstab). The researcher also used inferential analysis in the form of chi-squared to see the relationship of the variables of knowledge and teachers participation in Sampang District. The results of the study indicate that there is a relationship between teachers knowledge and participation in flood disaster risk reduction presented in the learning process. The analysis results show the probability value or Asymp Sig 0.034. so that the knowledge of the geography teachers is very influential.

1. Introduction
Indonesia is a tropical country in Southeast Asia with about 17,054 islands. The population of 270 Million souls, is the fourth most populous country in the world after China (1.4 Billion soul), India (1.36 Billion soul) and American (329 Million souls) [1]. Geologically, Indonesia passed two of Mediterranean Circum and the Pacific Circum. Indonesia exact position is at stake is the confluence of three plates to with Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate. The geological condition makes Indonesia is the country with subscription floods, volcanic eruptions, tsunamis, landslides, earthquakes, and drought.

Floods are an event that occurs every year in Indonesia and affects a large loss. Floods as the most dangerous and harmful natural disaster and compared with other countries, Indonesia is considerably more vulnerable to flooding disasters [2][3]. Floods, Water that OWS over river-bed levels and runs slowly on small areas or in vast regions usually periods of long duration (one or more days), compared with other countries, Indonesia is considerably more vulnerable to flooding disasters [4][5]. Indonesian flood disaster in the
2014–2018 period is likely to increase with the number of floods as much as 3,795 presented in figure 1.

![Indonesia Floods Data in 2014-2018 Period](image)

**Figure 1.** Data of Natural Disasters in Indonesia

Sampang is one of the cities in Indonesia that its development is in the floods. Morphological conditions which are a karst hill in the central and southern part of the basin syncline in the pattern of weak bedrock trellis flow and aggravate resistant Sampang. Sampang morphological condition resulted in a pattern which originally consequently became obsekuen, with the majority of the rivers leading to the south. This condition causes flooding every year in the Sampang. Flooding has been recognized as one of the worst disasters [6].

Type of floods in Sampang is a type of city flood or inundation, flood, and flooding. An urban flood can be categorized as flooding due to heavy rainfall, the flow is too high and flooding due to high tide [7]. Kemuning river flow is not able to accommodate the flow of water during rain upstream so that the surface Kemuning river to rise and overflow in the area around the river into urban flooding. Residential development along the river also reduces the ability of the river to store water and narrow the river bodies. Floods in the city will get worse if it coincides with a full moon that caused flooding.

Sampang floods cause material loss and non-material due to flooding occurred in the center of Sampang economy. The data loss due to flooding Sampang 2014-2018 period, with the details; 5 deaths, 145,787 displaced, 18 home destroyed, 22,141 house submerged, 19 school were destroyed and 6 mosque damaged [8]. One of the major factors for the rise in urban flood damages is simply the increasing number of population and assets that are physically exposed to floods in cities [9]. Sampang downtown has a high population density causes huge material losses. The risk of floods becomes more severe due to the high population density [10].

Potential losses caused by the flooding should be minimized by the great knowledge society to the dangers of the flood. The society should have a better understanding of the participation and knowledge of disaster risk reduction, and be able to evaluate the actions in disaster reduction would be useful to develop a disaster risk reduction policy strategically [11]. Many ways can be done to reduce the risk of flooding. Previous studies, has many review the effectiveness of disaster risk reduction by building flood embankments [12][13][14][15]. Some studies also assessed the level of community preparedness to face floods [16][17][18][19]. However, this paper gives a different perspective on disaster risk reduction, i.e. from the perspective of education with the knowledge and participation of the geography teachers. The important aspects of disaster mitigation efforts by knowing the knowledge and participation of the community before the disaster event [20].
Geography teachers are part of the community in a society that should have a great influence on the flood disaster risk reduction. Knowledge gives directions while the attitude always shows the positive and negative aspects [21]. Efforts to reduce risk needed support from human resources that have good knowledge about the disaster. Geography teachers' knowledge of hazards and vulnerabilities.

Disasters always synonymous with adverse elements, but on the other side of a disaster actually, have a positive value when using the perspective of participation. Disaster can increase solidarity, social awareness and foster togetherness spontaneously and massively based on the basic values of humanity are universal. The positive thing of disaster gives meaning to the spirit of togetherness to get out of difficult circumstances (relisiensi). Ocular proof about the knowledge and participation of geography teachers can improve learners' knowledge and awareness about the risks of Sampang floods. Important for researchers to disclose their knowledge and geography teachers participation in disaster risk reduction Sampang floods.

