ANALYSIS OF FACTORS CAUSING FLOODING IN PEOHO VILLAGE, WATUBANGGA DISTRICT, KOLAKA REGENCY

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Abstract

This study aims to analyze the factors causing flooding in Peoho Village, Watubangga District, Kolaka Regency. The type of research used in this study is descriptive research with qualitative and quantitative approaches. The data used in this study consists of rainfall data, soil type, slope gradient, land use, drainage system, flood control buildings and river conditions in Peoho Village. The data were collected using various methods including observation techniques, interviews, and documentation. Qualitative data were analyzed using qualitative data analysis according to Creswell. While quantitative data were analyzed using descriptive statistics. Based on the results of the study, the factors causing flooding in Peoho Village, Watubangga District, Kolaka Regency were caused by various factors, including moderate to high rainfall intensity. Another factor that causes flooding is the type of chromic latosol soil. This type of soil has a clay texture and small pores so that it quickly becomes saturated and water is difficult to absorb into the soil. The slope of the slope in Peoho Village which is dominated by flat and gentle slopes also contributes to the occurrence of flooding. Land use factors dominated by plantation land and a drainage system that does not function properly are also factors that cause flooding in Peoho Village.

Keywords: Analysis; Causative Factor; Flood; Peoho Village

A. Introduction

Floods are one of the hydrometeorological disasters that often hit various regions in Indonesia. Therefore, floods are not a new event in an area, especially during the rainy season (Yohana et al., 2017). This disaster can cause losses to the community (Suprapto et al., 2023). Floods can submerge people's settlements, and can even submerge people's agricultural land which can cause crop failure (Arrasyiida, 2023). Floods occur when the river body is no longer

able to accommodate the flow of water that occurs due to rainfall that falls on the earth's surface (Aryastana et. al., 2012). Floods are also caused by various other factors, such as the condition of the catchment area, duration and intensity of rainfall, land cover, topographic conditions, and drainage network capacity (Nurhadi, et. al., 2016), as well as soil infiltration (Awaliyah et al., 2020). In addition, the pressure of population growth can cause environmental damage which has an impact on the threat of flooding (Afrianto, et. al., 2015).

Kolaka Regency, which is one of the regencies in Southeast Sulawesi Province, is not free from flood disasters. Based on the Indonesian Disaster Information Data (DIBI), there were 44 disasters in Kolaka Regency (Triani & Mehora, 2023). These disasters occurred in the period from 2010 to 2021. One of the disasters that often occur is flooding. This disaster occurred in various areas in Kolaka Regency, including in Peoho Village, Watubangga District.

Peoho Village is one of the villages in Watubangga District which is a regular flood area when the rainy season hits the village. Flood disasters can cause social and economic impacts for the affected community (Welly, 2013; Santri, et. al., 2020). Based on information from residents of Peoho Village, the flood disaster began in 2021 which caused 103 houses to be submerged in water with a height of 30-50 cm. Meanwhile, the flood in 2022 caused several residents' houses to be submerged in floods, hampered community activities and also inundated several hectares of rice fields. Meanwhile, the impact of the flood in 2023 caused material losses of around IDR 10 million, around 10 hectares of rice fields were submerged in floods and 20 houses were damaged (https://www.antaranews.com, 2023). In 2024, flooding occurred in March and caused 70 hectares of rice fields, 100 housing units, and 50 hectares of gardens to be affected by flooding (https://kendariinfo.com, 2024).

Along with the increasing impact caused by the flood disaster in Peoho Village, Watubangga District, mitigation efforts are needed to reduce the risk of the disaster. According to Ani, et. al., (2020), flooding is a recurring natural phenomenon that is difficult to prevent but can be managed to reduce social and economic impacts. One of the efforts made is to conduct a study related to the factors causing the flood disaster in Peoho Village, Watubangga District. This is intended so that the mitigation efforts that will be implemented to reduce the risk or even prevent the occurrence of flood disasters can be more effective and efficient. Therefore, this study aims to analyze the factors causing flooding in Peoho Village, Watubangga District, Kolaka Regency.

