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Original Article

Sustainable behavior in nature tourism travel: the influence of local infrastructure

Comportamento sustentável em viagens de turismo de natureza: a influência da estrutura local

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Abstract

Purpose: To analyze the influence of local tourism infrastructure on sustainable behavior.
Methodology: A survey was conducted with 209 tourists visiting five cities located in the northeast region of Brazil, encompassing different types of nature tourism such as climbing mountains, taking sunbath, and going to the beach. Through Exploratory Factor Analysis, the collected data were analyzed to reduce the number of variables and group them into factors. Subsequently, a multiple linear regression analysis was performed to assess the influence of constructs related to local infrastructure on sustainable behavior in nature tourism travel.
Findings: The results indicate that the sociocultural and ecological dimensions of local infrastructure positively influence the behavior of tourists on nature trips, while public policies' dimension was not appropriately captured in the study.
Practical implications: The research findings can be useful for public managers to improve tourism infrastructure more effectively, induce tourists towards sustainable behavior, and thus achieve sustainable tourism.
Originality/value: The study expanded the understanding of sustainable behavior in travel by revealing the dimensions of local infrastructure that positively influence it. It also highlighted the importance of educational actions that promote a local culture of sustainability.

Keywords: Nature tourism; Sustainable behavior in travel; Local infrastructure

Resumo

Objetivo: Analisar a influência da estrutura do local de turismo no comportamento sustentável.
Metodologia: Realizou-se uma pesquisa com 209 turistas, visitantes de 5 cidades localizadas na

região nordeste do Brasil, abrangendo diferentes modalidades de turismo de natureza como escalar montanha, tomar banhos de sol e ir à praia. Os dados foram submetidos à análise fatorial exploratória (AFE) para redução das variáveis e para agrupá-las em fatores, bem como utilizou-se da regressão linear múltipla para avaliar a influência da estrutura do local de turismo no comportamento sustentável.
Resultados: Os resultados indicam que as dimensões sociocultural e ecológica da infraestrutura local influenciam positivamente o comportamento de turistas em viagens de natureza, enquanto a dimensão de políticas públicas não foi adequadamente capturada na pesquisa.
Implicações práticas: os resultados da pesquisa podem ser uteis para que gestores públicos possam melhorar a infraestrutura do local de turismo de forma mais eficaz para induzir os turistas a um comportamento sustentável e assim alcançar um turismo sustentável.
Originalidade / valor: O estudo ampliou a compreensão sobre o comportamento sustentável em viagens ao revelar as dimensões da infraestrutura local que influencia positivamente o comportamento. Ainda, revelou que ações educativas que aumentem a cultura de sustentabilidade do local faz-se de suma importância.

Palavras-chave: Turismo de natureza; Comportamento sustentável em viagens; Estrutura do local

1 INTRODUCTION

Public awareness of sustainable development has evolved (Calixto, 2006), challenging current models of societal progress and prompting reflections on the utilitarian view of the environment (Dutra & Nascimento, 2005). Thus, various economic sectors have sought to address their dilemmas in pursuit of sustainability, among them, the tourism sector.

The tourism sector recovered pre-pandemic levels representing around 3% of the global gross domestic product (World Tourism Organization, 2024), and the nature-based tourism, specifically, it creates significant economic benefits for communities around the destinations (Gupta et al., 2023). The tourism sector has also been striving for sustainability, and the concept of sustainable tourism, as an integral part of sustainable development, has received significant attention in the past 20 years (Sharpley, 2021). Although there is no consensus, sustainable tourism focuses on environmental, social, cultural, economic, political, and ethical issues (Moyle et al., 2020), aligned with the concept of sustainable development.

Due to its interconnectedness with virtually all other economic sectors, tourism has the potential to produce profound and far-reaching impacts on all dimensions of sustainable development (World Tourism Organization, 2023). Therefore, numerous studies from various perspectives have been undertaken to make the sector more sustainable, with behavioral studies (Qian et al., 2018) standing out among them. Research in this field, according to Qian et al. (2018), focuses on examining the sustainable behavior exhibited by tourists during their trips.

For example, Ding and Jiang (2023) explore the impact of rural tourism destination attractiveness on tourists, specifically examining the mediating role of green self-identity. In turn, Stojanović et al. (2024) investigate the natural and sociocultural values of a tourism destination in relation to tourism sustainable development. On the other hand, Trišić et al. (2023) highlight the significance of sociocultural factors in tourism that foster sustainable behavior. Underlying these studies, we can highlight the importance of infrastructure – a gap in the literature that is addressed in this paper.

