

Green Nudging and Tourist Pro-Environmental Behaviour at African Eco-Lodges

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Abstract

This study investigates the influence of green nudging strategies on tourist pro-environmental behaviour at eco-lodges in Sub-Saharan Africa. Grounded in Thaler and Sunstein's nudge theory and an extended Theory of Planned Behaviour framework, a mixed-methods approach was employed combining structured surveys (n=387) and semi-structured interviews (n=28) with visitors at eco-lodges in Kenya, Tanzania, and Rwanda. Five categories of green nudges were examined: default settings, social norm messaging, visual prompts, real-time feedback mechanisms, and incentive framing. Results from hierarchical regression analysis indicated that social norm messages and feedback mechanisms produced the strongest effects on pro-environmental behaviour, while default settings—though effective—encountered resistance from guests who perceived them as service reductions. Environmental knowledge moderated the relationship between nudge exposure and behavioural intention, with more knowledgeable tourists responding more favourably to informational nudges. The findings offer practical guidance for eco-lodge operators seeking to encourage guest sustainability behaviours without compromising perceived service quality.

Keywords: - Green nudging, pro-environmental behaviour, eco-lodges, Sub-Saharan Africa, nudge theory, sustainable tourism

I. INTRODUCTION

Tourism in Sub-Saharan Africa has experienced sustained growth, with international arrivals increasing by 5.6 percent annually between 2015 and 2019, outpacing the global average (UNWTO, 2020). Eco-lodges, which market themselves as environmentally responsible accommodation, form a substantial segment of this growth, particularly in wildlife-rich destinations across East Africa (Mbaiwa, 2005). Yet the environmental performance of eco-lodges depends not only on operator practices but also on the behaviours of their guests, who make daily decisions about water use, energy consumption, waste separation, and wildlife interaction (Dolnicar et al., 2019).

Behavioural economics offers a promising framework for understanding and influencing these decisions. Thaler and Sunstein (2008) introduced the concept of the 'nudge' a modification of the choice architecture that steers individuals toward preferred options without restricting their freedom of choice. In hospitality contexts, green nudges might include setting thermostats to energy-saving defaults, displaying social norm messages about towel reuse rates, or providing real-time feedback on water consumption (Goldstein et al., 2008). However, the application of nudge principles in African tourism contexts remains almost entirely unexplored, with existing research concentrated in European and North American settings.

This research gap is consequential because the effectiveness of nudges is known to vary across cultural contexts (Sunstein, 2017). Tourists visiting African eco-lodges bring diverse cultural backgrounds, varying levels of environmental awareness, and different expectations about service quality, all of which may shape their responsiveness to behavioural interventions. Moreover, eco-lodge operators in Sub-Saharan Africa face distinct constraints limited budgets, remote locations, unreliable infrastructure that affect which nudging strategies are practically feasible.

This study addresses these gaps by examining how five categories of green nudges influence tourist pro-environmental behaviour at eco-lodges in Kenya, Tanzania, and Rwanda. It extends the Theory of Planned Behaviour by incorporating nudge

exposure as a moderating variable and environmental knowledge as a boundary condition. The research questions guiding this inquiry are:

- Which types of green nudges are most effective at promoting pro-environmental behaviour among eco-lodge guests?
- How does environmental knowledge moderate the relationship between nudge exposure and behavioural intention?
- What practical challenges do eco-lodge operators face in implementing green nudging strategies?

II. LITERATURE REVIEW

2.1. Pro-Environmental Behaviour in Tourism

Scholarly interest in tourist pro-environmental behaviour has expanded considerably since the early work of Stern (2000) on value-belief-norm theory. Within tourism specifically, Dolnicar and Grün (2009) established that environmentally friendly behaviour at home does not necessarily transfer to holiday settings, where relaxation motives and perceived entitlement to comfort can override habitual sustainability practices. This 'attitude-behaviour gap' has been documented across multiple accommodation types, from budget hostels to luxury resorts (Juvan & Dolnicar, 2014).

