

Determination Of Geotourism Area Using Geographic Information System

Ketut Gunawan, Waterman Sulistyana Bargawa

Universitas Pembangunan Nasional Veteran Yogyakarta

^{a)} E-mail address: ketut.gunawan@upnyk.ac.id; ^{b)} E-mail address: waterman.sb@upnyk.ac.id

Abstract

The post-mining area in this study has the natural potential to become a tourism area in the form of pumice breccia outcrops. The problem is determining the zoning of tourism models. The purpose of this research is to identify the potential of the tourism area in the post-mining area, determine the feasibility parameters of the tourism model, and analyze the physical feasibility of utilizing the geotourism area. The research methodology includes a preliminary survey, mapping with drones, determining tourism feasibility parameters based on weight using the intersection method, social mapping, and determining the designation of the tourism model. The results of the study indicate that the potential of tourism includes natural phenomena in the form of geological structures, stratigraphy, topography, and rock types. This phenomenon has aspects of beauty, authenticity, scientific value, and uniqueness of nature (geology). Utilization of the tourism model requires a grand design for viewing posts, camping areas, open-air museums, gazebos, jogging tracks, hiking tracks, bicycle tracks.

Keywords: post-mining, geotourism, grand design, geology, community empowerment



This is an open access article under the CC-BY-NC license.

I. INTRODUCTION

Post-mining areas generally have steep slopes, morphology is less regular, and require land management. The area requires management so that it benefits local communities. The arrangement of the area requires spatial evaluation to create a zoning model for the tourism area (Rios *et al.*, 2020). Optimization of post-mining land management based on territorial aspects utilizing Geographical Information Systems (GIS). GIS is an appropriate tool to support the achievement of land management, namely efficiency, and equity in control, ownership, and use of land (Cope, 2016). The determination of the tourism zoning model requires weighting and scoring on the parameters for the overlay method. The purpose of this research is to identify the geotourism area, determine the model parameters, and analyze the utilization of the tourism area. This study develops a GIS application to determine a model of post-mining land use. The research area locates at Bukit Bucu, Bantul District, Special Region of Yogyakarta, Indonesia

II. LITERATURE REVIEW

Geotourism is a branch of tourism that is growing rapidly (Geert, 2019). Nature-based tourism motivates tourists to appreciate nature. Nature education and conservation can minimize the

negative impact of the environment on nature and socio-culture (Ross & Wall, 1999). Geotourism development generates economic benefits for local communities. The provision of tourism services increases local people's incomes and raises awareness of the conservation of

natural and cultural assets (Buckley, 1994; Chylińska, 2018; Lascuráin, 1996). Geotourism as sustainable tourism has economic, social, and environmental impacts, thus making an active contribution to the conservation of natural and cultural heritage (Niemiec, 2016. Kubalikova, 2013). The involvement of local communities in planning, implementation, development contributes to the welfare of the local community (Bargawa, 2014; Bargawa, 2012; and Bargawa, 2010).

III. RESEARCH METHODOLOGY

The method applied in this research is a weighting method on the concept of post-mining land use for the geotourism model. Whereas, field surveys to obtain topographic data using drones, and to obtain social data using the social map at Bukit Bucu area, Special Region of Yogyakarta Indonesia. Data processing use ArcGIS software for obtaining the method of determining the geotourism model uses weighting and scoring with the overlay method for all related sectors as determinants of the tourism model. Parameters in the overlay method are: (a) slope, (b) settlement, (c) morphology, (d) geological structure, (e) groundwater recharge, (f) soil type, (g), and (h) feasibility view. Geotourism area is determined based on weighting and scoring. The zoning is determined based on 8 (eight) parameters in the overlay method. There are 2 (two) parameters that have a weight value of 0.20 are settlement and groundwater recharge. The reason is that both parameters have a level of importance in utilization. While the other 6 (six) parameters have a weight value of 0.10 so that the total number of weightings is 1 (one).

Based on the 8 (eight) parameters used in the intersection method, there are parameters that have a maximum rating of 9910. These parameters have an absolute dominant factor. If the value is at the maximum rating, it will automatically be directed absolutely to enter the category of areas not suitable for geotourism. The five parameters with a maximum rating of 9910 are as follows: (a) If the location is in a residential area, (b) If the location is in a groundwater recharge area.