Methodology

1. Research Design

The type of research used in this study is a descriptive research type. This method is intended to find knowledge or theory on research at a certain time by describing and presenting data in the field (Abdussamad, 2021). The approach used in this study is a qualitative and quantitative approach (mixed). The qualitative approach is carried out to gain an in-depth understanding of community behavior related to flooding, drainage systems, and soil types. While the quantitative approach is used to analyze numerical data such as rainfall, slope gradient, land use. This research was conducted in Peoho Village, Watubangga District, Kolaka Regency. The location of the research is presented in the Figure 1.

The data in this study consists of primary data and secondary data. Primary data in this study consists of the condition of flood control buildings (dams), drainage systems, and river conditions. While the secondary data used in this study consists of soil type maps, rainfall data, slope maps and land use maps. Specifically for rainfall, the data used is rainfall data from Watubangga District. This is because the available rainfall data is only sub-district data, while data in Peoho Village is not available. The data was collected using various methods, namely observation, interviews and documentation studies. Observation is one of the empirical scientific activities that is based on field facts and texts, through the experience of the five senses without using any manipulation (Hasanah, 2016). Furthermore, Interviews are a data collection technique by conducting questions and answers, either directly or indirectly face to face with the source of information (Rahmawati, et. al., 2024). The form of information obtained is expressed in writing, or recorded audio, visual or audio-visual. While the documentation technique is a data collection technique through existing written documents or notes (Tanjung, et. al., 2022). In implementing the documentation method, researchers prepare a list of documents such as soil type maps, slope maps, land use maps and village/district profiles. In detail, the research design is presented in the following flow diagram at Figure 2.
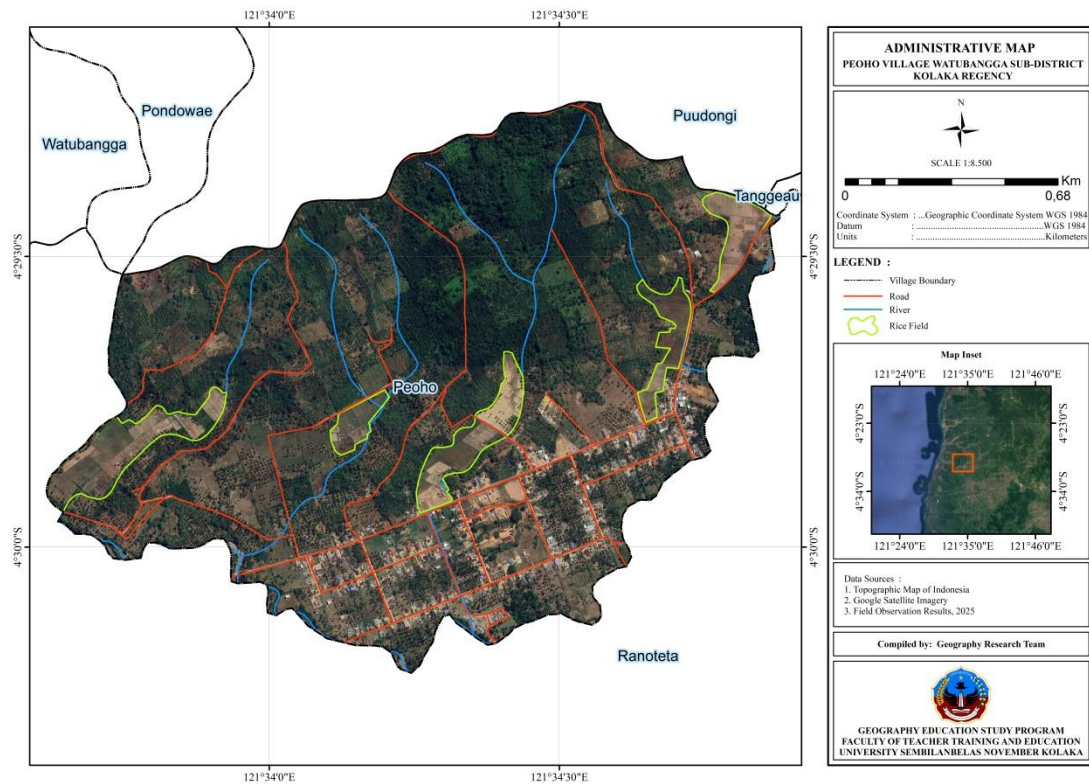
Figure 1. *Research Location Map*
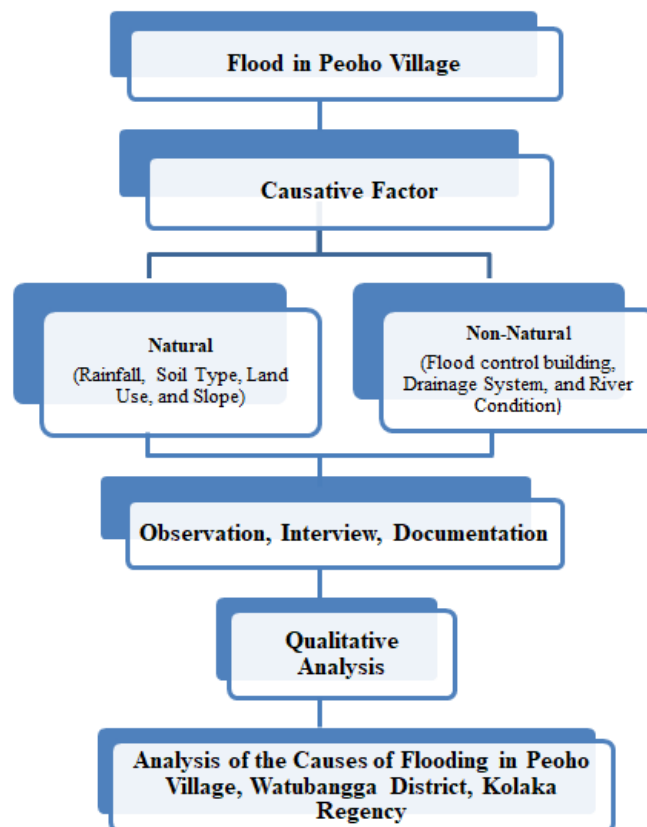
Figure 2. *Flow Diagram of Research Design*

