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Article

The Economic Cost-Effectiveness of Digital Ecotourism Campaigns in Promoting Environmental Awareness across Kerala's Backwaters

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Abstract: Digital ecotourism campaigns increasingly influence how tourists and local communities perceive and respond to environmental concerns in fragile destinations. The present study examined the economic cost-effectiveness of digital ecotourism campaigns in promoting environmental awareness across Kerala's backwater destinations. A quantitative cross-sectional design was adopted, and primary data were collected from 200 respondents selected from four major backwater locations in Kerala. The questionnaire measured campaign exposure, social media engagement, and environmental awareness using 5-point Likert-type items. The data were coded and analysed using EDUSTAT. Descriptive statistics summarised the study variables. An independent samples t-test assessed differences in awareness between high-exposure and low/no exposure groups. Pearson correlation and simple linear regression examined the relationship between engagement and awareness. Campaign-wise awareness uplift and unit cost indicators were used to interpret cost-effectiveness across digital formats. The results indicated significantly higher environmental awareness among respondents with high campaign exposure and a strong positive association between engagement and awareness. Cost-effectiveness patterns suggested that low-cost, high-engagement digital formats yielded better awareness returns per rupee spent than higher-cost, low-engagement placements. The study highlighted the value of engagement-centred digital strategies for environmentally responsible backwater tourism.

Keywords: Digital Ecotourism Campaigns; Environmental Awareness; Cost-Effectiveness.

INTRODUCTION

Ecotourism has been positioned as a development pathway that can generate local income while strengthening environmental stewardship in fragile destinations, provided that tourism growth is managed within ecological limits and supported by visitor education (Fennell, 2008; Honey, 2008; Weaver, 2001). In such contexts, environmental awareness functions as an intermediate economic outcome: higher awareness can reduce negative externalities such as littering, habitat disturbance, and water contamination and can thereby reduce clean-up and restoration costs borne by local bodies, operators, and communities. Awareness also supports compliance with destination rules and can strengthen the perceived legitimacy of conservation-oriented policies and user fees.

Kerala's backwaters represent a high-value tourism landscape where environmental quality is central to

the visitor experience and to the economic sustainability of the destination. Backwater tourism depends on clean waterways, healthy wetland ecology, and responsible visitor behaviour, particularly in segments associated with boating, houseboats, and waterfront recreation. In such settings, awareness related to waste management, plastic reduction, responsible boating, and conservation-friendly consumption becomes economically relevant because environmental degradation directly threatens demand, reputation, and long-term viability.

Digital communication has become a dominant channel through which destinations shape tourist expectations and behaviours. Tourism decision-making and trip experience are increasingly mediated by online search, social media, short video content, and platform-based recommendations, making digital campaigns a plausible instrument for influencing pro-environmental norms at relatively low marginal cost (Kaplan & Haenlein, 2010; Xiang & Gretzel, 2010). However, visibility alone does not guarantee outcomes, and the most economical approach is not necessarily the one with the highest spend or reach.

From an economics perspective, public and quasi-public spending on destination promotion increasingly faces the question of value for money. When campaign budgets compete with other environmental management expenditures, evaluation requires outcome-linked efficiency measures rather than impressions-based metrics. Cost-effectiveness analysis, which compares the costs of an intervention to a quantified outcome, provides a pragmatic framework for assessing whether a campaign produces measurable awareness gains per rupee spent (Drummond et al., 2015).

Background of the Study

Digital ecotourism campaigns aim to influence awareness by shaping knowledge, attitudes, and perceived norms, thereby creating a foundation for responsible behaviour. Evidence from behaviour change research indicates that information alone is often insufficient; outcomes are stronger when communication addresses attention, motivation, and convenience, with awareness acting as a necessary but not always sufficient condition for sustained behavioural change (Kollmuss & Agyeman, 2002; McKenzie-Mohr, 2011).

The tourism marketing literature suggests that user engagement is a key mechanism through which digital communication produces cognitive and attitudinal effects. Social media environments reward content that is interactive, locally resonant, and socially shareable, which can amplify message diffusion while strengthening recall and perceived relevance (Kaplan & Haenlein, 2010; Mangold & Faulds, 2009). In travel contexts, online information sources and social media influence destination image, information search, and travel decisions (Leung et al., 2013; Xiang & Gretzel, 2010).