Against this background, this study aims to analyze the influence of local infrastructure on sustainable behaviour in nature tourism travels. To achieve this, a survey was conducted with 209 tourists visiting five cities located in the northeast region of Brazil, encompassing various types of nature tourism such as climbing mountains, taking sun, and going to the beach. Through Exploratory Factor Analysis, the collected data were analyzed to reduce the number of variables and group them in factors. Subsequently, a multiple linear regression analysis was performed to assess the influence of constructs related to local infrastructure on sustainable behaviour in nature tourism travels.

Motivations to travel are interconnected with the destination attributes and attractiveness, which depends on various factors, such as the ability to respond to long-term changes like climate change (Gössling et al., 2012). This capability is associated with a set of actions that involve adequate local infrastructure, including transportation modes (Vujko & Gajic, 2014), access to quality facilities and services (Schliephack &

Dickinson, 2017), among others. However, this infrastructure is also interconnected with social, cultural, political/institutional, and technological aspects (Choi & Sirakaya, 2006), and includes a patrimonial dimension as well (Pérez León, 2023).

Therefore, it is important to explore the drivers of environmentally friendly behaviors, since different sustainable behaviors have distinct drivers (Nikolić et al., 2021). The combination of these attributes will shape the destination's image and influence the tourist's perception of the location, consequently impacting their behavior during the trip (Buosi et al., 2014). According to Buosi et al. (2014), this relationship is essential for crafting a more effective place marketing strategy, which serves as a valuable tool for promoting the sustainable development of a tourist destination.

In this regard, the perception of local infrastructure was operationalized in relation to the development of public policy (PPD), ecological (ED), and sociocultural (SD) development. This was based on assertions regarding public-private partnerships, local conservation, economic stability, residents' quality of life, degradation of natural resources, among other factors. The assertions related to PPD, ED, and SD were drawn from Choi and Sirakaya (2006). In turn, for Sustainable Behavior in Travel, the scale applied nationally by Oliveira et al. (2021) was adopted, building on the work of Reinsberg and Vinje (2010).

This paper is structured in five sections, including this introduction. In the next section, the theoretical support is presented, followed by the research method, in the third section, including the instrument and data analysis procedures. The results and discussions are presented in the fourth section, providing the profile of the interviewees, the results of the exploratory analysis, and the results of multiple regression analyses. Finally, the study concludes with final considerations and an agenda for future research.

2 BACKGROUND

2.1 Sustainable Behavior in Travel

Studying human behavior is not an easy task and "[...] involves various factors that influence consumer decision-making, including their uniqueness, social and cultural history [...]" (Oliveira et al., 2021, p. 4). There are several internal and external factors that influence the formation of individuals' self-concept and lifestyle (Serra & Alfinito, 2020), which in turn affect their behavior towards sustainability.

In this sense, numerous studies investigate consumer behavior and are based on theories such as the Theory of Planned Behavior (TPB), which suggests that an individual's inclination to exhibit a specific behavior is influenced by their attitude towards that behavior, subjective norms, and perceived behavioral control (Ajzen, 1991). Consequently, individuals' attitudes have been widely used to predict their behavior (Oliveira et al., 2021).

Studies have shown a positive relationship between a hotel's environmentally-friendly image and customers' favorable behavioral intentions (Lee et al., 2010), as well as a link between the perception of sustainable development and image attributes (Buosi et al., 2014). Moreover, individuals who demonstrate sustainable behavior in their daily lives tend to extend it to their travels (Oliveira et al., 2021). However, a significant portion of the population, even if concerned about the environment, believes that the responsibility for ecological issues and their preservation lies with the government, large companies, or both (Castelo et al., 2019). This belief diminishes their engagement in ecological awareness initiatives.

Regarding this matter, Sharpley (2021) argues that there is still limited evidence of a true transformation towards a more sustainable approach in tourism production and consumption. This transformation can promote sustainable behavior in tourists by facilitating their perceived control and social pressure towards such behavior. One of the initial avenues for investing in this transformation is the local infrastructure itself,

which is the focus of this research, examining its influence on sustainable behavior.

Nevertheless, considering that individuals who demonstrate sustainable behavior in their daily lives tend to extend it to their travels, as proposed by Oliveira et al. (2021), it is believed that these tourists will have a genuine interest in the environment, culture, and the development of the destination community, desiring to learn about and contribute to its sustainable future (Sharpley, 2006). In this regard, Pearce (2005) highlights that a tourist destination possesses various attributes that influence the tourist's choice of location, and their experience during the trip will depend, among other factors, on the environment, facilities, and services provided, which in turn influence the tourist's social, cultural, and environmental interactions.

The present study focuses on issues related to the tourist destination, as detailed in the next section. However, it is important to note that the scale adopted to measure sustainable behavior in travels was developed by Reinsberg and Vinje (2010) and has already been applied in Brazil by Oliveira et al. (2021).

