

## Mining-based tourism in Sawahlunto National Geopark

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**Abstract:** Determining post-mining land use is a challenging process for mining cities. The new rapid development of geopark is an alternative solution to how to deal with mined land. The objective of the research is to study potential anthropogenic landforms (mining landforms) or geosite as a tourism object in Sawahlunto national geopark. Sawahlunto in west Sumatra province is the oldest coal mining industry. This mining area mostly belongs to state-owned companies in Indonesia. The potential tourism in geoparks will be assessed using the ABC concepts. The method will be useful information for alternative post-mining land use. Primary data were obtained through field observations at Sawahlunto Regency and in-terviews with the stakeholders. Secondary data were collected through desk study in the form of spatial information and policy documents, especially from The Agency of Local Spatial Plan, and The Agency of Culture, Heritage, and Museum of Sawahlunto Regency. Field observation activities aim to determine the position of geodiversity, biodiversity, and cultural diversity potential using Global Positioning System (GPS) technology. The results of field observational data are processed using Geographic Information System (GIS) software including data inputting, data plotting, and data analysis. Interviews were conducted with ac-tors directly involved in the tourism development of the Sawahlunto Regency such as The Agency of Spatial Planning and The Agency of Culture, Heritage, and Museum of Sawahlunto Regency. The result of the research shows that there are four mining-based tourism zones in Sawahlunto national geopark. The identification of mining-based tourism is broadly useful for the future development of Sawahlunto geopark. However, since there is complexity in terms of the management of geopark, people need to carefully consider spatial planning for geopark area.

**Keywords:** mining-based tourism, geopark, Sawahlunto

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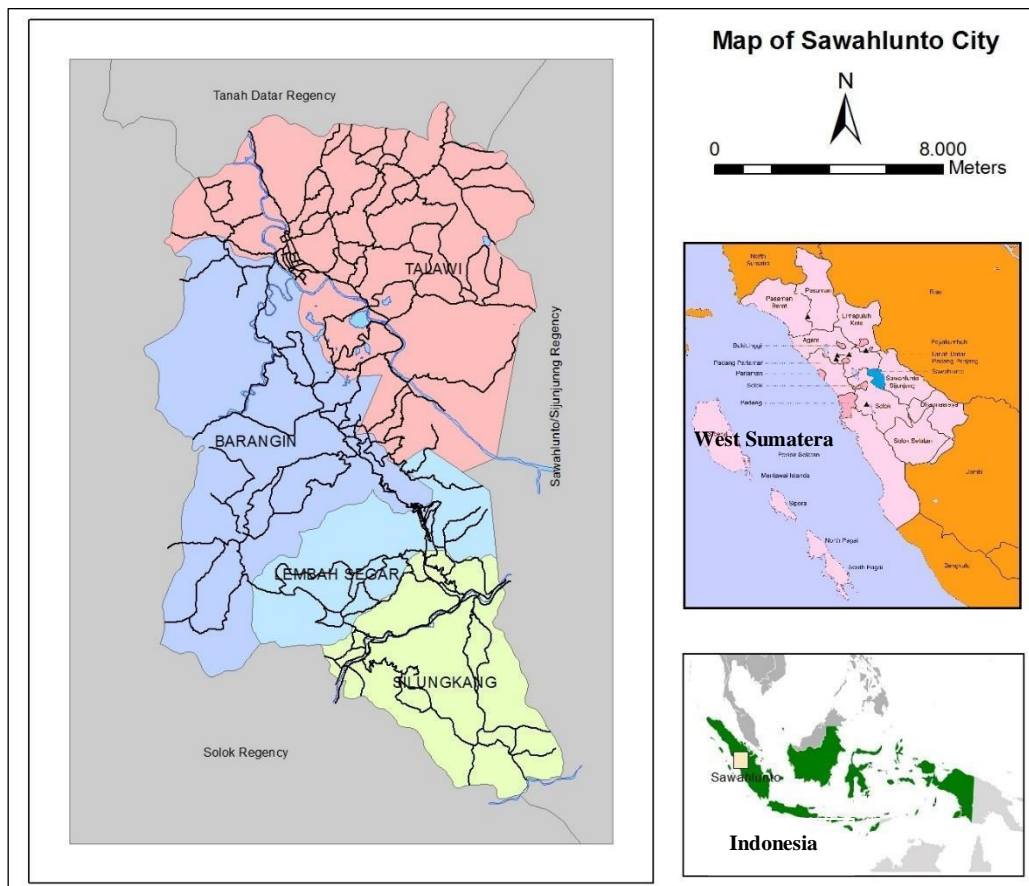
### Introduction

