PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 22 ISSUE 2 (2024), Page 503 – 516

EVALUATION OF THE READINESS OF THE KULON PROGO GEOHERITAGE IN SUPPORTING THE PROPOSAL OF YOGYAKARTA NATIONAL GEOPARK BASED ON SWOT ANALYSIS

Hita Pandita[1], Setyo Pambudi[2], Ignatius Adi Prabowo[3]

[1,2,3]*Department of Geological Engineering, Faculty of Mineral Technology,*
INSTITUT TEKNOLOGI NASIONAL YOGYAKARTA
[1]*Natural Research Disaster Centre,*
INSTITUT TEKNOLOGI NASIONAL YOGYAKARTA

Abstract

Since the establishment of 20 geological sites as Geoheritage sites in the Yogyakarta region, this has encouraged the Provincial Government's desire to form a national-scale Yogya Geopark area. The plan to form the Yogya Geopark area certainly requires an in-depth study so that the plan can be achieved. Of the twenty sites, 5 of them are in the Kulon Progo area. This study aims to find out how the conditions of the five geoheritage locations in Kulon Progo are, with the final result evaluating the readiness of the five locations in supporting the proposed Yogyakarta National Geopark area. The research method is in the form of field observations at the five locations. The results of the field data collection were then carried out by a SWOT analysis referring to the criteria from the Government. Of the five geosites in Kulon Progo, only two locations met the requirements, namely Mangan Kliripan-Karangsari and Kiskenda Cave. Hard and planned efforts are needed for structuring the geoheritage area in Kulon Progo so that it can support the Yogya Geopark proposal.

Keywords: Geoheritage, Geopark, Kulon Progo, SWOT, Yogyakarta

[1] Senior Lecturer at Institut Teknologi Nasional Yogyakarta. Email: hita@itny.ac.id

INTRODUCTION

The Special Region of Yogyakarta is an area that has quite interesting geological phenomena to study and research. One of the proofs is the stipulation of 20 Geoheritage sites in the Yogyakarta Region (Penetapan Warisan Geologi (Geoheritage) Daerah Istimewa Yogyakarta, 2021). The 20 geosite locations are 5 in Kulon Progo Regency, 7 in Sleman Regency, 3 in Bantul Regency and 5 in Gunungkidul Regency (Figure 1). Of the twenty geosites, 5 in Gunungkidul Regency have been designated as part of the Gunungsewu Geopark area which has been recognized by UNESCO.

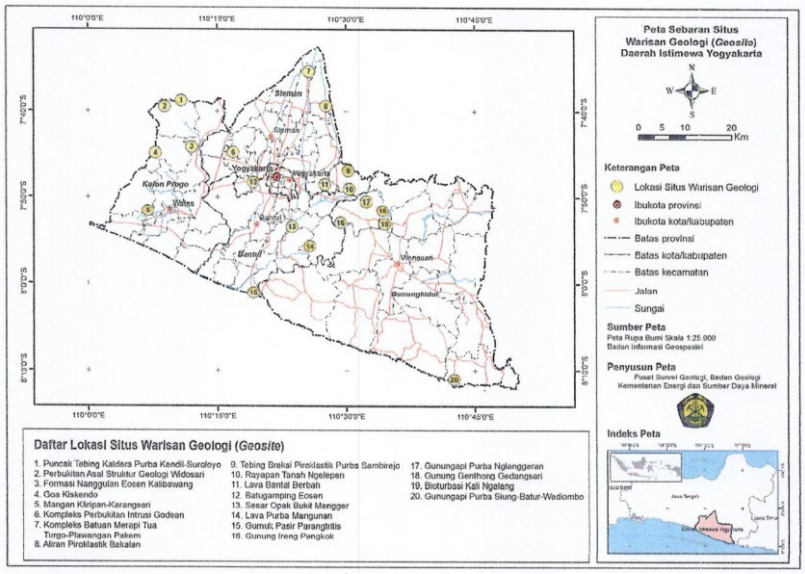

Figure 1: Locations designated as Geoheritage in Yogyakarta Special Region

Encouraged by the existence of the 20 Geoheritage sites, the government of Yogyakarta Special Region plans to turn the Yogyakarta area into a national-scale Geopark. The Yogya geopark area covers the areas of Sleman Regency, Kulon Progo Regency and Bantul Regency. In order for the Yogya Geopark proposal to be successful on a national scale, it is necessary to conduct a study of the geosite locations.