2. Instruments

Research instruments are tools or facilities used by researchers in collecting data so that their work is easier and the results are better, more accurate, complete and systematic so that they are easier to process (Arikunto, 2019). Data collection of a study is carried out using various research methods such as observation and interviews. The instruments used in this study were observation sheets, interview guidelines and documentation lists.

3. Technique of Data Analysis

The data analysis techniques used in this study consist of qualitative data analysis techniques recommended by Creswell and descriptive statistical analysis. According to Creswell (Harianto, et. al., 2019), the steps in data analysis consist of: a) Preparing data (raw data, field data transcripts, images and so on); b) Processing and preparing data for analysis such as interview transcripts, sorting and organizing data according to information sources; c) Reading all data to capture the general idea of what is contained in the participation information; d) Analyzing in more detail by coding. Coding is the process of processing material or information into written segments before interpreting it; and e) Apply the coding process to describe the settings, categories and themes to be analyzed. The descriptive statistical analysis used in this study consists of maximum and minimum values.

C. Findings and Discussion

1. Findings

Based on the research results, the factors that caused the flood disaster in Peoho Village include rainfall, land use, slope, soil type, and drainage system.

a. Rainfall
    The rainfall in Peoho Village is generally the same as in Watubangga District, where has a varied average rainfall. In 2020, the highest rainfall occurred in May with a rainfall of 422.4 mm. In 2021 and 2022, the highest rainfall occurred in January (348.2 mm) and March (352.9 mm), respectively. While in 2023 the highest rainfall occurred in March with a rainfall of 301.9 mm. The detailed of rainfall data for the 2020-2023 period is presented in the following table.