Sawahlunto Municipality is well known as the oldest coal mining city in Indonesia. The total area is 27,345 hectares. It has 4 districts including Talawi, Barangin, Lembah Segar, and Silungkang, 10 sub-districts (kelurahan), and 27 villages (desa). It is located 95 km from Padang (the capital of west Sumatera province). Geographically Sawahlunto Municipality lies on 0° 33' 40" – 0° 43' 33" South latitude and 100° 43' 13" – 100° 50' 40" East longitude, which is bordered by Tanah Datar Regency in the northern part, bordered by Sawahlunto/Sijunjung Regency in the eastern part, and bordered by Solok Regency in the southern and western part.

In the past, Sawahlunto is an agricultural area of rice fields which is surrounded by hills. Among the hills flowed two rivers - Sumpahan and Lunto rivers. The name of Sawahlunto is a combination between Sawah (paddy field) and Lunto River. In 1858 coal was found in the Ombilin valley by Ir. De Groet and then followed by Ir. W.H de Greve in 1867. A thorough investigation is conducted by Ir. R.D.M Varbeck (Dutch mine expert) at the beginning of the development Sawahlunto settlements (village). The commercial development of coal mines in 1891 pushed the rapidly growing of Sawahlunto. Earlier before, on July 27, 1886, made the first *Acte Notaricle* by E.L Van Ravvercy of Tanah Datar as a Resident Assistant Notary, between Hendrick Yacobus Pilter Schuurin as concession holders with Sutan Pamuncak who represents the people of the community Sawahlunto. Realizations of this *Acte Notaricle* are including setting up a seaport in Teluk Bayur, Padang, and developing Teluk Bayur railway network from Padang Panjang to

Sawahlunto (as one of the requirements for coal mining concession) during the years 1888 to 1893.

In 1887 with funding of 5.5 million Golden has begun to build a variety of mining facilities and settlements for coal miners. These settlements continue to grow into small towns with a population that is essentially an employee and mine workers. At the beginning of the exploitation of mines, coal is sent to the Muara Kelaban using a horse-drawn carriage. From Muara Kelaban, coal is transported by train to the seaport at Teluk Bayur in Padang. At that time, the production of coal is less than 100,000 tons per year. The completion of the railway from Muara Kelaban to Sawahlunto in 1894 opened opportunities for small coal mines to increase production to reach 0.5 million tons per year. Coal mining in this Ombilin reached its peak in the years 1920 to 1921. At that time, coal production reached 567,142 tonnes and 602,853 tonnes, and the number of workers reached about 7300 people (Rohaendi, 2012). This rapid development made the Dutch government give Sawahlunto *Gemeente* status in 1918.



(Source: Rohaendi, 2012)

**Figure 1.** The area of Sawahlunto

Rapid development occurring within this short time has made coal mining company provide better service to their large labour force. Adequate hospital and educational facilities are built. Even the night market is held regularly to entertain the workers and other urban communities. More facilities are also held for the exclusive Dutch workers. The form of such support has made Sawahlunto turn into a small town living and sparkling. This development has made the Dutch government plans to give the city an independent administrative unit in Sawahlunto. In 1922, the Dutch government set a new Act called *Bestuurshervorming* among others set several cities in the category *Stadsgemeente*, the city administration conducted by *Stadsgemeenteraad* (DPRD) and *Burgemeester* (Mayor). Under that Act, 1929 reinforces the Governor General of the Dutch East Indies as the existence and extent Sawahlunto *Gemeente* to 779 hectares, but not *Stadsgemeente* (which means it has not been categorized as a socioeconomic urban area with a

fully independent municipality). In 1930, Sawahlunto has a population of 43,576 inhabitants. This amount is greater than the population of Bandung with 38,403 inhabitants in 1906 set as the *Gemeente*.

