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DO TOURISM ACTIVITIES AND ENVIRONMENTAL QUALITY INFLUENCE EACH OTHER? EVIDENCE: FIVE SUPER PRIORITY TOURISM DESTINATIONS

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Abstract

This study examines the reciprocal relationship between tourism activity and environmental quality in Indonesia's five Super Priority Tourism Destinations (DPSP). Using panel data from 2013–2024, a simultaneous equations model is estimated through the Two-Stage Least Squares (2SLS) method. This study uses the Gross Regional Domestic Product (GRDP) of the accommodation and food and beverage sector as a proxy for tourism-driven economic activity, while environmental quality is measured using the Air Quality Index (AQI). The results indicate that AQI has a positive and significant effect on tourism GRDP, indicating that better environmental quality supports tourism activity and regional economic performance. Conversely, tourism activity significantly contributes to environmental degradation, reflecting increased environmental pressure from tourist mobility and intensity. Accessibility is found to have a significant negative effect on tourism activity, while the hotel occupancy rate (TPK) has a positive and significant impact, and population density shows no significant effect. Furthermore, rainfall and investment positively and significantly influence AQI, whereas population density has a negative and significant effect, and regional government expenditure (APBD) is not statistically significant. These findings highlight the importance of integrating tourism development with environmental protection through policies such as carrying capacity management, low-emission transportation, and green investment. This study provides empirical evidence to support sustainable tourism policies that balance economic growth and environmental preservation in Indonesia's DPSP.

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INTRODUCTION

Tourism is widely recognized as a strategic sector that contributes significantly to economic development, cultural preservation, and community welfare (Anjaswari et al., 2025). Empirical evidence indicates that tourism development contributes significantly to regional economic performance. In Bali Province, tourist arrivals and average tourist spending were found to positively and significantly influence local government revenue over the 1990–2019 period (Kunjungan et al., 2021). Previous studies also consistently highlight the positive role of tourism in stimulating regional economic growth. For instance, Purnomo (2022) finds that increasing tourist arrivals, both domestic and international, significantly enhance economic performance in Eastern Indonesia. Similarly, Madhumini (2024), emphasizes that tourism acts as a key engine of economic development through its contribution to employment generation, income creation, foreign exchange earnings, and cross-cultural interactions. However, due to data availability and the focus on sectoral economic performance, this study does not directly measure welfare in its broader sense. Instead, it employs the Gross Regional Domestic Product (GRDP) of the accommodation and food and beverage sector as a proxy for tourism-driven economic activity, which reflects the economic contribution of tourism to regional development. This approach is supported by the tourism-led growth literature, which highlights that tourism contributes significantly to economic performance and growth, commonly measured through GDP-based indicators (Castro-nuño[a] et al., 2013).

At the local level, Community-Based Tourism (CBT) has been shown to promote inclusive economic growth and improve community welfare (Novandi & Adi, 2021). In the context of sectoral performance, the accommodation and food service sector plays a crucial role as a proxy for tourism-driven economic activity. Empirical evidence suggests that an increase in tourist arrivals significantly contributes to the Gross Regional Domestic Product (GRDP) of this sector (Rawosi & Widiana, 2025). Supporting this, data from Statistics Indonesia (BPS) indicate that the accommodation, food, and beverage sector contributed approximately 2.64 percent to national GDP in the second quarter of 2024. The use of GRDP at constant prices (ADHK) is particularly relevant, as it reflects real output by eliminating the effects of inflation and reflects real production changes from year to year (Rawosi & Widiana, 2025). From a welfare perspective, this aligns with welfare theory, which emphasizes that the ability to meet basic needs especially food consumption is a fundamental indicator of economic well-being.

Tourism activity is influenced not only by demand factors such as tourist arrivals but also by supporting determinants, including hotel occupancy rates, length of stay, and accessibility. The hotel occupancy rate (TPK) serves as an important indicator of both tourism demand and business performance (Irawan, 2022; Khaerunnizam & Fadli, 2025). Meanwhile, Napitupulu et al. (2021) said that perceptions of destination accessibility are an important factor influencing tourists' intention to visit. Empirical findings by Sinaga & Syahwier (2025) further demonstrate that road infrastructure and tourist visits are interconnected in influencing tourism GRDP. Empirical evidence suggests that tourism development contributes to regional economic performance through various channels, including tourist attractions, tourist arrivals, and tourists' length of stay. A study conducted in Bali Province found that these variables simultaneously had a significant effect on local government revenue, although the effect of tourist attractions individually was positive but statistically insignificant (Dewi, 2024).