IV. FINDING AND DISCUSSION

IV.1 Zoning Determination

Based on zoning determination parameters in the development of post-mining areas, the zoning model of geotourism can be determined. Research locates at the Bukit Bucu Bantul District Special Region of Yogyakarta Indonesia. Figure 1 shows the morphology of the research area, resulting from the drone.

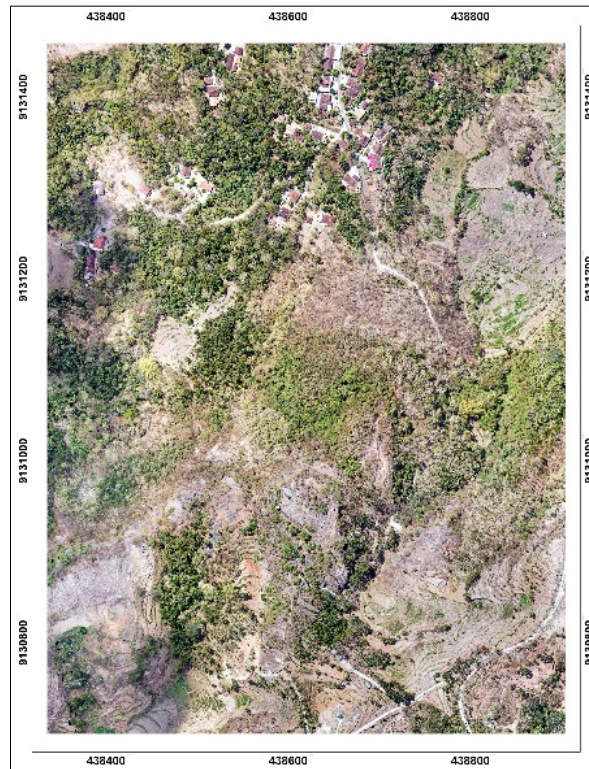


Figure 1. Morphology of research area

Based on the parameters for determining the zoning of geotourism potential, the zoning for the development of post-mining areas can be determined (not discussed in detail in this paper). Figure 2 shows the zoning model of geotourism at the Bukit Bucu Bantul District Special Region of Yogyakarta Indonesia.

IV.2 Area Analysis

Determination of several parameters and conditional consideration factors, it is determined that the zoning of the tourism area is as follows:

a. The factor of Natural Geotourism Area

An area that has the potential for the development and enrichment of geological science with a value range between 10 and 16. The composition of the pumice breccia in the Bukit Bucu area is the result of the development of a hilly system which is controlled by geological structures (fractures, layering, and tectonics), and climate. The existence of fault patterns in this area forms various dimensions of the rock blocks. Several periods of tectonic processes that have occurred in the past have identified the main fault structure in this area.