Through Law No. 3/1953 (State Gazette No. 19), the status of small town Sawahlunto is headed by a mayor, and it has its own parliament. Then, with the issuance of Law No.1/1957 Sawahlunto changed its status to *Kota Pradja* administration which is headed by Mayor. The next change was the issuance of Law No. 18/1965 Sawahlunto is changed to the regency. Government Regulation No. 44/1990 about the definition of municipality boundaries among Sawahlunto city, the regency of Sawahlunto-Sijunjung, and regency of Solok (Republic of Indonesia Number 3423), Sawahlunto is divided into 4 districts, 20 sub-districts and 31 villages with the total area is 27344.60 hectares. The decision of the governor of West Sumatra province, on July 21, 1993, No.143-487-1993 about structuring villages in phase IV in West Sumatra province, resulted in the merger of several villages in the region so that Sawahlunto has 4 districts, 20 sub-districts, and 27 villages. The decision of the governor of West Sumatra No. 140-199-1999 April 19, 1999, the 20 sub-districts are structured into 10 sub-districts.



(Source: Agency of Culture, Heritage, and Museum of Sawahlunto Regency, 2022)

**Figure 2.** Sawahlunto as mining city in 1920

Since coal mining is the main source of the economic sector, Sawahlunto has economic difficulties when PT. BA UPO (the biggest coal company) is terminating open-cut mining in 2003. The revenue from coal production is decreased significantly. This problem resulted because the government of Sawahlunto did not have a post-mining land use plan concerning sustainable development. Since there are 14 mining companies still operating in Sawahlunto, the government needs a method of how to develop possible future land development for mining areas when the mining industry is closed. The government of Sawahlunto, then proposed the idea to build post-mining land use with the theme "Kota Tambang Yang Berbudaya (Cultural Mining City)" from 2002 to 2020. The mining tourism is prioritized to develop geological and mining heritage for tourism object. The main goal is to increase income for society and surrounding areas including tourism practitioners such as local guide, hotel owner, etc. To achieve the goal, the local government has four agendas including institution capacity, interlocal cooperation, city quality improvement, and tourism area development. The idea to mix mining and tourism seems a good possibility for the future of the city. The city can deal with the hardship situation after mine closure. The area of mined land, the anthropogenic area is very useful for geotourism development (Kubalíková, 2017). Ex mining area can be as new choice for tourism related to

geological, mining, and environmental issues. Mining landscape is a link between the past and the present, mining city that maintain their natural and artificial heritage can also tell industrial memories that occurred from the past to the present (Anarta et al., 2019).

In 2019, Sawahlunto is appointed as the national geopark. This is a important step in terms of tourism development. The geopark Sawahlunto will be an ideal model for mining tourism since the geopark can protect not only geological heritage but also mining heritage (Dowling, 2011). Mining tourism can be categorized as industry tourism or heritage tourism, namely a tourism activity on mad-made sites, buildings, and landscapes derived from previous industrial processes (Nuryanti, 1996; Pretes, 2002). This commitment leads to study on evaluation of potential mining heritage and geological heritage as tourism object.

## Methodology

Mining is the temporary use of land with a highly variable duration of activities in different mining locations. A mine is closed when the reserve is depleted, or mining activity is no longer economically profitable in terms of economic cost. Mine closure is a serial activity that the process of transforming an active mine into a set of safe and stable landforms that are non-polluting and provide habitat and ecosystem services and/or support economic activities by the new land users (Limpitlaw & Briel, 2014). These activities and habitats may be different from those historically present on the site. The possibility of future post-mining land use of Sawahlunto has been exercised using Spatial Multi-Criteria Evaluation for residential, tourism, agriculture, and forestry (Rohaendi, 2012; Rohaendi & Agustine, 2014).