Despite its economic benefits, tourism also generates environmental pressures. The sector contributes significantly to global carbon emissions, with an average annual growth rate of 3.5 percent between 2009 and 2019 almost twice the rate of global economic growth (Sun et al., 2024). It is estimated that approximately 8 percent of global carbon emissions originate from tourism-related activities. This underscores that tourism activities significantly impact environmental quality conditions. Studies such as Aliasuddin et al. (2025) show that tourism expenditure, tourist flows, and aviation fuel consumption significantly increase carbon emissions in the short term. Furthermore, Bhuiyan et al. (2024) identify a

strong linkage between tourism-driven economic growth and environmental indicators, including carbon footprint and municipal solid waste generation.

In Indonesia, the environmental consequences of tourism expansion are increasingly evident. The growth of tourism has been associated with rising CO_2 emissions, increased energy consumption, and environmental degradation (Setiawati & Pamungkas, 2022). Case studies in regions such as West Java reveal that increased tourist activity contributes to water pollution, waste accumulation, and ecosystem damage (Adiatma et al., 2024). In addition, population density has been identified as a contributing factor to environmental degradation, particularly in urban and tourism-intensive areas (Wafiq & Suryanto, 2021). In a cross-country study, Sellyra & Ferezagia (2022) found that population density is one of the factors explaining variations in tourist visits. Natural factors, such as rainfall, also influence environmental quality through mechanisms such as pollutant dispersion and runoff (Leko, 2023; Marbun et al., 2025).

On the other hand, environmental quality plays a crucial role in supporting tourism development and destination competitiveness (Ginting et al., 2020). Environmental factors play an important role in sustainable tourism development, as environmental empowerment and conservation efforts contribute significantly to the sustainability of tourism destinations. Cleanliness, landscape quality, and air and water conditions significantly influence tourist satisfaction and revisit intentions (Sidabutar & Hidayat, 2023). A well-maintained environment serves as a competitive advantage for tourism destinations. Studies also show that environmentally friendly infrastructure and sustainable practices positively affect tourist arrivals and local economic performance (Setiawati & Pamungkas, 2022). In this context, investment becomes a key instrument in promoting green infrastructure and sustainable services, while government expenditure contributes to improving environmental indicators and supporting sustainability policies (Putra & Edward, 2023), such as carbon emissions, thereby supporting sustainable development policies.

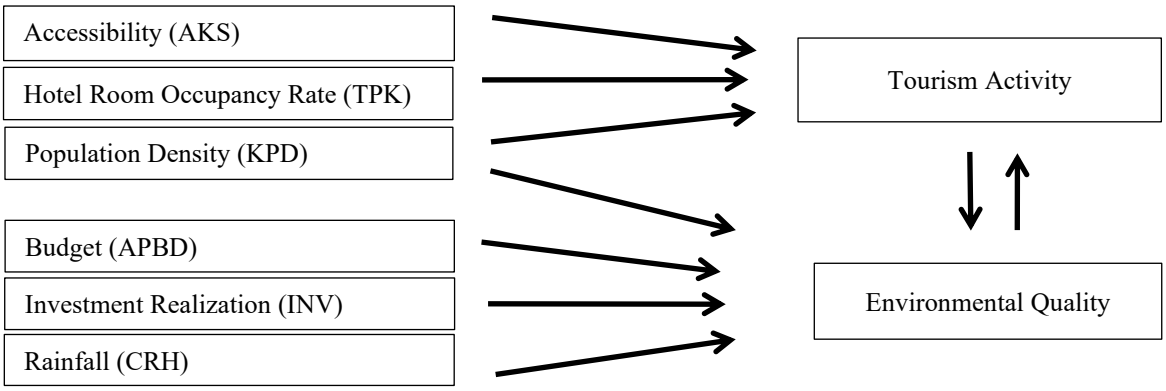
Taken together, these findings suggest a complex and potentially reciprocal relationship between tourism activities and environmental quality. While tourism drives economic growth, it also generates environmental externalities that may, in turn, affect the sustainability and attractiveness of destinations. Conversely, better environmental quality enhances tourism performance. However, most existing studies primarily examine this relationship in a unidirectional framework, focusing either on the impact of tourism on the environment or vice versa (Akpa et al., 2025). Empirical studies that explicitly model the bidirectional (simultaneous) relationship between tourism and environmental quality remain limited, particularly in the context of Indonesia's Super Priority Tourism Destinations (DPSP).