Table 1. *The Rainfall data in Watubangga District for 2020-2023*

| No.	Month	Rainfall (mm)			
		2020	**2021**	**2022**	**2023**
1.	January	147.5	348.2	101.5	97.9
2.	February	266.4	123.5	299.3	128.8
3.	March	319.4	262.8	352.9	301.9
4.	April	118.8	82.2	306.9	150.1
5.	May	422.4	156.1	215.1	131.5
6.	June	134.3	136.2	201.7	261.1
7.	July	143.9	158.6	128.0	229.2
8.	August	78.6	239.1	254.6	5.6
9.	September	152.3	162.2	237.0	50.6
10.	October	165.8	223.9	306.0	57.9
11.	November	260.0	299.4	149.0	156.9
12.	December	278.2	207.3	171.8	180.5

Source: BPS Kolaka

b. Land use
    Land use in Peoho Village consists of plantations, bushes, settlements, rice fields, fields, vacant land and jungle. Based on research data, the largest type of land use is plantations with an area of 144.51 Ha. While the smallest type of land use is forest with an area of 0.3 Ha. The detailed of area of each type of land use in Peoho Village, Watubangga District is presented in table 2 and its distribution is presented in figure 3.

Table 2. *Type of Land Use in Peoho Village*

No.	Type of Land Use	Area (Ha)
1.	Settlement	16.96
2.	Rice Fields	25.05
3.	Fields	22.56
4.	Empty Land	5.81
5.	Bush	53.48
6.	Forest	0.30
7.	Plantation	144.51
	TOTAL	**268.67**
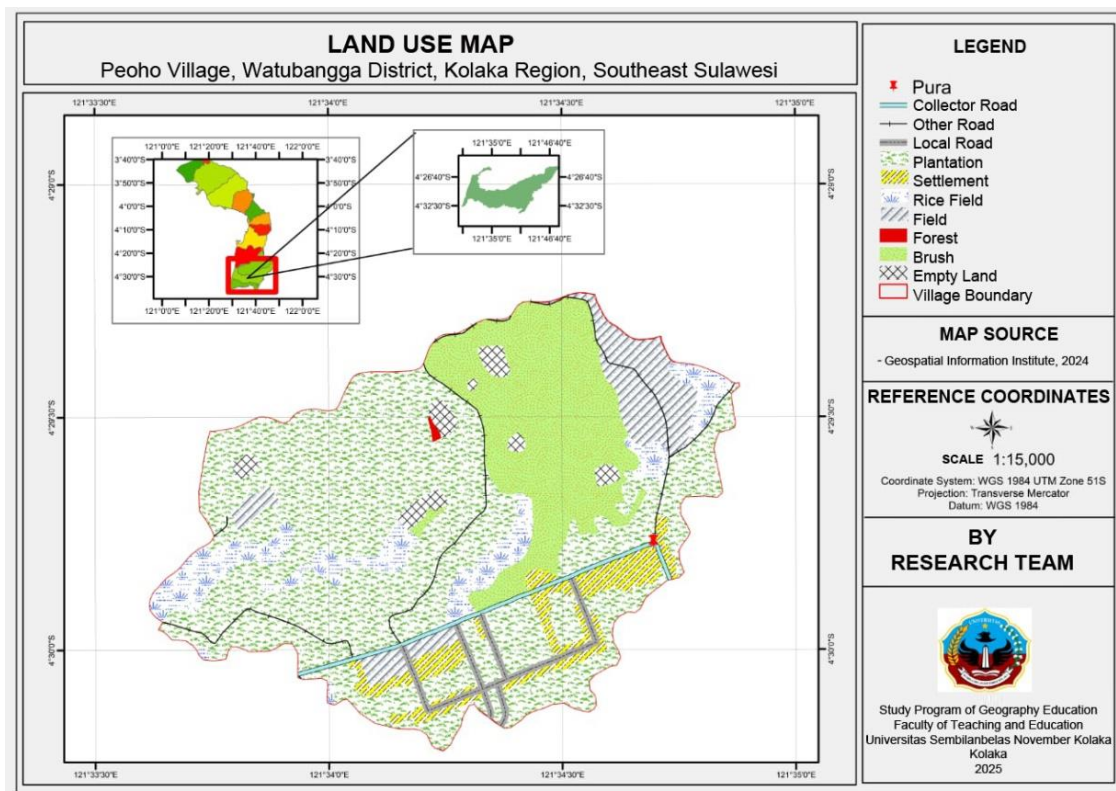
Figure 3. The Map of Land Use in Peoho Village, Watubangga District