2. Methods

This research is a survey study which lasted for one year to explore how science and participation of geography teachers in the effort to reduce flooding risk in Sampang. Survey research, independent and dependent variables are used to define the scope of the study, but can not be explicitly controlled by the researcher [22]. The analysis of data used univariate and multivariate quantitative descriptive approach to the singular frequency and crosstab. Multivariate logistic introduced by McCullagh and Nelder can be used to define a class of regression models, that is, in many applications, particularly subject relating suitable for the joint distribution of the responses to predictors [23].

This research also uses inferential analysis in the form of chi-square to see the relationship of variable geography teachers' knowledge and participation in disaster risk reduction Sampang flood. The level of significance of this study is set at $p < 0.05$. The analysis data using SPSS statistical software 20.0. version. Researchers also associate demographic factors and the experience of dealing with Sampang floods with knowledge and participation in disaster risk reduction.

Efforts to measure the level of knowledge and participation in disaster risk reduction, researchers deploy questionnaires and conduct in-depth interviews on the subject of research. All of the data collected in the process by providing a score on the answer to the guidelines of the Likert scale 1-4. The lowest score is 1, the medium score is 2, then 3-4 is high scores.
The research location took place in Sampang, East Java administration area. Sampang located at 1130 08' - 1130 39' East Longitude and 060 05' - 070 13' South Latitude with an area of 1233.30 km2 included 14 districts and 186 villages. The geographic location of the study area (indicated by the red box). This study focuses on the reduction of the risk of flooding South Sampang, Madura, Indonesia (SRTM elevation data) it shows in figure 2. Topographically, the slope of the slope Sampang between 0% - > 40%. The following description lerang Sampang slope; (1) The slope of 0-2% (area 17 130.26 ha or 54.70%), (2) The slope of 2-15% (an area of 12 965.62 ha or 41.41%), (4) The slope of 15-40% (765.12 ha area or 2.44 %) and (4) The slope of > 40% (area 453.00 ha or 1.45%), 3D maps of the study area (sentinel) see figure 3.

Figure 2. Topographic maps of Sampang in 2D

Figure 3. Sampang Map in 3D DEM
3. Results and Discussion

3.1. Socio-demographic Research Subjects
Based on results obtained 57 respondents participated in filling out the questionnaire in this study. Respondents in this study is a Geography teacher. The following table 1 illustrates the respondent's socio-demographic conditions.

| Table 1. Socio-demographic characteristics respondents |
|-----------------------------|------------------|
| Ratio of Male and Female    | 1: 0.9           |
| Age Average                 | 43 Years         |
| Gender                      |                  |
| Man                         | 30               |
| Woman                       | 27               |
| Level of education          |                  |
| Bachelor                    | 45               |
| Master                      | 12               |
| Clan                        |                  |
| Madura                      | 52               |
| Java                        | 5                |

The comparison of male respondents with women is 1: 0.9 which means 30 men and 27 women. The average age of the respondents is 43 years with as many as 45 teachers bachelor and master as many as 12 teachers. The background of ethnicity, the majority of respondents are of the clan and other clans Madura Java.

3.2. Socio-demographic factors influence the Geography Teachers Knowledge and Participation in Flood Disaster Risk Reduction Sampang
Socio-demographic factors (race, education, and gender) and the experience of dealing with disasters (experience of dealing with catastrophic floods), was analyzed using logistic regression. Logistic regression is useful to predict the presence or absence of a characteristic or outcome based on the values of predictive variables [24]. Purpose of analyzing socio-demographic by logistic regression in the study of disaster risk reduction Sampang flood which calculates the probability of respondents outside of respondents are already set, to see which factors govern reduction in the risk of flooding and find the most appropriate model to describe the relationship between the presence or absence of flooding through the dependent variable (participation) and a set of independent parameters (socio-demographic). The data is processed by using logistic regression, the results presented in table 2.