Therefore, this study addresses this gap by examining the endogenous and reciprocal relationship between tourism activity and environmental quality using a simultaneous equations approach. Specifically, the study employs the Two-Stage Least Squares (2SLS) method to account for endogeneity arising from mutual causality between variables. By utilizing panel data from five DPSP, this research contributes to the literature by providing robust empirical evidence on the dynamic interaction between tourism and environmental quality. The findings are expected to inform policy formulation for sustainable tourism development that balances economic growth with environmental preservation.

The conceptual framework underlying the simultaneous interaction between Tourism Activities and Environmental Quality is presented in Figure 1.

Figure 1 illustrates the conceptual framework of this study, which examines the relationship between tourism activity and environmental quality within a simultaneous modeling approach. Tourism activity, proxied by the performance of the tourism sector, is influenced by several key determinants, including accessibility (AKS), hotel room occupancy rate (TPK), population density (KPD), regional government budget (APBD), investment realization (INV), and rainfall (CRH). These variables represent economic, infrastructural, demographic, fiscal, and natural factors that potentially shape tourism performance. At the same time, environmental quality is also affected by a subset of these variables, particularly population density, government expenditure, investment, and rainfall, reflecting

both anthropogenic and natural influences on environmental conditions. Importantly, the framework highlights a bidirectional (reciprocal) relationship between tourism activity and environmental quality, indicating that tourism activities can impact environmental conditions, while environmental quality, in turn, influences tourism performance.



Source: Research Data, 2025

Figure 1. Research Conceptual Framework

This simultaneous interaction justifies the use of a simultaneous equations model to capture the endogenous relationship between the two main variables. The framework provides the basis for empirically testing how economic and environmental dynamics interact in Indonesia's Super Priority Tourism Destinations (DPSP).

RESEARCH METHODOLOGY

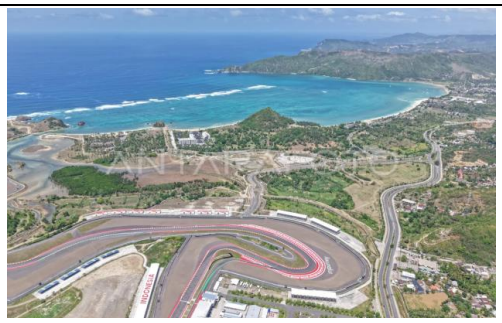
This study utilizes secondary data obtained from several government institutions, including Statistics Indonesia (BPS), the Meteorology, Climatology, and Geophysics Agency (BMKG), the Ministry of Investment/Indonesia Investment Coordinating Board (BKPM), and the Ministry of Environment and Forestry of the Republic of Indonesia. The study focuses on five Super Priority Tourism Destinations (DPSP) using panel data covering the period 2013–2024.

Source : (Patrizki, 2023)

Figure 2. Danau Toba, Sumatera Utara

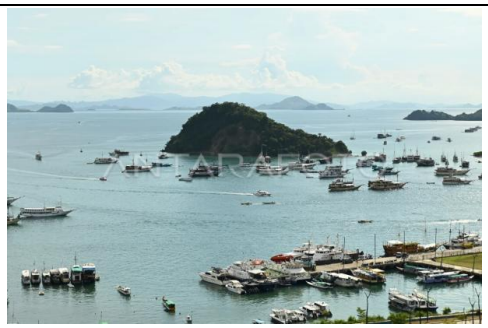
Source : (Efizudin, 2026)

Figure 3. Candi Borobudur, Jawa Tengah



Source : (Subaidi, 2025)

Figure 4. Mandalika, Nusa Tenggara Barat



Source : (Yusuf, 2025)

Figure 5. Labuan Bajo, Nusa Tenggara Timur

Source : (Pramono, 2023)

Figure 6. Likupang, Sulawesi Utara

These destinations were selected due to their diverse characteristics (Mahmudin et al., 2024), representing variations in socio-cultural conditions, environmental potential, and digital economic infrastructure across Indonesia. Furthermore, DPSP constitute the primary focus of national tourism policies (RPJMN and RIPPARNAS) and the strategic agenda of the Ministry of Tourism and Creative Economy, thereby reflecting the broader opportunities and challenges within Indonesia's tourism sector. Accordingly, the use of DPSP is expected to provide a comprehensive and relevant empirical representation of tourism destination conditions, particularly in the context of sustainable tourism development.