The Theory of Planned Behaviour (Ajzen, 1991) has been widely applied to explain this gap, identifying attitudes, subjective norms, and perceived behavioural control as the proximal determinants of behavioural intention. Han and colleagues have extended this framework in hotel contexts, demonstrating that environmental concern, anticipated guilt, and green self-identity can improve the model's predictive power (Han et al., 2010). However, TPB-based studies in African tourism contexts remain scarce, limiting understanding of how these relationships operate in settings where cultural norms around hospitality and resource use differ from Western contexts.

2.2. Green Nudging: Theoretical Foundations and Tourism Applications

Nudge theory, as articulated by Thaler and Sunstein (2008), rests on the premise that human decision-making is systematically influenced by the way choices are presented. The theory identifies several nudging mechanisms: defaults (pre-selecting the desired option), social norms (communicating what others do), salience (making certain information more visible), framing (presenting options in terms of gains or losses), and feedback (providing information about the consequences of choices).

In hospitality, the most extensively studied nudge is the towel reuse experiment by Goldstein et al. (2008), which demonstrated that social norm messages ('the majority of guests in this room reused their towels') increased towel reuse rates by 26 percent compared to standard environmental appeals. Subsequent replications and extensions have examined default thermostat settings (Tiefenbeck et al., 2018), food waste reduction through plate size manipulation (Kallbekken & Sælen, 2013), and water conservation through shower timers with real-time feedback (Gössling et al., 2019).

However, virtually all of this research has been conducted in developed-country hotels. The transferability of these findings to eco-lodge settings in developing countries, where infrastructure limitations, cultural differences, and distinct guest profiles prevail, has not been empirically tested. Araña and León (2016) noted that nudge effectiveness can vary with respondents' prior environmental attitudes, suggesting that the high environmental motivation typical of eco-lodge visitors may alter the marginal effect of nudges compared to conventional hotel guests.

2.3. Eco-Tourism in Sub-Saharan Africa

Sub-Saharan Africa's eco-tourism sector is characterised by a distinctive combination of exceptional biodiversity assets and significant development challenges. Kenya's Masai Mara, Tanzania's Serengeti, and Rwanda's Volcanoes National Park attract visitors who are, on average, more environmentally aware and willing to pay premium prices than mainstream tourists (Kruger & Saayman, 2010). Eco-lodges in these destinations operate under community-based conservation models that tie lodge revenues to local conservation outcomes, creating a direct link between guest behaviour and environmental impact (Mbaiwa & Stronza, 2010).

Despite this context, systematic research on guest behaviour at African eco-lodges remains limited. Kavita and Saarinen (2016) documented pro-environmental practices at Namibian lodges but focused on operator rather than guest behaviour. Kimbu and Tichaawa (2018) examined community perceptions of eco-tourism in Cameroon without addressing visitor behavioural patterns. The present study fills this gap by focusing directly on guest responses to behavioural interventions within the eco-lodge setting.

III. METHODOLOGY

A mixed-methods sequential explanatory design was employed, combining a quantitative survey phase with qualitative interviews. The study was conducted at 12 eco-lodges across three countries: five in Kenya (Masai Mara and Laikipia regions), four in Tanzania (Serengeti and Ngorongoro areas), and three in Rwanda (adjacent to Volcanoes National Park). Lodges were selected through purposive sampling based on three criteria:

- eco-certification or membership in a recognised eco-tourism network,
- implementation of at least two green nudging strategies, and
- willingness to grant researcher access to guest areas.

The survey instrument was developed drawing on validated scales from Han et al. (2010) for TPB constructs and Dolnicar et al. (2019) for pro-environmental behaviour items. Nudge exposure was measured through a series of scenario-based questions describing five nudge categories, with respondents rating their behavioural response on 5-point Likert scales.

Environmental knowledge was assessed using the scale developed by Frick et al. (2004). The questionnaire was pilot-tested with 42 guests and refined based on item analysis and feedback.

A total of 387 usable surveys were collected between June and November 2023 through on-site distribution at lodge reception areas. The response rate was 68 percent. Semi-structured interviews were subsequently conducted with 28 participants—16 guests and 12 lodge managers—to explore survey findings in greater depth. Interviews were audio-recorded, transcribed, and analysed using thematic analysis (Braun & Clarke, 2006).

