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The Influence of Green Tourism Practice, Green Communication and Tourist Green Lifestyle on the Pro-Environmental Behaviour of Tourists at the PIK Mangrove Nature Park

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Abstract

Urban nature-based tourism destinations face increasing environmental pressures, particularly Taman Wisata Alam Mangrove PIK in North Jakarta, which serves conservation, educational, and recreational functions. In mangrove ecosystem tourism, green tourism practices, effective environmental communication, and tourists' green lifestyles are essential for fostering consistent pro-environmental behaviour. This study aims to analyze the partial and simultaneous effects of Green Tourism Practice, Green Communication, and Green Lifestyle on tourists' Pro-Environmental Behaviour. A quantitative approach with a descriptive design was employed. Primary data were collected through a four-point Likert-scale questionnaire distributed to 100 domestic tourists aged at least 17 years who had visited Taman Wisata Alam Mangrove PIK within the previous 12 months. Respondents were selected using purposive sampling. Data were analyzed using validity testing, reliability testing, classical assumption testing, multiple linear regression, t-tests, F-tests, correlation coefficient analysis, and coefficient of determination analysis with SPSS 25. The

findings show that Green Tourism Practice has a positive and significant effect on Pro-Environmental Behaviour, with t = 6.068, Sig. = 0.000, and β = 0.400. Green Communication also has a positive and significant effect, with t = 6.909, Sig. = 0.000, and β = 0.454, making it the most dominant variable in the model. Green Lifestyle has a positive and significant effect, with t = 6.403, Sig. = 0.000, and β = 0.422. Simultaneously, the three independent variables significantly influence Pro-Environmental Behaviour, with F = 45.341, Sig. = 0.000, and R^2 = 0.586. These findings demonstrate that strengthening green tourism practices, environmental communication, and tourists' green lifestyles can enhance pro-environmental behaviour in urban mangrove tourism destinations. This study contributes to sustainable tourism literature by providing empirical evidence on behavioural determinants in an urban conservation-based tourism context and offers practical implications for destination managers in designing more effective environmental education, communication, and visitor-engagement strategies.

Keywords: Green Tourism Practice; Green Communication; Green Lifestyle; Pro-Environmental Behaviour; Sustainable Mangrove Tourism

INTRODUCTION

Within the broader context of national development, the tourism sector occupies a strategic position that cannot be overlooked. Its contributions extend beyond serving as a driver of local economic growth to creating employment opportunities, strengthening regional fiscal revenues, and accelerating infrastructure development across tourism destinations (Fadilla et al., 2024). Beyond its economic dimension, the contemporary tourism paradigm increasingly views tourism activities as a socio-ecological process that requires a balance between economic benefits, environmental integrity, and the quality of visitors' experiences. Recent studies have emphasized that, in the absence of sustainability-oriented governance, tourism expansion may instead lead to environmental degradation, ecosystem disruption, increased carbon emissions, and the uncontrolled exploitation of natural resources (Prawira et al., 2024).

The urgency of sustainable tourism has become even more pronounced following the post-pandemic recovery of the global tourism industry. In 2024, international tourism reached approximately 1.4 billion international tourist arrivals, representing nearly 99% of pre-pandemic levels, indicating that the sector had almost fully recovered while simultaneously increasing pressure on the carrying capacity of tourism destinations (UN Tourism, 2025). At the same time, the travel and tourism sector continued to contribute

substantially to global greenhouse gas emissions, accounting for 7.3% of total emissions in 2024, with transportation representing the largest source, contributing 40% of the sector's emissions (Travel & Council, 2025). Likewise, Sun et al. (2024) reported that global tourism-related carbon emissions increased by 3.5% annually between 2009 and 2019, reaching 5.2 Gt CO_2-e, equivalent to 8.8% of total global greenhouse gas emissions in 2019. These findings underscore the necessity of adopting environmentally sustainable tourism management practices to ensure that increasing tourist arrivals do not exacerbate ecological pressures.

In this context, the concept of green tourism has emerged as a fundamental approach to the development of sustainable tourism destinations. Green tourism emphasizes minimizing the negative environmental impacts of tourism activities through resource efficiency, waste management, habitat conservation, environmental education, and the development of destination images that reflect sustainability values (Farida & Adhitya, 2024). The implementation of green tourism extends beyond destination management policies and environmentally friendly facilities; it also depends on how tourists respond to these sustainability initiatives during their visits. By providing environmentally friendly facilities, conservation regulations, and environmental education, destinations can create tourism experiences that encourage visitors to engage in more environmentally responsible behaviors. Consequently, tourists' behavior constitutes a critical determinant of the success of green tourism initiatives.

