

Evaluation of Sustainable Tourism of Pacal Reservoir Based on Environment, Economic and Social Perspectives in Bojonegoro Regency

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Abstract: Pacal Reservoir has a function to irrigate agriculture in the Bojonegoro Regency area. Pacal Reservoir also has beautiful natural potential so that it is used as a mainstay tourism object of Bojonegoro Regency. The existence of the reservoir that has been for 90 years, makes the pacal reservoir experience several problems. The purpose of this study is to analyze pacal reservoir tourism into sustainable tourism. The method used is qualitative descriptive. The analysis used is a SWOT analysis. The results of the SWOT analysis are at the coordinate point (0.37; 0.28) where the coordinate point is in quadrant I. So that pacal reservoir tourism has opportunities and strengths, namely in that position is the most advantageous situation. Based on this study, it can be concluded that the results of the SWOT matrix produce several strategies when viewed in terms of environmental, social and economic tourism of the pacal reservoir. The result of the SWOT coordinate point is in quadrant I. Position in quadrant I means having opportunity and strength. The strategy that must be taken in conditions like this is to support an aggressive growth-oriented strategy by utilizing existing opportunities and strengths possessed.

Keywords: Historic reservoirs; Pacal reservoir; Sustainable tourism; SWOT

Introduction

Reservoirs serve as critical infrastructures for water management, playing a multifaceted role in regulating and storing water for various purposes, including irrigation, hydroelectric power generation, flood control, and recreational activities. The construction of reservoirs is primarily aimed at addressing water scarcity, particularly in regions experiencing seasonal fluctuations in water availability. For instance, during periods of heavy rainfall, reservoirs can capture and store excess water, which can then be utilized during dry seasons or drought conditions, thereby ensuring a consistent water supply for agricultural and domestic needs (Trimartinni, 2024; Biemans et al., 2011).

The ability of reservoirs to mitigate flooding is another significant aspect of their function. By controlling the flow of water during heavy rainfall events, reservoirs can reduce the risk of downstream flooding, which can cause extensive damage to property, infrastructure, and human life (Zhang et al., 2017; Schewe et al., 2013). This flood control capability is particularly vital in areas prone to extreme weather events, where the management of water resources becomes crucial for community safety and economic stability (Schewe et al., 2013; Biemans et al., 2011). Furthermore, the strategic operation of reservoirs can enhance resilience to climate change by adapting to altered precipitation patterns and increasing water demand (Granados et al., 2021; Zhao et al., 2013).

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Moreover, the ecological impacts of reservoirs cannot be overlooked. Large reservoirs can influence local ecosystems and hydrological cycles, potentially leading to changes in groundwater levels and affecting surrounding flora and fauna (Wisser et al., 2013; Zhu et al., 2019). Effective reservoir management practices are essential to minimize negative environmental impacts while maximizing the benefits of water storage. This includes addressing issues such as sedimentation, which can reduce storage capacity over time, and ensuring that water quality is maintained for both human consumption and ecological health (Wisser et al., 2013; Yu et al., 2021).

Pacal Reservoir, constructed in 1933 during the Dutch East Indies colonial period, serves as a vital water resource in Kedungsumber Village, Temayang District, Bojonegoro Regency. Its primary function is to facilitate agricultural irrigation in the surrounding areas, significantly contributing to local food production and water management (Trimartinni, 2024; Biemans et al., 2011). The reservoir is named after the Pacal River, which flows into it, highlighting the interconnectedness of local water bodies and their historical significance (Zhang et al., 2017).

In addition to its agricultural role, Pacal Reservoir is recognized for its natural beauty, making it a key tourist attraction in Bojonegoro Regency. The reservoir's scenic landscape not only enhances its recreational value but also supports local economies through tourism-related activities (Schewe et al., 2013; Granados et al., 2021). Khotimah (2016), Prathama et al. (2020), and Hardianti (2016) emphasizes the reservoir's fishery potential, noting that local residents engage in fishing activities, catching species such as tilapia and tawes. This local fishery not only provides food security but also serves as a source of income for the community, as catches are sold directly to tourists and visitors (Zhao et al., 2013; Wisser et al., 2013).

The multifaceted benefits of Pacal Reservoir extend to flood management, irrigation, and tourism, demonstrating its importance in maintaining water availability throughout the year. By collecting excess water during the rainy season, the reservoir ensures a sustainable supply for agricultural and domestic needs during drier periods (Zhu et al., 2019; Yu et al., 2021). This function is crucial in regions susceptible to drought, where reservoirs play a significant role in mitigating water scarcity and enhancing resilience against climate variability (Wen, 2023; Lee, 2023).

