

## Table Of Content

<b>Journal Cover</b> .....	2
<b>Author[s] Statement</b> .....	3
<b>Editorial Team</b> .....	4
<b>Article information</b> .....	5
Check this article update (crossmark) .....	5
Check this article impact .....	5
Cite this article .....	5
<b>Title page</b> .....	6
Article Title .....	6
Author information .....	6
Abstract .....	6
<b>Article content</b> .....	8

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## Resource Valuation of Kalilingseng-Cave Manganese Mining Site as a Tourist Destination Using the Travel Cost Method

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### Abstract

**General Background:** Kalilingseng Cave, a former Dutch-era manganese mine in Kulon Progo, has untapped potential for educational and cultural tourism. **Specific Background:** Despite its historical and aesthetic value, the cave remains underdeveloped as a tourist site, lacking comprehensive economic valuation. **Knowledge Gap:** Prior research has not addressed the cave's economic potential as a tourism destination, leaving a gap in understanding its full value. **Aims:** This study aims to evaluate the tourism potential of Kalilingseng Cave using SWOT analysis and estimate its economic value through the Travel Cost Method (TCM). **Results:** The SWOT analysis highlights the cave's accessibility and proximity to public facilities. TCM results show an average WTP of IDR 67,000.00, with annual economic benefits of IDR 21,775,000.00. **Novelty:** This research uniquely integrates SWOT and TCM to assess the tourism potential of an abandoned mining site. **Implications:** Proper development could make Kalilingseng Cave a sustainable tourist destination, benefiting the local economy and supporting geotourism education.

### Highlights:

- **Tourism Potential:** Kalilingseng Cave's historical and aesthetic value positions it as an educational and geotourism destination.
- **Economic Valuation:** The Travel Cost Method reveals an annual benefit of IDR 21,775,000.00 from visitors, indicating potential for community development.
- **SWOT Insights:** The SWOT analysis highlights strengths like accessibility and opportunities for geotourism while addressing weaknesses such as poor air circulation and lack of official management.

**Keywords:** Ex-Manganense Mining, Kalilingseng, SWOT, Travel Cost Method

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## Introduction

Kalilingseng Cave is former mine in operation during the Dutch era located in Ngeruno Village, Pengasih District, Kulon Progo District, DIY. When this area was actively used as a mine, it was the center of mining activities due to the potential for manganese which has super high quality to the point where it is said to be Kembang, meaning super manganese containing very high levels of manganese. Many Previously ex-excavated holes are scattered in this area, leaving behind caves with a depth of around 100-200 M, some even more than 500 M with Vertical Shaft wells. The history of mining there is now just a community story. Many former mining holes are now covered by soil and are not managed properly, even though they could be opportunities to be used as tourist attractions, whether educational tourism, earth tourism or nature tourism. One that has potential is the Kalilingseng cave. After being excavated again in 2012, this cave is expected to become a cave that has aesthetic value with beauty and the story behind the formation of the cave. Therefore, the people there continue to strive to develop the cave to become one of the tourist attractions in the Kulon Progo area which can later contribute to the development of Ngeruno Village in particular and Pengasih District in general.

The potential of the Kalilingseng cave which can be utilized as a tourist destination requires an appropriate strategy in order to assess the existing tourism potential. This is so that the existence of tourism is able to provide a multiplier effect not only for the tourist attraction in question but also for the surrounding community. Based on the background above, the author is interested in further researching tourism potential by conducting a SWOT analysis as a good method for the regional government of Kulon Progo district to further evaluate its economic potential. Apart from that, it is necessary to carry out further research related to the economic valuation of natural resources offered by its beauty. According to Djajadiningrat (2003), it is said that the main choice that is considered to have positive value in supporting human welfare is caring for and maintaining the surrounding environment. If economics which involve choices are integrated with environmental issues, it can raise awareness to protect the environment with the aim of improving general welfare [1].

So in this research we will study the calculation of ecosystem benefits and services or natural resources in the Kalilingseng area. This will be used to carry out economic valuations for tourist destinations, by utilising the travel cost method. This method determines the recreational value of a conservation area by the willingness to pay (Willingness to Pay) of visitors [2].