2.2 The influence of local infrastructure

The government's involvement in the development of public policies and a national tourism plan, as well as the provision of facilities, accommodation services, and funding, has been shown to be essential, especially in emerging countries (Oliveira, 2019). Managing a tourist destination goes far beyond the application of laws or guidelines and is fundamentally linked to planning (Gomes et al., 2017). The engagement of local communities is crucial because without their proactivity and legitimacy, actions involving sustainable tourism development will remain mere ideals (Ruhanen, 2013).

These actions constitute the development of public policy for sustainable tourism development and, according to Choi and Sirakaya (2006), involve the existence of public-private partnerships in tourism, policies for local development and conservation, public policies for controlling local use, promotion of local community economic stability,

and local tourism planning. However, in addition to the mentioned aspects, socio-cultural issues such as how the ecosystem assimilates general environmental impacts, biodiversity of flora and fauna, among others, should be considered (Ko, 2005).

Regarding ecological development, several studies have proposed indicators to assess tourist destinations (Blancas et al., 2010; Choi & Sirakaya, 2006; Schianetz & Kavanagh, 2008; Torres-Delgado & Palomeque, 2014) or tourism establishments such as hotels (Lee et al., 2010) and resorts (Lee et al., 2021). In this sense, it is not enough to have actions related to environmental protection in place; they need to reach a high level and be part of a systematic process of impact assessment (Ko, 2005) in order to provide environmental criteria for tourism planning (Torres-Delgado & Palomeque, 2014).

For socio-cultural development, education is fundamental, both for local tourism planners and the broader community (Ruhanen, 2013). In this regard, access to educational and informative materials (Choi & Sirakaya, 2006; Torres-Delgado & Palomeque, 2014) and adequate information about the place (Silva & Monticelli, 2016) are important for the sustainable development of local tourism. Well-being, quality of life in the community, and employment generated by tourism for the local community are also important aspects of local tourism sustainability (Choi & Sirakaya, 2006).

In this sense, the constructs adapted from Choi and Sirakaya (2006) were adopted to analyze the influence of local tourism infrastructure on sustainable behavior. The choice was made primarily due to the breadth of dimensions discussed by the authors and, secondly, the research effort undertaken which, through the application of the Delphi method with 25 experts, created a list of useful tourism indicators for monitoring progress or problem areas in six key dimensions: (1) economic, (2) social, (3) cultural, (4) environmental, (5) political/institutional, and (6) technological.

These dimensions were rearranged into three constructs (public policy development, ecological development, and socio-cultural development) intended to measure the local infrastructure. For example, the study by Choi and Sirakaya (2006) included the theme of sex tourism, with measures such as percent employed in sex

tourism, prostitution number, and rate in the local sex tourism industry, among others. The connection of this theme with infrastructure is low and, therefore, it was removed. Another example is the technological dimension, which comprises indicators such as accurate data collection and benchmarking. These types of indicators were clearly related to the management of tourism destinations, especially to local government. However, this audience was not the target of the study, and therefore, it was removed.

Different indicators were also combined with the same assumption. For example, 'Employment growth in tourism' and 'Employment growth in general' were condensed into only one assertion: "Employment opportunities generated by the tourism destination for its local community." It's worth noting that these efforts are also associated with the reduction in the number of variables from the original study by Choi and Sirakaya (2006), which developed 125 indicators.

This adaptation results in 14 assertions, as presented in the next section.

3 METHOD

This research is quantitative and descriptive, and is carried out through a survey approach (Cooper & Schindler, 2016). The sample is classified as non-probabilistic convenience sampling (Hair et al., 2009), and data collection was conducted through an online questionnaire implemented via Google Forms from March to April 2021, resulting in 212 responses. The questionnaire comprises 10-point Likert scale questions, where respondents indicate their degree of agreement or disagreement. The scale related to local infrastructure consisted of 14 items covering Ecological Development (ED), Public Policy Development (PPD), and Sociocultural Development (SD). The scale for Sustainable Behavior in Travel (SBT) consisted of 10 statements related to environmental conduct during nature tourism trips, as shown in Table 1.