Moreover, the management of reservoirs like Pacal is essential for balancing ecological health and human needs. Effective management practices can help maintain water quality and support biodiversity within the reservoir ecosystem (Xu et al., 2023; Athukorala & Amarasinbhe, 2020). The integration of local

community perspectives in reservoir management is also vital, as local stakeholders can contribute to conservation efforts and sustainable practices that enhance both ecological and economic outcomes (Kantoussan et al., 2014; Snow et al., 2022).

According to the Head of UPT Tourism Destinations of the Bojonegoro Regency Culture and Tourism Office in 2023, the reservoir is plagued by issues such as garbage accumulation from floodwaters, seasonal drying, and insufficient visitor numbers, which have resulted in low revenue generation (Trimartinni, 2024; Biemans et al., 2011). These problems are compounded by inadequate infrastructure, including limited road access and insufficient parking facilities, which further deter potential visitors (Zhang et al., 2017; Schewe et al., 2013).

The accumulation of waste in the reservoir, particularly during flood events, not only affects the aesthetic and recreational value of the site but also poses significant environmental challenges. Effective waste management strategies are essential to mitigate these impacts and improve the overall health of the reservoir ecosystem (Granados et al., 2021; Zhao et al., 2013). Additionally, the seasonal drying of the reservoir raises concerns about water availability for irrigation and other uses, particularly during critical agricultural periods (Wisser et al., 2013; Zhu et al., 2019). This situation underscores the importance of implementing sustainable water management practices that can adapt to changing climatic conditions and ensure the reservoir's functionality (Yu et al., 2021; Wen, 2023).

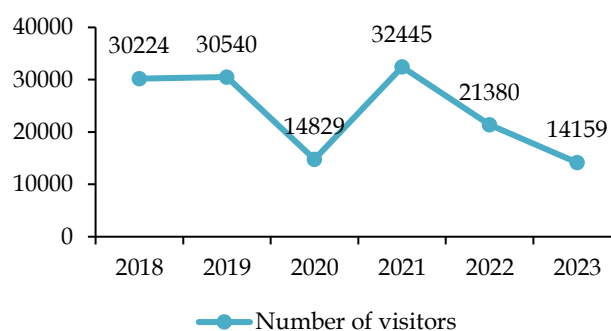


Figure 1. Graph of the number of visitors to Pacal Reservoir each year (Source: Bojonegoro Regency Culture and Tourism Office, 2023)

Moreover, the low visitor numbers indicate a need for enhanced marketing and development strategies to promote the reservoir as a tourist destination. Research has shown that improving access and amenities can significantly increase visitor engagement and satisfaction, thereby boosting local economies (Lee, 2023; Xu et al., 2023). The integration of recreational activities, such as fishing and eco-tourism, could also enhance the

reservoir's appeal and provide additional income streams for local communities (Athukorala & Amarasinghe, 2020; Kantoussan et al., 2014). Furthermore, the management of sedimentation is critical for maintaining the operational capacity of the reservoir. Sedimentation can reduce water storage capacity and negatively impact water quality, necessitating regular maintenance and dredging operations (Snow et al., 2022; Wilber et al., 2022; Rahmat

et al., 2023). Effective sediment management strategies, including the restoration of surrounding vegetation and the implementation of erosion control measures, can help mitigate these issues and prolong the reservoir's lifespan (Miranda et al., 2017; Chauhan, 2018).

From Figure 1, it can be seen that the number of visitors each year tends to decrease and increase once in 2021, namely after the COVID-19 pandemic. After 2021, the number of visitors has decreased continuously.

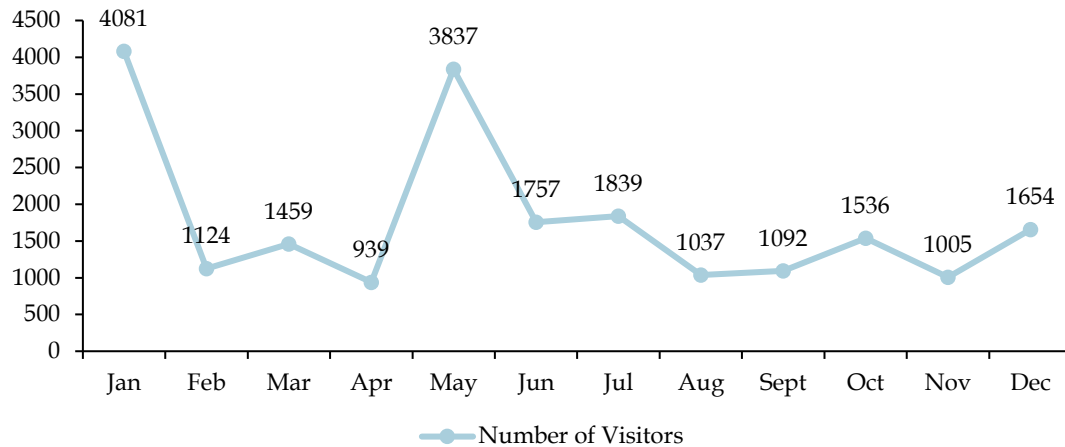


Figure 2. Graph of the number of visitors to Pacal Reservoir each month (Source: Bojonegoro Regency Culture and Tourism Office, 2023)