Within environmental tourism studies, pro-environmental behaviour is recognized as an expression of individuals' ecological responsibility during tourism activities. This construct encompasses a range of observable behaviors demonstrated by tourists, both directly and indirectly, to preserve and protect the natural environment. Such behaviors include properly sorting and disposing of waste, minimizing the use of single-use plastics, complying with designated visitor trails, refraining from damaging or collecting vegetation, and actively participating in conservation programs organized by destination managers. Wang et al. (2025) confirmed that tourists' pro-environmental behavior is shaped not only by their personal environmental values but also by the management context and environmental conditions of the destination itself.

One factor that may influence pro-environmental behaviour is green tourism practice. Green tourism practices refer to the concrete actions undertaken by destination

managers to provide environmentally sustainable facilities, regulations, conservation programs, and tourism experiences. These practices may include the provision of waste-sorting facilities, designated visitor pathways designed to minimize ecosystem disturbance, environmental interpretation signage, restrictions on environmentally harmful activities, and habitat restoration or reforestation programs. Cuong (2025), in a study conducted at coastal tourism destinations in Vietnam, found that environmental knowledge positively influenced environmental commitment ($\beta = 0.250$), environmental attitudes ($\beta = 0.331$), and tourists' pro-environmental behavior ($\beta = 0.220$). Furthermore, recreational experiences were found to positively influence pro-environmental behavior ($\beta = 0.259$). These findings suggest that environmentally oriented tourism experiences can strengthen tourists' propensity to engage in environmentally responsible behavior.

In the context of nature-based tourism destinations in Indonesia (Ardiansyah & Iskandar, 2022) found that ecotourism feasibility assessments encompass the quality of tourism infrastructure, carrying capacity, and destination management as key indicators determining visitors' overall experiences. These findings reinforce the importance of environmentally sustainable destination facilities in encouraging responsible tourist behavior.

In addition to green tourism practices, green communication represents another important determinant of tourists' environmental behavior. Green communication refers to communication strategies designed to convey sustainability messages to visitors through digital media, informational signage, direct interpretation by destination staff, social campaigns, and conservation narratives presented throughout the destination. Kim (2025) argued that environmental communication strategies play a significant role in mitigating the negative impacts of tourism because persuasive environmental messages can influence tourists' attitudes, emotions, and intentions to engage in pro-environmental behavior. Similarly, Octaviani et al. (2024) demonstrated that environmentally oriented communication grounded in local cultural values effectively promotes pro-environmental behavior at tourism destinations. Vicente (2024) further reported that digital green marketing and tourists' environmental attitudes positively influence environmentally responsible behavior at ecotourism destinations. These findings suggest that clear, consistent, and accessible green communication serves as an external stimulus that enhances tourists' awareness of the ecological consequences of their behavior while traveling.

Another relevant determinant is tourists' green lifestyle. A green lifestyle reflects everyday behavioral patterns that consider the environmental consequences of daily activities, including the use of environmentally friendly products, waste reduction, energy and water conservation, and the habitual use of reusable water bottles and shopping bags. Within the tourism context, tourists' green lifestyles are particularly important because environmentally responsible habits developed in daily life are likely to be carried over into tourism activities. Farida & Adhitya (2024) found that tourists' intention to behave responsibly toward the environment had a positive effect on green behavior (coefficient = 0.716, $p < 0.001$), while green behavior positively influenced green lifestyle (coefficient = 0.315, $p < 0.001$). These findings indicate that tourists with stronger environmental orientations are more likely to adopt environmentally friendly behaviors during their tourism experiences.

From a broader destination management perspective, (Rosanto & Carennia, 2022) argued that the successful implementation of sustainable tourism principles depends largely on the alignment between destination managers' environmental commitments and the environmental values and lifestyles of visiting tourists. In other words, the effectiveness of sustainability initiatives at nature-based destinations depends not only on infrastructure and regulatory frameworks but also on the congruence between destination values and visitors' environmental orientations. Consequently, tourists' lifestyle profiles particularly the extent to which they consistently adopt environmentally responsible behaviors in their daily lives should be regarded as an important consideration in designing ecosystem-based tourism management strategies.

These issues become increasingly relevant in the context of tourism development in the Special Capital Region of Jakarta (DKI Jakarta). As Indonesia's economic, governmental, and transportation hub, DKI Jakarta functions not only as a center for business activities but also as a destination for urban, historical, cultural, coastal, and nature-based tourism. Following the COVID-19 pandemic, tourist arrivals in DKI Jakarta have demonstrated a significant upward trend, as illustrated in Table 1.

