Danau Seran, a pit lake in an ex-mining area as an opportunity for sustainable tourism

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Abstract. The mining activities left so many environmental impacts on its ex-mining areas. Some of the abandoned open-cut mines often filled by groundwater or rainwater and turn into pit lakes. Despite its toxic water and other environmental problem, this pit lakes become a tourist attraction in some areas. This research aimed to analyse whether a pit lake in the ex-mining area is potential for sustainable tourism and how it impacts the environment and local community. This research took Danau Seran (Seran Lake), ex-diamond mining as a case study. Some field research and interviews with local communities were done during this research. The environmental condition of the area shows that the water of Danau Seran is acidic and harmful for long term daily use. No green plantation is seen in the area. Based on 3A tourism principle (Attractiveness, Amenity, Accessibilities), Danau Seran has fulfilled almost all principles of 3A. The result shows that Danau Seran as a pit lake needs to improve its environmental quality and community development through reclamation. Hence, this will create an opportunity for sustainable tourism.

1. Introduction
Indonesia is one of the massive producers and exporters of many natural resources, such as coal, copper, gas, etc. Those natural resources are distributed across many islands in Indonesia, especially Sumatera and Kalimantan[1]. Due to the unrestrained mining wastes, a lot of environmental problems have arisen. Air pollution, water pollution, and soil pollution are some of the negative impacts of mining activities. Moreover, these pollutions also affected the durability of indigenous animals and plantations. However, the mining sectors already were given a huge contribution to the economy of Indonesia. For example, according to Indonesia’s Ministry of Energy and Mineral Resources, Coal reserves in Indonesia is estimated to last in 83. There are numerous numbers of coal mining in Indonesia, but the three largest areas are in South Sumatra, South Kalimantan, and East Kalimantan. Reclamation aims to arrange, restore, and improve the quality of the environment and ecosystem to be able to function again in accordance with its allotment [2],[3]. The Indonesian Government considers that changing ex-mining area into a tourist attraction might be one of the efforts could be done in land reclamation. Many of pit lakes as the result of abandoned open-cut mines turn into tourist attraction. Despite the acidity of the water and the bad environmental condition, somehow a pit lake is attractive enough for tourism[4][5][6].
South Kalimantan is already famous for its coal mining and diamond mining, which some of them have had pit lakes as the result of mining activities. Danau Seran, Danau Galuh and Danau Caramin are some of the pit lakes famous among the people of South Kalimantan as tourist attractions. These pit lakes is an abandoned diamond mine. The ex-mining area is still under the authorization of some mining companies until sometime in the future. After being filled by groundwater and rainwater, the area turns into tourism area. This phenomenon is also happening in some parts of the world, where pit lakes in ex-mining areas turn to tourist attractions[7], [8] and should be considered as one of the solutions for the ex-mining area.

Mining activities used to be called as a whole process of exploration, feasibility study, construction, mining, loading and transportation, and ended with rehabilitation for the ex-mining area. While the maintenance of mining activities is an effort done technically and non-technically to prevent possible problems caused by mining activities inside the mining area and also its surroundings. Despite the examining activities impacts, some researchers have provided an idea about green mining. The green mining concept aims to create a healthy connection between the mining company, environment, and the surrounding community[9],[10], [11]. However, this concept also faces a difficult choice between nature’s exploitation of mining activities or focused more on its ecological condition. The green mining concept is not yet ready to be fully implemented directly in mining activities.

In Indonesia, there are Government Regulations regarding Mining Activities. The first one is Law No. 4of 2009 concerning mineral and coal mining which manage the basic law of land reclamation and ex-mining plan. It states that every stakeholder who holds the right for mining activities has an obligation to make a reclamation plan for ex-mining activities including reclamation bond. Below Law No. 4of2009, there is Government Regulation No.78of 2010[3] about Land Reclamation for Mining Area including Reclamation in the ex-mining area and its surroundings; Maintenance of the reclamation; Community development; Monitoring. Land Reclamation in Indonesia has not been implemented appropriately.

According to researchers in some ex-mining areas in Indonesia, the reclamation has not been done based on the law. The environmental quality after land reclamation has not met the requirements of Government Regulation No.78 of2010. Nevertheless, in another ex-mining area that turns to tourist attraction the environmental quality and economic value of the area can be improved [12]. Adding a new concept of tourism to an ex-mining area must be followed by local regulations, such as improving environmental condition through re-vegetation/plantation, land reclamation, adding green infrastructure, improving facilities and public infrastructure in line with the specific character of each area.

Nevertheless, as frequently happens in ex-mining areas, there are some environmental problems caused by previous mining activities. Therefore, sustainable tourism is a good concept for further development to be implemented in the ex-mining area that turns into a tourist attraction. Sustainable tourism is a balanced approach in tourism that basically has the concept of environmentally friendly or reducing environmental impact by also focusing on economic and political impact[13]. The involvement of indigenous people or local community is considered as an important factor in sustainable tourism[14]. By applying the concept of sustainable tourism, an ex-mining area might have the opportunity to improve its environmental quality.