Some of these geosite locations have become locations for tourist visits, such as the Prambanan Breccia Cliff (Safira et al., 2023), Parangtritis Sand Dunes, and Pillow Lava (Prasetyadi, 2012). But not all locations become tourist destinations. The area that needs to be studied is the geosites in Kulon Progo. This is due to not being widely known by the public and not attracting high tourist interest (Pandita & Prabowo, 2022). Besides that, the geological phenomena that

developed in Kulon Progo are also interesting to study (Pandita & Hartono, 2019).

Understanding the need for support for each geosite in order to apply for a Yogya geopark, it is necessary to study the condition of the existing geosites in Kulon Progo. This research is aimed at finding out whether the condition of each geosite in Kulon Progo is in accordance with the needs of the Yogya geopark. This research is also intended to provide an overview of the extent of the need for geosite development in Kulon Progo.

LITERATURE REVIEW

Geopark based on Government Regulation No. 19 of 2019 is defined as a single or combined geographical area, which has a Geological Heritage Site (Geosite) and valuable natural landscapes, related to aspects of Geological Heritage (Geoheritage), Geological Diversity (Geodiversity), Biodiversity, and Cultural Diversity, and managed for the purposes of conservation, education, and community economic development in a sustainable manner with the active involvement of the community and local government, so that it can be used to foster public understanding and concern for the earth and the surrounding environment (Tentang Pengembangan Taman Bumi (Geopark), 2019). This regulation from the government is close to the provisions of Unesco which is also referred to by several countries (Aziz et al., 2011; Semeniuk, 1998).

Referring to the definition of the regulation above, an area can be determined to become a Geopark if it has Geoheritage, Geodiversity, Biodiversity and Cultural diversity. The existence of these sites and culture can be managed and developed for education, conservation and economic empowerment.

The existence of the geopark itself is very dependent on the existence of geoheritage and also strengthens the existence of other diversity fields (Norhayati et al., 2011). The meaning of geoheritage was first introduced by (Bradbury, 1993) that introduced Tasmania Geopark. In Indonesia, geoheritage and geopark research has been going on since 2012 (Prasetyadi, 2012), who proposed several geoheritage locations in the Yogyakarta area. Sahara & Setiawan (2022) conduct a geoheritage study in the Solok area and its surroundings and propose a quantitative analysis method to assess its feasibility.

The Indonesian government through the Geological Agency has also issued technical guidelines for the Geological Heritage Resource Assessment in 2017(Anonim, 2017). The technical guideline contains the requirements for a geological site to be recognized as a geoheritage.

Not much research has been done on geoheritage in the Kulon Progo area. This is because the echo of geoheritage only occurred after the establishment of several geosites in Kulon Progo in 2021. The research carried out so far has

focused more on geological conditions in general, such as those carried out by Harjanto (2011), Pandita and Hartono, (2019), and others.

PROBLEMS AND RESEARCH OBJECTIVES

This research is focused on determining the condition of the Kulon Progo geoheritage in its readiness as part of the Yogya geopark proposal. The issues that will be raised in this study are: 1) What is the condition of public facilities at the geosite location; 2) Availability of Geology information boards; and 3) What are scientific value of the Geosites. The purpose of this study was to determine the readiness of each Geoheritage location to support the Yogya Geopark proposal on a national scale.

Investigations were carried out on five geoheritage in the Kulon Progo area (Figure 2). The five geosites are:

i. The Ancient Caldera at Kendil-Suroloyo Peak
ii. the Widosari Structural remaining hill
iii. Kiskenda Cave
iv. Eosen Nanggulan Formation Kalibawang
v. Kliripan – Karangsari Mangan Mining

