

Determination of Cultural Tourism Development Strategy in the Special Capital Region of Jakarta Using the Dynamic Model Method

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ABSTRACT

DKI Jakarta has great potential in tourism development, but has several shortcomings, especially in cultural tourism, especially museums. DKI Jakarta has great potential for tourism, especially cultural tourism, but problems such as lack of museum management hinder its growth. The increase in the number of tourists can have both positive and negative impacts. The positive impacts include increasing regional income, GRDP, MSME income, and labor absorption. While the negative impacts include cultural filtration, environmental pollution, risk of disease transmission, and so on. To bridge these problems, this study was conducted to obtain an optimal strategy for the cultural tourism sector in DKI Jakarta in order to increase MSME income and DKI Jakarta's Gross Regional Domestic Product (GRDP). This study develops a dynamic model to capture the complex interactions between MSME income and DKI Jakarta's GRDP so that it allows the development of optimal strategy scenarios. The scenario of increasing parameter values can be selected for the MSME income factor and DKI Jakarta's GRDP, because it produces an increase of 5% and 0.008%, respectively. These results indicate that MSMEs have moderate economic benefits, but still have a minimal impact on the overall GRDP. This study contributes valuable insights for policymakers to enhance MSME growth and optimize the economic benefits of cultural tourism.

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1. Introduction

The tourism sector is a new alternative with potential for the development of traditional industries that can improve the welfare and sustainability of the community (Lacher et al., 2013). According to the mandate of Law Number 10 of 2009 concerning tourism, it is explained that tourism development is necessary to encourage equal business opportunities and benefits, as well as to face the challenges of local, national, and global life changes. Therefore, tourism must be developed to its fullest potential (Soeswoyo et al., 2021). Every year, the number of tourists visiting the DKI Jakarta area continues to increase. In Fig. 1, you can see the number of tourists visiting the leading tourist attractions in DKI Jakarta.

In DKI Jakarta, tourism potential can be classified into several types, such as religious tourism, nature tourism, cultural tourism, and others. Cultural tourism is one of the potentials to attract tourists. Therefore, cultural tourism must be developed to increase regional income (Kamariotou et al., 2021).

However, besides the positive impacts, the increase in the number of tourists also has negative impacts (Garcia-Buades et al., 2022), such as cultural filtration, environmental pollution, and so on. Additionally, there are also problems occurring in museums, such as the lack of museum education institutions, lack of local government attention to museum management, weak management systems Masnadi (2023) and a shortage of experts in the museum field. Therefore, the DKI Jakarta Tourism Office must have strategies for tourism sector development by considering the negative impacts and existing shortcomings (Damanik et al., 2019). In response to these challenges, the development of a comprehensive strategy is imperative, and this research offers a solution through the utilization of dynamic modeling (Rahman et al., 2022).

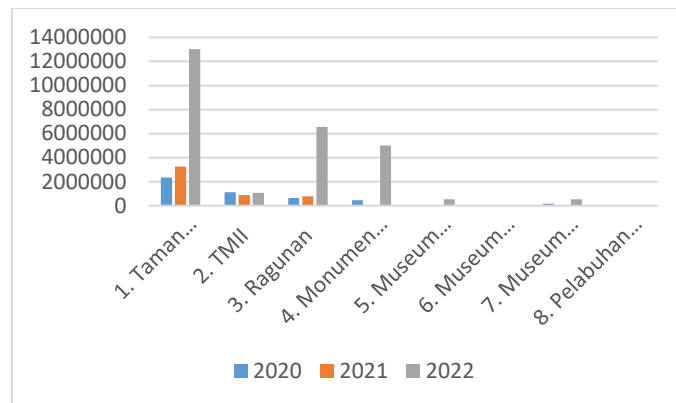


Fig. 1. Number of visitors to DKI Jakarta's leading tourist attractions

Tourism is also one of the most important sectors for economic growth (Muryani et al., 2020), offering various benefits including job creation, regional development, and increased income (Azizurrohman et al., 2021). The development of museums and heritage sites offers significant economic opportunities for cultural tourism in DKI Jakarta. However, addressing weak management structures and environmental impacts is crucial for realizing this potential. This research focuses on identifying sustainable strategies for cultural tourism in DKI Jakarta, using a dynamic model approach to measure the impact on SME income and RGDP. The objectives of this research are:

1. To determine the dominant factors affecting the cultural tourism sector in DKI Jakarta
2. To determine strategies for the cultural tourism sector to increase SME income and RGDP in DKI Jakarta using a dynamic system.