The influence of socio-demographic factors on the teachers' knowledge is measured using logistic regression. Socio-demographic factors that have the most impact which is a variable rate of 22.64, followed by the education variable 1.02 and 0.38 gender. The value of the coefficient of determination in the logistic regression model indicated Nagelkerke R Square grade. The table above shows that the Nagelkerke R Square grade of 0.382 and Cox & Snell R square of 0.256, which means that the independent variables (socio-demographic) in explaining the dependent variables (knowledge) of 0.382 or 38.2%.
Nagelkerke R Square grade provides that as whole socio-demographic factors accounted for 38.2% of 100%. There is 62.2% influenced by other variables outside the research related to the geography teachers' knowledge in reducing the risk of Sampang floods. Another factor that can influence the respondent's knowledge can be a state of the cultural, economic and information that was made by the respondent. Combining the knowledge context of cultural influences on hazards, vulnerabilities and disaster risks [25][26]. From the data processing obtained logistic regression models.

The regression models as follows:

\[
\text{Constant} + Y = X_1 + X_2 + X_3 \\
Y = -44.34 + 22.64 + 1.02 + 0.28
\]

3.3. Socio-Demographic Influence Of Geography Teachers Participation Rate

Subsequent analysis was conducted to see the effect of socio-demographic against the participation of teachers in Sampang flood disaster risk reduction. The table according to variables in the equation, socio-demographic variables that influence greatly to the variable geography teachers participation rates by 2.68, variable 1.36 and sex education for 0.96. Results illustrating that the factor of the ethnic background of the respondents also affects the participation of teachers of geography. The majority of respondents came from Madura clan, which is native clan Sampang Madura. The education level of the respondent (bachelor or master) the effect is not at a variable rate. Logistic regression model of the variable participation to the socio-demographic variables as follows:

\[
\text{Constant} + Y = X_1 + X_2 + X_3 \\
Y = -4.14 + 2.68 + 1.36 + 0.96
\]

Note:
X1 = Clan
X2 = Education
X3 = Gender
Table 3. Factors of Socio-Demographic Regression Toward Participation Level of Geography Teachers

| Variables in the Equation | B       | SE       | Wald    | Df | Sig.    |
|---------------------------|---------|----------|---------|----|---------|
| Clan                      | 2.682760442 | 1.21684201 | 4.860662 | 1  | 0.027476 |
| Education                 | 1.360618683 | 1.11906671 | 1.478294 | 1  | 0.224042 |
| Gender                    | -0.968237685 | 0.694649908 | 1.942817 | 1  | 0.163363 |
| Constant                  | -4.140887827 | 2.568391237 | 2.599349 | 1  | 0.106908 |

Model Summary

| Step | -2 log likelihood | Cox & Snell R Square | Nagelkelker R Square |
|------|-------------------|----------------------|----------------------|
| 1    | 54.82782621       | 0.173682806          | 0.254                |

When viewed as a whole, socio-demographic variables have contributed 25.4% to the geography teachers' participation in the flood disaster risk reduction. 74.6% means that there are factors beyond the socio-demographic variables that researchers are using that influence the participation of teachers of geography. Another factor that can influence the form of internal and external factors. The internal factors may be the attitude and motivation of the respondents in the participation of the flood disaster risk reduction. Meanwhile, external factors may include the opportunity and willingness to encourage respondents to be actively involved in activities that are available in the environment [26][27]. The extent to which a person is determined by the individual psychologist. Geography teachers encouragement of the participation of disaster risk disaster reduction depends on the expectation of the creation of these objectives.

3.4. Knowledge Level of Geography Teachers on Sampang Flood Disaster

The knowledge level of the geography teachers is the result of a questionnaire filled out by the respondents regarding the teachers’ knowledge of the geography of the Sampang floods. Researchers divided two categories of knowledge, the knowledge of the natural disasters in general and knowledge of Sampang floods. Knowledge level of geography teachers about natural disasters, the question in this category include the concept of disaster, types of disasters, disasters potential, hazards, and preparedness. The knowledge level of the respondents presented in figure 4.
Factors that affect the knowledge level of geography teachers. the factors meant that; the level of education, type of job, easy access to information about the disaster, and most respondents were able to interpret the disaster as a medium of learning to take the wisdom and draw closer to God. The factors severally considered to have the same contribution, the absence of a method that can be maintained [28]. The researcher feels this is the best choices to do. Knowledge is a process in shaping a person's actions (overt behavior), built progressively starting from the know, understand, practice (use), lays (analysis), and being able to evaluate. Knowledge about the natural disaster is already showing good results. Presented from the diagram above, 37 percent of respondents have great knowledge, while respondents who have great knowledge of 46 percent. So if totaled 83 percent of respondents have grat knowledge about natural disasters. Professional teachers learn continuously to improve the quality of learning and the material delivered to students.