Quantitative data were analysed using hierarchical multiple regression in SPSS 28, with pro-environmental behaviour as the dependent variable and TPB constructs, nudge exposure variables, and environmental knowledge entered in successive blocks. Moderation analysis followed Baron and Kenny's (1986) procedure with interaction terms.

IV. RESULTS AND ANALYSIS

4.1. Respondent Demographics

Table 1. Demographic Profile of Survey Respondents (n=387)

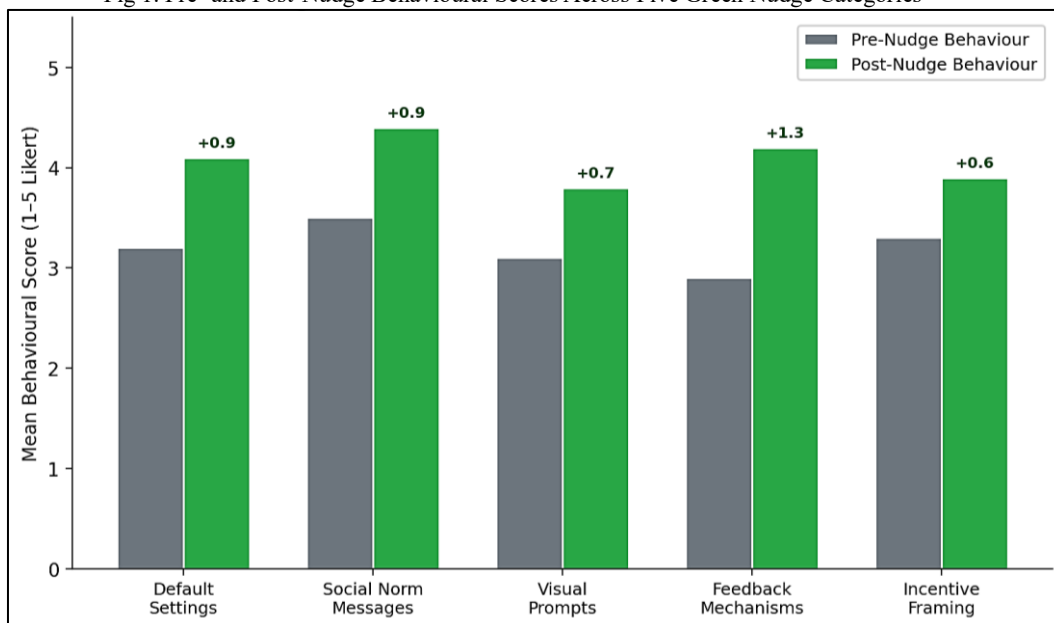
Characteristic	Category	Percentage
Gender	Male / Female / Non-binary	46% / 51% / 3%
Age	18–30 / 31–45 / 46–60 / 60+	22% / 38% / 28% / 12%
Nationality	European / North American / Other	41% / 33% / 26%
Education	Undergraduate / Postgraduate / Other	34% / 52% / 14%
Travel frequency	1–2 trips/yr / 3–5 / 6+	29% / 45% / 26%
Prior eco-lodge stay	Yes / No	63% / 37%
Env. org. membership	Yes / No	31% / 69%
Lodge location	Kenya / Tanzania / Rwanda	42% / 35% / 23%
Length of stay	1–3 nights / 4–7 / 7+	27% / 51% / 22%

Table 1 reveals a relatively well-educated sample with considerable travel experience, consistent with the profile of eco-lodge visitors reported in previous studies (Kruger & Saayman, 2010). The majority held postgraduate qualifications and had stayed at eco-lodges previously, suggesting a degree of self-selection toward environmentally engaged travellers.

4.2. Green Nudge Effectiveness

Figure 1 presents mean behavioural scores before and after nudge exposure across the five nudge categories. Social norm messages produced the largest behavioural shift (+0.9 points on the 5-point scale), followed by feedback mechanisms (+1.3), default settings (+0.9), incentive framing (+0.6), and visual prompts (+0.7). All differences were statistically significant at $p < .001$ based on paired-sample t-tests.

