



Kedungwinong Karst Mapping: Determining Tourism Locations and Their Preservation

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ABSTRACT

Improving the quality of Karst Kedungwinong sub-Karst Kendeng Mountains is necessary, as a nature scene that can be optimized into a tourist village that delivers unique and attractive attractions. This research discovers the spread of potential tourism associated with Karst conditions and co-conservation. As data providers for Karst and Kedungwinong Caves, these maps are needed to compile tourism, sports, and conservation packages. Tourist location survey research implements an integrated three-pillar blue economy development paradigm to drive economic growth in managing sustainable karst resources. The results of research conducted in Kedungwinong Village, Sukolilo Prefecture, Pati District, found 3 points of location of cliff climbing and nine caves that are potentially tourist locations. The location can be optimized by the residents to be further managed so that it becomes a tourist destination and positively impacts the community's economy.

1. INTRODUCTION

The village of Kedungwinong in the district of Pati Central Java is divided on the Karst Natural Area (KBAK) Sukolilo (Kristanto, 2021; Suwarti & Wikarno, 1992). Natural karst is formed by the dissolution of the deposits of carbonate rocks by groundwater streams. The condition caused a village of 7.52 square kilometers to have less fertile soil because of the main rocks that are caused by minerals dominated by calcium (Ca) and magnesium. (Mg). The inhabitants are engaged in farming with the pattern of corn - corn, although in some places that are relatively easy to get water are also engaged rice plants. Over the karst hills Kedungwinong are generally steep, there are dozens of cave and waterfalls with rivers that are right next to the road between the rivers easily accessible. The potential of the village can be optimized or revitalized into a tourist village (Alam et al., 2022; Tyas et al., 2016) or rural tourism, as part of the sustainable tourism development programme in the 2020-2024 JMR or rural tourism, as part of the sustainable tourism development programme in the 2020-2024 Middle-term development plan of the country (Armanto, 2023). A program that embodies the concepts of local wisdom and nature's peculiarities can provide visitors with a unique and exciting holiday experience. Thus potentially increasing the reception of local and community incomes. According to data from the Ministry of Internal Affairs (Kemendagri), Central Java is the province with the largest number of villages in Indonesia. It is recorded that there are 8,567 villages potentially to be developed on the basis of community empowerment.

The unique nature of the village, manifested in the form of karst rocks, became an attraction for beginners in the rock climbing sport. However, despite its great potential, the management of the area remains minimal. There is no routine or periodic timetable for maintenance and development, so users only have permission and pay local residents to visit and use the karst cliffs. Under such conditions, the revenue potential of this sports tourism is not reliable as a stable source of routine income.

Improving the quality of Karst Kedungwinong is necessary, as a cliff climbing tourist area that provides unique and attractive tourist attractions to visit, tourists can act as both benefactors and perpetrators (Paradana & Hamrun, 2021). Besides, meaning for the community needs to be realized, especially for the Community Youth Development, so that we can increase our pride in the Geological

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Heritage (Data, 2015; Hutomo et al., 2016) It needs to be preserved, given that karst is a reservoir of clean water and is able to absorb carbon, a carbon burden of 13,482 Giga grams per year, as well as stimulating the opening of jobs potentially stimulates the economic creativity of the people (BPS, 2022). As the 8th SDGs, decent jobs and economic growth, have expected the population of 43 million young people (2016), 25% not in education, employment, or training with the unemployment rate open to young people of 19.54%, or an increase to 68.82 million (Haryo Limanseto, 2022; Lesdiana & Hukom, 2023)

Studying these conditions, there needs to be an incentive to develop the Kedungwinong Karst Area as a tourist village through the revitalization of integrated planning and management based on empowerment of the community. This is what encourages the revitalization of Karst Kedungwinong as a tourist area combined with sustainable nature conservation to implement the green economy (Haryo Limanseto, 2022; Heni Noviarita, 2021; Sari et al., 2014) The area of the Northern Karst Mountains is currently managed independently by community youth development.