Generally, the level of knowledge about the geography teachers Sampang flood into the high category. Presented by 24 percent with very high category, 53 percent high, 14 percent
The knowledge level includes knowledge about the level of disaster risk, disaster vulnerability, and disaster capacity. Knowledge is required in decision-making [29]. Teachers must reflect on learning, then improve and improve their abilities so that learning is better, so as to provide meaningful lesson learned for students. The great level of knowledge of the geography teachers, be a good capital to improve the state of the next generation.

The teachers’ knowledge about disaster risks, including knowledge of the potential loss of material (damaged home, infrastructure, educational facilities and houses of worship) and non-material (casualty, traumatic, disease) in a vulnerable time, given the flood, occurred in Sampang downtown. Disaster risk arises because there is uncertainty, failure to manage disaster risks resulting in serious consequences for society [30]. Management of disaster risk guided (prevention, preparedness, and mitigation) and action in providing assistance and solidarity and development (reconstruction) [31]. The great knowledge of geography teachers on the risks of floods, easy for students to multiply the risks faced during floods and able to evaluate and measure the level of risk so that losses can be reduced significantly.

The results of the questionnaire and interview gained an average of correct answers by 85 percent of respondents correctly. The results can describe if geography teachers have good knowledge about the risk of flood. Table 4 presented knowledge of geography teachers about Sampang flooding risk.

| Question theme | Percentage of Correct Answers |
|----------------|--------------------------------|
| Can you mention the losses caused Sampang floods? | 92% |
| Can you sever material and non-material losses from Sampang floods? | 86% |
| Can you mentioned, outbreaks of disease caused post-Sampang floods? | 87% |
| Can you explain the disasters are activities that disrupt public? | 85% |
| Can you mentioned the risk of Sampang floods element? | 84% |

The knowledge of geography teachers of the vulnerability of Sampang flood measured by questions about the vulnerability of the environmental, economic, social, cultural and physical so that they can adapt to the disaster. Spotlighted the vulnerability as the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt [32]. The results of questionnaires in the analysis of the knowledge level about the vulnerability, the researchers also conducted in-depth interviews to explore the geography teachers knowledge associated with knowledge locations that are vulnerable to flooding. See Table 5.

| Question theme | Percentage of Correct Answers |
|----------------|--------------------------------|
| Can you mention the potential for disaster in Sampang? | 89% |
| What Potential disaster most threatened Sampang communities? | 93% |
| Can you mention any location that is prone to floods? | 87% |
| Any location that has a high population density? | 83% |
Knowledge of geography teachers about the capacity of disaster resilience is measured by summarizing the questions specifically. The questions include knowledge about mitigation, preparedness, survival, and knowledge of local government efforts to take action to reduce risk and losses. Researchers prepare questions by considering the field conditions, where all questions tailored to the flood disaster Sampang. Disaster resilience capacity comes from preparedness and environmental conditions [33].

In case geography teachers have prepared for and recognize good environmental conditions, be authorized in a flood disaster risk reduction. Rate disaster resilience as a way to understand the changing environment and uncertain, as well as a decision support tool to manage how people live in an environment that is changing and uncertain [20]. The assessment of resilience is only one part of the field of disaster resilience broader and more research is needed in many fields. The assessment summarizes the status of disaster resilience geography teachers. see table 6.

### Table 6. Knowledge of Geography Teachers about the Capacity for Disaster

| Question theme                                                                 | Percentage of Correct Answers |
|--------------------------------------------------------------------------------|-------------------------------|
| Can you explain the flood disaster mitigation in Sampang?                      | 82%                           |
| Can you explain the disaster mitigates cyclical, disaster management activities can be divided into four categories? | 70%                           |
| Can you mention the two types of mitigation?                                   | 86%                           |
| If you were affected by Sampang floods, how do you survive?                   | 84%                           |
| Can you explain what to do before the floods?                                 | 89%                           |
| Can you explained what to do during the floods?                               | 87%                           |
| Can you explained what to do after the floods?                                | 85%                           |
| Mention local government's efforts in reducing the threat of disaster?         | 97%                           |
| Whichever side to help you, if you are exposed to Sampang floods?             | 90%                           |

The translation of the knowledge level of geography teachers about disaster risk, disaster vulnerability and capacity to disasters gives importance to the reduced risk of Sampang floods. Limitations in the study, limited resources enabling field data taker intervention study design with pre-post evaluation study of the field. Second, the study of a single community may limit the generalizability of the findings, but the population geography teachers respondents indicate that sociodemographic characteristics will be different from other locations. The findings of this study can be considered as the improvement of policies and decision-making and develop disaster education based on local conditions. Barriers
in culture and language become another thing challenges but the support of experienced translators in this study has helped minimize limitations.