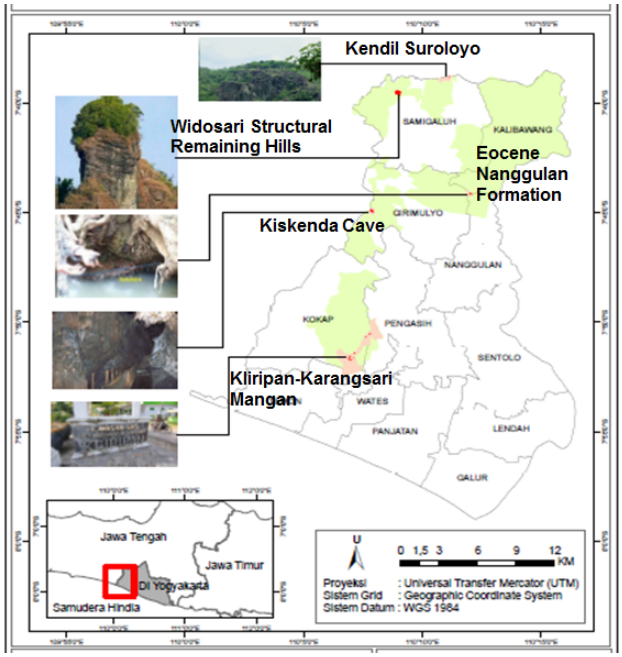

Figure 2: Location of the Kulon Progo Geoheritage

RESEARCH METHOD

Research methods include literature review, field investigation, geological analysis, SWOT analysis and synthesis (Figure 3).

The literature review was carried out in the form of searching for references related to geoheritage locations in Kulon Progo. The results of this study are to determine the extent to which research on geoheritage locations has been carried out, so that it can be seen how far the benefits of these geosites are supporting research and education. Apart from that, other aspects of research in other fields can also be known but are still related to geoheritage locations.

Field investigations were conducted to collect data, including: 1) the existence of public facilities, 2) information boards, 3) geological conditions, 4) socio-cultural conditions. In addition, if necessary, take rock samples for the purposes of geological analysis. It is hoped that the results of the field investigation will also provide an overview for spatial planning around the geosite.

Geological analysis was carried out to determine the rocks, stratigraphy, geological structure and environmental geology. The final result of the geological analysis determines the value of its geological uniqueness and the potential for environmental management.

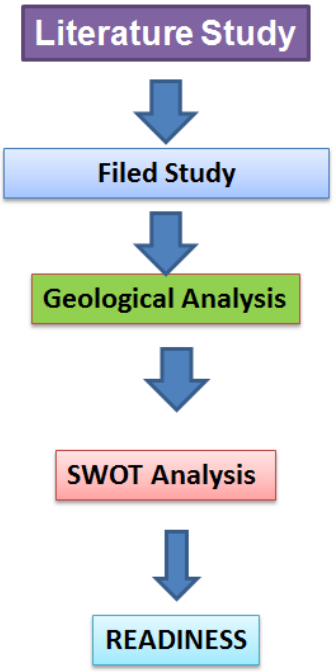

Figure 3: Research flowchart

SWOT analysis was conducted to determine the values of strengths, weaknesses/weaknesses, opportunities and challenges at each location. The final result of the analysis can identify the needs and level of readiness of each location.

RESULT

The results of field observations at the five Geoheritage locations in Kulon Progo Regency can be described as follows:

The Ancient Caldera at Kendil-Suroloyo

The peak of the Kendil-Suroloyo Ancient Caldera is located in the northern part of Kulon Progo district, bordering Magelang regency. Geologically, it is a cliff from the ancient caldera of Mount Menoreh. The incised volcano is thought to have formed approximately 12 million years ago (Widagdo, et al., 2019). The geological uniqueness of this location lies in the natural scenery that can be reached from the top of the cliff. Past volcanic processes are clearly well recorded. In the north of the cliff, the morphology of the dome is clearly visible, so it can be a good learning process (Figure 4).

The condition of facilities and infrastructure at the Kendil Peak location is still very minimal, but at the Suroloyo peak there are several public facilities. The condition of the access road to the location can be passed by mini bus vehicles with a passenger capacity of 15-25 passengers. However, the condition of the road is prone to landslides.

Figure 4: Natural Scenery at the Kendil-Suroloyo Peak

The socio-cultural conditions around Kendil-Suroloyo Peak are closely related to the name Suroloyo itself. The name Suroloyo is related to the palace where the gods live in wayang mythology. This place has also been used by the community for religious rituals, because there are offerings placed in one of the viewing posts. The placement of the Punokawan statues draws closer to the cultural meaning of wayang for this Puncak Kendil-Suroloyo site.