Since mining is related to 17 sustainable development goals, such as the promotion of the job, the reduction of poverty, and the elimination the hunger. When the mining industry is closed that have lost its economic significance for local development (Monteiro et al., 2019). For that reason, people need appropriate assessments for the future of mining areas. The main purpose of this assessment as the way to maintain a sustainable future for mining areas (Rohaendi et al., 2021). The assessment of geosites is usually using either qualitative approaches or quantitative approaches (Hose & Vasiljevic, 2012). Firstly, the example of qualitative assessment of geosites and mining sites is including the inventory of all sites, reports, maps, classification of element geological mining interest, SWOT, and TOWS matrix (Carrión-Mero et al., 2018). Secondly, the inventory model and quantitative assessment of geosites and geodiversity are needed for site management (Brilha, 2016). The example of the quantitative assessment for thirteen sites in the Metalliferous Mountains in Western Romania to support scientific, educational, and geotourism has been done by previous researchers (Milu, 2021). Mining tourism also aims to show the importance of mining activity despite its difficulties and to contribute to the economy of the local mining community in Sawahlunto. Hopely, mining tourism can change the image of the mining region from negative to positive, after major mining accidents and increase the morale of the local miners (Gürer et al., 2019).

Mining landform including quarries, pits, coal mines, and other mines is popular also as anthropogenic landforms and has great potential for the geotourism objects (Kubalíková, 2017; Singh & Ghosh, 2021). The classification of geotourism values that usually occurred in mining areas is as follows:

**Table 1.** The basic group of geotouristic values (Wendt, 2021)

No.	Object type	Group of items	Examples of items
1	Natural object	Geological	Volcanoes, rocks minerals
		Geomorphological	Cliff, dunes, karst forms



2	Anthropogenic object	Kopalnie, kamieniołomy	Salt mines, coal mines, and other mines
		Stone building	Rock cities, rock temples, castles, bridges
		Archaeological excavations	Stone tools, arrowheads
		Museum and exhibitions	Geological and paleontological museums, geoparks

Geosites and geomorphosites are sites of geological interest with high scientific, educational, and tourist value, representing the geological heritage and promoting conservation (Carrion-Mero et al., 2022). Anthropogenic sites are man-made sites that have scientific, educational, cultural, tourist, and conservation values (Kubalíková, 2017).

Abiotic, Biotic, and Culture or the ABC approach is applied in this research (Dowling, 2016). Abiotic are elements of geology and climate, biotic are elements of animals (fauna) and plants (flora) and cultural are the human components (Pásková et al., 2021). The basis of the concept is the same as the analysis unit of geodiversity, biodiversity, and cultural diversity at Sawahlunto. This research was conducted through a literature review, fieldwork, interview, and policy analysis. The data consisted of primary and secondary data. The approach used in this research is qualitative research.

Primary data were obtained through field observations at Sawahlunto Regency and interviews with the stakeholders. Secondary data were collected through desk study in the form of spatial information and policy documents, especially from The Agency of Local Spatial Plan, and The Agency of Culture, Heritage, and Museum of Sawahlunto Regency.

Filed observation activities aim to determine the position of geodiversity, biodiversity, and cultural diversity potential using Global Positioning System (GPS) technology. The results of field observational data are processed using Geographic Information System (GIS) software including data inputting, data plotting, and data analysis. Interviews were conducted with actors directly involved in the tourism development of the Sawahlunto Regency such as The Agency of Spatial Planning and The Agency of Culture, Heritage, and Museum of Sawahlunto Regency.

## Results and Discussion

### Results

The negative impacts of mine closure are diverse including economic, social, and environmental dimensions (Armis & Kanegae, 2020). The skilled labor forces will leave the city for a better life in new cities or mining cities. The unskilled labor force will be losing their job and create social problems. The transformation process from mining cities to new cities is very crucial. Some drivers should be taken into account for the process such as the role of stakeholders and actors, public participation, infrastructures, and the revitalization and preservation of mining heritages or geosites.