4. Conclusion
Indonesia is a tropical country that is geologically located between two circums with exact position between the three world plates. The geological condition makes Indonesia is the country with natural disaster subscriptions. Floods is one of the most natural disasters that contributes huge losses. Sampang is one of the cities in Indonesia that is development in the floodplain. Morphological conditions which are a karst hill in the central and southern part of the basin syncline in the pattern of weak bedrock trellis flow and aggravate resistant. Sampang morphological condition resulted in a pattern which originally consequently became obsekuen, with the majority of the rivers leading to the south. Sampang's flooding condition causes of river flow that is not able to accommodate water discharge during upstream rain, causes an increase in surface water and overflows. Floods in the city will get worse if it coincides with a full moon that caused flooding.

Sampang floods cause material and non-material losses because flooding occurs in the economic. The potential losse caused by this flood, should be minimized by a good understanding by the community of the dangers of the threat of flooding. Potential losses caused by the flooding should be minimized by the great knowledge society to the dangers of the flood. The society should have a better understanding of the participation and knowledge of disaster risk reduction, and be able to evaluate the actions in disaster reduction would be useful to develop a disaster risk reduction policy strategically. Geography teachers are part of the community in a society that should have a great influence on the flood disaster risk reduction. Knowledge gives directions while the attitude always shows the positive and negative aspects. The results of the elaboration on the knowledge level of geography teachers' about disaster risk fall into the high category so that it can be concluded that the geography teachers can contribute as the first agent besides the government to provide an understanding and public awareness about natural disaster mitigation and how to overcome it.

Acknowledgement
Researchers would like to thank Malang State University for providing research grants through the Center for Environmental Studies and Natural Disaster Management with sources of sources of non-tax state revenues (PNBP UM 2019).

References
[1] World Population Review, (2019). World Population by Country (Live). http://worldpopulationreview.com/. (Accessed on June 02, 2019).
[2] Dutta, D. and Herath, S. (2005). Trend of floods in Asia and flood risk management with integrated river basin approach in Proceeding of the 2nd International Conference of Asia-Pacific Hydrology and Water Resources Association, Singapore, 55–63, 2005.
[3] Balica, S. F., Douben, N., & Wright, N. G. (2009). Flood vulnerability indices at varying spatial scales. Water science and Technology, 60(10), 2571–2580.
[4] Tse, C. (2012). Do natural disasters lead to more migration? Evidence from Indonesia. Social science research network publication. http://ssrn. com/abstract, 1906556.
[5] Dutta, D., & Herath, S. (2004). Trend of floods in Asia and flood risk management with integrated river basin approach. In Proceedings of the 2nd international conference of Asia-Pacific hydrology and water resources Association, Singapore (Vol. 1, pp. 55–63).
[6] Few, R. (2006). Flood hazards, vulnerability, and risk reduction, in Few, R. and Mattheis, F. (Eds.), Flood Hazards and Health: Responding to Present and Future Risks, Earthscan, London, 8-27.

[7] Tingsanchali, T. (2012). Urban flood disaster management. Procedia engineering, 32, 25-37.

[8] Badan Penanggulangan Bencana Nasional (BNPB). (2019) Data Informasi Bencana Alam di Indonesia. http://dibi.bnpb.go.id/dibi/ (Accessed on June 17, 2019).

[9] Urban Flood Risk Management, a Tool for Integrated Flood Management. (2008). Associated Programme on Flood Management. APFM Technical Document No 11 Flood Management Tools Series.

[10] Neolaka, A. (2012). Flood disaster risk in Jakarta, Indonesia. WIT Transactions on Ecology and the Environment, 159, 107-118.

[11] Chan, E. Y. Y., Lam, H. C. Y., Chung, P. P. W., Huang, Z., Yung, T. K. C., Ling, K. W. K., ... & Chiu, C. P. (2018). Risk Perception and Knowledge in Fire Risk Reduction in a Dong Minority Rural Village in China: A Health-EDRM Education Intervention Study. International Journal of Disaster Risk Science, 9(3), 306-318.