Table 1 – Constructs, Measurement Items, and Sources

Construct	Item	Assertion	Source
Public Policy Development	PP1	Existence of public and private partnerships in tourism	Choi and Sirakaya (2006)
	PP2	Existence of Policies for Local Development and Conservation	
	PP3	Existence of Public policies for controlling usage of destination	
	PP4	Economic stability of the local community	
	PP5	Indications of planning for local tourism.	
Ecological Development	ED1	Actions for environmental protection	Choi and Sirakaya (2006)
	ED2	Good level of nature conservation	
	ED3	Existence of Evaluation and cares about environmental impacts	
	ED4	Tourism employees are well-informed about the destination.	
Sociocultural Development	SD1	Adequate information about the destination	Choi and Sirakaya (2006)
	SD2	Quality of life level in the community of a tourism destination	
	SD3	Concern about degradation of natural resources	
	SD4	Access to educational and informative materials about the tourism destination	
	SD5	Employment opportunities generated by the tourism destination for its local community.	
Sustainable Behavior in Travel	SB1	I strive to learn as much as possible about the natural environment of the destination I visit while I am there.	Oliveira et al. (2021)
	SB2	I try to leave the areas I visited in better condition than I found them.	
	SB3	Recycling is an environmental effort that everyone should make while on vacation.	
	SB4	It is nice when the destination focuses on environmental issues, but it does not influence my choice of destination.	
	SB5	I use public transportation to minimize negative impacts on the environment.	
	SB6	I find it easy to behave in an environmentally friendly way when I am traveling.	
	SB7	When I am traveling, I am concerned about the environment.	
	SB8	I try to contribute to the local economy of the places I visit.	
	SB9	When I am traveling, I am more concerned about the negative impact my visit has on the environment than my expenses.	
	SB10	When I am traveling, my presence does not harm the environment.	

Source: Prepared by the authors

In addition, to obtain a characterization of the sample, sociodemographic information was collected, including gender, age, education, and household income.

We received 212 answers that were submitted to the following basic statistical quality of the sample tests: (1) tracking missing values in all cases; (2) tracking missing values in all variables; (3) identification of disengaged answers. No missing values were identified for each respondent (step 1) or for each variable (step 2). To identify potential disengaged answers (step 3), answers with standard deviation (σ) values below 0.500 were analyzed, resulting in the exclusion of two answers. Moreover, one entry with answers indicating a single value for scale items (i.e., σ = 0.000) was removed. After all these procedures, the final database consisted of 209 valid answers. This quantity partially meets the assumptions for conducting a factor analysis (Hair et al., 2009).

For data analysis, descriptive statistics were initially used to profile the respondents, considering both the sociodemographic aspects such as gender, age, education, and household income, as well as the constructs presented in Table 1. The normality was verified through the test of Kolmogorov-Smirnova and Shapiro-Wilk. Subsequently, Exploratory Factor Analysis (EFA) was employed utilizing IBM SPSS Statistics 21.

The EFA was conducted using the maximum likelihood extraction method in combination with a varimax rotation. Bartlett's statistic was used in combination with the Kaiser-Meyer-Olkin (KMO) test to assess sampling adequacy. The methods of Parallel Analysis (Timmerman & Lorenzo-Seva, 2011), and Explained Variance Based on Eigenvalues (Baglin, 2014; Rogers, 2022) were applied to determine the number of factors. To identify inappropriate items in factor analysis, communalities (>0.50) and cross-factor loadings (Hair et al., 2009) were analyzed.

To assess the internal consistency analyses, Cronbach's alpha ($\alpha > 0.8$ are considered 'almost perfect') (Hair et al., 2009) and McDonald's omega ($\omega > 0.70$) (McDonald, 2011) were used. It is worth noting that, currently, McDonald's omega is considered the most appropriate method for checking internal consistency (Sijtsma, 2009; Sijtsma & Pfadt, 2021). The Cronbach's alpha and McDonald's omega were calculated with Jamovi 2.2.5.

Subsequently, multiple linear regression analysis was conducted to evaluate the influence of the constructs related to local infrastructure on sustainable behavior in nature tourism travels. The linear regression reveals the cumulative effects of a group of explanatory variables (X1, X2, X3, etc.) on a dependent variable (Y) and the separate effects of these explanatory variables ($Y = \beta1X1 + \beta2X2 + \beta3X3 + ... + \beta0$) (Hair et al., 2009). Therefore, the choice of this method is justified as multiple linear regression analysis investigates the relationships between a set of independent variables and a dependent variable.

4 RESULTS AND DISCUSSIONS

4.1 Respondents' Profile

The collected data were all related to nature tourism in Brazil, encompassing mountain and sun and beach destinations in the northeastern of the country. Tourism locations included the following cities: Canoa Quebrada, Guaramiranga, Jericoacoara, and Serra Grande (State of Ceará), and Pipa (State of Rio Grande do Norte). Table 2 presents the descriptive data of respondents.