From data Tourism and Cultural Office of Sawahlunto city, there are twenty-nine tourism objects that are direct and indirect related to mining heritages. The tourism object can be classified based on the ABC concept or Abiotic, Biotic, and Culture. An abiotic is a tourist object that has geological or geomorphological aspects. Biotics is a tourism object that has a biological aspect. Culture based on the ABC concept can be seen in the list of tourism objects in Sawahlunto as listed in Table 2.

**Table 2.** Potential Tourism Objects of Sawahlunto Regency from The Agency of Culture, Heritage, and Museum of Sawahlunto Regency

No	Tourism Objects	Locations
<b>Geodiversity</b>		

1	Batu Runcing	Silungkang Oso, Kec. Silungkang
2	Puncak Polan	Aur Mulyo, Kec. Lembah Segar
3	Kelok 16	Kubang Sirakuk Selatan, Kec. Lembah Segar
4	Puncak Cemara	Lubang Tembok, Kec. Barangin
5	Danau Biru	Perambahan, Desa Salak
6	Sawah Luwung	Sawah Luwung, Kec. Talawi
7	Batu Hitam	Lumindai, Kec. Barangin
8	Batu Tanjung (Sport Tourism Paralayang)	Batu Tanjung, Kec. Talawi
<b>Biodiversity</b>		
9	Rafflesia	Lubang Tembok, Kec. Barangin
10	Taman Satwa Kandi	Kandih, Kec. Talawi
<b>Cultural Diversity</b>		
11	Kampung Tenun	Batu Mananggau, Kec. Silungkang
12	Waterboom The Unique Park	Muaro Kalaban, Kec. Silungkang
13	Gedung Pusat Kebudayaan	Pusat Kota, Kec. Lembah Segar
14	Gedung PT.BA	Pusat Kota, Kec. Lembah Segar
15	Museum Goedang Ransoem	Air Dingin, Kec. Lembah Segar
16	Info Box dan Lubang Tambang Mbah Soero	Tangsi baru, Kec. Lembah Segar
17	Silo	Saringan, Kec. Barangin
18	Museum Kereta Api	Kampung Teleng, Kec. Lembah Segar
19	Komplek Pemakaman Belanda	Lubang Panjang, Kec. Barangin
20	Desa Wisata Rantih	Rantih, Kec. Talawi
21	Makam M. Yamin	Talawi Mudik, Kec. Talawi
22	Lubang Kalam Sawahlunto	Mudik Air, Kec. Lembah Segar
23	Kerajinan Batu Bara Cendra Lestari	Tangsi baru, Kec. Lembah Segar
24	Payung Kote	Bukik Gadang, Kec. Talawi
25	Mesjid Agung Nurul Islam	Mudik Air, Kec. Lembah Segar
26	Tari Tenun	Tangsi baru, Kec. Lembah Segar
27	Tari Layuak Batoboh	Tangsi baru, Kec. Lembah Segar
28	Kuda Kepang	Tangsi baru, Kec. Lembah Segar
29	Songket Silungkang	Silungkang Tigo, Kec. Silungkang

From the air, the form of Sawahlunto looks like a basin. Geologically, the name of the surrounding area of Sawahlunto is Ombilin basin. There are two hypotheses about the development of the Ombilin basin. The first hypothesis is block fault caused by uplift (Van Bemmelen, 1949). According to this hypothesis, the cause of the formation of the Ombilin Basin is the uplift by magma activity, namely the intrusion of granite whose distribution is seen around the Ombilin Basin. The age of the granite is from 206 to 112 million years (determined radiometrically) or from the Upper Jurassic to the Lower Cretaceous. This age is slightly older

than the age of the Ombilin Basin, namely Cretaceous to Early Tertiary which is estimated based on the age of the sedimentary rocks in the basin. This fact supports the first hypothesis.

Secondly, another hypothesis has been proposed by Koning (1985) (Rohaendi, 2012). This second hypothesis states that the Ombilin Basin was formed by a block fault by a horizontal fault. The mechanism for this is called "pull apart". So-called in it there is a process of pulling the earth's crust that causes normal faults. The basin formed is known as a "pull apart basin".