Based on Figure 2 it can be seen that the number of visitors to Pacal Reservoir tends to decrease, occasionally increasing at the beginning of the new year and during the Eid al-Fitr holiday (May). Reihanian et al. (2012), explained that to achieve sustainable tourism, which is defined as tourism that is environmentally friendly, economically feasible, and socially acceptable, relies on environmental protection and aligns tourism activities with social and economic values. Based on the background above, the author wants to evaluate environmentally, economically and socially so that the Pacal Reservoir, which is a tourist icon of Bojonegoro Regency, can become sustainable tourism. So that future generations in the Bojonegoro region can enjoy the tourism of Pacal Reservoir.



Figure 3. The beauty of Pacal Reservoir

Method

The research method employed in this study is descriptive research with a qualitative approach, focusing on a case study of sustainable tourism at Pacal Reservoir in Kedungsumber Village, Temayang District, Bojonegoro Regency. This qualitative approach allows for an in-depth analysis and evaluation of the reservoir's tourism potential and its socio-economic impacts on the local community (Chen et al., 2021; Eppinger et al., 2012).

The significance of utilizing a qualitative case study design is highlighted in the literature, where it is noted that such methods enable researchers to explore complex phenomena within their real-life contexts. For instance, Chen et al. (2021) discuss how the construction of large reservoirs can transform cultural landscapes and influence local economies through tourism activities, emphasizing the need for sustainable development practices that consider the socio-cultural dynamics of the surrounding communities. This aligns with the objectives of the current study, which seeks to evaluate the impact of Pacal Reservoir on local tourism and community development.

Furthermore, sustainable tourism development is critical in ensuring that local resources are managed effectively while meeting the needs of both visitors and residents (Shen et al., 2020). argue that understanding the local community's needs and expectations is

essential for the sustainable development of tourism resources in reservoir areas, as it fosters a sense of ownership and responsibility among local stakeholders (Shen et al., 2020). This perspective is particularly relevant to the Pacal Reservoir case, where community involvement could enhance tourism experiences and promote environmental stewardship.

The data sources used in this study consist of primary data sources and secondary data sources. Primary data were obtained directly from the field through observation methods and interviews with informants and questionnaires with community respondents Tretes Hamlet, Kedungsumber Village, Temayang District, Bojonegoro Regency. Secondary data in the form of documents from books, websites, magazines, journals, documentation, and other data sources. The data sources used in this study consist of primary data sources and secondary data sources. Primary data were obtained directly from the field through observation methods and interviews with informants and questionnaires with community respondents Tretes Hamlet, Kedungsumber Village, Temayang District, Bojonegoro Regency. Secondary data is in the form of documents from books, websites, magazines, journals, documentation, and other data sources.

Data collection techniques used include interview techniques, observation techniques, documentation techniques and questionnaires. The sampling method used in this study is purposive sampling. Purposive sampling means that respondents are selected deliberately according to research needs (Musfiquon, 2012). The respondents interviewed were 59 respondents consisting of the Head of the Bojonegoro Regency Culture and Tourism Office, Kedungsumber Village Apparatus, Pacal Reservoir tourism managers, business actors and the people of Kedungsumber Village. During the research process within a period of 2 months and respondents obtained as many as 59 people obtained from interviews and observations.

The number of samples is calculated based on the Slovin formula which is used to determine how large a sample is taken from a population. The calculation is as follows.

$$n = \frac{N}{1 + N (d)^2} \quad (1)$$

n = Sample Size

N = Population Size

d = Selected error level (1%, 5% and 10%)

Based on this formula, many samples are obtained as follows:

$n = 149 / 1 + 149(0,10)^2$, $n = 59$. Based on the formula above, the minimum number of samples used is 59 Heads of Families.

Result and Discussion

Based on the results of the analysis of internal and external factors, strategies can be identified by looking at the factors that are strengths, weaknesses, opportunities and threats that affect the environmental, social and economic tourism of Pacal Reservoir (Fatimah, 2016). This SWOT analysis uses qualitative descriptive data analysis by analyzing external and internal that can affect the environmental, social and economic tourism of Pacal Reservoir.