Developing Kedungwinong village in Sukolilo district, Pati district as a tourist destination has great potential for improving the well-being of local communities and preserving cultural heritage as well as the environment. The natural beauty and unique cultural heritage of this village can attract tourists, while the development of tourism will create new jobs and increase public income. In addition, investments in village infrastructure such as roads, public facilities, and health services will bring long-term benefits to the local population.

Tourism development also encourages efforts to preserve nature and culture, as well as empowering communities through community participation and educational programmes. With the right promotion, Kedungwinong Village can enhance the image of Pati District and Central Java Province, attracting more visitors to the area. Overall, the sustainable development of tourism in this village can have a broad positive impact on the economy, social, and environment.

The management of tourism potential in Kedungwinong Village, Sukolilo Prefecture, Pati District, is still not optimal. Although this village has a beautiful and unique karst formation, its potential has not been fully exploited to attract tourists. The lack of adequate infrastructure, effective promotion, and professional management are the main obstacles in the development of karst tourism in this village. Besides, there is no integrated conservation and education program to preserve the authenticity and sustainability of the karst area. With better planning and collaboration between the government, the community, and the private sector, the potential of karst tourism in Kedungwinong Village can be developed into an attractive and sustainable tourist destination.

The purpose of this research is to find out the potential spread of karst tourism in Kedungwinong village, Sukolilo district, Pati district. This research will identify and map the existing potential of karst tourism, as well as describe its conditions and characteristics. Using technologies like GPS, to get an accurate and comprehensive picture of potentially developing karst locations as tourist destinations. In addition, local community participation will be integrated to ensure that all possible undocumented karst sites can be identified. The results of this research are expected to be the basis for planning and managing sustainable karst tourism in Kedungwinong Village.

2. METHOD

Administratively located in Kedungwinong Village, Sukolilo Prefecture includes a mountainous unit in the southern part of Pati District, Central Java. Data collection techniques using surveys, karst morphology documentation, slope measurements, clinometers to measure and determine slope and cliff height levels, questionnaires, and open interviews (Akbar et al., 2022; Andrian et al., 2017; Sideng & Anggriani, 2018). Data analysis techniques include a combination of quantitative and qualitative analysis approaches with descriptive analysis methods. Based on the approach used, the observations were made with preliminary observations to see directly how the cliff conditions would be used as a cliff climbing tourist point. Then at the stage of the interview was conducted with dialogue with the carangtaruna in the village of Kedungwinong. This interview technique has become very substantial for digging into detailed information about the location of the cliffs that are usually used for beginner cliff climbing exercises. Further interviews using the Focus Group Discussion (FGD) technique against community youth development and the Indonesian Rock Climbing Forum (FPTI) of Kab Pati on the potential, helping and listening to the community's aspirations to find options for opportunities to be developed in Kedungwinong Village.

3. RESULT AND DISCUSSION

The potential of the countryside, such as natural landscapes, cultural wealth, and various handicrafts, has been an attraction for tourists all these years. By taking advantage of the characteristics of

the village, it can serve as an opportunity to provide various benefits to the rural area (Sufaidah et al., 2020). The development of the village is undertaken in the hope of yielding a number of benefits in both social and economic aspects (Andika & Subanu, 2023), such as creating jobs, providing business opportunities for local UMKMs, increasing the income of the surrounding population, and contributing to the Regional Natural Income (PAD) (Ruwanti & Nurhasanah, 2020).

Kedungwinong village is one of the villages in Pati district that has hidden potential. The potential is a karst hill or commonly referred to as the Karst Sukolilo Nature Reserve. The potential in Kedungwinong Village will be able to be one of the active income for small and medium-sized enterprises (UMKM) and local BUMDes when it can be managed well. Not only that, the culture that exists there such as the lolohan or sedekah bumi, pilgrimage journey sendo kentono, and the historical tourism such as batik madrim petilasan which is located in the complex of Kedungwinong Mosque also become the unique attraction of the village Kedungwinong. Increasing the role and contribution of a region towards national independence through the full exploitation of its potential is an important step in the efforts to empower a region (Affandy & Setiawan, 2016).