c. Slope

Based on the research results, the slope gradient in Peoho Village, Watubangga District consists of 5 classes, namely flat (<8%), gentle (8% - 15%), rather steep (16% - 25%), steep (25% - 40%) and very steep (> 40%). The Peoho Village area is dominated by gentle and flat slopes, 102.23 Ha (38.05%) and 66.29 Ha (24.67%), respectively. Meanwhile, the area with a very steep slope class covers 29.36 Ha (10.9%). The area of Peoho Village based on the slope class is detail presented in the following table.

Table 3. Slope gradient classification in Peoho Village

No.	Slope Gradient	Area (Ha)
1.	Flat (<8%)	66.29
2.	Gentle (8%-15%)	102.23
3.	Rather steep (16%-25%)	34.80
4.	Steep (25%-40%)	35.99
5.	Very steep (>40%)	29.36
	TOTAL	**268.67**

d. Soil type

Based on the research results, the type of soil in Peoho Village, Watubangga District consists of one type of soil, namely Latosol Chromic (Lc78-3c). Latosol soil is formed due to high intensity weathering. The type of Latosol Cromic soil is soil that has a dark brown to red horizon. This type of soil has a loamy texture, with a clay content of <35%. The distribution of soil types in Peoho Village, Watubangga District is presented in Figure 4.
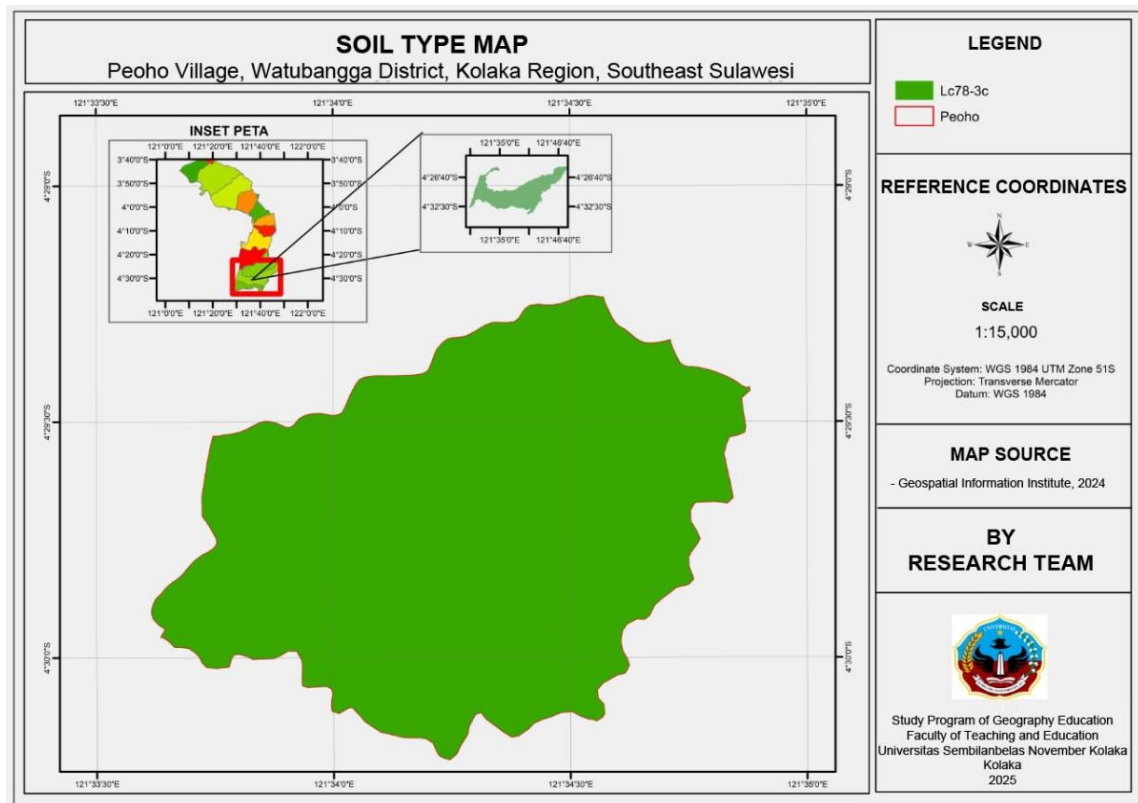
Figure 4. The Map of Soil Type in Peoho Village, Watubangga District