[12] Lechowska, E. (2017). The Impact of Embankment Construction on Floodplain Land Use in the Context of its Influence on the Environment: a Case Study of Selected Cities in Poland. Polish Journal of Environmental Studies, 26(2).

[13] Bandyopadhyay, S., Ghosh, P. K., Jana, N. C., & Sinha, S. (2016). Probability of flooding and vulnerability assessment in the Ajay River, Eastern India: implications for mitigation. Environmental Earth Sciences, 75(7), 578.

[14] Devkota, L., Crosato, A., & Giri, S. (2012). Effect of the barrage and embankments on flooding and channel avulsion case study Koshi River, Nepal. Rural Infrastructure 3 (3), 124-132.(2012).

[15] Lambert, S., Gotteland, P., & Nicot, F. (2009). Experimental study of the impact response of geocells as components of rockfall protection embankments. Natural Hazards and Earth System Sciences, 9, p-459.

[16] Zein, M. (2010). A community-based approach to flood hazard and vulnerability assessment in flood prone areas:: A case study in Kelurahan Sewu Surakarta City Indonesia (Doctoral dissertation, Universitas Gadjah Mada).

[17] Scolobig, A., De Marchi, B., & Borga, M. (2012). The missing link between flood risk awareness and preparedness: findings from case studies in an Alpine Region. Natural Hazards, 63(2), 499-520.

[18] Coates, G., Hawe, G. I., McGuinness, M., Wright, N. G., Guan, D., Harries, T., & McEwen, L. (2013). A framework for organisational operational response and strategic decision making for long term flood preparedness in urban areas. WIT Transactions on the Built Environment, 133, 89-98.

[19] Adegoke, O. H., Odufuwa, B. O., & Jidebi, O. H. (2012). Building capabilities for flood disaster and hazard preparedness and risk reduction in Nigeria: need for spatial planning and land management. Journal of sustainable development in Africa, 14(1), 45-58.

[20] Marshall, G., Parsons, M., Glavac, S., Hastings, P., McGregor, J., McNeill, J., & Stayner. R. (2016). Top-down assessment of disaster resilience: A conceptual framework using coping and adaptive capacities. International Journal of Disaster Risk Reduction, 19, 1-11.

[21] Rahajeng, M. A., Hendrarto, B., & Purwanti, F. (2014). Pengetahuan, Persepsi Dan Partisipasi Masyarakat Dalam Konservasi Di Kawasan Cagar Alam Pulau Sempu Kabupaten Malang. Management of Aquatic Resources Journal, 3(4), 109-118.

[22] Marsden, P. V., & Wright, J. D. (Eds.). (2010). Handbook of survey research. Emerald Group Publishing.

[23] Glonek, G. F., & McCullagh, P. (1995). Multivariate logistic models. Journal of the Royal Statistical Society: Series B (Methodological), 57(3), 533-546.
[24] Lee, S. (2005). Application of logistic regression model and its validation for landslide susceptibility mapping using GIS and remote sensing data. International Journal of Remote Sensing, 26(7), 1477-1491.
[25] Oliver-Smith, A., & Hoffman, S. M. (Eds.). (1999). The angry earth: disaster in anthropological perspective. Psychology Press.
[26] Slamet, M. (2003). Membentuk Pola Perilaku Manusia Pembangunan. Bogor: IPB Press.
[27] Mardikanto, T., & Soebiato, P. (2013). Pemberdayaan Masyarakat dalam Perspektif Kebijakan Publik (2nd ed.). Bandung: Alfabeta.
[28] Cutter, S. L. (2003). The vulnerability of science and the science of vulnerability. Annals of the Association of American Geographers, 93(1), 1-12.
[29] Sitompul, O. S., & Nasution, M. K. M. (2006). Data dan pengetahuan: Suatu tinjauan. Al-Khawarizmi: Journal of Computer Science, 2(2), 1-11.
[30] Hanafi, Mamduh. (2014). Manajemen risiko. 1-40.
[31] Schipper, L., & Pelling, M. (2006). Disaster risk, climate change and international development: scope for, and challenges to, integration. Disasters, 30(1), 19-38.
[32] Adger, W. N. 2006 Vulnerability. Glob. Environ. Change 16, 268–28.
[33] Chen, S. C., Ferng, J. W., Wang, Y. T., Wu, T. Y., & Wang, J. J. (2008). Assessment of disaster resilience capacity of hillslope communities with high risk for geological hazards. Engineering geology, 98(3-4), 86-101.