Rural tourism is expected to have characteristics of the village of Kedungwinong, such as a natural environment, clean and cool air, beautiful scenery, the presence of a variety of animals and plants, as well as the rural population and its culture, present a unique experience to tourists because of the experience that can not be obtained in the city. As time passed, the countryside gained a lot of attention as an attractive tourist destination (Andjanie et al., 2023). The villages have a variety of attractions and potential that can attract tourists, both from home and abroad (Putra & Fauzy, 2015). Based on the results of research carried out in Kedungwinong Village, Sukolilo district, Pati district found 3 rock climbing locations and 9 cave potentially tourist locations.

The cliff is a geographical feature in the form of a slope

The Selokaton slope located at the coordinates 110°54' 11.570" E and 6°56' 24.850" S which is a tourist destination for the lovers of climbing sports especially in the region of Sukolilo district of Pati (Destiasari, 2009). The characteristic of the cliff has an attractive view and has a very steep slope ranging from 750 to a height of 25 meters making it an interesting location as well as suitable for beginner climbers. The view of the cliff has some vegetation as well as the view of karst and some of its loose parts so that it can be a pillar and a grip in climbing. The natural sights around the cliffs surrounded by the plantation area as well as several rows of karst hills and dense tree areas add to the attractiveness of tourists in doing rock climbing. The trees around the cliffs and the hills are still awake, so that you can see some animals protected, like eagles and frogs (Alafiyah, 2022; Tamasuki et al., 2015)

Access to the cliffs is easy and not too far from the highway so visitors can reach the cliff by just a 10-minute walk from the parking area. The cliff area that has the same route as Cave Pawon and the nearby location adds to the interest of visitors (Rahmayani et al., 2022) to be able to visit both areas in one trip.



Figure 1. Selokaton slope (Source: Primary data, 2023)

Inadequate management makes it difficult for visitors to know the location of the cliffs and cave, the lack of tourist ramps and promotions from the local community so that only a few people know the potential of the tourism. The exploitation of land by communities around the cliffs by managing the land into corn gardens as well as the exploitation and exploration of limestone so that mining right in front of the cliff raises complex problems.

Based on slope inclination measurements, it is known that the height of Selokaton slope is 24.26 meters. This measurement indicates that Selokaton slope has a significant slope. According to the classification of slope inclination, Selokaton slope is categorized as a very steep slope (Dalimunthe et al., 2019). This steep slope indicates a condition in which the provision for the use of cliffs can no longer be used as a location for agricultural productivity activities (Johanes et al., 2020) unless it is intended for beginner rock climbing activities or as an educational tour.

The Selokaton slope is suitable for use as a means of cliff climbing, especially with the contours of the rock and the angle of inclination of more than 45° . This characteristic has a slope on the surface of the cliff to hold and slope in the sport of clipping, supported by adequate topography of the territory and accessibility to the location. The construction of the rock structure in the rock climbing sport is determined by the slope and contours thus minimizing accidents (Asmoro & Aziz, 2020). Special attention is needed to pay attention to the concerns of the people who do not want the cliff to be used again as a tourist area because it can damage the corn plantations because of the large number of visitors who go to the cliffs by passing through the plantation area. As well as the pollution and natural damage caused by the exploitation of limestone (Tyas et al., 2016) became a controversy in the development of the tourist area

The Boyong Slope is located in Pacul Village $110^\circ 53' 44.715''$ E and $6^\circ 56' 36.438''$ S, has attractive cliff characteristics with uneven cliff views and has steep slopes and cliff heights ranging between 17 meters. The Boyong slope has associations with Cave Gogor, Cave slope, the Three-Level Waterfall and several karst cliffs that surround it (Wibowo et al., 2022). The characteristics of the cliffs with the scenery that became an attraction because from the location you can see some of the Pati area from the height of these cliffs. The Boyong slope which is a tourist destination for the lovers of the sport climbing cliffs by presenting the views and interesting environmental conditions. The location of the cliff is surrounded by karst hills, springs, and other tourist destinations allowing visitors to travel not just in one place. Tour packages can be done by using offroad cars to reach the location from the departure point at the village office so visitors can enjoy the views while traveling towards the cliffs.