Table 1. Trends in Domestic Tourist Trips to the Special Capital Region of Jakarta (DKI Jakarta), 2020–2024

Year	Number of Trips (Million)	YoY Growth (%)	Description
2020	27.44	−52.14%	COVID-19 pandemic; strict Community Activity Restrictions (PPKM); widespread closure of tourism destinations.
2021	34.97	+27.44%	Gradual recovery; growing interest in outdoor nature-based tourism.
2022	51.22	+46.46%	Full reopening; significant increase in nature-based and urban tourism.
2023	63.64	+24.24%	Stable growth; DKI Jakarta remained one of Indonesia's leading tourism destinations.
2024	87.23	+37.11%	Highest post-pandemic growth; increasing pressure on the carrying capacity of nature-based tourism destinations.

Base on table 1 trends in domestic tourist trips to the special capital region of jakarta (dki jakarta), 2020–2024, the number of domestic tourist trips to the Special Capital Region of Jakarta (DKI Jakarta) declined sharply in 2020 to 27.44 million trips due to the COVID-19 pandemic. However, tourism demand gradually recovered, increasing to 34.97 million trips in 2021, 51.22 million in 2022, and 63.64 million in 2023. The recovery reached its peak in 2024, when domestic tourist trips surged to 87.23 million, representing a 37.11% increase compared with the previous year (BPS Province of DKI Jakarta, 2025). This sustained upward trend confirms DKI Jakarta's position as one of Indonesia's leading domestic tourism destinations while simultaneously underscoring the growing urgency of implementing environmentally sustainable destination management.

Environmental pressures in DKI Jakarta are also reflected in the city's solid waste management challenges. The Executive Summary of the 2025 Environmental Status Report of DKI Jakarta Province (DIKPLHD) reported that municipal solid waste generation increased to 8,688 tons per day in 2024, with organic and plastic waste constituting the largest proportions, thereby posing substantial risks to both environmental quality and public health (Environmental Agency of DKI Jakarta Province, 2025). In 2025, daily waste generation remained between 7,700 and 8,000 tons, while the cumulative waste volume at the Bantargebang Integrated Waste Processing Facility (TPST Bantargebang) reached approximately 55 million tons (Government of DKI Jakarta Province, 2025). These figures indicate that the increasing mobility of residents and tourists must be accompanied by

environmentally responsible behavior and destination management systems capable of minimizing waste generation and mitigating environmental degradation.

Within this broader context, North Jakarta represents a strategically important area for the development of coastal tourism in DKI Jakarta due to its beaches, ports, recreational spaces, and mangrove ecosystems. One destination that simultaneously serves tourism and conservation functions is the Angke Kapuk Nature Tourism Park, commonly known as the PIK Mangrove Ecotourism Area. Located in Kamal Muara, Penjaringan, North Jakarta, the protected area covers approximately 99.82 hectares. Azzahra et al. (2022) reported that nearly 90% of the mangrove ecosystem had been degraded by 1998, after which ecological restoration efforts commenced in 2006. This history highlights the importance of continuously evaluating destination readiness, environmental carrying capacity, and service quality, as similarly emphasized in the ecotourism assessments of comparable nature tourism parks conducted by (Ardiansyah & Iskandar, 2022). These findings demonstrate that the PIK Mangrove Nature Tourism Park possesses significant ecological value while remaining highly vulnerable if tourism activities are not effectively managed through green tourism practices, environmental communication, and responsible tourist behavior.

As a mangrove ecosystem-based tourism destination, the PIK Mangrove Nature Tourism Park plays a strategic role in environmental education, coastal conservation, carbon sequestration, shoreline protection against erosion, and the provision of nature-based recreational spaces within an urban setting. However, these ecological characteristics also make the destination particularly vulnerable to environmentally irresponsible tourist behavior, such as littering, failing to comply with designated visitor trails, disturbing mangrove vegetation, and disregarding conservation messages. In the context of coastal tourism, (Cuong, 2025) emphasized that tourists' environmental behavior has become a critical issue because irresponsible visitor behavior can generate serious environmental challenges for tourism destinations. Therefore, the management of the PIK Mangrove Nature Tourism Park should focus not only on the destination's physical infrastructure but also on tourists' behavioral patterns as primary users of the recreational environment.