## Method

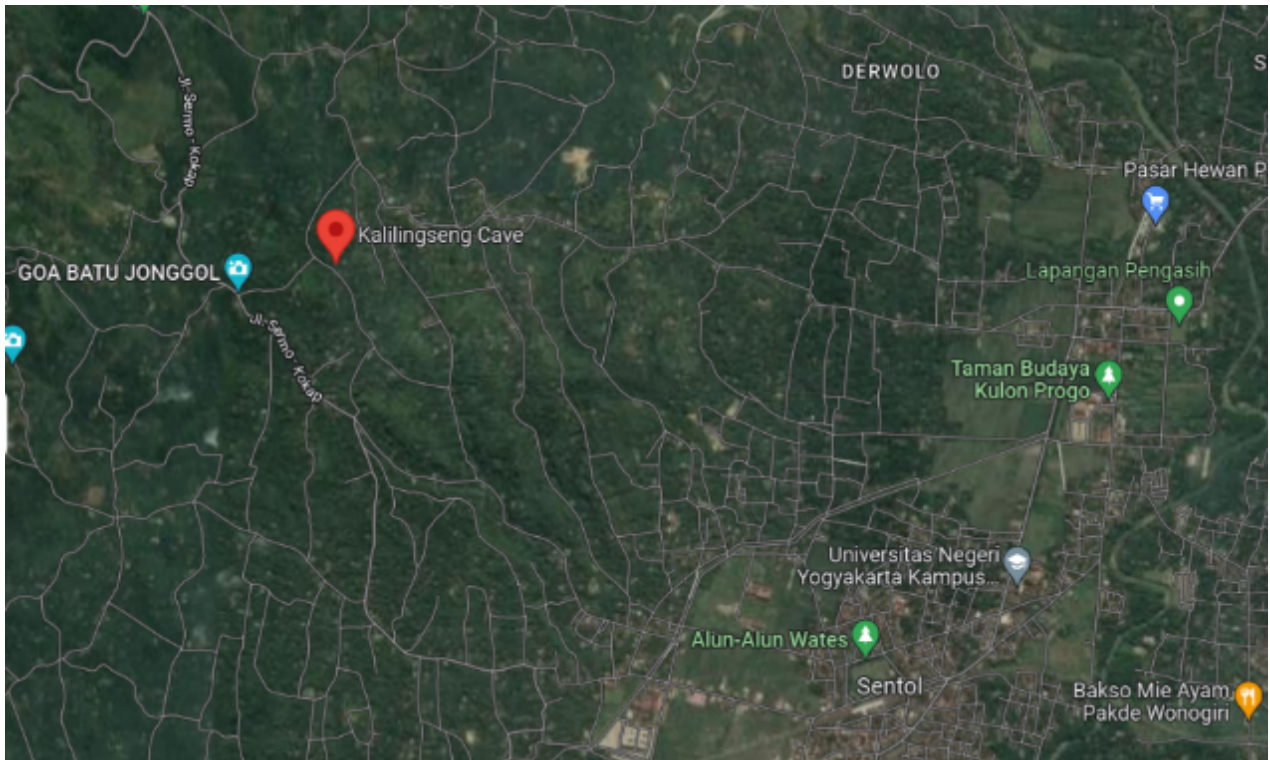
This research utilizes the Travel Cost Method (TCM) to estimate the economic value of Kalilingseng Cave as a tourist destination. The method assesses the cost incurred by visitors for recreation, reflecting their willingness to pay (WTP) for visiting the cave. The data collection process involved surveying tourists who visited Kalilingseng Cave over a three-year period. Visitors were asked about their transportation costs, consumption costs during the trip, parking fees, and facility usage fees. The SWOT analysis was also conducted to evaluate the strengths, weaknesses, opportunities, and threats of the cave as a potential geotourism site. The results of the SWOT analysis were combined with TCM data to generate an estimation of the cave's economic value based on visitors' average WTP and the total number of annual visitors. Additionally, the study considered the potential benefits that the development of this area could bring to the local community, in terms of both direct tourism income and broader economic opportunities such as the sale of local food and cultural experiences.

## Results and Discussion

### A. Kalilingseng Cave

Kalilingseng is a cave used by former Dutch manganese mining activities that has been abandoned and is no longer in operation. As a former manganese mining activity, Kalilingseng certainly has a lot of history.[3] These mining activities have left caves with considerable potential to be used as geological, educational and natural tourism areas. There are several caves that have been discovered and have been excavated again, and there are still many indications that caves are still buried in the ground in the area. Kalilingseng Cave is located in the Kulon Progo area. The exact location of the cave is in Karang Sari Village, Pengasih District, Kulon Progo Regency, Yogyakarta Special Region.





**Figure 1.** Location of Kalilingseng cave seen from Google Map

Here we can see the condition of the inside of this former mining working. The condition of the workings, which had not been visited for a long time, made it a little muddy and a bit dark.



**Figure 2.** The condition of the opening hole is relatively damp

The location of Kalilingseng Cave has great potential if it is used as a tourist attraction, this can be seen from the visits carried out by several visitors in one year, around 20-50 people, both from the community and from students who carry out research in the cave.