To ensure clarity and measurement consistency, all variables are defined based on their conceptual framework and operational indicators. A description of the research variables and their definitions is presented in Table 1.

Table 1.
Variables and Definitions

		Variable	Definition	Unit
Dependent Variable	1.	Tourism Activity (PDB)	The level of community welfare generated as a result of tourism activities.	Billion Rupiah
	2.	Environmental Quality (IKU)	A measure representing air quality in the form of a composite index derived from various air quality parameters within a particular region over a specific period.	-
Independent Variable	1.	Accessibility (AKS)	Primary network collector roads connecting provincial and regency/municipality capitals, measured by total road length.	Kilometers (km)
	2.	Hotel Room Occupancy Rate (TPK)	The percentage of hotel rooms sold and occupied out of the total available rooms within a given period.	Percent
	3.	Population Density (KPD)	A measure comparing the total population to the land area of a region (population per unit area).	Persons/km^2

	Variable	Definition	Unit
4.	Budget (APBD)	The total provincial Regional Revenue and Expenditure Budget (APBD) allocated to the environmental sector.	Million Rupiah
5.	Investment Realization (INV)	The actual value of investment that has been realized within a specific period and region, in the form of both Domestic Investment and Foreign Direct Investment.	Million Rupiah
6.	Rainfall (CRH)	The amount of rainfall that falls in a particular area over a specific period of time.	Millimeters (mm)

Source: Statistics Indonesia, 2013-2024.

A Simultaneous Equations Model approach is applied in this study to examine the dynamic linkage between tourism activity and environmental quality. The system is specified as two structural equations as follows.

$$PDB_{it} = \alpha_0 + \alpha_1 IKU_{it} + \alpha_2 AKS_{it} + \alpha_3 TPK_{it} + \alpha_4 KPD_{it} + e_{it} \quad (1)$$
$$IKU_{it} = \beta_0 + \beta_1 PDB_{it} + \beta_2 KPD_{it} + \beta_3 APBD_{it} + \beta_4 INV_{it} + \beta_5 CRH_{it} + u_{it} \quad (2)$$

The reduced-form representation of the two equations above, after substitution, is as follows.

$$PDB_{it} = \pi_0 + \pi_1 KPD_{it} + \pi_2 APBD_{it} + \pi_3 INV_{it} + \pi_4 CRH_{it} + \pi_5 AKS_{it} + \pi_6 TPK_{it} + v_{1it} \quad (3)$$
$$IKU_{it} = \theta_0 + \theta_1 AKS_{it} + \theta_2 TPK_{it} + \theta_3 KPD_{it} + \theta_4 APBD_{it} + \theta_5 INV_{it} + \theta_6 CRH_{it} + v_{2it} \quad (4)$$

Description:

PDB_{it}	= Gross Regional Domestic Product of the destination i in year t
IKU_{it}	= Air Quality Index of the destination i in year t
AKS_{it}	= Road accessibility of the destination i in year t
TPK_{it}	= Hotel Occupancy Rate of the destination i in year t
KPD_{it}	= Population density of the destination i in year t
$APBD_{it}$	= Environmental budget of the destination i in year t
INV_{it}	= Realized investment of the destination i in year t
CRH_{it}	= Rainfall of the destination i in year t
e_{it}	= The error term of the first equation for destination i in year t
u_{it}	= The error term of the second equation for destination i in year t
α_0	= Constant of the first equation
β_0	= Constant of the second equation
$\alpha_1, \alpha_2, \alpha_3, \alpha_4$	= Coefficients of the explanatory variables in the first structural equation
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$	= Coefficients of the explanatory variables in the second structural equation
v_{1it}	= Error term of the first reduced-form equation for destination i in year t
v_{2it}	= Error term of the second reduced-form equation for destination i in year t
π_0	= Constant term of the first structural equation
θ_0	= Constant term of the second structural equation
$\pi_1, \pi_2, \pi_3, \pi_4, \pi_5, \pi_6$	= Coefficients of the explanatory variables in the first reduced-form equation
$\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6,$	= Coefficients of the explanatory variables in the second reduced-form equation