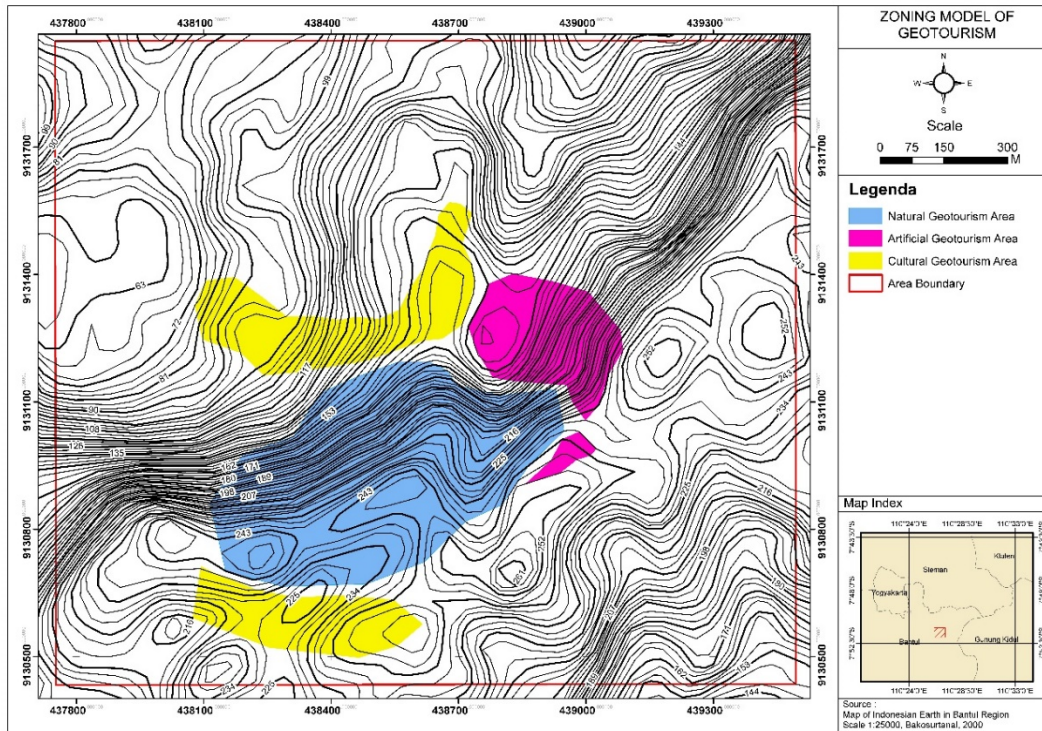


Figure 2. Zoning model of geotourism

b. Artificial Geotourism Area

The artificial tourism area is a development of natural artificial or man-made natural tourism to become a tourist attraction. Examples of artificial tourism such as playgrounds, and rice fields for farming. This artificial tourism area has a value range of 16–24.

c. Cultural Geotourism Area

The cultural tourism area is an area that is basically for activities related to the life of the local community. The use of local people's land consisting of annual crops, fields, and local cultural attractions is a source of economic income for the population. Cultural tourism areas can broaden one's view of life by studying the condition of the community, customs, culture, and local arts. Cultural diversity can be combined with the opportunity to participate in cultural activities, such as artistic exposition (dance, music, sound art) or historical activities, and so on. The range of values in the cultural tourism area is >24 .

d. Partnership

The development of tourism in Bukit Bucu requires cooperation between the Bantul Regency Government, Piyungan District, and the communities around the tourism object for mutual benefit. Tourism development in all activities and coordinated efforts to attract tourists, providing all necessary infrastructure and facilities, goods, and services to serve the needs of tourists.

Bantul Regency Government plays an important role. The development of tourism activities in the Bukit Bucu area includes broad aspects and is related to various aspects of community life, ranging from transportation activities, accommodation, tourist attractions, food and beverages, souvenirs, services, comfortable atmosphere, and others.

Piyungan District is a key factor in the development of tourism. The development of sites and destinations in Bukit Bucu as well as the empowerment of local communities has high tourism opportunities. Increasing tourist destinations on sites in this area require the construction of translation facilities and infrastructure, the arrangement of routes (tertiary access), development of health facilities and infrastructure, construction of culinary and souvenir facilities and infrastructure, construction of tourist information centers, provision of health facilities and infrastructure, local transportation, and provide tracking paths to Puncak Bucu and camping areas.

The local community in this area is also a key factor that must be involved in planning. The development of community-based tourism in the Bukit Bucu area has the potential to be realized with the support and active participation of the community. This community participation supports the sustainability of tourism objects. The integration of scientific, cultural, and tourism values from natural tourism products attracts tourists and investors to invest.

Another factor is education and training. In order to support the preservation of nature, the environment, disaster mitigation, and conservation of natural resources, various forms of geological information are required for the benefit of regional development in the research location. The tourism sector requires geological information to support the development of natural tourism or tourism. The increasing interest of tourists to return to nature shows a new paradigm of the tourism industry. This is shown by the emergence of tourists' awareness, appreciation, and appreciation of nature and the environment. The growing interest has opened up opportunities for the development of tourism geological resources.

The development of the tourism area adopts the concept of sustainable development. Based on the above discussion, field conditions and geotourism development prospects in this study must consider natural factors to maximize geotourism land use. Fairness and compensation as conditions for land acquisition are other aspects to be considered. Based on the above aspects, it becomes a program for geotourism land arrangements to support regional development and development that has environmental insight. Geotourism integrates geological and tourism natural phenomena so as to attract tourist visits. Tourists can visit the geotourism area, if supported by good facilities and infrastructure, including transportation. Friendliness to tourists is needed for the continuation of this geotourism. The most important thing in this management is the capital aspect. It is important because it is necessary to develop all aspects of tourism.