## **B . SWOT Analysis to Assess Tourism Potential**

To assess the potential of Kalilingseng Cave, a SWOT analysis is carried out. Carrying out viability assesment can be done utilising a SWOT analysis. SWOT is a strategic planning analysis method used to evaluate strengths,

weaknesses, opportunities and threats in a planning activity. SWOT analysis is applied by analyzing and sorting various items related to the 4 analytical components consisting of strengths, weaknesses, opportunities and threats. Then, after mapping, a strategy is created to solve the problem. [4]

**SWOT Analysis Matrix** The SWOT Matrix is useful for clearly describing how the external opportunities and threats faced by a company can be adjusted to its strengths and weaknesses. From this we look at the level of interrelationship between elements to get the best strategy in carrying out activities. This matrix can produce four sets of possible strategic alternatives.

a. The SO strategy is a combination of Strengths and Opportunities from which conclusions will be drawn that produce the best decisions which can be a reference in assessing a process. [5]

b. ST Strategy This strategy is used by using the company's strengths to overcome threats.

c. WO Strategy This strategy is implemented based on exploiting existing opportunities by minimizing existing weaknesses.

d. WT Strategy This strategy is based on defensive activities and tries to minimize existing weaknesses and avoid threats. [6]

By applying SWOT analysis and several quadrants, you can get more in-depth research results and understand the main problems of the object being studied. [7]

Strengths (Strength)	Weaknesses (Weakness)	Opportunities (Opportunity)	Threats (Threat)
<p>a. The distance by land is only 14.3 km via National Road III in approximately 30 minutes from YIA airport. YIA Airport is located in Kulon Progo the establishment of several housing complexes, rental houses and boarding houses. For residents who are "business savvy", the existence of YIA can be used to seek financial gain. Thus, it has the potential to later be developed into a tourist destination (Susanto, 2020). There is the development of tourist village destinations and cultural villages that are capable of becoming centers of culture-based tourist destinations [8] b. There has been development of the KPK community (Kalilingseng Cave Community) which was developed by students majoring in communication science FIS UNY in 2018, with the output in the form of a website <a href="http://www.goakalilingseng.com">www.goakalilingseng.com</a> c. The cave is still in its original and beautiful condition, making it suitable for educational geotourism for students related to the earth. d. There are other famous tourist areas within a distance of less than 7 km which can be used as educational tourism ideas</p>	<p>a. Based on reviews on Google, tourists say that the lighting at Kalilingseng Cave is still very minimal and poorly maintained. b. The condition of the cave does not have good air circulation so it cannot be explored by groups at once. c. There is no official cave manager, no tour guide facility that can guide and educate tourists about Kalilingseng Cave. d. The lack of functioning websites and official accounts for Kalilingseng Cave means that few tourists visit.</p>	<p>a. The location is easy to reach from the center of Yogyakarta city and the existence of YIA developing tourist villages and cultural villages which are able to become the center of culture-based tourist destinations (Habib, 2022) in the Kalilingseng area can be an opportunity for the potential of this cave. Kalibiru is only 6.8km from Kalilingseng Cave, Kulonprogo Cultural Park is 5.2 km from Kalilingseng Cave, and Sermo Reservoir is only 5 km. b. The potential for traditional food produced by residents to become a business opportunity that can attract tourists and increase residents' income. c. Regional governments continue to strive to improve their regions to develop tourism to increase regional income. d. The large number of campuses that have fields in the earth sector, especially mining engineering, around the Yogyakarta area has the potential to make this place an educational tourist attraction.</p>	<p>a. Other nearby tours are more interesting and Instagrammable. b. The pattern of people who prefer to travel to open locations and have direct contact with foreign culture. c. There is a tendency for people to prefer to spend time on staycations in hotels or inns and chatting with family. d. The condition of the community is tired of developing this tourism potential. e. People who do not yet understand a good management system to increase the attractiveness of the tourist area.</p>

and become potential integrated tourism.		
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**Table 1.** Mapping of SWOT indicators for Lingseng River Cave

From the identification of the 4 SWOT components, an analysis is carried out to obtain a strategy for solving the problem:

SO Strategy	Wo Strategy
1. Area locations that are close to other public facilities can be utilized by creating information that advise people to know the location of the cave, such as making directions and advertising on banners in PUBLIC locations such as airports, etc. 2. The food and cultural potential in the region can continue to be developed by utilizing existing websites and other publication media such as Instagram. 3. The cave, which has a long history of mining, can be used as an attraction for location development in accordance with the geotourism development plan by the regional government. 4. Areas that are still natural and have natural geological features can be used as geotourism. 5. The location of the area close to other tourist attractions can be an opportunity for a one way educational trip Kulon Progo tourist idea that is profitable for tourists and cave managers.	1. For air circulation, a proposal for the procurement of a ventilation system can be made to the regional government as a form of enthusiasm for regional development. 2. The absence of an official cave manager can take advantage of the opportunity to have an integrated management system in the Kulon Progo tourist destination area, because the location is very close to other tourist attractions and this can be managed by the local government with the assistance of local tourism awareness groups. 3. Increasing publications in public facilities is a way to introduce existing websites and official accounts because the location is close to facilities such as YIA airport
ST Strategy	WT Strategy
1. In order for Kalilingseng tourism to have attraction levels for tourism, it is necessary to update and organize the location, as well as carry out promotions in the area by introducing all the potential that the area has. This will include appropriate safety measures to ensure the safety of tourists. 2. Reactivating the existing KPK for regional development, such as providing open land for tourism, and creating exhibitions or outbound places around the cave area. 3. Providing comfortable lodging locations for visitors, such as glamping or homestays, or using community houses as comfortable shelters and providing tourism wrapped in beautiful, natural village accommodation. 4. Continue to stimulate the community to develop their region to continue to progress, by carrying out outreach from the government or Kalilingseng Cave tourism awareness groups.	1. Make a book describing caves and stories related to the history of caves around the cave area so that people who are afraid to enter can use it to find out how the cave was formed. 2. Complete tour facilities as well as a good information system and a good promotion system too. 3. Reinforce the function of the existing website by actively providing educational content to attract tourists who previously thought that educational tourism was not interesting. 4. Implement a good management system by installing good and beautiful lighting to give the impression that the cave can be used as a means for tourism.

**Table 2.** The Strategy is Determined as Analysis

### C . Calculation of Benefit Value using the Travel Cost Method

Resource Value Assessment using the Travel Cost Method. The use of the Travel Cost Method (TCM) analyzes the economic valuation of tourist attractions to determine demand and interest in outdoor recreation. The application of this method examines the costs incurred by each individual to visit recreation areas [9] To be able to apply TCM and obtain unbiased research results, the demand function must be built with the following basic assumptions [9]

1. Travel costs and time costs are used as proxies for the price of recreation.
2. Travel time is neutral, meaning it does not produce utility or disutility.
3. The trip is a single trip (not a multitrip)[10].

In principle, this method examines the costs incurred by each individual to visit recreational places [11]. The fundamental assumption used in the TCM approach is that the utility of each consumer for activities, for example recreation, is separable. Therefore, the demand function for recreational activities is not influenced by demand for other activities such as watching movies, shopping, etc. [12]

The TCM analysis will be carried out with several areas of origin for visitors who will visit the Goakalilingseng tourist area, namely the Kulon Progo, Bantul, Yogyakarta City and Sleman districts, as well as the Magelang and Purworejo districts which are located in Central Java [13]. Based on data that existed in the Kalingseng cave by looking at several cost components to look for, namely

1. Transportation costs
2. Consumption costs during activities
3. Parking fee
4. Facility usage fees

The value of utility or WTP from several regions is known as follows: [14]

	Average Cost Components				
	Transportation	Consumption	Parking	Facility Fees	WTP
Kulon Progo	IDR 25,000.00	Rp. 15,000.00	Rp. 3,000.00	IDR 5,000.00	Rp. 48,000.00
Bantul	IDR 30,000.00	IDR 25,000.00	Rp. 3,000.00	IDR 5,000.00	Rp. 63,000.00
Yogyakarta City	Rp. 43,000.00	IDR 35,000.00	Rp. 3,000.00	IDR 5,000.00	Rp. 86,000.00
Sleman	IDR 40,000.00	IDR 20,000.00	Rp. 3,000.00	IDR 5,000.00	Rp. 68,000.00
Magelang	IDR 50,000.00	IDR 25,000.00	Rp. 3,000.00	IDR 5,000.00	Rp. 83,000.00
Purworejo	IDR 28,000.00	Rp. 18,000.00	Rp. 3,000.00	IDR 5,000.00	IDR 54,000.00
Average	IDR 36,000.00	Rp. 23,000.00	Rp. 3,000.00	IDR 5,000.00	Rp. 67,000.00

**Table 3.** Average WTP Value

From the data above, the average WTP from various visiting locations is IDR 67,000.00, with data from the last 3 years at the Kalilingseng cave location, the average number of visits is 325 people, consisting of 220 practical college students and the remaining 105 people from general visitors in 1 year, it can be seen that resources amount to IDR 21,775,000.00/year. [15]

## Conclusion

Kalilingseng Cave has great potential to be used as a tourist attraction. From the results of the SWOT analysis, it is known that the Kalilingseng location has the potential to be used as a tourist spot by looking at the strengths of the area which is relatively easy to reach and close to public facilities. The potential for establishing a geotourism area in this area must be utilized by community groups to continue to innovate so that the cave is more attractive and can be used as a tourist destination. There needs to be other supporting facilities by continuing to collaborate with the government or campuses in the surrounding area. There needs to be awareness for joint development of integrated areas with tourist locations or areas around Kalilingseng.

The benefit value of the resources there is IDR 21,775,000.00/year, which means that if it is well developed with proper planning, the value of these benefits can be used as a source of welfare for the people in the area.

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