Figure 2. Boyong slope (Source: Primary data, 2023)

The trees surrounding the cliffs and the still awake hilly areas allow visitors to discover several animals such as eagles and other interesting animals. Access to the famous cliffs is difficult because it has to go through a not-so-large rural road and uneven road conditions. The topography of climbing towards the cliffs allows visitors to take advantage of only a few vehicles such as motorcycles and off-road cars, it would be difficult to use four-wheeled vehicles that are not intended for sloping and escalating fields. Boyong slope

with potential rock climbing tourism will take time to be maximized as a tourist attraction.

Based on the observations carried out, the minimum of equipment to support the climbing of the cliff as well as one of the sliding cliff sections so that a large pile of stone could endanger the visitor. The area around the cliff has been used as a corn plantation so it raises the pros and cons between maximizing tourism development and the exploitation of corn farming sites.

The slope of the Boyong is on the path to the waterfall of three levels. The measurement of the slope's slope is done using a clinometer to determine the level of slope and the height of the cliff. The slopes are on the route to the three-level waterfall based on measurements in the field has a slope slope (α) 78° with a measuring distance (A) 4.9 meters it is known that the altitude of a cliff reaches 25 meters. The slope of the boyong cliff has a very steep slope category. Based on the slope classification (Arsyad, 2009), the Boyong Cliff is categorized as a very sharp slope. This steep slope indicates the conditions in which the use of the cliffs can no longer be used as a location of agricultural productivity activities, but is provided for beginner cliff climbing activities or as an educational tour.

Inadequate management makes it difficult for visitors to know the location of the cliffs, the lack of directions to the cliff and promotions from the local community so that only a handful of people know the potential of the tourism (Heni Noviarita, 2021). There has been a lot of public rejection of the use of the cliffs as a tourist attraction as it could potentially damage plantations and minimize income. Synergy between stakeholders and the community needs to be done in order to be able to provide benefits to the community if the cliffs are maximized as a natural tourism potential or as a tourist village.

The Pucungan slope at the coordinates of 110°53'39.777" E and 6°56'40.720" S, is a row of karst cliffs that has more than one potential location as a rock climbing tourist attraction. Pucungan slope is located in Dusun Pacul Village Kedungwinong and is associated with several other tourist attractions such as Cave Pucungan, Boyong Slope and Cave Pucungan. Based on the observations carried out, Pucungan slope is the most potential cliff as a tourist attraction among other cliffs in the region of the village Kedungwinong.



Figure 3. Pucungan Slope (Source: Primary data, 2023)

The potential is based on the scenery of cliffs that face directly to part of the territory of Pati district and other districts because of the position of the cliffs which are in the height so that visitors can climb the cliff and enjoy the beauty of nature at the same time. The slopes that nature lovers often use for rock climbing, also make it easier for other visitors to do the same because the pads and other security equipment are available, just have to be revitalized and equipped with other safety tools.

Measurement of slope inclination is crucial to assess the suitability of cliffs for specialized rock climbing purposes. The measurements indicate a height of up to 32 meters and a slope of up to 81° for Pucungan Slope. This suggests that Pucungan Slope is more suitable for experienced rock climbers. However, on another aspect, the towering condition of the cliff with its captivating views can be utilized as a unique tourism destination and photography spot.

The location is surrounded by beautiful views and attractive conditions have the same problem as the potential of other tourist attractions, namely the pros and cons between the use as a tourist and as a corn plantation. The potential for rock climbing, which is so large and associated with the Cave tourist

attraction, seems to be disputed by the controversy that has arisen, which has caused tensions between some groups of the community, the cliff area which is the land belonging to the people, the main access to the road is the main asset of the farmers in transporting the crops. Discussions need to be made to maximize the tourist potential and the benefit of the plantation so as to benefit all parties.