e. Flood Control Building

    Flood control structures are structures designed to reduce the impact of flooding, either by controlling the flow of water or by containing it. Based on the research results, the flood control structure in Peoho Village is a dam. The dam functions to contain water and release it in a controlled manner, so that it can reduce the volume of flooding downstream. In addition, the community uses the dam to irrigate rice fields. The dam in Peoho Village functions well in controlling flooding. However, when the rainfall intensity is high, the dam is unable to accommodate the water. As a result, the air will overflow and cause flooding. This condition is caused because the dam in Peoho Village has a relatively small capacity. The condition of the dam in Peoho Village, Watubangga District, Kolaka Regency is presented in the following figure.

Figure 5. The Dam of Peoho Village, Watubangga District

f.   Drainage system
     Based on the research results, Peoho Village has a drainage system as shown in the figure 6. Peoho Village has drainage channels on several roads. However, these channels do not function to drain water, they only collect the water. As a result, if there is heavy rain, the water collected in the channels will overflow and inundate the surrounding areas.

Figure 6. *The Drainage System of Peoho Village, Watubangga District*

g.   River Condition
     Based on the research results, the condition of the river in Peoho Village is very good. The river body looks clean from garbage or vegetation and there is no narrowing. Although there is sedimentation, the flow of water in the river also looks smooth without obstacles. The condition of the river in Peoho Village, Watubangga District is presented in Figure 7.

Figure 7. *The River Condition in of Peoho Village, Watubangga District*

2. Discussion

Based on the research results, the factors that caused the flood disaster in Peoho Village include rainfall, land use, slope, soil type, and drainage system. Based on the research results, the main factors causing flooding in Peoho Village, Watubangga District, Kolaka Regency are rainfall, soil type, slope, land use and drainage system. Based on the data in Table 1, the average rainfall in Peoho Village each month is classified as moderate to high. Moderate rainfall has an intensity of 100-300 mm/month, while high rainfall has an intensity of 300-500 mm/month

(Supriyati, et. al., 2018; Ruqoyah et. al., 2023). Moderate to high rainfall intensity can cause flooding (Seprianto, et. al., 2024). This condition occurs because the rainwater that falls does not enter the ground or is drained quickly through the drainage system, causing waterlogging and flooding.

One of the reasons why water does not easily seep into the soil is the type of soil. The type of soil in Peoho Village is dominated by chromic latosol soil. This type of soil is soil that is formed due to weathering that has a dark brown to red B horizon (Handayani, et al. 2018). Chromic latosol soil has good water absorption capacity because its soil pores are small. This soil has a clay structure and tends to have a low to moderate organic matter content (Saragi, et. al., 2023). Soil with a clay structure and low pores tends to become saturated quickly. This condition causes the soil to be unable to absorb much more water, resulting in puddles and flooding. The flood disaster in Peoho Village is also supported by the slope of the slope. Based on the data in table 3, more than 50% of the Peoho Village area has a flat and gentle slope. Flat and gentle slopes are prone to flooding (Dewangga, et. al., 2024). This is because flat and gentle slopes can slow down the flow of water so that it can increase the possibility of puddles or flooding. This condition is further exacerbated by the drainage system in Peoho Village not functioning properly to drain rainwater, which will cause flooding (Novrianti, 2017; Zulkarnaen, et. al., 2023).