The Widosari Remaining Structural Hill

The structural hill landscape of Widosari is an isolated hill that is higher than its surroundings. This hill is bounded by vertical cliffs resulting from erosion of joint areas and faults (Figure 5). The Widosari Hills are the remnants of the rocks from the Menoreh ancient volcano. It is composed of closed packed breccia with intercalated tuff of gravel and layered sandstone. The upper part of the Widosari hill is composed of breccia and gravel. The rock position is estimated to be $N325^{O}E/25^{O}$. Regionally, this rock is included in the Old Andesite Formation group. Based on the variation of the rock that developed, it is possible that it is the proximal-medial part. This is based on the slope of the rock which tends to the southwest.

Conditions of facilities and infrastructure are available, but still minimal. Parking lots and access roads are still through private land owned by residents. The location can only be reached by private vehicle, because the road width is not sufficient + 3m.

The biodiversity of Widosari Hill is close to the Nglinggo tea plantation which has become a tourist destination, as well as other tourist locations. The viewing post facility on Widosari Hill offers quite a beautiful view, with cool air. The peak name Widosari has no special meaning. Widosari villagers also have the ability in culinary offerings in the form of Widosari Roasted Tea, Coffee, Enting-enting Ginger, Geblek, Palm Sugar.

Located near the Widosari Peak location is the village of Widosari which has various traditions. These cultures include dance, shadow puppets and the traditional arts of Bangilan and Lengger Tapeng. In addition, there are still Kenduri and Merti Desa traditions. In addition, there are handicrafts in the form of written batik, stamped batik, gradation batik, sandals made of corn chips, carved kentongan, wooden masks, and leather puppets.

Figure 5: Widosari Remaining Hill, Insert Photo saw a Fracture Deformation

Eocene Nanggulan Formation

Eocene rock outcrops on the island of Java are only found in four locations, namely in the Ciletuh, Karangsambung, Bayat and Nanggulan areas. (van Bemmelen, 1949), so the Nanggulan Formation which is located in the Kalibawang area is worthy of being a Geoheritage location. The Nanggulan Formation is composed of quartz sand, claystone, silt and coal (Figure 6A). This location is also one of the biostratigraphic Mollusk levels (van Bemmelen, 1949).

The location is along the Kali Songgo river's, with surrounding morphology in the form of rice fields. The river is frequently flooded and has a high erosion rate. Acsess to see the outcrop or geosite is still inadequate. It can only be traversed on foot. Public facilities are not specifically available. Near the location is ITNY's field campus, and it has often been the place for field lectures from various universities (Figure 6B).

Figure 6: A) Ones of Eocene Nanggulan outcrop at Kalisonggo river's; B) Field Camp of ITNY at Banjararum Village, near Eocene Nanggulan outcrop

Kiskenda Cave

Kiskenda Cave is a natural cave formed in a Karst landscape. This karst landscape results from the karstification process in the Jonggrangan Formation. The location of Jonggrangan Village and its surroundings is in a young karst stage, which is characterized by the formation of underground caves and rivers. The phenomenon of geological natural disasters that occur around the cave is an avalanche on the north side of the cave. The occurrence of this landslide indicates the potential for sink holes which are common in karst areas.

Figure 7: Facilities in Kiskenda Cave: A) Revitalization of the Amphitheater; B) Stairs into Cave.

The facilities available at this geoheritage location are quite complete, because they have been developed since 2005. Several facilities such as parking lots can accommodate small buses (15-25 passengers). In addition, there is an amphitheater which is used for Sugriwa-Subali ballet performances (7A). The

stairs and entrance to the cave have been repaired (B). The road to the location is adequate, although large buses (> 40 passengers) cannot pass due to the many uphill bends.

Mangan Kliripan-Karangsari

It is a former manganese mining location, in the form of underground mining. Based on the regional geological map, the former mining location is in the Sentolo Formation, which is in the form of clastic limestones. The presence of manganese in this formation is the result of a sedimentation process, and is found in the form of nodules and layers (Harjanto, 2021). The rock conditions found are layered limestone with moderately weathered conditions on the surface (Figure 8). The Sentolo Formation at this location has an unconformity overlying with the Old Andesite Formation.

The facilities available at this geoheritage location are complete, but currently several renovations have been carried out. The access road to several holes is still a dirt road that can be passed by private cars. Some of the remaining mining buildings can be reached by private vehicles, located near the main road.