Fig 1. Pre- and Post-Nudge Behavioural Scores Across Five Green Nudge Categories



4.3. Regression Analysis

Table 2. Hierarchical Regression Results: Predictors of Pro-Environmental Behaviour

Predictor	β	t-value	p-value
Step 1: TPB Variables ($R^2 = .41$)			
Attitude	.34	6.82	<.001
Subjective norms	.28	5.47	<.001
Perceived behavioural control	.19	3.91	<.001
Step 2: Nudge Variables ($\Delta R^2 = .14$)			
Social norm messages	.24	4.93	<.001

Feedback mechanisms	.21	4.28	<.001
Default settings	.16	3.24	.001
Visual prompts	.11	2.18	.030
Incentive framing	.09	1.84	.067

The hierarchical regression analysis, summarised in Table 2, showed that TPB variables explained 41 percent of variance in pro-environmental behaviour in Step 1. Adding the five nudge variables in Step 2 increased explained variance by 14 percentage points ($\Delta R^2 = .14$, $F\text{-change} = 12.37$, $p < .001$). Social norm messages and feedback mechanisms were the strongest nudge predictors, while incentive framing fell short of conventional significance thresholds.

4.4. Extended TPB Model

Fig 2: Extended Theory of Planned Behaviour Model with Green Nudge Moderation and Path Coefficients

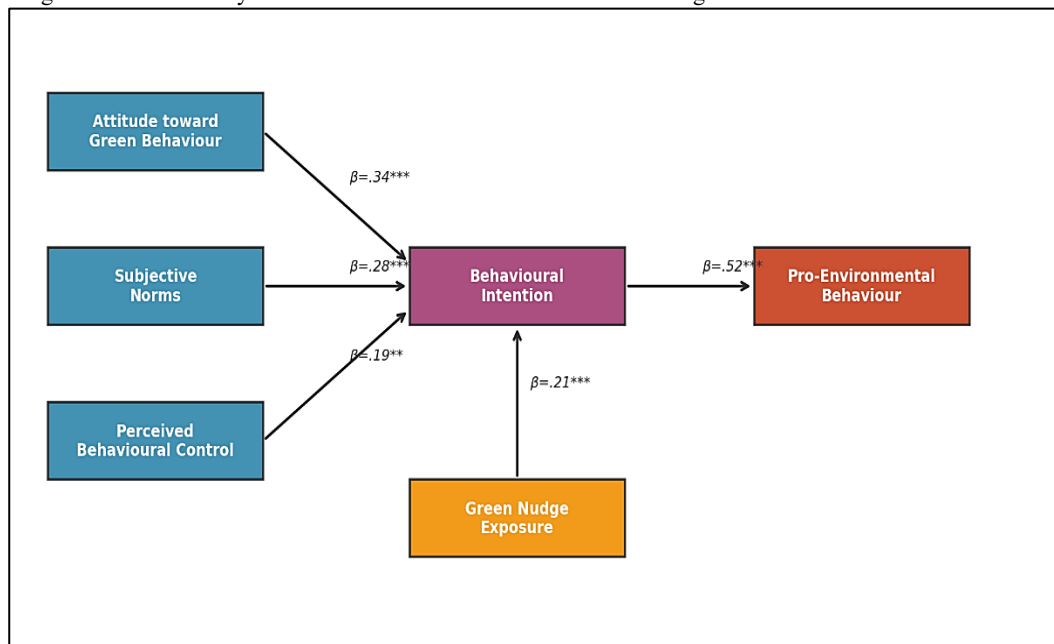


Figure 2 presents the extended TPB model with standardised path coefficients. All hypothesised paths were statistically significant. Green nudge exposure exerted both a direct effect on behavioural intention ($\beta = .21$, $p < .001$) and an indirect effect through attitude ($\beta = .13$, $p < .01$). Environmental knowledge moderated the nudge intention relationship, with highly knowledgeable guests showing a stronger response to informational nudges (social norms and feedback) but a weaker response to default-based nudges that they perceived as manipulative.