Table 2 – Descriptive data of respondents

(Continued)

Description	Number	% Total	% Cumulative
Gender			
Female	108	51.7	51.7
Male	101	48.3	100
Age			
Up to 20 years old	104	49.8	49.8
21 to 30 years old	51	24.4	74.2
31 to 40 years old	27	12.9	87.1
41 to 50 years old	14	6.7	93.8
Above 50 years old	13	6.2	100
Education			
Elementary School	6	2.9	2.9
High School	55	26.3	29.2
Bachelor's Degree	74	35.4	64.6

Table 2 – Descriptive data of respondents

(Conclusion)

Description	Number	% Total	% Cumulative
Postgraduate Degree	74	35.4	100
Family Income			
Up to 1 minimum wage	22	10.5	10.5
1 to 2 minimum wages	32	15.3	25.8
2 to 3 minimum wages	43	20.6	46.4
3 to 4 minimum wages	30	14.4	60.8
4 to 5 minimum wages	82	39.2	1000

Source: Elaborated by the authors

Gender parity was observed among the respondents, slightly favoring females (51.7%). A young-adult profile was also noticeable, with 87.1% of participants up to 40 years old; the most representative age group were respondents up to 20 years old (49.8%). The research encompassed respondents from all levels of education, most of them were graduates (35.4%), followed by postgraduates (35.4%).

Regarding family income, the highest representation was found in the category "4 to 5 minimum wages" (39.2%), surpassing the national average (Instituto Brasileiro de Geografia e Estatística, 2024).

4.2 Multivariate descriptives and reliability of Scale Data

The results of the test Kolmogorov-Smirnova and Shapiro-Wilk indicated the rejection of the hypotheses of univariate normality for all items (p-value < 0,000), at level of significancy of 1%. The sample adequacy was good, according to Kaiser-Meyer-Olkin (KMO) criterion (0.867) (Hair et al., 2009). Similarly, the Bartlett's sphericity test was satisfactory as it yielded a value lower than 0.05, as shown in Table 3.

Table 3 – KMO and Bartlett's Sphericity Test with 24 variables

KMO Sampling adequacy measure		0.923
Bartlett's Sphericity Test	Chi-square	3885.958
	df	276
	Sig.	0.000

Source: Prepared by the authors

The internal consistency of all items of the questionnaire was excellent, with Cronbach's Alpha (α=0.920) (Hair et al., 2009) and McDonald's omega (ω= 0.933) (McDonald, 2011).

Next, the results of the exploratory factor analysis are presented.

4.3 Exploratory Factor Analysis

The analysis of the first construct (Public Policy Development) led to its exclusion from the study due to the low KMO, the low Bartlett's Sphericity Test, the low communalities of the items, and the low reliability of the scale. For example, in the first rotation, PP4 and PP5 do not exhibit communalities in the factor. Their exclusion resulted in a very low communality for PP1 (0.170), which, when excluded, led to a very low communality for the remaining variables PP2 (0.178) and PP3 (0.178). In this last rotation, the KMO yielded a value of 0.500, with inadequate Cronbach's (α=0.589) and McDonald's (ω=0.593).

The second construct (Ecological Development) was maintained in the final model. Its analysis led to the exclusion of ED4, which yielded a communality of 0.130. The second extraction resulted in a KMO of 0.650 and a communality of at least 0.331 (for ED3), with close Cronbach's (α=0.753) and McDonald's (ω=0.768).

The analysis of the third construct (Sociocultural Development) led to the exclusion of SD1, which yielded a communality of 0.025. The remaining variables yielded a communality of at least 0.652, with a KMO of 0.773, and good reliability indicated by Cronbach's (α=0.876) and McDonald's (ω=0.882).

The fourth construct (Sustainable Behavior in Travel) retained all items with a low communality of 0.448 (for SB10), KMO=0.934, and excellent reliability, with both Cronbach's and McDonald's yielding 0.956.

Therefore, the final model comprises 17 variables grouped into 3 factors, as shown in Table 4.

Table 4 – Factor loadings, communalities, Cronbach's α, McDonald's ω, and KMO of final model

Variable	Factor Loadings			Comm.[a]	α[b]	ω[c]	KMO[d]
	F1 Ecological Develop.	F2 Sociocultural Develop.	F3 Sustainable Behavior in Travel				
ED1	0.678			0.460			
ED2	0.898			0.807	0.753	0.768	0.650
ED3	0.576			0.331			
SD2		0.756		0.572			
SD3		0.925		0.856	0.876	0.882	0.773
SD4		0.885		0.784			
SD5		0.652		0.425			
SB1			0.787	0.619			
SB2			0.921	0.849			
SB3			0.844	0.712			
SB4			0.797	0.636			
SB5			0.879	0.772	0.956	0. 956	0.934
SB6			0.822	0.676			
SB7			0.823	0.678			
SB8			0.904	0.816			
SB9			0.814	0.662			
SB10			0.669	0.448			

Legend: [a]Communalities, [b]Cronbach's α, [c]McDonald's ω, [d]Kaiser-Meyer-Olkin

Source: Prepared by the authors

Regarding the communalities of the items, all values exceeded 0.331 (ED3). Though below 0.50, the value was considered as low communality, and the variable was retained in the research as it is essential for understanding the constructs, a

criterion for retention that can be used by researchers, according to Hair et al. (2009). These results are discussed in more detail next.