Likewise, the type of land use in Peoho Village is dominated by plantation land, mainly oil palm plantations. These plantations tend to be clean from other vegetation so that surface flow in this area is higher. The higher the surface flow, the higher the river discharge will be. This condition can cause flooding if the river body is no longer able to accommodate water (Mahmud, et. al., 2021).

D. Conclusion

Based on the results and discussion, it can be concluded that flooding in Peoho Village, Watubangga District, Kolaka Regency is caused by several factors, namely rainfall, slope, soil type, land use and a drainage system that is not functioning properly. The higher the intensity of rainfall can cause the higher the potential for flooding. The potential for flooding will be even higher if the soil conditions are unable to drain water into the soil because it has a clay texture with small pores such as the type of latosol chromic soil in Peoho Village. If water is unable to seep into the soil, it will increase surface flow. Surface flow will be higher if vegetation on the surface of the soil is also reduced. This condition will cause the river body to fill up faster and can overflow into a flood. Likewise, the drainage system will accelerate flooding if it does not function properly to drain water.

E. References

Abdussamad, Z. (2021).Metode Penelitian Kualitatif. Makassar: Syakir Media Press.

Afrianto, Y., Marfai, M.A., & Hadi, M.P. (2015). Pemodelan Bahaya Banjir dan Analisis Risiko Banjir Studi Kasus: Kerusakan Tanggul Kanal Banjir Barat Jakarta Tahun 2013. Majalah Geografi Indonesia, 29(1), 95-110.

Arikunto, S. (2019). Prosedur Penelitian. Jakarta: Rineka cipta.

Ani, C.N., Ezeagu, C.A., Nwaiwu, N.K., & Ekenta, E.O. (2020). Analysis of Factor Influencing Flooding and Vulnerability Assesment of Awka and Its Environs. American Journal of Engineering Research, 9(5), 34-45.

Arrasyiida, R, A., & Dharmawan, A.H. (2023). Respon Rumah Tangga Petani terhadap Ancaman Perubahan Ekologi: Analisis Kelentingan dan Fungsi Ikatan Sosial. Jurnal Sains Komunikasi dan Pengembangan Masyarakat, 07(01), 86-102.

Aryastana, P., Tanaka, T., & Mahendra, M.S. (2012). Characteristic of Rainfall Pattern Before Flood Occur in Indonesia Based on Rainfall Data From GSMaP. Ecotrophic, 7(2), 100-110.

Awaliyah, N., Ariyaningsih, & Ghozali, A. (2020). Analisis Faktor yang Berpengaruh terhadap Terjaninya Banjir di DAS Ampal/Klandasan Besar dan Kesesuian Program dengan Faktor Penanganannya. Jurnal Penataan Ruang, 15(2), 57-70.

Dewangga, W., Linda, V., Ningtyas, M.L.R., & Safitri, D.A. (2024). Peta Kerawanan Banjir di Kabupaten Bandung. Jurnal Multimedia Dehasen, 3(2), 91-100.

Handayani, S., & Karnilawati. (2018). Karakterisasi dan Klasifikasi Tanah Ultisol di Kecamatan Indrajaya Kabupaten Pidie. Jurnal Ilmiah Pertanian, 14(2), 52-59.

Harianto, E., Nursalam, L.O., Ikhsan, F.A., Zakaria, Damhuri, & Sejati, A.E. (2019). The Compatibility Ofoutdoor Studyapplication Of Environmental Subjectusingpsychological

Theories Of Intelligence Andmeaningful Learning In Senior High School. Geosfera Indonesia, 4(2), 201-216.

Hasanah, H. (2016). Teknik-Teknik Observasi. Jurnal at-Taqaddum, 8(1), 21-46.

Mahmud, Wahyudi, Bataradewa, S., Budirianto, H.J., Mutakim, & Muhlis, L.O. (2021). The Relationship of Rainfall on Surface Runoff and Sediments on Various Land Use in Arui Watershet, Manikwari Regency. Jurnal Ilmu Tanah dan Lingkungan, 23(2), 85-92.