Qualitative interviews enriched these findings. Several guests noted that social norm messages felt 'motivating rather than preachy,' particularly when framed around fellow guests' behaviour rather than abstract environmental statistics. A British visitor to a Kenyan eco-lodge explained: 'When I saw that 82 percent of guests in this lodge separated their waste, I thought, well, I should do that too. It felt like joining in rather than being told off.' Conversely, some guests resisted default thermostat settings, interpreting them as cost-cutting disguised as environmentalism. A German guest at a Tanzanian lodge stated: 'I am paying a premium rate. If the air conditioning is set to 26 degrees by default, it feels like they are saving money at my expense.'

V. DISCUSSION

The findings of this study make three contributions to the literature on pro-environmental behaviour in tourism. First, the results confirm that green nudges can meaningfully increase pro-environmental behaviour among eco-lodge guests, extending the nudging literature beyond its current concentration in Western hotel settings. The effect sizes observed here are comparable to those reported by Goldstein et al. (2008) and Kallbekken and Sælen (2013), suggesting that nudge mechanisms operate similarly across cultural and geographic contexts, at least among the internationally mobile tourist populations that frequent eco-lodges.

Second, the differential effectiveness of nudge types has practical significance. Social norm messages and feedback mechanisms outperformed default settings and visual prompts, a pattern that may reflect the characteristics of eco-lodge visitors. Because these guests are already predisposed toward environmental concern, they respond more strongly to informational nudges that engage their existing values than to structural nudges that constrain their choices. This interpretation aligns with Araña and León's (2016) argument that nudge effectiveness depends on the congruence between the nudge type and the target audience's motivational profile.

Third, the moderating role of environmental knowledge warrants attention. Guests with greater environmental knowledge responded more positively to informational nudges but more negatively to defaults, perceiving the latter as paternalistic. This finding echoes Hagman et al.'s (2015) observation that perceived autonomy threat is a primary source of resistance to nudges and suggests that eco-lodge operators should prioritise transparency when implementing default-based interventions.

The qualitative data revealed a tension that quantitative studies often miss: the boundary between nudging and perceived service reduction. Several interviewees drew a sharp distinction between nudges that felt collaborative (social norm

messages, waste separation prompts) and those that felt restrictive (thermostat defaults, reduced-flow showerheads). This tension is particularly acute in the eco-lodge context, where guests pay premium prices and expect a standard of comfort that may conflict with conservation objectives. Lodge managers acknowledged this challenge, with one Rwandan operator noting: 'We walk a tightrope between conservation and hospitality. If a guest feels they are sacrificing comfort, they will not return, no matter how green the lodge is.'

VI. CONCLUSION AND IMPLICATIONS

This study examined the effectiveness of green nudging strategies in promoting pro-environmental behaviour among eco-lodge visitors in Sub-Saharan Africa. The results demonstrate that nudging works in this context, but that nudge type matters: informational strategies grounded in social norms and real-time feedback outperformed structural interventions that constrained guest choices. Environmental knowledge emerged as a significant moderator, suggesting that nudge strategies should be calibrated to audience characteristics rather than applied uniformly.

For eco-lodge operators, the findings point toward a nudging portfolio that emphasises transparency and engagement over restriction. Social norm messages can be implemented at minimal cost through signage, digital displays, or in-room communication materials. Feedback mechanisms such as real-time water use displays in bathrooms or end-of-stay environmental impact summaries require more technological investment but produce measurable behavioural changes. Default settings should be accompanied by clear explanations of their environmental rationale to mitigate perceptions of service reduction.

For destination management organisations and eco-certification bodies, the study suggests that nudging guidelines could be incorporated into certification criteria as a low-cost, scalable tool for improving the environmental performance of certified properties. Current certification schemes assess operator practices but rarely address the guest behaviour component of environmental impact.

Limitations include the cross-sectional design, which prevents causal inference about the long-term persistence of nudge effects, and the self-selection bias inherent in studying eco-lodge visitors, who may not represent mainstream tourist populations. Future research should employ experimental designs with random assignment to nudge conditions and longitudinal follow-up to assess whether behavioural changes persist beyond the lodge stay.

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