Through the simulation of multiple scenarios, dynamic modeling furnishes policymakers with a means to achieve equilibrium between economic development and sustainability. By developing conceptual models and simulations, this research can provide useful insights for policymakers in formulating effective tourism development policies that enhance economic benefits. Furthermore, it aims to contribute to the sustainability of cultural tourism in Jakarta, ensuring long-term benefits for the local economy and the preservation of cultural heritage.

The tourism sector plays an important role in the economic development of various regions around the world. Specifically, in urban environments like DKI Jakarta, cultural tourism offers significant growth potential by leveraging local heritage and attractions, such as museums and historical sites. Several studies have explored the complex relationship between tourism development, economic growth, and environmental sustainability, emphasizing the need for balanced strategies that maximize economic benefits while minimizing environmental and cultural degradation.

This research refers to previous studies on increasing the number of tourists. As in the study conducted by Emra et al., (2018) research on the development of tourism potential only on Surga Beach in Lombok. This study uses a descriptive qualitative method that produces the development of potential and inhibiting factors. The results are that even though the original regional income and

regional autonomy have increased, Surga Beach still has obstacles to developing tourism potential. As in the study conducted by [Haribudiman et al., \(2023\)](#) tourism contributes to gross domestic product even though there are negative impacts. To reduce the negative impact by conducting tourism carry capacity. This study uses a qualitative method that uses five dimensions of tourism carrying capacity. This study produces three frameworks and implications of strategic analysis, namely natural resource recovery, implementing integrated planning and providing tourist ethics education to visitors.

This study [Salim \(2021\)](#) aims to determine how much influence the number of tourist arrivals and the level of hotel housing on the receipt of the tourism industry's GRDP sector. With the results of the magnitude of the influence indicated by the R^2 value of 0.95, which means that the dependent variable GRDP can be explained by the independent variables, namely foreign tourists and hotels by 95%, while the remaining 5% is explained by other variables outside this study. [Agustyawati, \(2023\)](#); [Ramadhan et al., \(2022\)](#); [Yanti et al., \(2024\)](#) examined how much influence marketing has in increasing the number of tourists. [Zunaidi et al., \(2022\)](#) conducted research using descriptive qualitative methods in Kampung Naga which is a cultural tourism object. The results of this study are that there is a significant impact on the community when tourism development is carried out which is influenced by the economy, social and culture of the community around Kampung Naga. [Fadli et al., \(2022\)](#); [Fatina et al., \(2023\)](#); [Zhao et al., \(2024\)](#) using a dynamic model to find out what influences the increase in the number of tourists.

As in the study conducted by [Kusumawardhani \(2023\)](#) increasing the number of tourists must be done in collaboration with the government using the SWOT method. There are three types of experiments used as sources in this research, namely thematic village managers, local government officials, and tourism academics. Furthermore, research on increasing the number of tourist visits using an ethnographic design. The study [Lestari & Dewanti \(2019\)](#) aims to determine the factors influencing tourist visits to Kalibiru Nature Tourism, using the dependent variable as the visit rate and five independent variables, namely age, education, income, distance, and travel costs. Using multiple linear regression methods, the variables that significantly affect the visit rate are distance and income. The results of this study are almost the same as the study [Eljawati \(2021\)](#), but this study explains that SMEs play a very strategic role in increasing tourist visits in Sidamulih District. This research uses descriptive qualitative methods with an inductive approach. Although these studies point to elements that affect tourist growth, they don't provide a dynamic, integrated strategy that takes environmental and economic sustainability into account, which is what this research attempts to achieve.

Table 1. Literature Review

Variable	Kusumawardhani (2023)	Priyono (2022)	Lestari and Dewanti (2019)	Wahyundari and Sunarta (2020)	Eljawati (2021)	Prawesti, et all (2024)
Increase in the number of tourists	V	V	V	V		V
Role of government	V					
Ethnographic design		V				
Income			V			
Distance to Tourist Attractions			V			
Multiple linear regression method			V			
MSMES					V	V
Gross Regional Domestic						V

Variable	Kusumawardhani (2023)	Priyono (2022)	Lestari and Dewanti (2019)	Wahyundari and Sunarta (2020)	Eljawati (2021)	Prawesti, et all (2024)
Product Amount						
The Object is only tourist spot	V	V	V	V	V	
The objects are several tourist attractions						V
Descriptive analysis						
Qualitative methods					V	
Quantitative methods						V
Dynamic Modeling						V