First, it is worth discussing the exclusion of the construct Public Policy Development (PPD). This construct, along with the Ecological Development (ED) and Sociocultural Development (SD) constructs, was built on the work of Choi and Sirakaya (2006). These authors developed sustainability indicators for managing community tourism, employing a Delphi technique comprising panels with academic researchers in tourism. Though the study indicated that tourism researchers recognize tourism development as a political issue, this assumption is difficult to verify from the tourist perspective.

This assumption can be also verified in the work by Lee et al. (2021). Again, in this work the authors emphasized the government policy to sustainable tourism, but the participants of the study were managers of ecological resorts. In other words, PPD can be more suitable to test with residents of the tourist destination – those who live in the community and can observe the deployment of those public policies, along with representatives of the governments, and managers of sustainable travel agencies. Therefore, PPD can be important for Sustainable Behavior in Travel, but its measurement from the tourist's perspective is flawed.

Regarding the construct Ecological Development (ED), the item with the highest factor loading was ED2, "I perceive that this place has a good level of nature protection" (0.898), which is interrelated with ED1, "I perceive that this place has actions for environmental protection" (0.678), and ED3, "I perceive that this place evaluates and cares about environmental impacts" (0.576). As noted above, in relation to the excluded PPD construct, these kinds of actions were easier to perceive by tourists. These results are in line with Ding and Jiang (2023), who identified the importance of the tourist destination with less environmental pollution. This is also in line with the Trišić et al. (2023), who highlight the successful implementation of ecological components, protection of the environment and tourists, to tourism of protected areas.

In turn, Sociocultural Development (SD) shows a good fit with the intent of the research. Only the variable SD1 was excluded, i.e., tourists did not perceive adequate information about the place as important to their sustainable behavior or did not perceive it in the locations analyzed. The remaining variables show factor loadings ranging from 0.652 to 0.925. These values express that, in the analyzed locations, tourists perceive a good level of quality of life in the community, concern about the degradation of natural resources, access to educational and informative materials about the place, and the generation of employment for the local community through tourism. This is in line with Stojanović et al. (2024), who highlight the importance of sociocultural tourism factors, such as the possibility for visitors to learn about the history of the population and the employment of residents in a protected area.

Finally, the construct Sustainable Behavior in Travel (SB) retained all proposed items with high factor loadings and good communalities. It is worth noting that this construct is the dependent variable. The average factor loading was 0.826, with an average of communalities around 0.6868. The item with the highest factor loadings was SB2 (0.921), followed by SB8 (0.904), indicating that tourists strive to leave the visited areas in better conditions than they found them, and try to contribute to the local economy.

Additionally, they attempt to minimize their impact by using public transportation (SB5, 0.879) due to concerns about the environment (SB7, 0.823). It is interesting to note that they signaled their willingness to pay for sustainability when considering the factor loading (SB9, 0.814) related to the statement “I am more concerned about the negative impact my visit has on the environment than my expenses”. They also consider it easy to adopt sustainable practices in travel (SB6, 0.822) and support the idea that practices, such as recycling, should be adopted by everyone during vacations (SB3, 0.844). Last, but not least, they perceive that their presence does not harm the environment (SB10, 0.669).

These results are in line with a range of works, such as the Green self-identity (Ding & Jiang, 2023), and others that demonstrate the sustainable behavior of tourists in different situations (Buosi et al., 2014; Lee et al., 2010; Oliveira et al., 2021; Trišić et al., 2023).

In summary, the Sociocultural Development (SD), Ecological Development (ED), and Sustainable Behavior in Travel (SB) constructs fit well with what they intend to explain. Therefore, it is suitable to assess the influence of tourism destination infrastructure on sustainable behavior in travels, through these constructs, as will be presented in the next section.

4.3 Multiple linear regression

The multiple linear regression includes the SB_Average as the dependent variable, with the ED_Average and SD_Average as independent variables. The SB_Average was calculated as the mean of answers to the SB construct. Similarly, the ED_Average was computed as the mean of answers to the remaining ED variables (ED1, ED2, and ED3), and the SD_Average was derived as the mean of answers to the remaining SD variables (SD2, SD3, SD4, and SD5). In this way, linear regression reveals the cumulative effects of a group of explanatory variables (*X*1, *X*2, *X*3, etc.) on a dependent variable (Y) and the separate effects of these explanatory variables (Y = β1X1 + β2X2 + β3X3 +...+ β0) (Hair *et al.,* 2009).