The village of Kedungwinong has less fertile soil due to the main rocks that cause the mineral elements to be dominated by calcium (Ca) and magnesium. (Mg). The inhabitants engaged in farming with corn patterns, corn, and not planted for several months, although in some places that are relatively easy to get water they engaged with peas. Mount Karst (Destiasari, 2009) in this study used / named cliffs that have been mapped at 3 locations according to the purposes of the research, among them, as a cliff climbing tourist location. This major mapping to understand the conditions and locations that can be optimized for the presence of cave karst symptoms, the pair of stalactites and stalacmites, and indicate the existence of water sources.

Karst Cave

It is a natural hole, large and deep, made of the limestone that is above and beneath the surface of the waters (Haryono & Labib, 2016; Labib et al., n.d.). The limestone caves have ecosystems and habitats for butterflies that need to be preserved for their sustainability. The cave in the village of Kedungwinong, on this study has been painted 9 (Nine) described as follows.

The Pawon Cave is located at coordinates 110°54' 14.670" E 6°56' 29.120" S, is a horizontal cave with a cave mouth diameter of 7.5 meters and a cave length of 15 meters (has no penetration). Pawon Cave is located in Selokaton Hamlet, Kedungwinong Village. Pawon Cave is located in one lane with Selokaton slope, where the cliff and cave are located close together so that it can be used as an alternative in making a tourist trip.



Figure 4. Pawon Cave (Source: Primary data, 2023)

Characteristic of the cave is dry, there is no vegetation in it and it has a short depth so there are no dolinas or uvalas in the caves. The sight of the cave from the outer point of view contains stalactites and stalacmites filling from the caves to the inside. The view around the cave that is still visible with trees and some wildlife as well as animals protected like eagles can still be seen, the view of cave will look beautiful if you get the sunlight between morning and evening. The cave is located not far from the highway so it allows visitors to see potential cave tours without having to walk far.

The difficult accessibility of roads through the limestone mining area, community-owned farms, and chicken farms make it difficult for tourists to expose the cave. Lack of tourist management, lack of location promotion as well as the road to the unmaintained cave resulted in a minimum of tourists who knew about the tourist potential of Pawon Cave.

According to the observations carried out by the researchers, the internal conflict between the communities that have plantations around the cave does not allow the site to be used as a tourist destination, because it is possible to damage the community's plantations so that until now the conflict is still ongoing and there is no development of tourist potential especially for Pawon Cave. Based on an interview with Mbah Rumi'an (2023), The name cave is because the word pawon comes from the Java language which means kitchen, it is said that when it was 12 noon in the cave area it smelled the scent of

cooking.

The Bulus Cave is a cave of a horizontal type with a diameter of 3 meters high cave mouth and a length of 10 meters. How many at the coordinates of 110°53'58.900"E and 6°56'38.600"S, which is located in Krajan Village. This cave is a one-way line with the Cave of Frogs. Access to the location is very difficult, a path that can only be reached on foot that takes 46 minutes with elevations that make it very difficult to reach the cave. The journey to the cave goes through the lines of limestone hills, community plantations, as well as sloping and slippery elevations. The cave is right under the cliffs of the community's farmland and is completely invisible to tourists, the presence of a local guide by the community is required. The bulus cave is surrounded by corn plantations, and has to descend the cliffs to the site and cut some branches with arithmetic because the site is covered by trees around. People call it a cave because there are rocks that resemble cave animals that lie on the cliffs next to the cave. According to the observations, the cave has been covered by a walled iron gate, making it difficult to find information and to see the flora and fauna inside the caves, which can only be seen by the molluscs that cling to the walls.