Based on the foregoing discussion, examining the effects of green tourism practices, green communication, and tourists' green lifestyle on the pro-environmental behaviour of visitors to the PIK Mangrove Nature Tourism Park is both timely and highly relevant. From a theoretical perspective, this study contributes to the growing body of literature on tourist

behavior within the context of green tourism, particularly in relation to urban mangrove tourism destinations. From a practical perspective, the findings are expected to provide valuable insights for destination managers in designing effective green tourism practices, environmental communication strategies, and educational programs that encourage tourists to engage in more environmentally responsible behavior. Given the continued growth of tourism demand in DKI Jakarta alongside increasing environmental pressures in urban areas, understanding the factors that shape tourists' pro-environmental behaviour is essential to ensuring that the tourism and conservation functions of the PIK Mangrove Nature Tourism Park can be maintained in a balanced and sustainable manner.

This study aims to analyze the influence of Green Tourism Practice, Green Communication, and Green Lifestyle on tourists' Pro-Environmental Behaviour, both partially and simultaneously.

METHODS

This study employed a quantitative approach (Amruddin et al., 2022; Sidik & Denok, 2021) with a descriptive-verificative research design to examine the effects of Green Tourism Practice, Green Communication, and Tourist Green Lifestyle on tourists' Pro-Environmental Behaviour at PIK Mangrove Nature Tourism Park, North Jakarta. A quantitative approach was selected because the study aimed to objectively test the relationships among variables using statistical analysis.

The research was conducted at PIK Mangrove Nature Tourism Park, North Jakarta, from February to April 2026 (adjust according to the actual research period). The study participants consisted of tourists who had visited the destination at least once within the previous 12 months and were at least 17 years of age. A non-probability sampling technique employing purposive sampling was used to select the respondents. The sample size was determined using the Slovin formula, resulting in a total of 100 respondents (Sahir, 2021; Sugiyono, 2021; Sugiyono, 2022).

Data were collected using a structured questionnaire based on a four-point Likert scale, which measured four constructs: Green Tourism Practice, Green Communication, Tourist Green Lifestyle, and Pro-Environmental Behaviour. Prior to data collection, the instrument underwent validity and reliability testing to ensure its adequacy for measurement. Primary data were obtained through the direct distribution of questionnaires to tourists at

the study site, while secondary data were collected from scholarly journal articles, books, and other relevant supporting documents (Muharlisiani et al., 2023).

The data were analyzed using IBM SPSS Statistics version 25. The analytical procedures included descriptive statistics, validity and reliability tests, classical assumption tests (normality, multicollinearity, and heteroscedasticity), multiple linear regression analysis, partial hypothesis testing (t-test), simultaneous hypothesis testing (F-test), the coefficient of determination (R^2), and multiple correlation analysis to examine both the individual and simultaneous effects of the independent variables on tourists' Pro-Environmental Behaviour (Hidayat, 2021; Maharani et al., 2022).

RESULTS

1. Partial t-Test

A partial *t*-test was conducted to examine the individual effect of each independent variable on the dependent variable. An independent variable was considered to have a statistically significant effect if the calculated *t*-value exceeded the critical *t*-value ($t_{calculated} > t_{critical}$) or if the *p*-value was less than 0.05 ($p < 0.05$). With a sample size of 100, the degrees of freedom were calculated as 96 ($df = n - k - 1 = 100 - 3 - 1$), where k represents the number of independent variables. At a 5% significance level (two-tailed), the corresponding critical *t*-value was 1.985.

Table 1. Results of the Partial t-Test

Hypothesis	Variable	Calculated t-value	Critical t-value	p-value (Sig.)	Decision
H_1	Green Tourism Practice (X_1)	6.068	1.985	0.000	H_1 Supported
H_2	Green Communication (X_2)	6.909	1.985	0.000	H_2 Supported
H_3	Green Lifestyle (X_3)	6.403	1.985	0.000	H_3 Supported

Base on table 1 results of the partial t-test hypothesis (H_1): The calculated *t*-value for Green Tourism Practice (X_1) was 6.068, which exceeded the critical *t*-value of 1.985 ($t = 6.068 > 1.985$), with a *p*-value of 0.000 ($p < 0.05$). Therefore, the null hypothesis (H_0) was rejected, and H_1 was supported. These findings indicate that Green Tourism Practice has a positive and statistically significant partial effect on the Pro-Environmental Behaviour of visitors to the PIK Mangrove Nature Tourism Park.