Figure 3 shows a map of the distribution of tourist locations in the Bukit Bucu.

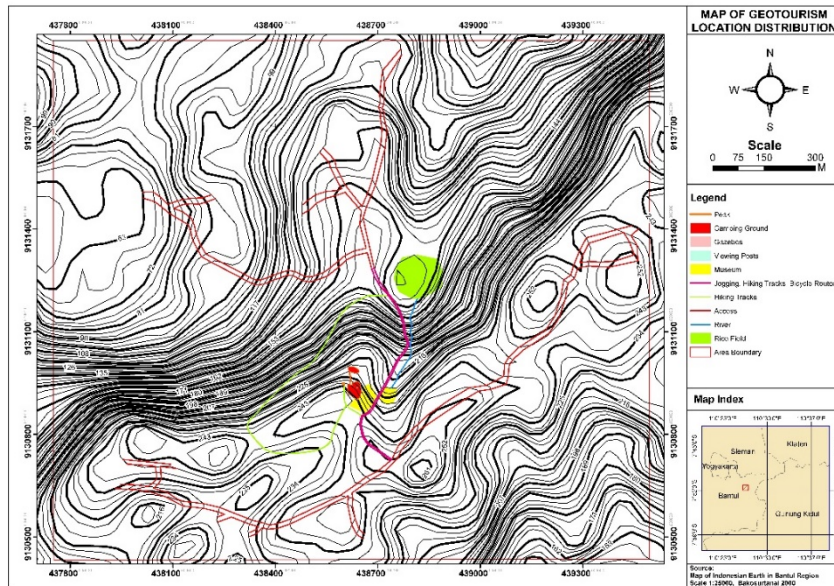


Figure 3. Map of Geotourism Location Distribution

Management of the geotourism area in the Bukit Bucu area as part of community resource development planning and community economic activities. Based on these tourism activities, the people in the Bukit Bucu area have abandoned the illegal exploitation of mining materials. The development of the tourism area has the potential of a survival strategy. Local people in the Bukit Bucu area create jobs to improve the family economy by utilizing tourism management. Figure 4 shows a map of village administrative boundaries at the geotourism location.

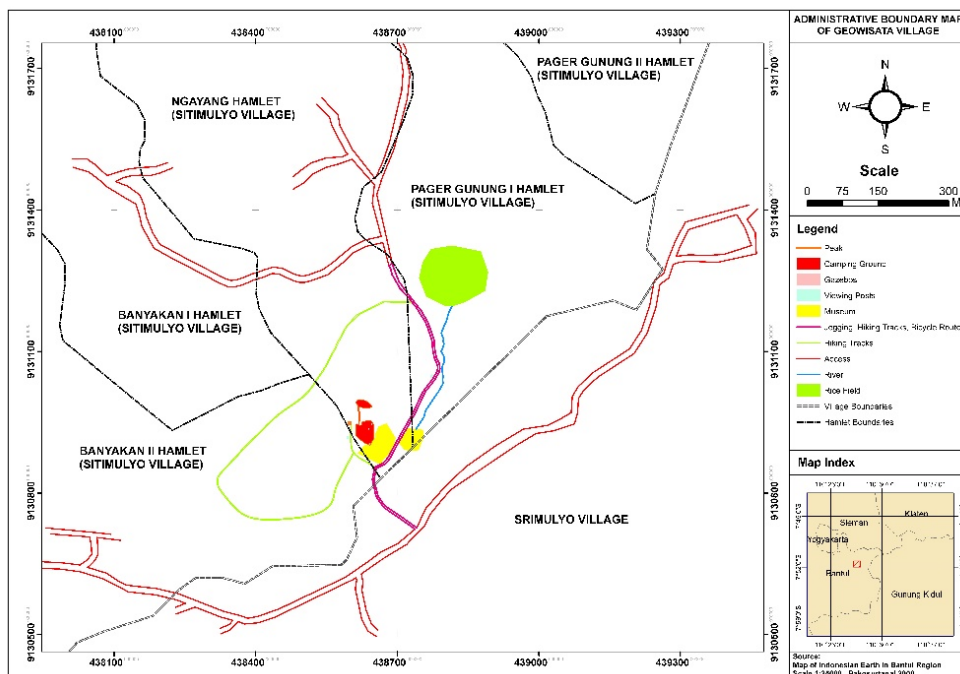


Figure 4. Administrative boundary map of Aerowisata village

V. CONCLUSION AND FURTHER RESEARCH

Based on the previous discussion, it can be concluded as follows:

1. The potential of Bukit Bucu Geotourism as a natural tourist attraction includes geological structures, stratigraphy, topography, rocks, and natural landscapes. The potential benefits of Bukit Bucu tourism are aspects of information and enrichment of geological science, diversity of attractions in one area, beauty, authenticity, scientific value, and uniqueness of nature (geology), the existence of natural ecosystems and maintenance through tourism activities/management.
2. Regional planning for tourism includes open museums, camping areas, jogging tracks, hiking trails, bicycle paths, gazebos, and viewing posts.
Suggestions for further research are:
 1. The management of the Bukit Bucu area requires a grand design and the involvement of all parties, as a form of concern for the integrated management of the Bukit Bucu area for tourism development.
 2. The management of Bukit Bucu tourism requires promotions such as the creation of the Bukit Bucu tourism web, the latest information, and activities provided by visitors. Management of the social media aspects maximizes promotion to increase tourist attraction.
 3. Management of tourism zoning, for example, areas of rare flora and fauna, areas of geological phenomena, natural scenery of Bukit Bucu, which are regulated in the form of village regulations for the protection and sustainability of the potential development of the Bukit Bucu area in the future.

IV. REFERENCES

- Bargawa, W. S. 2014. "Kajian lingkungan hidup strategis sektor pertambangan". Prosiding Seminar Nasional Kebumihan 9: 1-13. eprints.upnyk.ac.id. (in Indonesia).
- Bargawa, W. S. and Wibowo, A. 2012. "Kontribusi pendapatan regional hijau dari industri pertambangan mineral terhadap pendapatan regional". JIK TekMin 23: 358-367. eprints.upnyk.ac.id. (in Indonesia).
- Bargawa, W. S. 2010 – "Model reklamasi pada lahan bekas penambangan bijih timah". JIK TekMin 24: 49-60. eprints.upnyk.ac.id. (in Indonesia).
- Buckley, R. 1994. "A Framework for ecotourism". *Annals of Tourism Research* 21: 661-669.
- Chylińska, D., and Kołodziejczyk, K. 2018. "Geotourism in an urban space?" *Open Geosciences* 10: 297–310
- Cope, M. A. 2016. "Derbyshire geodiversity, historical geotourism and the 'commercialization' of tourists: setting the context of the Castleton Blue John Stone industry." *Proceedings of the Geologists' Association* 127: 738-746.
- Geert, F. V. 2019. "The uses and challenges of the geopark label as a place branding tool. The case of the Geopark of the Tremp Basin-Montsec (Catalonia-Spain). *International Journal of Geoheritage and Parks* 7: 72-84
- Kulikova, L. 2013. "Geomorphosite Assessment for Geotourism Purposes". *Czech Journal of Tourism* 2: 80-103.
- Lascuráin, C. H. 1996. "Tourism, ecotourism, and protected areas: the state of nature-based tourism around the world and guidelines for its development". *IUCN Publications Cambridge* 4: 10-21.
- Niemiec, D., Duraj, M., Marschalko, M., and Işik Yilmaz, I. 2016. "Conservation of Selected Churches in the Most Region and Karviná Region and their Significance for Geotourism". *Procedia Engineering* 161: 2276-2281.
- Ríos, C. A., Amoroso, R., Villarreal, C. A. Mantilla, W., and Briggs, A. 2020. "Chicamocha Canyon Geopark project: A novel strategy for the socio-economic development of Santander (Colombia) through geo education, tourism, and conservation." *International Journal of*

Geoheritage and Parks 8: 96–122.
Ross and Wall, G. 1999. “Ecotourism: Towards congruence between theory and practice”. Tourism Management 20: 123-132.