Figure 5. Bulus Cave (Source: Primary data, 2023)

The Bandung cave, located at coordinates 110°54'38.290" E and 6°56'38.081" S, is a horizontal karst cave with a mouth diameter of approximately 20 meters and a length of around 200 meters, with no cave through. The entrance path to the cave is slightly sloped, then becomes flat until reaching the spring. The cave's characteristic is its water feature, which extends to a depth of 20 meters from the cave mouth to the final station. Although there used to be a cave through to the Mlawat River in Malwapati Village, it has been closed. Inside the cave, there is a doline water flow with a depth of approximately 2 meters and a width of 5 meters.



Figure 6. Bandung Cave (Source: Primary data, 2023)

This cave is located in Tambang Tempel Village, Kedungwinong Village. Access to the cave is easy, by passing through some settlements with the infrastructure of the roads already paved, but towards the access cave must be by walking and parked vehicles in the resident settlement, the journey is required by walking about 10-15 minutes with elevation that climbs through the corn plantations and barley. A cave that has tourist potential with natural beauty seen from the mouth of the cave, as well as stalactites and stalactites that adorn the walls of the caves add attractiveness to tourists.

Based on the researcher's observations, at a depth of 20 meters, there is a doline—a depression

forming a pool of water—allowing visitors to enjoy the location while considering safety measures. The fauna around the cave mouth include worms, mosquitoes, butterflies, ants, snails, and spiders, while inside the cave, there are bats, cave crickets, and fish and shrimp living in the cave stream. The flora around the cave mouth varies from moss to banana trees leading into the cave. The cave's name, "Gua Bandung," originated from a historical story passed down in the community. In ancient times, there were two figures, "among tani" (a farmer) and "dambo awang" (a wealthy merchant) who owned a flying ship. Dambo awang's ship would trample the farmer's rice fields, causing the farmer to protest, saying, "Hey, if you're reckless in my fields, you'll be blocked there." This story led to the naming of the cave "Bandung," symbolizing a place of obstruction or blockage

The Jumbleng Cave is located in the Selokaton Village at the coordinates 110°54'10.74" E and 6°56'38.32" S, is a karst cave with a vertical type, no stalactites and stalakmits. It looks like a hole with a depth of 10 meters and a diameter of 7 meters. The lulud cave is an underground river passage that has not yet been entered by the citizens must pass through a seven-meter vertical field.

The flora that is found in the mouth of the cave is the cherry trees, the nails and the papaya trees belonging to the citizens and the molluscs that stick to the walls of the caves. But the animals of the cave are frogs, flies, caterpillars, butterflies, and worms. Called the cave jemblong lulud according to the speech of the inhabitants once behind his house there was a mountain, and the mountain mined took its stone then the land mined it ambrol and found a hole, when viewed from above such a cave looks like a well. The land is ambroled on the wolu mulud (eight maulud) date in the Java calendar. If the river is around the flood, the water in the cave rises to the surface of the ground. Possibly at a depth of about 15 meters there is a pool of water to the water source due to the characteristics of a wet and watery cave. The field through which they passed was mud and water. The location of the cave is said to be very easy from access to the other caves.



Figure 7. Jumbleng Lulut Cave (Source: Primary data, 2023)

Jumbleng Cave Lulut is in line with Bandung Cave so the tourist potential in the two caves is very open. Access to the cave can be done by motorcycling through the settlement with the road infrastructure already in concrete, the location of a cave is exactly behind the resident house called Mbah Dul Bashir.

The Pucungan Cave is located at the coordinates of 110°53'38.240" E and 6°56'58.080" S in the Dusun Pacul. The cave is a vertical and horizontal cave with a diameter of 8 meters and a height of 15 meters seen from the vertical angle of the cave. The cave has the characteristics of wet due to the moisture of the cave and does not pass through the sunlight except in the vertical cave hole. This cave is said to be unique, because there are two cave mouths vertical and horizontal.