Hypothesis 2 (H_2): The calculated *t*-value for Green Communication (X_2) was 6.909, which was greater than the critical *t*-value of 1.985 ($t = 6.909 > 1.985$), with a *p*-value of 0.000 ($p < 0.05$). Moreover, this variable produced the highest *t*-value among the three independent variables. Accordingly, the null hypothesis (H_0) was rejected, and H_2 was supported. These results demonstrate that Green Communication has a positive and statistically significant partial effect on Pro-Environmental Behaviour and represents the most influential predictor among the variables examined in this study.

Hypothesis 3 (H_3): The calculated *t*-value for Green Lifestyle (X_3) was 6.403, exceeding the critical *t*-value of 1.985 ($t = 6.403 > 1.985$), with a *p*-value of 0.000 ($p < 0.05$). Therefore, the null hypothesis (H_0) was rejected, and H_3 was supported. These findings indicate that Green Lifestyle has a positive and statistically significant partial effect on the Pro-Environmental Behaviour of visitors to the PIK Mangrove Nature Tourism Park.

2. Simultaneous F-Test

The F-test was conducted to examine the simultaneous effect of all independent variables on the dependent variable. The null hypothesis (H_0) was rejected if the calculated F-value exceeded the critical F-value (Fcalculated > Fcritical) or if the *p*-value was less than 0.05 ($p < 0.05$). With 3 numerator degrees of freedom ($df_1 = 3$) and 96 denominator degrees of freedom ($df_2 = 96$) at a 5% significance level ($\alpha = 0.05$), the corresponding critical F-value was 2.699.

Table 2. Results of the F-Test (ANOVA)

Model	Sum of Squares	df	Mean Square	F	p-value (Sig.)
Regression	1,150.990	3	383.663	45.341	0.000
Residual	812.320	96	8.462	—	—
Total	1,963.310	99	—	—	—

Base on table 2 results of the F-Test (ANOVA) shows that the calculated F-value was 45.341, which exceeded the critical F-value of 2.699 ($F = 45.341 > 2.699$), with a *p*-value of 0.000 ($p < 0.05$). Therefore, the null hypothesis (H_0) was rejected, and H_4 was supported. These findings indicate that Green Tourism Practice (X_1), Green Communication (X_2), and Green Lifestyle (X_3) jointly exert a positive and statistically significant effect on the Pro-Environmental Behaviour of visitors to the PIK Mangrove Nature Tourism Park.

3. Pearson Correlation Analysis

Table 3. Results of the Pearson Correlation Analysis

Variable Pair	Pearson's r	p-value (Sig.)	Correlation Strength (Sugiyono, 2022)
Green Tourism Practice (X_1) → Pro-Environmental Behaviour (Y)	0.451	0.000	Moderate
Green Communication (X_2) → Pro-Environmental Behaviour (Y)	0.461	0.000	Moderate
Green Lifestyle (X_3) → Pro-Environmental Behaviour (Y)	0.488	0.000	Moderate

Base on table 3 results of the pearson correlation analysis indicates that all three independent variables exhibit positive correlations of moderate strength (r = 0.400–0.599) with Pro-Environmental Behaviour. Among them, Green Lifestyle (X_3) demonstrated the strongest bivariate correlation (r = 0.488), followed by Green Communication (X_2) (r = 0.461) and Green Tourism Practice (X_1) (r = 0.451).

Interestingly, although Green Lifestyle exhibited the strongest bivariate correlation with Pro-Environmental Behaviour, the standardized regression coefficient for Green Communication was larger (β = 0.454) than that of Green Lifestyle (β = 0.422). This finding suggests that after controlling for the effects of the other independent variables, Green Communication contributes more uniquely to explaining Pro-Environmental Behaviour than Green Lifestyle.

4. Coefficient of Determination (R^2)

Table 4. Results of the Coefficient of Determination (Model Summary)

Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	0.766	0.586	0.573	2.909

Base on table 4 results of the coefficient of determination (model summary) shows that the correlation coefficient (R) was 0.766, indicating a strong relationship (0.600–0.799) according to Sugiyono's (2022) classification. The coefficient of determination (R^2) of 0.586 indicates that the regression model explains 58.6% of the variance in Pro-Environmental Behaviour among visitors to the PIK Mangrove Nature Tourism Park.

Furthermore, the Adjusted R^2 value of 0.573 provides a more conservative estimate after accounting for the number of predictors included in the model, while still demonstrating substantial explanatory power. The remaining 41.4% of the variance in Pro-Environmental Behaviour is attributable to other factors not included in the present study.