SWOT ANALYSIS

Analysis was carried out on the results of identification of geological conditions and general conditions. The method used in the analysis of general conditions and strategic issues is SWOT analysis, namely: Strengths, Weaknesses, Opportunities and Threats.

Strengths

The five geoheritage locations each have different geological characteristics. Some of the strengths that can be relied upon in the development of geoheritage areas can be described as follows.

i. The Kliripan-Karangsari Manganese and Kiskenda Cave locations are Geoheritage locations that have been arranged and are supported by cultural diversity and biodiversity.
ii. Two locations are good for learning about mining-geology there are Eocene Nanggulan and Kliripan-Karangsari Mangan.
iii. Kendil-Suroloyo Peak and Widosari Structural Hill have very interesting views.

Weakness

The five geoheritage locations each have different problems for their development. Weaknesses recorded from field survey data and FGDs are as

follows. The access road to the location is one of the deficiencies in the four locations.

Figure 8: A) Location of the mining cave entrance being renovated; B) The outcrop condition of the Sentolo Formation is strongly weathered.

Four locations, except Kiskenda Cave, do not yet have adequate facilities, such as food kafe, toilets, parking lots and praying place.

Kiskenda Cave and Puncak Kendil-Suroloyo are directly adjacent to other districts. It needs cooperation between local governments for their development.

Except for Manganese Kliripan-Karangsari, the other four locations do not yet have information boards explaining their geological phenomena.

Opportunity

The five geoheritage locations have a number of opportunities to be developed in order to support the Yogya Geopark. Some of the opportunities that can be developed are as follows

i. The five locations have the same opportunities to become geotourism locations, both in terms of educational tourism or to enjoy the beauty of nature. In general, compared to one of the other geoheritage locations in DIY, such as the Breksi Cliff, the Kendil-Suralaya Peak, Kiskenda and Widosari Caves have more charm of natural beauty and also knowledge of geology.

ii. The Kulon Progo area has become an interesting location for learning the evolution of volcanoes and also field lectures. This condition allows geoheritage in Kulon Progo to be further developed into a natural laboratory or geopark. Several universities have made the geology of Kulon Progo a research and education object.

Threat

As a Geoheritage area, the main goal is to conserve the area. Threats to this conservation process are more in natural conditions and also in society

i. Natural disaster conditions such as landslides can occur at the five geoheritage locations.
ii. The threat of conflict of interest within the community, given the status of land ownership. So that the status of land ownership needs to be resolved before planning the development of the area is carried out.

DISCUSSION

Not all of the five Geoheritage areas in Kulon Progo are ready to support the Yogya Geopark. Only two locations have all the requirements to become geosites for the existence of a National Yogya Geopark. Therefore, it takes a lot of effort and a clear road map in structuring the Geoheritage area in Kulon Progo so that it can fully support the proposal to National Yogya Geopark.

Based on the SWOT analysis, it appears that there is a lot of added value that can be utilized by the existence of the Geoheritage site in Kulon Progo. As the main purpose of establishing a geoheritage area is to make the area protected, it is necessary to have a well-planned management. Currently, governance still overlaps between the Department of Tourism and the Office of Education and Culture.

Governance conditions that do not involve the community can be a separate obstacle. Therefore, it is necessary to realize community participation in the management of the Geoheritage area. This needs to be done because most of the land around the geoheritage area is owned by individuals and used as their livelihood. Location such as in Widosari where the entrance is through the residents' yard shows the need for cooperation between managers and residents. Until the FGD was held there was no agreement on the use of the land, this is a separate problem that must also be resolved.

CONCLUSION

Based on the results of direct observations in the field and SWOT analysis, several conclusions can be drawn. The five Geoheritage areas in Kulon Progo still need a lot of improvement so that they can support the existence of a national-scale Yogya geopark. However, in a short time, two locations were ready to become part of the Yogya geopark proposal. The two locations are Kiskenda Cave and Mangan Kliripan-Karangsari. The other three locations still require additional public facilities, ease of access to the location and improvements to geosite management. For this reason, cooperation between various parties such

as the Regency Government, Provincial Government, Universities and Tourism Stakeholders needs to be realised in the near future.

For future development, the study of the added value of the geology of this geological site needs to be deepened at each location. The study of the Nanggulan Formation needs to be deepened so that its added value as a geosite can truly be justified. Kendil-Suralaya Peak also requires detailed unique geological information that is easy for tourists to understand. This also applies to the other three locations so that geological values can be further displayed at each location.