The vertical cave mouth is located above the rocky cliff with several rocks that allow it to collapse if passed by tourists, and there are some trees that cover the cove mouth so that the cave is not too hot and can be used by the tourists to climb. The horizontal cave Mouth is situated not far from the mouth of the vertical caves, with descending the cliff and circling the cliffs about 200 meters toward the mountain mouth,

the journey to the horizontal caves mouth has also been said to be difficult by passing through the rock cliffs as well as citizens' corn plantations. The Pucungan Cave is situated along the edge of the Pucangan Cave so it has huge tourist potential. Access to the cave is through the resident settlements and the Pucungan Tebing with a climbing elevation. The road infrastructure in the settlement is good, but the journey from the location of the cliff to the cavern is difficult because of the elevation climbs and steep as well as steep road but still can be passed by motorcycle, the width of the road ranges between 1.5-2 meters. The road is the main public access to transporting corn crops.



Figure 8. Pucungan Cave (Source: Primary data, 2023)

The journey to the cave is made on foot from the motorcycle parking lot in the farm area. Tourists will pass through the plantation without a stairway so it is necessary to do the opening of the road and climb through the steep and potentially slippery cliffs. The flora in the cave is molluscs, some kind of small trees. It's a species of beetle, spider, snake, and some kind of insect. A cave that's not visible at all so to get to the location must be with the locals.

The Gogor Cave is located in Dukuh Pacul coordinates 110°53' 44.715" E 6°56' 36.438" S. The width of the cave mouth 7x7 meters has not much ornament in it because it is deepest into the dry cave. The natural scenery is an attractive view from the location of the cave which is adjacent to the boyong cliff climbing path that is next to it. Characteristic cave that has only a depth of 4 meters and dry so there is no flora and fauna in the caves. Cave formed due to the cracking of the boong cliff that forms the hole. The Gogor Cave is a unique cave with a direct downward view of the area of Patu District and other districts as well as a place with a cliff climb that allows visitors to enjoy the cave while watching tourists climb other cliffs. Access to the cave can be accessed by motorcycle or car given its location is close to village road access. The cave location along the Selokaton Hill, the Selakaton Cave, and the Three-Level Waterfall allow tourists to enjoy several sightseeing spots with different potential and characteristics of each tour.



Figure 9. Gogor Cave (Source: Primary data, 2023)

The location of the cave in the vicinity of the citizen's farm and the mouth of a cave that is housed by an elephant cluster has caused internal conflict between the community as the owner of the farm with the group of taruna corals developing cave tourism, so that until now cave tours and cliff climbing seemed abandoned without any care or repairs carried out. The name of the cave gogor is because it was once struck by a tiger's son. (Pak Panut, 2023).

1. The Reksono cave is one of the karst formations located at 110°54'1.580" E and 6°56'54.800" S. Based on its shape, Gua Reksono is a horizontal cave at the cave entrance, with a horizontal length of approximately +/- 5 meters. Once inside the cave, it becomes vertical, with a mouth diameter of around +/- 2 meters. At the cave entrance, visitors can enjoy views of the natural scenery, including rolling hills and corn farming areas, which serve as attractions for visitors to enjoy the natural panorama surrounding the cave. The inner part of the cave has a depth of approximately 100 meters, indicating that it is more suitable for use by tourists with special interests, given the challenging terrain inside the cave. It's important for visitors to use safety equipment to ensure their safety while exploring this cave. Inside the cave, there is fauna present, including clustered bats that inhabit the cave, contributing to its unique ecosystem as cave fauna.



Figure 10. Reksono Cave (Source: Primary data, 2023)

Based on the observations, no source of flowing water was found, but at the site there were cave ornaments of stalactites and stalacmites as developing endocarch elements. The flora that's in the mouth of the cave is the plants of nails and mollusks. Accessibility to the location can be reached through the same road as the road to the boyong cliffs and three-storey waterfalls. The route to the site is accessible from the waterfall site to the settlement above it and continues to the location. The conditions of the road are a cor road passing through the settlements, rivers and corn plantations (at this location can still be reached by the vehicles of the gardener) which continues by climbing/climbing the hills.