Novrianti. (2017). Pengaruh Drainase terhadap Lingkungan Jalan Mendawai dan sekitar Pasar Kahayan. Media Ilmiah Teknik Lingkungan, 2(1), 31-36.

Nurhadi, Sumunar, D.S.R., & Khotimah, N. (2016). The Vulnerability Analysis of Flood and Flood Disaster Management in Code Watershet, Yogyakarta. Jurnal Penelitian Saintek, 21(2), 75-86.

Rahmawati, A., Halimah, N., Karmawan, & Setiawan, A.A. (2024). Optimalisasi Teknik Wawancara dalam Penelitian Field Research Melalui Pelatihan Berbasis Participatory Action Research pada Mahasiswa Lapas Pemuda Kelas IIA Tangerang. Jurnal Abdimas Prakasa Dakara, 135-142.

Ruqoyah, R., Ruhiat, Y., & Saefullah, A. (2023). Analisis Klasifikasi Tipe Iklim dari Data Curah Hujan Menggunakan Metode Schmidt-Ferguson (Studi Kasus: Kabupaten Tangerang). Jurnal Teori dan Aplikasi Fisika, 11(01), 29-38.

Santri, Apriyanto, E., & Utama, S.P. (2020). Dampal Sosial Ekonomi dan Estimasi Kerugian Ekonomi Akibat Banjir di Kelurahan Rawa Makmur Kota Bengkulu. Naturalis-Jurnal Penelitian Pengelolaan Sumberdaya Alam dan Lingkungan. 9(2), 77-84.

Saragi, G.N., Andayani, N., & Noviana, G. (2023). Pengaruh Media Tanam dan Dosis Pupuk NP terhadap Pertumbuhan Bibit Kelapa Sawit (*Elaeis Guineensis Jacq*) pada Fase *Pre Nursery*. Agroforetech, 1(01), 147-151.

Seprianto, M., Anggo, M., Surdin, Harudu, L., & Aldiansyah, S. (2024). Pemetaan Daerah Potensi Rawan Banjir Menggunakan Metode Overlay. Jurnal Penelitian Pendidikan Geografi, 9(4), 214-226.

Suprapto, F,A., Juanda, B., Rustiadi, E., & Munibah, K. (2023). Kajian Kerawanan dan Kesiapsiagaan Kelembagaan dalam Penanganan Banjir di Kota Batu, Jawa Timur. Majalah Geografi Indonesia, 37(1), 48-58.

Suprirati, Tjahjono, B., & Effendy, S. (2018). Analysis of Rainfall Pattern for Lahar Mitigation at Sinabung Volcano. Jurnal Ilmu Tanah dan Lingkungan, 20(2), 95-100.

Tanjung, R., Supriani, Y., Mayasari, A., & Arifudin, O. (2022). Manajemen Mutu dalam Penyelenggaraan Pendidikan. Jurnal Pendidikan Glasser, 6(1), 29-36.

Triani & Mehora, S. (2023). Pemetaan Daerah Rawan Banjir Berbasis Sistem Informasi Geografis sebagai Upaya Antisipasi Bencana Banjir di Kecamatan Pomalaa. Saintifik, 9(1).

Welly, M. (2013). Dampak Banjir Way Kemiling dan Way Pemanggilan terhadap Sosial dan Ekonomi Masyarakat. Jurnal Rekayasa, 17(1), 23-38.

Yohana, C., Griandini, D., & Muzambeq, S. (2017). Penerapan Pembuatan Teknik Lubang Biopori Resapan sebagai Upaya Pengendali Banjir. Jurnal Pemberdayaan Masyarakat Madani, 1(2), 296-308.

Zulkarnaen, Purnama, A., & Arbensyah. (2023). Analisis Sistem Drainase di Desa Soriutu Kecamatan Manggelewa Kabupaten Dompu. Jurnal SaintekA, 4(1), 13-18.