As can be seen in [Table 1](#), while several studies have examined the role of government and SME income in the development of tourism, none have used dynamic modelling to combine these elements with environmental sustainability. Although there is extensive literature on tourism development and sustainability, there is still a gap in understanding how to optimize cultural tourism in urban environments like Jakarta. Specifically, previous research has not comprehensively addressed the integration of sustainability into tourism development strategies that consider economic and environmental factors, particularly using dynamic system models. This research aims to fill this gap by developing a system dynamics model to assess the sustainability of cultural tourism in DKI Jakarta. By incorporating key variables such as the income of micro, small, and medium enterprises (MSMEs), regional gross domestic product (RGDP), and environmental impacts (pollution and waste), this research provides a holistic approach to optimizing tourism development strategies. By incorporating sustainability into tourism initiatives using a dynamic system model, this study closes a significant gap and provides a comprehensive strategy that takes into account both environmental and economic issues.

2. Method

The method used in this research involves conducting a literature review and field study. Subsequently, the formulation and objectives of this research are determined. SFD and CLD were chosen because they can capture feedback cycles and time delays, which are critical to understanding the complex interactions that occur in the tourism industry. Following this, data collection is carried out. The data collection techniques employed include [Afra \(2023\)](#) interviews and some references. The data used encompasses the types of tourism in DKI Jakarta, the number of tourists, the types and number of MSMEs, and the policies of central and local governments. Data processing is conducted on the dynamic system modeling of the tourism itself. The model development is carried out through several methodological stages ([Suleiman et al., 2023](#)).

2.1. Casual Loop Diagram

A Causal Loop Diagram (CLD) can be used to record a model that represents the interconnections and feedback processes within a system ([Rifaldi et al., 2021](#)). Additionally, [Aryani & Siallagan \(2021\)](#) states that the main purpose of CLD is to depict causal hypotheses, thereby presenting the structure of the problem in an aggregate form. From these two definitions, CLD can help users by communicating feedback structures and presenting how the observed system works. The creation of CLD is very useful for:

1. Quickly providing a hypothesis of the causes of dynamics.
2. Providing reliable and important input for a problem.
3. Triggering and illustrating models for both individuals and teams.

CLD consists of variables connected by arrows to show causal relationships between variables. Each causal relationship has a positive (+) or negative (-) polarity, indicating how the dependent variable changes when the independent variable changes. Causal relationships are divided into two types, including:

1. Positive relationship, which is a condition where element A has a positive influence on element B, where an increase in the value of A affects an increase in the value of B.
2. Negative relationship, which is a condition where element A has a negative influence on element B, where an increase in the value of A affects a decrease in the value of B.

As an illustration, increasing the number of tourists can boost MSME income, increase GRDP but may have a negative impact on the environment.

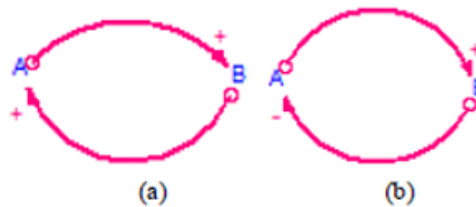


Fig. 2. Causal loop diagram when (a) reinforcing feedback and (b) balancing feedback

From several causal relationships between variables, a loop will be formed. A loop is reinforcing feedback if all causal relationships between variables in the loop circulate in the same direction. Conversely, a loop is balancing feedback if there are causal relationships in the loop that do not circulate in the same direction (Sterman, 2004). Fig. 2, above shows an example of a CLD.

2.2. Stock and Flow Maps

A Stock Flow Diagram (SFD) is a system that illustrates the relationships between variables, often used in dynamic system methods. To simulate a system, a model representing 29 conditions of the real system is created. CLD is also a model that identifies important variables in the observed system, but CLD cannot contain all the necessary information for simulation to be run. CLD cannot explain variables that are stocks and flows within the system (Sterman et al., 2004). Essentially, SFD is a transformation of CLD into relationships between stocks and flows that can be understood by computer software. Stocks and flows, along with feedback between them, are important concepts in dynamic system theory. SFD facilitates the simulation of how changes in tourist numbers affect MSME revenue and environmental sustainability, thereby assisting in the determination of sustainable growth approaches. Fig. 3, shows an example of SFD implementation.