DISCUSSION

1. Effect of Green Tourism Practice on Pro-Environmental Behaviour (H_1)

The results of the *t*-test demonstrated that Green Tourism Practice (X_1) has a positive and statistically significant effect on the Pro-Environmental Behaviour of visitors to PIK Mangrove Nature Tourism Park ($t = 6.068$; $p = 0.000$; $\beta = 0.400$). This finding indicates that the higher the quality of green tourism practices implemented by destination managers including the provision of environmentally friendly facilities, mangrove planting programs, visitor route management that protects the ecosystem, and effective carrying capacity management the stronger the tendency of visitors to exhibit pro-environmental behaviour during their visit.

From a theoretical perspective, these findings can be explained through the Stimulus–Organism–Response (S–O–R) framework. Within this framework, green tourism practice functions as an environmental stimulus that visitors perceive through their sensory experiences while visiting the destination. Physical stimuli, such as well-maintained visitor trails, segregated waste bins, and signage prohibiting damage to mangrove vegetation, provide strong normative cues regarding the expected behaviour within a conservation area. These environmental cues influence visitors' internal psychological states including environmental perceptions, attitudes, and affect which subsequently generate actual pro-environmental behavioural responses.

These findings are consistent with (Cuong, 2025), who reported that environmentally designed tourism experiences significantly contribute to the development of tourists' pro-environmental behaviour in coastal destinations across Asia. Within the context of PIK Mangrove Nature Tourism Park, the visually distinctive and ecologically fragile mangrove ecosystem naturally reinforces these environmental cues, thereby strengthening the influence of green tourism practices on visitors' environmentally responsible behaviour. Likewise, (Ardiansyah & Iskandar, 2022) emphasized that infrastructure quality, carrying capacity management, and destination governance are critical determinants of visitor experience and play an important role in fostering environmentally responsible tourist behaviour.

The descriptive statistical analysis further revealed that several indicators of Green Tourism Practice remained at the lower threshold of the "High" category, particularly X1.5 (restricted conservation zones; mean = 3.05) and X1.4 (plastic reduction policy; mean = 3.06). These findings indicate considerable opportunities for destination managers to

strengthen the implementation of these aspects in order to further enhance the influence of Green Tourism Practice on visitors' Pro-Environmental Behaviour.

2. Effect of Green Communication on Pro-Environmental Behaviour (H_2)

The *t*-test results confirmed that Green Communication (X_2) exerts a positive and statistically significant effect on visitors' Pro-Environmental Behaviour ($t = 6.909$; $p = 0.000$; $\beta = 0.454$). Among all independent variables, Green Communication emerged as the most influential predictor, as reflected by the highest standardized regression coefficient ($\beta = 0.454$) and the largest *t*-value (6.909) in the multiple linear regression model.

The dominant influence of Green Communication can be explained through two complementary theoretical perspectives. First, the Elaboration Likelihood Model (ELM) proposed by Petty and Cacioppo suggests that persuasive messages are processed through either the central route, which relies on strong logical arguments and conservation-related information, or the peripheral route, which emphasizes visual and emotional appeal. At PIK Mangrove Nature Tourism Park, environmental messages delivered through tour guides, interpretive signage, and digital media create layered persuasive effects that simultaneously activate visitors' pro-environmental intentions through both processing routes.

Second, the Framing Effect Theory argues that the manner in which environmental messages are framed significantly shapes individuals' behavioural responses. Messages framed positively and emphasizing tangible environmental benefits generate stronger pro-environmental behavioural responses than messages relying solely on prohibitive or normative instructions.

These findings are consistent with Kim (2025), who demonstrated that structured and multi-channel environmental communication strategies significantly influence tourists' environmental attitudes, emotions, and behaviours. At a more operational level, (Putra & Djunaid, 2023), in their study examining the impact of green marketing at Ecaps Café Jakarta, found that both green advertising and green branding significantly influenced consumer behaviour, highlighting that the way environmentally friendly destinations are communicated to visitors is a critical determinant of pro-environmental behaviour.

The dominant role of Green Communication is also highly relevant to the demographic characteristics of the respondents, of whom 85.0% were aged between 17 and 35 years, representing the demographic group most responsive to digital environmental

communication and value-based sustainability narratives (Chen et al., 2023). Furthermore, (Vicente, 2024) demonstrated that digital green marketing strategies significantly shape tourists' environmental attitudes within ecotourism destinations across Southeast Asia. These findings provide clear managerial implications, suggesting that destination managers should prioritize investments in strengthening green communication systems, particularly through social media content which recorded the lowest mean score (2.99) and interactive environmental interpretation media throughout the destination.