The internal factors in this SWOT analysis include the strengths and weaknesses that exist in the environmental, social and economic environment of Pacal Reservoir tourism. Strengths are special advantages and abilities while weaknesses are shortcomings, limitations, or obstacles in every environmental, social and economic element of Pacal Reservoir tourism. External factors in this SWOT analysis are opportunities and threats in the environmental, social and economic tourism of Pacal Reservoir. Opportunity is a change that can be predicted and seen in the future in the near future and can provide benefits for the tour. While threats are symptoms that have a negative impact. The SWOT matrix analysis is as follows.

Internal Factors

The Pacal Reservoir in Bojonegoro presents several strengths that contribute to its significance as a tourist attraction and a resource for local communities. Firstly, it is recognized as a unique tourist destination that combines natural beauty with historical significance, making it a distinctive site in the region. This aligns with findings from Dewantara, who emphasizes the importance of local communities in preserving their cultural and environmental heritage, which is crucial for sustainable tourism development (Dewantara, 2024). The active participation of local residents in maintaining the reservoir ensures that it remains a safe and appealing destination for visitors, showcasing a strong community commitment to environmental stewardship (Dewantara, 2024).

Secondly, the reservoir serves as a vital source of livelihood for local residents, particularly through fishing activities. This aspect is supported by research indicating that community-based tourism can enhance local economies by providing sustainable income sources while promoting environmental conservation (Giampiccoli & Kalis, 2012). The introduction of culture-based fisheries has been shown to significantly increase

fish production and improve the socio-economic conditions of local fishers, which is relevant to the context of Pacal Reservoir (Pushpalatha et al., 2015). This economic benefit reinforces the importance of the reservoir not only as a recreational site but also as a critical resource for the community's sustenance.

Moreover, the concept of sustainable tourism is increasingly recognized as essential for balancing economic growth with environmental preservation. As highlighted by Marsiglio, tourism can act as a catalyst for green growth, provided that the preservation of natural resources is prioritized (Marsiglio, 2015). This perspective is particularly relevant for Pacal Reservoir, where the integration of tourism with conservation efforts can lead to long-term benefits for both the environment and the local economy.

The Pacal Reservoir faces several weaknesses that hinder its potential as a sustainable tourism destination. One significant issue is that it serves as the final accumulation point for garbage from upstream areas, particularly from Gondang District. This accumulation of waste not only detracts from the aesthetic appeal of the reservoir but also poses environmental challenges, impacting water quality and local biodiversity (Dag et al., 2024). Research indicates that effective waste management is crucial for maintaining the attractiveness of tourist destinations, as litter and pollution can significantly diminish visitor experiences and deter repeat visits (Plessis et al., 2017; Yıldız & Khan, 2019).

Another weakness is the narrow access roads leading to the reservoir, which can create logistical challenges for visitors and limit the potential for increased tourism traffic. Accessibility is a critical factor in tourism competitiveness, as it directly influences the ease with which tourists can reach a destination (Nuringsih et al., 2020). Studies have shown that destinations with poor accessibility often struggle to attract visitors, as potential tourists may opt for more accessible alternatives (Liasidou et al., 2021). Improving infrastructure, including road access and parking facilities, is essential for enhancing the overall visitor experience and increasing tourism revenue (Pröbstl-Haider et al., 2014).

Additionally, the limited number of local vendors selling goods and services around the reservoir area further restricts its tourism potential. A vibrant local economy that includes diverse offerings can enhance the attractiveness of a destination, providing visitors with more reasons to stay longer and spend more (Liasidou et al., 2022). The lack of commercial activity can lead to a diminished visitor experience, as tourists may seek out areas with more robust local economies and a variety of services (Kuntariningsih et al., 2023). Encouraging local entrepreneurship and supporting small businesses around the reservoir could help address this weakness

and contribute to a more vibrant tourism environment (Medarić et al., 2021).

External Factors

The external factors influencing the development of Pacal Reservoir present several opportunities. The natural beauty of the reservoir holds significant potential for tourism, particularly with the addition of camping areas and children's play zones, which could attract more visitors. Additionally, there is the opportunity for collaboration with other parties, including the private sector, to enhance the area's infrastructure and services. Furthermore, efforts to diversify the yields of the reservoir, such as introducing new activities or products, could help increase the income of local residents, benefiting the surrounding community economically.