2. Method
The location of this research is called Danau Seran, which is a pit lake from ex-diamond mine. Danau Seran is very famous in South Kalimantan around 2016-2018. Located in Banjarbaru, around 20 minutes from the local airport, Danau Seran gave a new alternative for tourism and sight seeing. It can be said that the lack of tourism areas in Banjarmasin and its surrounding area has made this pit lake into a new tourist attraction.

This research was mixed with descriptive-qualitative and quantitative research. The whole data collection was done through literature review, field research, and interview between October-December 2018. The literature review discovered the phenomenon of a pit lake turns to tourist
attraction. There were around 6 papers reviewed related to pit lake that turns to tourist attraction and 2 papers about sustainable tourism. Field researches intended to: 1) observe the tourist zoning area in Danau Seran base on 3A (Attraction, Amenity, Accessibility) principles; 2) calculate the pH scale of the pit lake’s water while also identify the ecological condition of the pitlake. At the same time, some interviews were done with 15 local communities who manage to run some business in Danau Seran. They opened restaurants, kiosks, renting small boats, and opening public toilets. The interviews mostly focused on the positive and negative impacts of the pit lake to local communities.

The data was then analyzed according to Government Regulation Number 78 of 2010 about Land Reclamation for Mining Area and Tourism 3A principles to determine whether Danau Seran as a pit lake in the ex-mining area is potential for tourism area. Overall this research tries to find out whether a pit lake can change its function from the ex-mining area to be a tourist attraction, and how it might impact the environment and local community.

3. Result and Discussion
Danau Seran is located in Banjarbaru, East Kalimantan. Banjarbaru is the administrative city of South Kalimantan. Located in the middle of housing areas, Danau Seran started to become a tourist attraction at the beginning of 2016. At first, there were only some teenagers (millennial generation) found this pit lake and later spread the information through social media. After that, gradually the pit lake attracted more visitors and become a tourist attraction. The pit lake is an ex-mining area of PT Galuh Cempaka, and is still authorized by this company until 2034. The company has granted the local community the right to manage the area until the end of the contract.

Danau Seran encompasses around 10 Hectares wide and 30 meters depth land. In the middle of the pit lake, lies land that now looks like an island. The water is very clear, which is why the locals use to call the pit lake as a mirror lake. The objects in the lake are clearly seen. Danau Seran offers beautiful natural sceneries (Figure 1) that most people cannot find in urban areas. The local people provide small boats to cross the lake into the small island in the middle of it. The locals also built some facilities, especially kiosks for food and beverages, and also public toilets.

During 2016-2017 there was a large number of visitors or tourist visited Danau Seran. According to the locals, each day there were around thousands of tourists came to visit the pit lake. However, at the beginning of 2018 until now, the number of tourists has decreased, from thousands per day to only 20-100 tourists per day. This number gradually decreased day by day. According to the locals, the lack of tourism attraction in Danau Seran might affect the visitation number of tourists. Today, there are other tourist spots in the area that have the same type of natural tourist destination called Danau Caramin (Caramin Lake), Danau Galuh Cempaka (Gauh Cempaka Lake), Kebun Raya Banua (Banua Botanical
Garden), Meek Farm. Apart from the natural tourist spots, there is also another type of tourist spot such as an amusement park called Amanah Borneo Park, Bekantan Park. There are also some tourist spots that Instagrammable like Rumah Jomblo, Bukit Lentera and Kampung Pelangi. The number of kiosks opened by the local community has also decreased from around 50 into 20 tenants in 2018. The number of visitors to Danau Seran has decreased since 2018, and this has impact Danau Seran in many ways.

According to some research about tourism in Indonesia, the trend of tourism in Asia and Indonesia are dominated by millennial generations [15]. This generation has some unique preferences for traveling style. Millennial generation picks tourism areas that offer some new interesting places and up-to-date spots to be shared on social media. Danau Seran as a pit lake no longer has other things to offer than scenery of the lake. Nowadays, people or tourists who visit Danau Seran are mostly groups of families or people above 30s. The millennials are infrequently seen in Danau Seran probably because the lake does not have many interesting spots to take pictures. The researchers interviewed some groups of teenagers of the age between 15-20s regarding their point of view about Danau Seran, and surprisingly they said that as millennials, they need interesting spots for photos in their social media. Danau Seran in this case, does not have so many interesting photo spots.

Therefore, many of the millennials who have visited Danau Seran rarely return because of the limited photo spots. They would prefer other tourism spots with new concepts. Moreover, other tourism spots often offer many events such as music festival, street food bazaar and festival, or other amusing activities. Compared to other tourist spots around Banjarbaru, Danau Seran still lacks in tourist attraction and facilities.