ACKNOWLEDGMENTS

Acknowledgements are addressed to several parties who have assisted in this research. Special thanks to the head of the laboratory in the ITNY Faculty of Mineral Technology who allowed the use of laboratory facilities. This research can run because it received funding from the Yogyakarta National Institute of Technology in 2021. Thank you to the reviewer team and the Head of LPPMI for agreeing to fund this research.

REFERENCES

Anonim. (2017). *Petunjuk Teknis Asesmen Sumberdaya Warisan Geologi* (R. P. S. Geologi (ed.)). PSG Badan Geologi, Kementrian ESDM.

Aziz, S., Hashim, H. S., Unjah, T., Abdul Aziz, R., & Geraldine, C. K. (2011). Land Use Planning Statutes for Langkawi Geopark Conservation and Development. *Planning Malaysian*, *1* (Special), 83–102. https://doi.org///doi.org/10.21837/pm.v1i1.92

Bradbury, J. (1993). *A Preliminary Geoheritage Inventory of the Eastern Tasmania Terrane.*

Harjanto, A. (2011). Vulkanostratigrafi di daerah Kulon Progo dan sekitarnya, Daerah Istimewa Yogyakarta. *Jurnal Ilmiah MTG*, *4*(2).

Harjanto, A. (2021). Karakteristik Mangan (Mn) di Daerah Kliripan dan Sekitarnya, Desa Hargorejo, Kecamatan Kokap, Kabupaten Kulon Progo, Propinsi Daerah Istimewa Yogyakarta. *Jurnal Geosains Dan Teknologi*, *4*(1), 30–37. https://doi.org/https://doi.org/10.14710/jgt.4.1.2021.30-37

Penetapan Warisan Geologi (Geoheritage) Daerah Istimewa Yogyakarta, Pub. L. No. 13.K/HK 01/MEM. G/2021 (2021).

Norhayati, A., Chan, K. ., Daicius, B., Grismer, L. ., & Izzudin Mohd, A. (2011). Potential Biosites of Significant Importance in Langkawi Geopark: Terrestrial Vertebrate Fauna. *Planning Malaysian*, *1*(1), 103–110.

Pandita, H, & Prabowo, I. A. (2022). *Penyusunan Roadmap Pengelolaan Geoheritage Kabupaten Kulon Progo Tahun 2023 - 2027*.

Pandita, Hita, & Hartono, G. (2019). Identification and Stratiraphic Position of Mollusk Type Locality at West Progo Stage. *Journal of Geoscience, Engineering, Environment, and Technology*, *4*(2), 76.

https://doi.org/10.25299/jgeet.2019.4.2.2682

Tentang Pengembangan Taman Bumi (Geopark), Pub. L. No. No. 9 Tahun 2019, 22 (2019).

Prasetyadi, C. (2012). Exploring Jogja Geoheritage: The Lifetime of an Ancient Volcanic Arc of Java. *1st Earth Science International Seminar*, 387.

Safira, C., Indainanto, Y. I., & Nasution, F. A. (2023). Strategi Digital Marketing dalam Meningkatkan Kunjungan Wisatawan Objek Wisata Tebing Breksi Pasca Pandemi. *Journal of Business Administration (JBA): Entrepreneurship and Creative Industry*, *2*(1), 38–47.

Sahara, R., & Setiawan, B. (2022). Assessment of Geosite and Geomorphosite at South Solok Aspiring Geopark Area. *Journal of Geoscience, Engineering, Environment, and Technology*, *7*(3), 110–116.

Semeniuk, V. (1998). *Identifying sites of geoheritage in the region of the RFA (Regional Forest Agreement), Southwestern Australia a Discussion.*

Van Bemmelen, R. W. (1949). *The Geology of Indonesia* (1st ed.). The Hague Martinus Nijhoff.

Widagdo, A.; Pramumijoyo, S.; Agung Harijoko, A. (2019). Pengaruh Tektonik Kompresional Barat laut-Tenggara Terhadap Struktur Bidang Perlapisan, Kekar, Sesar Dan Lipatan Di Pegunungan Kulon Progo-Yogyakarta. *Jurnal Geosapta*, *5*(2), 81–91.

Received: 29th Feb 2024. Accepted: 8th May 2024