Other investigations of pull-and-separate basins show the following general characteristics of these basins:

1. The sediment deposit is quite thick with a relatively small area.
2. The composition and texture of the sediments indicate the high rate of sedimentation.
3. The sedimentary texture cycle shows tectonic activity.

All of the characteristics mentioned above are found in Ombilin so it is evidence to support hypothesis 2. The cause of the horizontal fault in the Ombilin Basin, there is a "dextral" Sumatran horizontal fault, which is the result of the Indian-Australian plate infiltration under the Asian Plate (plate tectonic theory). The fault passes only 10 km to the west of the Ombilin Basin boundary, so the cause of the horizontal fault forming the Ombilin Basin may be the subduction of the Indian-Australian Plate under the Asian Plate.

In general, there is four tourism zonation in term of geotourism or mining-based tourism as follows. The first mining tourism zone is Balai Diklat Tambang Bawah Tanah/BDTBT (Underground Mine Training Center). This type of tourism is for those who have a background in geology and mining. BDTBT can organize one day tour visiting Sawahluwung and open-cut mining in Sawahlunto. BDTBT can provide personal protective equipment for visitors.

The state-owned company PT BA UPO has the biggest role in the development of Sawahlunto city. There are many mining facilities of PT BA UPO that have become city landmarks. One of the mining facilities is a training center, recently known as BDTBT. The facilities have been transferred to the government (Ministry of Energy and Mineral Resources).

The occurrence of a training center has the advantage for Sawahlunto city since it is a place for visitors to learn how the operation of underground coal mining. The visitors can also see and visit mining facilities safely. There are many mining and geology students from many universities all around Indonesia who came to BDTBT since the mine facilities are very complete, especially for underground mines. In addition, the students from the elementary, junior, and senior schools are also regularly visiting BDTBT to get to know about coal mining.



(Source: Rohaendi, 2022)

**Figure 3.** Sawah luwung as underground coal mining and open cut area as the place for mining training, ex the mining facilities as a training center.

The second mining tourism zone is in the "old" city center of Sawahlunto. PT BA UPO has its head office in the city center. This historical building is located in the main center of the city and became an iconic landmark of the city. Since the main function of the city is to administer mining activities, there are many mining facilities located in the city center, for example, the silo, the three very high buildings erected about 30 meters to place coal. From the silo, the coal is transported using the train to Padang.

Then, very close to the main office, there is 'mbah suro' tunnel. The tunnel is an old tunnel built in the colonial era. In 2010, the local government opened the old tunnel as a tourist destination, for safety reasons, all visitors who want to look at the tunnel should wear personal protective equipment. This area is suitable for day trips, especially for families and children. We will see mining production, mining transportation, and stockpile.

This zone is the real picture of the oldest mining city in Indonesia, all infrastructure and facilities were established through coal mines. The road and transportation networks, water and sanitation services, housing, hospitals, schools, hotels, electricity, religious places, and recreation centre developed by mining activities. In the past, even some facilities have high standards in comparison to the same facilities in the capital city of West Sumatera (Padang). Most of the facilities were transferred to the government after the mine closure.

Sawahlunto seems successful to transform from a mining city to a new cultural and tourism mining city. The participation of the youth generation in local development by opening café, and coffee shops is notable. The revitalization and preservation of mining heritage also work well.





(Source: Rohaendi, 2022)

**Figure 4.** Mine facilities and mine office of PT Bukit Asam Unit Production Ombilin in City Center

The third mining tourism zone is Kandi. The area is the mining area of PT BA UPO. The area is mined land that has been reclaimed as a tourism zone. The facilities here are there are zoos, horse races, road races facilities, etc. In the same area, there is Kandi lake. The lake is an ex-mining area. This area is suitable for those who are interested in learning about mine reclamation practices. The development of area is cooperation between corporate and government. This area is suitable also for families and kids. This zone offers local recreational, cultural services, and education.