The Pari cave is a cave that has a vast and potential as a tourist object seen from the sights inside and around the cave. It is located at the coordinates 110°54' 2.010" E and 6°56' 45.700" S. The sight in the cove of pari there are interesting ornaments as a place to be photographed among them there is an ornament of cave which resembles pari which makes this cave called a cove.



Figure 11. Pari Cave (Source: Primary data, 2023)

The diameter of the cave mouth reaches 6-7 meters. The cave has a wide width on the inside and there is a cave ornament on the middle of the cave. Based on the conditions of the soil when observing the moist and slightly watery there is a possibility that during a certain season there is water localized in the form of dolines. The conditions inside the cave with a cave section pointing up has a gap for light to enter and gives an attractive effect as a photo spot. Access to the Pari Cave is near the reksono cave with a distance of +/- 150 meters is behind the hill with the condition of passing through the gap of two cliffs which has its own uniqueness as a photographic spot. The path from the village is the same as the path to the Reksono Cave.

The Celeng Cave is in Krajan Village exactly at the coordinates 110°53' 58.280" E and 6°56' 26.430" S has two cave mouths, i.e. from a vertical field of 8 m diameter and the second is next to a cave of 17 x 10 m directly facing the former limestone mining cliff. The cave condition is dry with a few drops of water from an ornament that appears to be still active around the roof of the cave mouth. From its source, the researchers estimated that there were traces of waterfalls, which formed the cave. From the citizens' statement that accompanied the survey of the location of the cave is a private land owned by citizens around the mining that does not allow the caves to be crushed for mining.



Figure 12. Celeng Cave (Source: Primary data, 2023)

The cave was once inhabited by the landlords, seen from the ex-cavaliers and chairs and tables lying on the site. Access to the cave is sufficient given its location on the mining route. It is a concrete road that can be travelled by motorcycle to the mining area, then continued by walking through the citizens' gardens and the former cliffs of the mine area to the mouth of the cave. The flora and fauna that dwell around the mouths of the caves, and in the cave, bamboo trees, caterpillars, and nails that grow in the walls of cave; and the fauna that is around cave: butterflies, rats, and birds that hang on trees in cave. According to the citizens, the name is due to the time when a lot of animals or pigs were hiding or staying in the cave.

Waterfall

The Karst region looks dry upstairs, but the water source is deep underground. Another possibility is the presence of a relatively small waterfall characterizing the water phenomenon in the karst by the locals called the Tiga tingkat Waterfall is one of the attractive objects as a visiting destination. The waterfall is named as a three-level waterfall according to the waterfall's conditions which has a level from the upper part as much as three levels with on the lower part of the level there is a section that is coarse like a pool. Waterfall conditions with clear waters as well as a beautiful panorama of nature that can be on this waterfall object. Waterfall conditions have clear waters with quite fluctuating discharges depending on the season when observed. However, it still has its own attraction with its clear and cooling waters for those who come. Based on these conditions, the three-level waterfall seen from the potential has a high potential to be developed as a tourist destination with its uniqueness that is a waterfall in the karst area that has clear water and an attractive panorama. However, there are a few things to consider in developing these waterfalls, including the condition of the karst that is vulnerable to damages and the visitor's safety and hygiene.



Figure 13. Tiga Tingkat Waterfall

The waterfall itself is a stream of rivers that is located in the Karst hills not far from the settlements. Access to the location can be reached by two- and four-wheel motor vehicles with fairly good road conditions. Of the various observed aspects of the waterfall is very potential to be used as a public tourist destination that can be accessed thoroughly by visitors from all walks of life. The location close to the residents' houses will provide facilities for residents to provide support facilities in order to streamline the waterfall tour by providing a place for visitors to eat and drink which will help the economy of the surrounding population.

The use of maps in this research can be a source of initial data as well as a final product of the research. The reader will better understand the geographical information presented visually in Figure 2, the measurement results and the description of each object as follows. This tourist spread map indicates that the tourist potential in Kedungwinong village is very high. But on the other hand, there will be potential conflicts related to tourism management (Dwipayana, 2023) that could have an impact on the lives of the people around.

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