3. Effect of Green Lifestyle on Pro-Environmental Behaviour (H_3)

The results of the *t*-test indicated that Green Lifestyle (X_3) has a positive and statistically significant effect on visitors' Pro-Environmental Behaviour ($t = 6.403$; $p = 0.000$; $\beta = 0.422$). Green Lifestyle recorded the highest overall mean score among all study variables (46.75) and exhibited the strongest bivariate correlation with Pro-Environmental Behaviour ($r = 0.488$), suggesting that visitors to PIK Mangrove Nature Tourism Park generally possess well-established environmentally friendly lifestyles in their daily lives.

The influence of Green Lifestyle on Pro-Environmental Behaviour can be understood through the Theory of Planned Behaviour (TPB) (Ajzen, 1991, as applied by Chen et al., 2023). According to TPB, actual behaviour is primarily determined by behavioural intention, which is influenced by three factors: attitudes toward the behaviour, subjective norms, and perceived behavioural control. Green Lifestyle reflects the internalization of environmental values and attitudes developed through daily practices, including waste separation, plastic reduction, and responsible consumption. Once these values become integrated into an individual's self-identity, tourists are more likely to display similar environmentally responsible behaviours during their travel experiences without requiring explicit external prompts.

Rosanto & Carennia (2022) argued that the successful implementation of sustainable tourism principles in nature-based destinations depends largely on the compatibility between visitors' environmental values and those promoted by the destination itself. This perspective is particularly relevant to visitors who intentionally choose PIK Mangrove Nature Tourism Park, a conservation-based destination, as they are likely to exhibit value-based self-selection, resulting in stronger green lifestyle orientations than visitors to conventional tourism destinations. Similarly, (Liobikiene & Poškus, 2023) found that tourists possessing strong green lifestyles tend to encourage environmentally responsible behaviour among those

around them, thereby generating positive social spillover effects that support conservation-based destination management.

Interestingly, although Green Lifestyle demonstrated both the strongest bivariate correlation (r = 0.488) and the highest descriptive mean score, its standardized regression coefficient (β = 0.422) ranked slightly below that of Green Communication (β = 0.454). This finding suggests that when all predictors are considered simultaneously, environmental communication received at the destination plays a slightly greater role in activating actual pro-environmental behaviour during the visit than visitors' pre-existing environmental lifestyles. From a practical perspective, this finding is particularly important, indicating that even tourists who already possess strong green lifestyles continue to require effective environmental communication from destination managers to translate their internal environmental values into observable pro-environmental actions while visiting the destination.

4. Simultaneous Effects on Pro-Environmental Behaviour (H_4)

The results of the F-test demonstrated that Green Tourism Practice (X_1), Green Communication (X_2), and Green Lifestyle (X_3) jointly exert a positive and statistically significant influence on the Pro-Environmental Behaviour of visitors to PIK Mangrove Nature Tourism Park (F = 45.341; p = 0.000). The coefficient of determination (R^2 = 0.586) indicates that the proposed model explains 58.6% of the variance in visitors' Pro-Environmental Behaviour, while the multiple correlation coefficient (R = 0.766) indicates a strong overall relationship.

From a destination management perspective, these findings carry important strategic implications. The three variables do not operate independently; rather, they form an integrated sustainability ecosystem that reinforces one another. Green Tourism Practice provides the physical environmental context that facilitates environmentally responsible behaviour; Green Communication transforms this physical context into cognitive understanding and affective motivation that stimulate behavioural intentions; whereas Green Lifestyle represents visitors' internal capacity that determines the consistency and strength of the resulting behavioural responses. Together, these three dimensions constitute an interconnected system in which deficiencies in one component may reduce the overall effectiveness of the sustainability model.

The R^2 value of 58.6% represents substantial explanatory power for behavioural research. According to (Hair et al., 2023), an R^2 value of 50% or higher in consumer behaviour studies reflects strong predictive capability. Likewise, (Ardiansyah et al., 2025) demonstrated that destination management strategies integrating environmental practices, sustainability communication, and community-based environmental values are more effective in enhancing visitor engagement and satisfaction.

The remaining 41.4% of unexplained variance presents important opportunities for future research. Based on the existing literature, several additional factors may account for this remaining variation, including (1) social norms and peer-group influence during visits (Chen et al., 2023); (2) tourists' environmental identity as part of their broader self-concept; (3) emotional experiences, particularly feelings of awe elicited by mangrove ecosystems (Liu et al., 2024); (4) demographic characteristics, such as income level, which were not included in the present model; and (5) perceived behavioural control regarding the effectiveness of individual conservation actions within the context of urban mangrove ecosystem management.