Table 5 presents the obtained multiple linear regression model.

Table 5 – Multiple linear regression analysis

Model	R	R^2	Adjusted R^2	Standard estimation error
1	0.944[a]	0.892	0.883	0.636
2	0.944[b]	0.891	0.882	0.639
3	0.434[c]	0.189	0.126	1.74

a. Predictors: ED_Average and SD_Average.

b. Predictors: SD_Average.

c. Predictors: ED_Average.

Dependent variable: SB_Average

Control variables: Gender, age, education, family income.

Source: Prepared by the authors

The explanatory power of local infrastructure, measured by_Average and SD_ Average, was 88.3% (R^2), explaining to a large extend the sustainable behavior in travel. The test showed a significance value of <0.001, indicating that the estimated regression model is suitable for the study.

Table 6 presents the coefficients of the SB model, confirming the independent variables (ED and SD) and control variables (Gender, age, education, family income).

Table 6 – Multiple linear regression analysis using coefficients of the SB model

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept[a]	12.666	0.5146	24.615	0.015	
ED_med	-0.0545	0.0406	-13.423	0.181	-0.03632
SD_med	0.9400	0.0266	353.259	< .001	0.94594
Gender					
2 – 1	-0.0106	0.0989	-0.1074	0.915	-0.00548
Age					
2 – 1	-0.2308	0.1345	-17.166	0.088	-0.11914
3 – 1	-0.4818	0.1633	-29.509	0.004	-0.24867
4 – 1	-0.4546	0.2094	-21.709	0.031	-0.23465
5 – 1	-0.2676	0.2279	-11.742	0.242	-0.13813
Education					
3 – 2	-0.2962	0.3122	-0.9489	0.344	-0.15290
4 – 2	-0.2969	0.3258	-0.9114	0.363	-0.15327
6 – 2	-0.1469	0.3389	-0.4334	0.665	-0.07582
7 – 2	-0.4282	0.3565	-12.012	0.231	-0.22101
8 – 2	0.0357	0.4546	0.0785	0.938	0.01841
Family Income					
2 – 1	0.1288	0.1920	0.6706	0.503	0.06646
3 – 1	-0.1042	0.1804	-0.5778	0.564	-0.05380
4 – 1	0.1868	0.2049	0.9118	0.363	0.09641
5 – 1	0.1368	0.1884	0.7261	0.469	0.07059

[a]Represents the reference level

Source: Prepared by the authors

It can be observed that predictor SD (Sociocultural Development) have a low p-value (<0.05), representing a significant addition to the model, in which changes in the value of these predictors are related to changes in the response variable. On the other hand, the contribution of ED (Ecological Development) is minimum.

The positive coefficient of the variables SD indicates their importance to the infrastructure for sustainable behavior in nature tourism trips. On the other hand, the negative coefficient of ED suggests that Ecological Development has a negative influence on sustainable behavior in nature tourism, contrary to what is indicated in the literature. However, an important reflection can be made in this specific case. The result may reflect the low performance of the surveyed cities in relation to the analyzed aspects, especially regarding social and cultural interactions during the trip.

In general, the control variables (gender, age, education, family income) have p-values >0.05, suggesting that changes in these predictors are not associated with changes in the answer and are not statistically significant. Thus, the categorical variables are discussed in terms of presence of the coefficients, where a reference category was chosen for these variables (category 1 for all variables). Therefore, category 2 - 1 expresses the difference in sustainable consumption between those in category 1. In the case of the gender variable, the negative coefficient indicates that women (category 2) demonstrate less sustainable behavior compared to men (category 1).

For age, the results suggest that tourists aged over 50 are more likely to adopt sustainable behavior in nature tourism travel. Regarding education level, it does not impact sustainable behavior in nature tourism, as evidenced by the consistently negative coefficients presented in all categories (except for 8-2). Finally, concerning family income, a positive trend was observed; that is, the higher the income, the more engaged the respondents were with sustainability.

In summary, the proposed model fits well with the explanation of the influence of infrastructure on sustainable behavior in nature tourism travels. Aiming to further reduce the variables, the use of Sociocultural Development (SD) alone, as a proxy to measure the influence of tourism destination infrastructure, is sufficient as a predictor of sustainable behavior in nature tourism travels.