Economic evaluation strengthens campaign decision-making by enabling comparisons across alternative digital formats. Cost-effectiveness approaches are suitable when the outcome is measurable but not easily monetised in the short run and when decision-makers must choose among competing campaign options under constrained budgets (Drummond et al., 2015). In the present context, comparing campaign types using unit-cost indicators such as cost per unit increase in awareness provides a practical basis for identifying formats that deliver stronger awareness returns.

Research Questions

- RQ1. Does exposure to digital ecotourism campaigns related to Kerala's backwaters significantly influence environmental awareness among tourists and residents?
- RQ2. Is social media engagement with digital ecotourism campaign content significantly associated with environmental awareness in Kerala's backwater destinations?
- RQ3. Are digital ecotourism campaigns economically cost-effective in improving environmental awareness, as reflected in awareness uplift relative to campaign cost?

Research Objectives

- Objective 1. To examine whether environmental awareness differs significantly between respondents with high exposure and those with low or no exposure to digital ecotourism campaigns in Kerala's backwaters.
- Objective 2. To assess the relationship between social media engagement with digital ecotourism campaign content and environmental awareness among respondents in Kerala's backwater destinations.
- Objective 3. To evaluate the economic cost-effectiveness of digital ecotourism campaigns in improving environmental awareness by estimating campaign-wise awareness uplift and unit cost indicators using campaign cost measures.

Hypotheses

- H1. There is a significant difference in environmental awareness between respondents with high exposure and those with low or no exposure to digital

ecotourism campaigns related to Kerala's backwaters.

- ❖ H2. Social media engagement with digital ecotourism campaign content has a significant positive association with environmental awareness.
- ❖ H3. Digital ecotourism campaigns are economically cost-effective in improving environmental awareness, indicated by higher awareness uplift at lower unit cost for higher-performing campaign formats.

METHODOLOGY

The study adopted a quantitative, cross-sectional research design to assess the economic cost-effectiveness of digital ecotourism campaigns in promoting environmental awareness in Kerala's backwater destinations. The investigation focused on the roles of campaign exposure and social media engagement in shaping environmental awareness, and it compared campaign formats using outcome-linked unit cost indicators.

The study area comprised four major backwater destinations in Kerala, namely Alappuzha, Kumarakom, Kochi backwaters, and Ashtamudi (Kollam). The population included tourists and local residents aged 18 years and above who visited or lived in these backwater regions during the period of data collection and who had potential exposure to digital ecotourism messages through social media platforms, tourism websites, online advertisements, or digital community channels.

A sample of 200 respondents was selected, with 50 respondents from each location to ensure balanced representation of the major backwater sites. Respondents were contacted through a location-wise intercept approach in public tourism areas such as boat jetties, waterfront promenades, major entry points, and nearby public spaces. Participation was voluntary.

Primary data were collected using a structured questionnaire. The instrument consisted of a demographic profile section and three study constructs measured on a 5-point Likert scale. Digital campaign exposure was measured using three items (E1 to E3), social media engagement was measured using five items (G1 to G5), and environmental awareness was measured using ten items (A1 to A10). Mean scores were computed for each construct by averaging item responses within the respective scale. Respondents were classified into a high exposure group and a low/no exposure group using the exposure score cut-off applied in the dataset.

The collected data were coded, tabulated, and analysed using EDUSTAT. Descriptive statistics such as mean, median, mode, standard deviation, skewness, and kurtosis were computed to summarise exposure, engagement, and awareness. Hypothesis 1 was tested using an independent samples t-test (Welch) to compare awareness between exposure groups. Hypothesis 2 was examined using Pearson correlation and simple linear regression to evaluate the association and predictive relationship between engagement and awareness. Hypothesis 3 was interpreted using campaign-wise awareness uplift and unit cost indicators based on campaign budget records.