Model identification was conducted prior to the estimation process to determine the feasibility of estimation and the most appropriate estimation method to be used in the simultaneous equation system. Based on the order condition, an equation is under-identified if $(K - k) < (m - 1)$, exactly identified if $(K - k) = (m - 1)$, and over-identified if $(K - k) > (m - 1)$. In this framework, K refers to the total number of independent variables in the model, including all exogenous variables as well as lagged endogenous variables. The parameter k denotes the number of independent variables included in a

particular equation. Meanwhile, M represents the total number of endogenous variables in the system, and m indicates the number of endogenous variables contained in the specific equation.

Model identification is a crucial step in simultaneous equation estimation. In the case of over-identification, the structural parameters can be estimated using instrumental variable techniques such as Two-Stage Least Squares (2SLS). The identification results show that the equation model used in this study falls into the over-identified category. Therefore, the Two-Stage Least Squares (2SLS) method was chosen as the appropriate estimation technique for this study.

Multicollinearity occurs when multiple regression models include explanatory variables that are significantly correlated with each other, which can make variables that should be significant appear statistically insignificant (Shrestha, 2020). A multicollinearity diagnostic was carried out to assess the degree of correlation among the explanatory variables included in the regression model. A high pairwise correlation among explanatory variables, typically above 0.80, indicates potential multicollinearity in regression models. The findings reveal that the maximum correlation value observed among the variables is 0.80. This value remains within the acceptable tolerance limit. Therefore, the model can be used without modification of the independent variables. To examine whether the residual variance varies across observations, a heteroskedasticity test was performed within the regression framework.

Heteroskedasticity occurs when the variance of the error term is not constant across observations, which can lead to inefficient estimators and unreliable statistical inference. The test results indicate that all independent variables have significance values greater than 0.05. This implies that the independent variables do not exert a statistically significant effect on the absolute residuals, confirming the absence of heteroskedasticity in the regression model

RESULT AND DISCUSSION

This study applies the Two-Stage Least Squares (2SLS) method because the econometric model faces endogeneity problems, which arise partly from the bidirectional (simultaneous) relationship between tourism activities and environmental quality. The 2SLS method was chosen to obtain more consistent parameter estimates by utilizing relevant instrumental variables.

Table 2.
2SLS Statistical Test Results

	Variable	Coefficient (SE)	Prob.
Model 1	C	-18.55 (4.69)	0.00***
	LOG(IKU)	8.11 (2.85)	0.01***
	LOG(AKS)	-1.26 (0.62)	0.05**
	LOG(TPK)	0.38 (0.19)	0.048**
	LOG(KPD)	-0.28 (1.56)	0.86
R-square			0.98
F-statistic			276
Prob(F-statistic)			0.00
Durbin-Watson stat			2.34
Model 2	C	2.60 (0.57)	0.00***
	LOG(PDB)	-0.01 (0.00)	0.00***
	LOG(KPD)	-0.01 (0.05)	0.02**
	LOG(APBD)	-0.00 (0.00)	0.18
	LOG(INV)	0.14 (0.04)	0.00***
	LOG(CRH)	0.05 (0.01)	0.00***
R-square			0.89
F-statistic			25.45
Prob(F-statistic)			0.00
Durbin-Watson stat			1.38

*Significant at α=10%; **Significant at α=5%; ***Significant at α=1%
Source: Research Data, 2025

The findings derived from the 2SLS estimation are summarized in Table 2. The p-value for the first model is 0.000, indicating that the null hypothesis is rejected at the 0.05 significance level. The results confirm that the Environmental Quality Index (IKU), Accessibility (AKS), Hotel Occupancy Rate (TPK), and Population Density (KPD) exert a statistically significant joint impact on the GDP of the Accommodation and Food & Beverage sector. The coefficient of determination (R^2) of 0.98 indicates that the model explains 98 percent of the variability in the dependent variable, with the remaining 2 percent attributable to unobserved variables or other influences not included in the specification. The estimation results show that the second model is statistically significant ($p < 0.001$). The simultaneous test confirms that GDP of the Accommodation and Food & Beverage sector, KPD, APBD, INV, and CRH collectively influence the Environmental Quality Index (IKU). An R^2 of 0.89 indicates high explanatory power, as most of the variation in IKU (89 percent) is captured by the model, while only 11 percent is determined by other external variables.