2.3. Model Validation

The assumptions used in model formation must be valid, and only certain models can be evaluated for their validity. A common method used to test the validity of a model is by comparing its performance with available past data. In this study, the accuracy of the model was assessed by validating it with actual data from 2017, comparing the simulated and actual numbers of cultural tourists. In Eq. (1) Mathematically, the usual method for testing validity is with the AME (Average Mean Error) formula as follows:

$$AME = \frac{|S - A_I|}{A_I} \quad (1)$$

Description:

S = scenario simulation results

A_I = actual condition simulation results

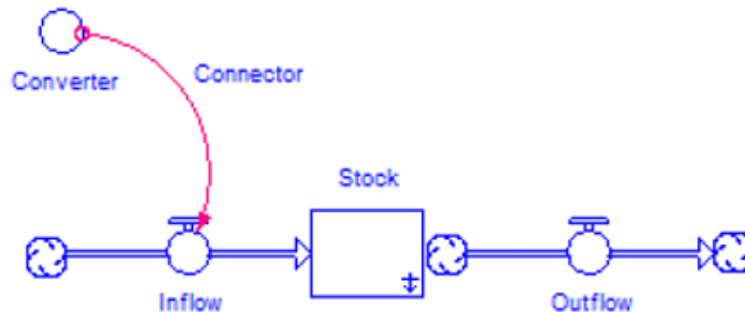


Fig. 3. Stock, flow, auxiliary and connector symbol

2.4. Powersim Software

In conducting a model simulation, a tool or software is needed that can quickly show the behavior of the created model. Various simulation software is available for specific needs in analyzing a system, but in this research, the software used is Powersim. Powersim is a dynamic system modeling simulation software. Powersim can present the conditions or behavior of a real system based on predetermined variables and parameters. Powersim was chosen because it has a visual interface that is easier to understand than other model simulation software such as Vensim or AnyLogic. Moreover, powers have advantages in determining policy analysis and scenario simulation.

3. Results and Discussion

3.1. Tourist Submodel Output

As seen in Fig. 4, this Submodel determines the number of tourists coming to DKI Jakarta. Furthermore, the number of tourists will be divided into non-ecotourism and ecotourism visitors. This is directly related to the number of ecotourism attractions and locations, which are also connected to promotional efforts. Given the expectation that ecotourism will generate different economic and environmental benefits than mass tourism, a focused promotional strategy is essential to maximise positive outcomes. Given the expectation that ecotourism will generate different economic and ecological benefits than mass tourism, a focused promotional strategy is necessary to maximise positive outcomes.

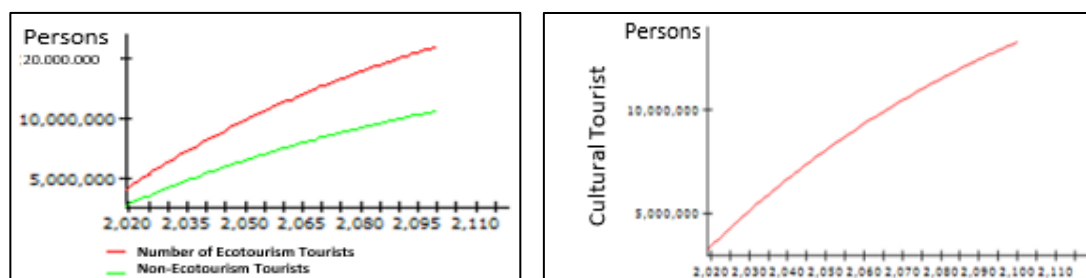


Fig. 4. Tourist submodel output

3.2. Output of DKI Jakarta APBD

This submodel aims to examine the allocation of the DKI Jakarta Regional Budget (APBD), which in this system is limited to two sectors, namely the tourism sector and others. The APBD increases yearly, and there is additional revenue from the Regional Original Income (PAD). The

allocation of funds for ecotourism development is used to invest in developing ecotourism sites and promotional efforts for both existing tourist attractions and ecotourism sites. Fig. 5, in the graph below shows that the proportion of the tourism budget allocation fluctuates along with the increase in the APBD every year. Fluctuations in tourism budget allocations indicate a fundamental need for a more predictable and consistent funding mechanism to support tourism development, focusing on promoting ecotourism destinations that are crucial for long-term sustainability.