Data Analysis and Interpretation

The primary data (n = 200) were coded and analysed using EDUSTAT. Percentage analysis described the respondent profile. Mean, median, mode, standard deviation, skewness, and kurtosis summarised the key study constructs. Hypotheses were tested using appropriate inferential statistics as presented in the following tables.

Table 1. Profile of respondents (n = 200)

Variable	Category	Frequency	Percentage
Location	Alappuzha	50	25.0
Location	Kumarakom	50	25.0
Location	Kochi Backwaters	50	25.0
Location	Ashtamudi (Kollam)	50	25.0
Respondent type	Tourist	134	67.0
Respondent type	Resident	66	33.0
Gender	Male	103	51.5
Gender	Female	97	48.5
Age group	26–35	56	28.0
Age group	18–25	53	26.5
Age group	36–45	37	18.5
Age group	46–55	30	15.0
Age group	56+	24	12.0
Education	UG	96	48.0

Education	PG	45	22.5
Education	Higher Secondary	44	22.0
Education	Professional/Other	15	7.5

The sample was evenly drawn from four backwater locations (25 per cent each). Tourists constituted 67 per cent of respondents and residents 33 per cent. Gender distribution was nearly balanced. The largest age group was 26–35 years (28 per cent), and UG-level education formed the largest education group (48 per cent).

Table 2. Descriptive statistics of key constructs (n = 200)

Variable	N	Mean	Median	Mode	Std. Deviation	Skewness	Kurtosis
Exposure score	200	3.003	3.33	3.0	1.036	-0.463	-0.742
Engagement score	200	2.778	2.8	2.8	0.918	-0.13	-0.601
Awareness score	200	2.782	2.9	1.9	0.89	-0.112	-0.888

Mean scores indicated moderate levels of digital campaign exposure and engagement, with a comparable average level of environmental awareness. The distributional indices suggested mild departures from normality that were not severe for mean-score based analysis.

Hypothesis Testing

Hypothesis 1 (H1): Environmental awareness differs significantly between respondents with high exposure and those with low/no exposure to digital ecotourism campaigns related to Kerala's backwaters.

Table 3a. Group statistics for awareness by exposure group

Exposure group	N	Mean awareness	SD
High exposure	101	3.274	0.699
Low/No exposure	99	2.281	0.778

Table 3b. Welch independent samples t-test for awareness score

Test	t value	df	p value	Mean difference	95% CI (Lower)	95% CI (Upper)	Cohen's d
Welch independent samples t-test	9.494	194.872	<0.001	0.993	0.787	1.2	1.344

Mean awareness was higher among the high-exposure group (Mean = 3.274) than the low/no exposure group (Mean = 2.281). The difference was statistically significant ($p < 0.001$), with a large effect size (Cohen's $d = 1.344$). Hence, H1 was supported.

Hypothesis 2 (H2): Social media engagement with digital ecotourism campaign content has a significant positive association with environmental awareness.

Table 4. Pearson correlation results (n = 200)

Variables	Pearson r	p value
Exposure score – awareness score	0.742	<0.001
Engagement score – awareness score	0.805	<0.001
Exposure score – engagement score	0.694	<0.001

Table 5a. Regression model summary (awareness score as dependent variable)

R	R^2	Adjusted R^2	F (1,198)	p value
0.805	0.648	0.647	365.077	<0.001

Table 5b. Regression coefficients (awareness score on engagement score)

Predictor	B	Std. Error	t	p value	95% CI (Lower)	95% CI (Upper)
Constant	0.615	0.119	5.148	<0.001	0.379	0.85
Engagement score	0.78	0.041	19.107	<0.001	0.7	0.861

Engagement showed a strong positive association with environmental awareness and significantly predicted awareness. The regression results indicated that engagement explained a substantial proportion of the variance in awareness, implying that higher engagement corresponded to higher awareness outcomes. Hence, H2 was supported.

Hypothesis 3 (H3): Digital ecotourism campaigns are economically cost-effective in improving environmental awareness, indicated by higher awareness uplift at lower unit cost for higher-performing campaign formats.

Baseline used for uplift computation: Mean awareness score of the Low/No exposure group = 2.281. Awareness uplift was computed as campaign mean awareness minus the baseline.