![Figure 2. Visitors’ reasons to visit Danau Seran (Source: Analysis, 2018)](image)

Based on the 3 principles of Tourism (Attraction, Amenity, Accessibility), Danau Seran has almost fulfilled all three (Figure 2). Through some interviews, around 50% of Danau Seran visitors said that the accessibility and natural-beautiful sceneries of Danau Seran are the main attractions to visit the pit lake. Regarding facilities, less than 10% of the visitors thought that Danau Seran has good facilities. The local community has actually developed some facilities for tourism such as restaurants, public toilets, praying room. There is even a water boom park built nearby Danau Seran to attract more visitors. However, these facilities still have lower qualities compared to other tourism spots near Danau Seran. The facilities in Danau Seran are relatively standard. There are no other attractions at Danau Seran other than its beautiful sceneries and strategic location.

While many of the visitors said that Danau Seran has a strategic location and good accessibility, apparently access to Danau Seran I crossing the housing area (Figure 3). Some visitors may find this uncomfortable as they must cross a private zone to access the tourism area. As showed in Figure 4, Danau Seran is located in the middle of the housing area. Safety and environmental factors become important for people living in the housing area.
Another minus point is the condition of the lake. The lake has 30 meters depth and the bottom of the lake consist of ex-mining remaining materials. Deep holes and other materials can still be found at the bottom of the lake. This condition makes Danau Seran uncomfortable and unsafe for swimming. According to the field research, the pH scale of Danau Seran is around 3.75 using pH meter. The same research in 2017 also found that the pH scale of Danau Seran was around 3.65 to 3-9 [7]. This means the water of the lake is very acid and is not good to be consumed by the people living in the housing area and also the surrounding community. The acid water brings impacts to the ecological condition of its surrounding area.

The local Government of Banjarbaru chose not to do any actions regarding the condition of Danau Seran because the area will still be under the authorization of PT Galu hCempaka until 2034. As an ex-mining area, the reclamation has not been implemented in Danau Seran since the end of diamond mining activity. Since Danau Seran has changed function into a tourist destination, there are no specific plans or actions regarding reclamation to improve the environmental quality of the ex-mining area and its surroundings. The lake is created from rainwater, which means there was no land reclamation has been done to fill the abandoned big hole. There is also no plantation or greeningeries around the area, making the temperature of the area quite high during daytime.

The natural sceneries, good accessibility, and facilities of Danau Seran are potential to be developed for sustainable tourism spot (3A principles). In this point, it is clear that the reclamation for the pit lake needs to be done. Through reclamation, the environmental quality of the ex-mining area can be improved gradually, which means the problems with acid water and high temperature can be reduced and more environmentally friendly conditions for tourism spots can be created.

4. Conclusion
Based on 3A tourism principle (Attractiveness, Amenities, Accessibilities), Danau Seran has no specific tourism attraction, which affects the number of tourists visiting the pit lake. The field survey shows that the Danau Seran’s water is acidic and might be harmful for long term daily use. The tourism development in Danau Seran has purely been done by the local community, who only supply the needs of amenities and accessibility by opening new access road to the pit lake and building some facilities. This development has not been followed by the environmental quality improvement. To achieve the
concept of sustainable tourism, an environmental quality which followed by community development should be improved[7], [9].

A pit lake needs to be filled with soil when the mining operation ends. This shall be the first step of reclamation [3]. In the case of this pit lake, the big hole was abandoned and filled by rainwater. Therefore, there should be another way to improve environmental quality given that the first stage of reclamation in the area has been neglected. The next step for the land reclamation is improving the soil quality by adding fertilizer containing calcium and phosphor. This method aims to prepare the soil for plantation. Planting the right vegetation in the area also needs to be planned efficiently. The type of vegetation appropriate for the ex-mining area is corn, cassava, Sengon (Albizia chinensis) and Jabon (Anthocephalus cadamba)[14].

The local Government and Banjarbaru’s Mining authority chose not to do any legal actions regarding Danau Seran. This lake is still under the management of PT Galuh Cempaka who is still undergoing its contract until 2034. The local government of Banjarbaru is still reviewing Banjarbaru’s Spatial Plan (RTRW Banjarbaru 2014-2034) in 2019. According to the document, Danau Seran is located in low-density settlement zone, and not specifically stated as a tourism zone. It is expected that the process of reviewing the spatial plan will consider Danau Seran as a tourism zone. Sustainable tourism and land reclamation also consider involving the local community in the whole process. On the other hand, the local community has given many attentions to manage Danau Seran as a tourism spot. Sooner or later, Danau Seran will need a special approach to overcome its situation as a pit lake. Community development under the principle of sustainable development could be applied to the area because the local community as the indigenous people can provide uniqueness of management approaches for the ex-mining area[10]. There are some cases showing that the local community should be involved in the planning process [16]. Reclamation also can be done with the help of the local community. When a better quality of the environment in Danau Seran is finally improved by the help of the local community, a great opportunity for sustainable tourism in the future may be achieved.

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