Based on the estimation results, the Environmental Quality Index (IKU) has positive and significant effect on GDP in the five Super Priority Tourism Destinations (DPSP) in Indonesia. Thus, better air quality tends to increase tourism activity, which ultimately has a positive impact on community welfare. This finding confirms that improvements in environmental quality, particularly air quality, constitute a strategic factor contributing to increased regional economic output in the short to medium term. In line with Rodrigues et al. (2021), clean air quality directly influences tourists' visitation decisions and becomes an important consideration in travel planning and destination selection, thereby affecting GDP. Globally, carbon taxes function not only as fiscal instruments for emission reduction but also play a crucial role in encouraging green technological innovation and more effective environmental policy planning (Gumilang et al., 2025). This indicates that well-maintained environmental conditions are essential in various aspects of life, including tourism in Indonesia, where tourists who feel comfortable with the environment are more likely to revisit destinations.

The findings show that road infrastructure, representing accessibility in the five DPSP locations, has a significant but inverse relationship with tourism activity. This result suggests that, in priority destinations characterized by natural and cultural attractions, improved land accessibility does not necessarily translate into higher tourist arrivals. One possible explanation is that excessive infrastructure development may alter the ecological and aesthetic value of destinations, thereby reducing their attractiveness to tourists who seek authenticity and environmental quality. For instance, in nature-based tourism areas, road expansion is often associated with deforestation, habitat fragmentation, and increased pollution, which can degrade the overall visitor experience. In addition, improved accessibility may trigger overtourism, leading to congestion, environmental degradation, and declining destination quality (Grossling et al., 2019; Urban & Growth, 2018). This condition can ultimately reduce tourist satisfaction and discourage repeat visits. From a sustainable tourism perspective, infrastructure development that is not aligned with environmental carrying capacity may undermine long-term destination competitiveness (UNWTO, 2021). This finding is consistent with Kuncoro & Wurarah (2024), who argue that poorly managed infrastructure expansion can negatively affect ecosystem sustainability and tourism value. Therefore, these results indicate that accessibility alone is not the primary determinant of tourism activity in DPSP. Instead, other factors such as the quality of attractions, environmental conditions, destination management, and the availability of tourism amenities play a more decisive role in attracting and retaining visitors.

The Hotel Occupancy Rate (TPK) shows a positive and statistically significant relationship with tourism activity, indicating that higher hotel occupancy levels are linked to increased tourism activity in the five Super Priority Tourism Destinations (DPSP). This result supports the findings who said that page emphasize that accommodation performance, including occupancy levels, is strongly associated with visitor arrivals and the economic performance of tourism. Empirical evidence suggests that the implementation of digital marketing, flexible pricing mechanisms, and experience based promotional offerings plays a significant role in shaping booking behavior and occupancy rates in competitive

tourism markets (OECD, 2020). Tourism sector development, reflected in tourist arrivals and tourism facilities, significantly influences regional labor market conditions, including unemployment rates (Weda & Dewi, 2023). This occurs because increasing tourism activity encourages greater demand for accommodation, transportation, and supporting tourism services, which subsequently expands employment opportunities in tourism-related sectors (Wardhana et al., 2020). The findings of this study highlight the need for tourism development strategies that encourage higher hotel occupancy, such as promotional packages and improvements in service quality. Population density does not have a significant effect on regional GDP, this indicates that tourism activity does not solely depend on demographic aspects but is also strongly influenced by the quality of destination management and services provided to tourists (Nastabiq & Soesanto, 2021). Areas with high population density may have abundant labor availability; however, they also face risks of reduced comfort and increased environmental pressure.