Several threats pose challenges to the development of Pacal Reservoir. One of the main concerns is the increasing silting of the reservoir, which could negatively impact its functionality and attractiveness for tourism. Additionally, the rise of contemporary tourism in Bojonegoro presents competition, potentially drawing visitors away from Pacal Reservoir. Another threat is the lack of awareness and cooperation from local communities and village governments, who may be "ignorant" of the reservoir's significance, leading to insufficient support and engagement in preserving and promoting the area.

Table 1. Matrix analysis IFAS

		Weight	Rating	Score
Variable Strength	S1	0.18	4.24	0.77
	S2	0.16	4.12	0.67
	S3	0.17	4.19	0.72
Sum				2.16
Variable Weakness	W1	0.16	3.98	0.62
	W2	0.16	4.24	0.67
	W3	0.17	4.07	0.69
Sum				1.98

Table 2. Matrix analysis EFAS

		Weight	Rating	Score
Variable Opportunities	O1	0.19	4.25	0.80
	O2	0.17	4.36	0.73
	O3	0.17	4.34	0.75
Sum				2.29
Variable Threat	T1	0.18	4.27	0.77
	T2	0.15	4.44	0.68
	T3	0.14	3.98	0.54
Sum				1.99

According to Salim & Siswanto (2019), from this matrix four kinds of strategies with their respective characteristics can be produced, namely: SO strategy is a strategy that must be able to use strengths while taking advantage of existing opportunities; WO strategy is a strategy that must be demonstrated to reduce the weaknesses faced and at the same time take advantage of the opportunities that exist; ST strategy is a strategy that must be able to highlight strengths to overcome threats that may arise and WT strategy is a strategy that aims to overcome obstacles and minimize the impact of existing threats.

From the results of the strategy that has been made, it can be concluded using the SWOT quadrant as follows.

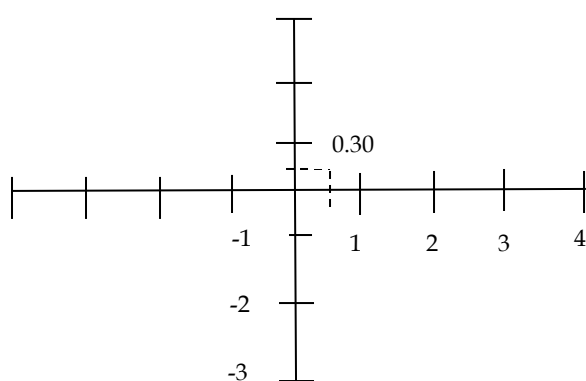


Figure 4. SWOT analysis results

Based on the SWOT analysis above, it is at the coordinate point (0.18; 0.30) where the coordinate point is in quadrant I. So that the opportunities that exist and the internal strength possessed so that it can be concluded that Pacal Reservoir tourism is in the position of quadrant I, which position is the most favorable situation. A position in quadrant I means having opportunities and strengths. The strategy that must be taken in conditions like this is to support an aggressive growth policy or growth-oriented strategy by utilizing existing opportunities and strengths possessed. According to Rangkuti (2006), quadrant I is a very favorable situation. Companies have opportunities and strengths so that existing opportunities can be utilized. The strategy that must be applied in these conditions is to support an aggressive growth policy (Growth-oriented strategy).

This can be done by implementing existing opportunities such as the potential natural beauty of Pacal Reservoir with the addition of camping areas and children's play areas, efforts to increase the income of local residents by diversifying reservoir results and cooperation with others parties/private sector.

Conclusion

Based on the description above, it can be concluded that several strategies are needed such as maintaining the natural conditions of Pacal Reservoir tourism, involving residents around the reservoir and cooperation with other private sector. Keep making the reservoir a place to fish and diversify fish. carry out periodic cleaning of reservoir waste, widening roads by the Regional Government, improving the economy of residents by adding sales areas, normalizing reservoirs periodically. Rehab reservoirs regularly so as not to be left behind by new tours that have sprung up, involve local residents so that residents' income increases, clean up garbage and normalize reservoirs, coaching local residents to make typical food/snacks of tourist areas. Based on the SWOT quadrant is in quadrant I. In quadrant I position, which is the most favorable situation. A position in quadrant I means having opportunities and strengths. The strategy that must be taken in conditions like this is to support an aggressive growth policy or growth-oriented strategy by utilizing existing opportunities and strengths possessed.

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Author Contributions

Conceptualization, data curation, Y.A. and B.S.; methodology, validation, supervision, B.S., R.B.E.W., and B.H.; software, formal analysis, investigation, resources, writing—original draft preparation, writing—review and editing, visualization, project administration, funding acquisition, Y.A.

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Conflicts of Interest

The authors declare no conflict of interest.

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