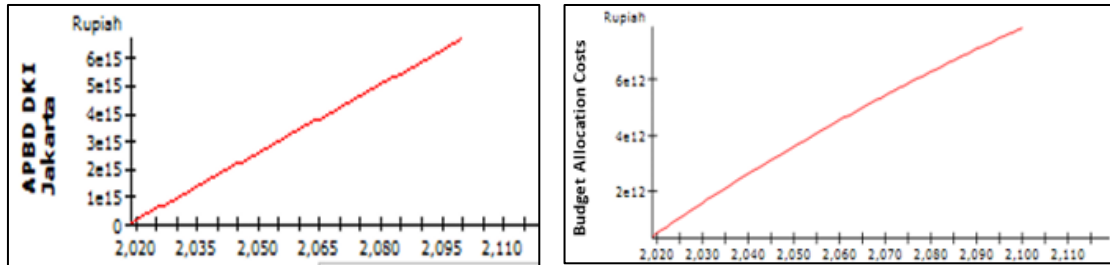


Fig. 5. Output of DKI Jakarta APBD

3.3. Output of PDRB and MSMEs Income DKI Jakarta

This submodel is used to observe the revenue of MSMEs in the tourism support sector and the GDP of DKI Jakarta, which continues to increase. This increase is directly related to the revenue from the pricing of each tourism support sector with the number of tourists. Additionally, the increase in the GDP of DKI Jakarta is related to the revenue from the tourism support sector and the GDP of other sectors. As seen from the graph below, the revenue of each MSME or tourism support sector has increased, as has the GDP of DKI Jakarta. The observed increase in MSME revenue demonstrates the capacity of cultural tourism to function as a crucial engine for local economic growth, particularly impacting sectors like retail, hospitality, and transportation.

Fig. 6, illustrates an increase in both the revenue and profit of the tourism support sector (MSMEs). In 2019, the revenue of the tourism support sector (MSMEs) was IDR 1.14 trillion, experiencing a consistent annual growth of 15%.

3.4. Model Validation

Validation is carried out to assess whether a model can be considered to provide an accurate representation of a system and its results. Validation is done by observing the increase in cultural tourists. To justify the validity of the model, a statistical test based on the AME (Average Mean Error) value is necessary. Actual data show in Table 2, and model output data are required for comparison. The data used is the number of cultural tourists in 2019, with the actual condition being 3,468,983 people and the model output being 3,618,205 people.

Table 2. Current Cultural Tourist Levels

Year	Number of Cultural Tourists (People)
2017	3,260,320
2018	3,420,271
2019	3,468,983
2020	3,260,230
2021	3,440,117
2022	3,618,205

$$AME = \frac{|S - A_I|}{A_I} = \frac{(3618205 - 3468983)}{3468983} = 0.043 = 4.3\% \quad (2)$$

Eq. (2), the AME (Average Mean Error) test value shows 4.3%, which means it is still below the maximum threshold of 10%. Therefore, the system model can be considered valid based on the

statistical test (AME). Despite the fact that AME testing shows model validity, additional validation methods such as cross-validation or sensitivity analysis can increase confidence in model accuracy.