(Source: Rohaendi, 2022)

**Figure 5.** The mined land area has new function as tourism area of Kandi, cow breeding, and horse race



(Source: Rohaendi, 2022)

**Figure 6.** Kandi lake with background the active mining



The fourth mining tourism zone is the forest area. This place is very suitable for seeing and enjoying jungle sports, orienteering, or geological fieldwork. The morphology and geology are interesting. There are many types of rocks, types of minerals, and geological structures. This tourism area is only suitable for those who are interested in extreme sports, or geological or exploration backgrounds.



(Source: Rohaendi, 2022)

**Figure 7.** Kandi Lake with a background the active mining,

## Discussion

Sawahlunto, as a mining city, was to generate economic development for the region by providing job opportunities and gaining fiscal revenue from mining. However, mining is the temporary use of land, when the post-mining period comes, a city will suffer economic, social, and environmental problems. So, transforming geosites and mining sites values for mining-based tourism has become a wise choice, not only for Sawahlunto but also for other mining cities. The factor that is important to determine the success of the tourism industry is the point of view of the visitors. There are important aspects of the attractiveness of Sawahlunto such as natural beauty, mining heritages, museums, and architectural features (Armis & Kanegae, 2020).

Mining-based tourism is a special interest tourism. For Indonesian people, this type of tourism is still new. However, since there are thousands mining areas in Indonesia especially outside of Java islands. Hopefully, this type of tourism will be an alternative in the future. The public that is interested in geotourism can also be motivated by mining tourism attractiveness. Tourists will be interested in the environment. The implementation of mining-based tourism after mine closure or mine production becomes a key element for the motivational process of tourists.

Developing mining-based tourism in Sawahlunto needs a comprehensive plan. The development of tourism is already following several steps including: The opening of mining-based tourism should consider the public interest, social demand (leisure and cultural installations), description of mine features and facilities to recover, proposed activities (tourist area layout, etc.), security plan, information board, programming, and publicity, offering local recreational and cultural services, feasibility study (Costa & dos Santos, 2016).

To enjoy mining-based tourism, there are many preparations people should know, for example, to make sure the area is safe, and healthy physics, and sometimes personal protective equipment is needed. Mining in full operation can produce risks to tourist safety. For these reasons, people should have contact with the local tour guide or event organizer.

## Conclusion

The state-owned compan, PT BA UPO has the biggest role in the development of Sawahlunto city. There are some mining facilities of PT BA UPO that have become city landmarks. Now, all mining facilities have become the main tourist destination in Sawahlunto. Based on the analysis, there are four mining-based tourism zones in Sawahlunto regency.

The first mining tourism zone is Balai Diklat Tambang Bawah Tanah/BDTBT (Underground Mine Training Center). This type of tourism is for those who have a background in geology and mining. BDTBT can organize one day tour visiting Sawahlungung and open-cut mining in Sawahlunto. BDTBT can provide personal protective equipment for visitors. One of the mining facilities is a training center, recently known as BDTBT. The facilities are transferred by PT BA UPO to the government (Ministry of Energy and Mineral Resources). The occurrence of a training center has an advantage for Sawahlunto city since the place is for visitors to learn how the operation of underground coal mining. The visitors can also see and visit mining facilities safely.

The second mining tourism zone is in the city center of Sawahlunto. PT BA UPO has its main office in the city center. This historical building is the main center of the city and the iconic landmark of the city. Since the main function of the city is to administer mining activities, there are many mining facilities located in the city center, for example, silo, the three buildings erected about 30 meters to place coal. From silo, the coal is transported using the train to Padang. Then, very close to the main office, there is 'Mbah Suro' tunnel. The tunnel is an old tunnel built in the colonial era. In 2010, the local government opened the old tunnel as a tourist destination, for safety reasons, all visitors who want to look at the tunnel should wear personal protective equipment.

The third mining tourism zone is Kandi. The area is the mining area of PT BA UPO. The area is a reclamation area as a tourism zone. The facilities here are there are the zoo, horse race, and road race facilities.

The fourth mining tourism zone is an undisturbed area. This place is very suitable to see and enjoy geological exploration. The morphology and geology are interesting. There are many types of rocks, types of minerals, and geological structures.

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