Table 6. Campaign-wise awareness uplift and unit cost (sorted by unit cost)

Campaign ID	Campaign type	n	Mean awareness	Awareness uplift	Total cost (₹)	Unit cost per respondent (₹)	Effectiveness
C1	Organic social media eco-tips series	49	2.959	0.678	60,000	1,805.03	Effective
C5	WhatsApp community broadcast with NGOs	12	3.350	1.069	40,000	3,117.62	Effective
C6	Instagram reels contest + pledge drive	31	3.158	0.877	90,000	3,309.44	Effective
C3	YouTube Shorts + micro-influencer video	58	2.760	0.480	150,000	5,393.14	Effective
C2	Paid social ads (Meta/FB/IG)	29	2.445	0.164	120,000	25,228.29	Effective
C4	Tourism portal banner/display ads	21	2.019	-0.262	200,000		Not effective

Campaign formats showing positive awareness uplift displayed different unit cost levels. Lower-cost, engagement-centred formats achieved awareness uplift at lower unit cost per respondent, whereas higher-cost, weaker-uplift formats showed poor economic efficiency. The display-style campaign showed negative uplift and was not cost-effective under the study outcome metric.

DISCUSSION OF THE RESULTS

The results indicated that digital ecotourism campaigns exerted a meaningful influence on environmental awareness in Kerala's backwater context. Even within a moderate overall exposure environment, the observed group differences and the strength of associations indicated that digital campaigns can create measurable awareness gains among tourists and residents.

The group comparison supported the proposition that higher campaign exposure corresponds to higher environmental awareness. Respondents in the high-exposure group recorded a substantially higher mean awareness score than those in the low/no exposure group, and the difference was statistically significant with a large effect size. This pattern supports the view that repeated and salient exposure increases awareness outcomes in destination contexts where environmental quality directly affects tourism value.

The association analysis showed that engagement

with campaign content was strongly and positively related to environmental awareness. The regression results demonstrated that engagement explained a substantial share of variance in awareness scores. This implies that awareness outcomes are strengthened not merely by passive visibility but by interaction-oriented behaviours that deepen message processing and recall.

The cost-effectiveness comparisons suggested that campaign formats vary in economic efficiency. Engagement-centred, lower-cost formats produced awareness uplift at lower unit cost per respondent, while high-cost formats with weak uplift exhibited poor economic efficiency. This indicates that spending intensity alone is not a reliable indicator of awareness returns and that format selection and engagement design matter for value-for-money outcomes.

Implications of the Study

Digital ecotourism communication can be used as a practical instrument for awareness creation in Kerala's backwater destinations alongside on-site instructions, signage, and monitoring. Tourism agencies and local bodies can institutionalise regular backwater-specific digital awareness campaigns as part of destination management.

Because engagement strongly relates to awareness, campaign success should not be evaluated only through reach or impressions. Campaign evaluation can prioritise engagement indicators such as completion rates for short videos, shares, comments, link clicks, participation in eco-pledges, and user-generated content. This implies that campaign design should be engagement-led and behaviour-oriented.

The unit cost patterns support prioritising low-cost, high-engagement formats and community partnerships under budget constraints. Resource allocation can shift away from high-cost display formats when they deliver weaker awareness returns, and toward formats that produce measurable awareness uplift per rupee spent.

Environmental awareness messaging is strengthened when supported by enabling infrastructure and consistent destination standards. Integrating digital campaigns with on-ground environmental management measures can help convert increased awareness into sustained responsible behaviour among tourists and local communities.

CONCLUSION

The study indicated that digital ecotourism campaigns in Kerala's backwater destinations were associated with higher environmental awareness, with significantly higher awareness among respondents with high campaign exposure and a strong positive association between engagement and awareness. Campaign-wise comparisons suggested that engagement-centred, lower-cost formats produced better awareness uplift per rupee spent than higher-cost formats with weaker uplift. The findings supported the prioritisation of measurable engagement and economically efficient digital formats to strengthen environmental awareness and promote responsible ecotourism practices in Kerala's backwaters.

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