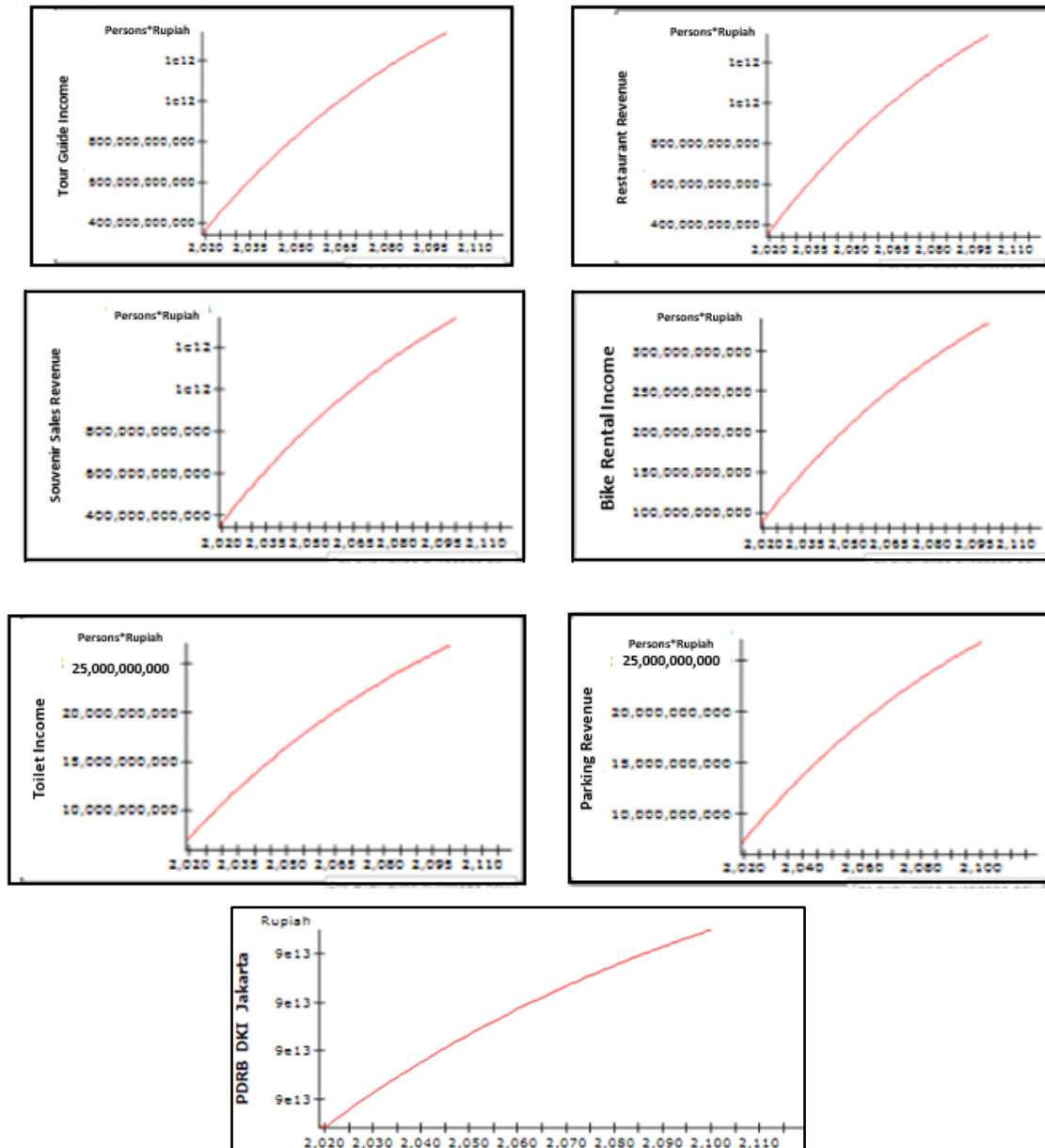


Fig. 6. Output of PDRB and MSMEs Income DKI Jakarta

4. Conclusion

This research concludes that policy scenarios for the development strategy of cultural tourism in DKI Jakarta are formulated based on a combination of schemes determined from the variables that have been created. Each variable is analyzed for its impact on cultural tourism in DKI Jakarta: (1) The environmental impact on tourism is a 5% increase in pollution and waste. This volume increase can be addressed by implementing sustainable tourism practices, such as applying the 3R (Reduce, Reuse, Recycle), educating and raising awareness among tourists regarding the environment of the tourist destination, and effective waste management. (2) The analysis of the impact of tourism on MSME income and profit results in an increase of 5% and 7%, respectively. Future research efforts could be directed toward identifying solutions that enable sustainable tourism, where economic benefits can be enjoyed without sacrificing environmental preservation. (3) Analysis of the impact of tourism on PAD

and GRDP revenues resulted in an increase of 4% and 0.008%, respectively. This indicates that there must be increased investment in the tourism sector, such as infrastructure, promotion, service quality, etc. Future research can identify what types of investments should be developed.

The optimal strategy selection for the sustainable cultural tourism sector can be determined by using scenarios of increasing and decreasing parameter values to achieve an increase in MSME income and GRDP in DKI Jakarta. The chosen scenario combines parameter values based on the results obtained. The scenario of increasing parameter values can be chosen for MSME income and GRDP factors in DKI Jakarta, resulting in an increase of 5% and 0.008%, respectively. DKI Jakarta's policymakers can use these results to develop well-defined strategies that promote cultural tourism and concurrently ensure a harmonious relationship between economic expansion and environmental well-being. This study only focused on specific parameters (MSMEs income, GRDP, environmental impact), so other potentially relevant factors that affect cultural tourism development are not considered. Further research can be investigated by adding relevant variables and allowing approaches to reduce the ecological footprint of tourism while maintaining economic development.

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