This study offers both theoretical and practical implications. Theoretically, the findings reinforce the validity of the Stimulus–Organism–Response (S–O–R) framework and the Elaboration Likelihood Model (ELM) by demonstrating that Green Tourism Practice, Green Communication, and Green Lifestyle play significant roles in shaping tourists' Pro-Environmental Behaviour. Furthermore, the study enriches the existing literature on pro-environmental behaviour within the context of urban ecotourism destinations. Practically, the findings suggest that the management of PIK Mangrove Nature Tourism Park should prioritize strengthening green communication through social media platforms and interactive environmental education media. In addition, greater emphasis should be placed on enhancing green tourism practices, particularly by reducing single-use plastic consumption and strengthening the enforcement of conservation zones. Destination managers are also encouraged to develop participatory programs that actively engage visitors in adopting environmentally responsible lifestyles throughout their tourism experience.

This study has several limitations that should be acknowledged. First, the research was conducted exclusively at PIK Mangrove Nature Tourism Park, limiting the generalizability of the findings to other ecotourism destinations. Second, the proposed research model explained only 58.6% of the variance in Pro-Environmental Behaviour,

indicating that other influential factors, such as environmental identity, social norms, perceived behavioral control, and ecological emotion, were not included in the present study. Third, the use of a cross-sectional research design restricts the ability to establish causal relationships and examine changes in tourists' behaviour over time. Fourth, the application of purposive sampling may have introduced self-selection bias, while the use of self-report questionnaires is inherently susceptible to social desirability bias. Furthermore, because the majority of respondents were between 17 and 35 years of age, the findings may not fully represent the broader population of tourists. Nevertheless, several measures were undertaken to minimize these limitations, including establishing the validity and reliability of the research instruments, ensuring compliance with the classical assumptions of multiple regression analysis, employing an adequate sample size, and implementing a forced-choice response scale to improve data quality and reduce response bias.

CONCLUSION

Based on the results of multiple linear regression analysis involving 100 respondents, this study demonstrates that Green Tourism Practice, Green Communication, and Green Lifestyle have positive and statistically significant effects on tourists' Pro-Environmental Behaviour at PIK Mangrove Nature Tourism Park, North Jakarta. Individually, Green Tourism Practice significantly influences Pro-Environmental Behaviour ($\beta = 0.400$; $t = 6.068$; $p = 0.000$), indicating that the implementation of sustainable tourism practices encourages environmentally responsible behaviour among visitors. Green Communication also exerts a significant effect ($\beta = 0.454$; $t = 6.909$; $p = 0.000$) and emerges as the most influential predictor, highlighting the critical role of environmental information dissemination and educational communication in fostering pro-environmental behaviour. Furthermore, Green Lifestyle significantly affects Pro-Environmental Behaviour ($\beta = 0.422$; $t = 6.403$; $p = 0.000$), suggesting that visitors who adopt environmentally friendly lifestyles are more likely to exhibit pro-environmental behaviour during their visits. Simultaneously, the three independent variables have a significant effect on Pro-Environmental Behaviour ($F = 45.341$; $p = 0.000$), with an R^2 value of 0.586, indicating that they jointly explain 58.6% of the variance in tourists' pro-environmental behaviour. These findings underscore that the integration of sustainable tourism practices, environmental communication, and environmentally responsible lifestyles constitutes an effective strategy for promoting pro-environmental behaviour in conservation-based tourism destinations.

This study contributes to the advancement of knowledge in the field of sustainable tourism by providing empirical evidence that Green Tourism Practice, Green Communication, and Tourist Green Lifestyle significantly influence tourists' Pro-Environmental Behaviour. The findings support the application of the Stimulus–Organism–Response (S–O–R) framework and further demonstrate that Green Communication is the most influential determinant in shaping pro-environmental behaviour among tourists. Moreover, this study enriches the existing body of literature on tourist behaviour within the context of urban ecotourism in Indonesia and provides a valuable reference for future research on sustainable tourism and environmentally responsible tourist behaviour.

Future research is recommended to incorporate additional mediating variables, such as environmental identity, perceived behavioral control, or ecological emotion, to better explain the remaining variance in Pro-Environmental Behaviour that was not accounted for in the present study. Furthermore, comparative studies across various urban ecotourism destinations in Indonesia, longitudinal research examining changes in tourists' behaviour before and after their visits, and the application of mixed-methods approaches incorporating in-depth interviews are recommended to provide a more comprehensive understanding of the factors and underlying mechanisms that influence tourists' pro-environmental behaviour.

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