The estimation results in the second model show that Tourism Activity (GDP) has a negative and statistically significant effect on the Environmental Quality Index (IKU). Rahmawati et al. (2023) found that tourism development increases tourist activities and infrastructure demand, which may influence spatial and environmental conditions in tourism destinations. This implies that a decline in tourism economic activity may potentially improve air quality. Tourism activities are often accompanied by increased tourist mobility, transportation use, and facility utilization, all of which contribute to air pollutant emissions such as fine particles and vehicle exhaust gases. This evidence supports the findings of Zhang et al. (2022), indicating that tourism growth, alongside broader economic activities, can intensify environmental pressures, particularly in terms of air pollution. Rainfall has a positive and statistically significant effect on the Environmental Quality Index (IKU), indicating that higher rainfall intensity contributes to improved air quality. Wang et al. (2022) found that rainfall significantly reduces the Air Quality Index (AQI) and $PM_{2.5}$ concentrations in Suzhou, China, as precipitation removes pollutant particles from the atmosphere, leading to cleaner air following rainfall events.

The estimation results indicate that population density exerts a negative and significant impact on the IKU, suggesting that higher population concentration is associated with lower environmental quality. Areas with high population density tend to experience increased activities, such as vehicle mobility, household energy consumption, and economic activities, which ultimately lead to higher pollutant emissions. This finding is consistent with Borck & Schrauth (2021), who show that increasing population density is significantly associated with higher levels of major pollutants and declining environmental quality in urban areas in Germany.

On the other hand, investment has a positive and statistically significant effect on IKU, suggesting that investment particularly when allocated to environmentally friendly technologies, green infrastructure, and pollution control facilities contributes to improved air quality. The Regional Government Budget (APBD) variable, in this estimation context, does not have a significant effect on IKU. This indicates that overall regional government spending may not yet be sufficiently focused on air pollution control or effective environmental policy instruments, so its contribution to improving air quality is not statistically evident. One possible explanation lies in the inefficiency of budget allocation, where environmental spending is often dispersed across multiple programs such as sanitation, waste management, and general environmental administration without a specific focus on air quality improvement. Consequently, the direct impact on air pollution indicators becomes diluted.

This finding is consistent with international evidence suggesting that public environmental expenditure does not automatically translate into improved environmental outcomes without targeted and performance-based allocation (OECD, 2020). Furthermore, institutional fragmentation and weak inter-agency coordination present significant challenges. Environmental management typically involves multiple agencies at both national and regional levels, such as environmental offices, transportation departments, and public works agencies. However, the lack of integrated policy frameworks and coordination mechanisms may lead to overlapping responsibilities, policy inconsistencies, and

suboptimal implementation outcomes. This finding is consistent with previous studies indicating that provincial government environmental expenditure in Indonesia does not provide clear evidence of improvements in the air quality index, although a relationship between environmental taxes and air quality has been identified (Qibthiyyah & Zen, 2023). This suggests that budget allocation alone is insufficient without strong inter agency coordination and effective policy implementation mechanisms to ensure measurable environmental outcomes (Kurrohman, 2021; Qu et al., 2025).

CONCLUSION AND SUGGESTION

The empirical evidence confirms a two-way causal relationship between tourism activities and environmental quality in Indonesia's five DPSP. Hence, tourism development at the national level must be closely coordinated with environmental governance especially air quality regulation to ensure that destination growth remains sustainable and resilient as a foundation of the national economy. Central and regional governments need to strengthen sustainable tourism regulations, including limiting environmental carrying capacity, controlling motor vehicle-based mobility within destination areas, and implementing environmentally friendly operational standards for tourism businesses. From the tourism perspective, policies are needed to improve the quality and equitable distribution of accommodation across destinations without encouraging excessive environmental exploitation. Tourism development should not be focused solely on increasing visitor numbers and economic growth, but should also prioritize improvements in environmental quality and long-term sustainability, in line with the role of DPSP as drivers of environmentally oriented economic growth.

The policy implications derived from this study align with the strategic agenda of the Ministry of Tourism and Creative Economy (Kemenparekraf), which emphasizes quality and sustainable tourism development supported by green investment. Such initiatives encompass low carbon transportation, renewable energy adoption within tourism destinations, and improved waste and emission control mechanisms. This study has limitations regarding the selection of indicators used to measure tourism activities and environmental quality, as they do not yet fully represent non-formal tourism activities such as the creative economy sector, nor comprehensively capture environmental dimensions. Therefore, future research should consider more precise measurement indicators to better capture the full impact of tourism activities. In addition, future studies are expected to expand the research scope to provide more generalizable findings across regions in Indonesia.

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