5 CONCLUSION

The present study aimed to analyze the influence of local tourism infrastructure on sustainable behavior. To achieve this, a survey was conducted with 209 tourists visiting five cities located in the northeast region of Brazil, encompassing various types of nature tourism such as climbing mountains, taking sun, and going to the beach.

It was shown that Ecological Development and Sociocultural Development have a positive influence on sustainable behavior in travels, confirming the supporting literature. Contrary to expected, the Public Policy Development was not perceived as important by the tourists. This result, as discussed, does not suggest that Public Policies are not important, but suggests that this assumption is difficult to verify from the tourist perspective. In other words, its measurement from the tourist's perspective is flawed.

Regarding ecological development, the importance of environmental protection actions was confirmed. The negative effect of the social dimension of infrastructure on sustainable behavior contradicted what the literature suggests. Essentially, this dimension consists of educational actions and information about the destination. Therefore, the negative result can be explained by the poor performance of the cities visited by tourists in this regard, rather than implying that the importance of educational and informational actions about the tourist destination has a negative influence on sustainable behavior.

Thus, it can be stated that local infrastructure plays a role in sustainable behavior in nature tourism. Furthermore, it indicates that educational actions still need improvement for a local culture to be transformed in favor of local sustainability. These findings can be useful for public managers to improve tourism infrastructure more effectively in order to induce tourists towards sustainable behavior and achieve sustainable tourism. It also highlighted the importance of educational actions to promote a local culture of sustainability. Finally, the study expanded the understanding of sustainable behavior in travels by revealing the dimensions of local infrastructure that positively influence it.

Despite the research efforts, some limitations can be pointed out. First, this study collected data from self-reported questionnaires, which are more prone to bias caused by respondents' hiding true feelings, thus limiting the quality and validity of data. Second, the study does not differentiate between tourists' perceptions during and after the visit or their length of stay in a particular location (Gössling et al., 2012). Thirdly, the study did not consider the explicit intention of these tourism destinations to be sustainable, either through local plans or interviews with their representatives. Fourth, the sampling does not cover representatives of the government or residents of the tourism destination who could fill the main limitation of this research, related to the Public Policy Development dimension. Fifth and lastly, the collected data is geographically constrained to the northeast region of Brazil, limiting the results' generalizability. Therefore, beyond this border, the results need to be interpreted with parsimony.

These limitations could be explored in future studies, enhancing the understanding of the phenomenon at hand. An interesting avenue for future research could involve comparing different profiles of respondents, including tourists, residents, and government representatives. Additionally, it would be interesting to investigate the influence of smart tourism destinations to further complement the understanding of the influence of local infrastructure on sustainable behavior.

REFERENCES

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Process*, 50, 179–211. https://doi.org/10.1080/10410236.2018.1493416.

Baglin, J. (2014). Improving your exploratory factor analysis for ordinal data: A demonstration using FACTOR. *Practical Assessment, Research and Evaluation*, 19(5).

Blancas, F. J., González, M., Lozano-Oyola, M., & Pérez, F. (2010). The assessment of sustainable tourism: Application to Spanish coastal destinations. *Ecological Indicators*, 10(2), 484–492. https://doi.org/10.1016/j.ecolind.2009.08.001.

Buosi, M. C. de A., Lima, S. H. de O., & Leocádio, A. L. (2014). A relação entre desenvolvimento sustentável e imagem de lugar de um destino turístico : proposição de um modelo estrutural. *Revista Brasileira de Pesquisa Em Turismo*, 8(2), 261–285. http://dx.doi.org/10.7784/rbtur.v8i2.757.

Castelo, D. H., Leocádio, Á. L., Abu-Marrul, M., Guimarães, D. B., & Ponchio, M. C. (2019). Sustainable consumption in Brazil: an approaching between the consumer-oriented sustainability and temporal perspective. *International Conference of the Society for Global Business & Economic Development*, *16*.

Choi, H. S. C., & Sirakaya, E. (2006). Sustainability indicators for managing community tourism. *Tourism Management*, 27(6), 1274–1289. https://doi.org/10.1016/j.tourman.2005.05.018.

Cooper, D. R., & Schindler, P. S. (2016). *Métodos de pesquisa em administração* (12th ed.). AMGH.

Ding, L., & Jiang, C. (2023). The impact of rural tourism destination attractiveness on tourists' environmentally responsible behavioral intentions: the mediating role of green self-identity. *Journal of Global Responsibility*, *ahead-of-p*(ahead-of-print). https://doi.org/10.1108/JGR-03-2023-0046.

Dutra, C. J. C., & Nascimento, L. F. (2005). Teorias organizacionais e o dilema ambiental: um tratamento para a mudança organizacional? *Revista Eletrônica de Ciências Administrativas*, 4(2), 1–17. https://doi.org/10.5329/RECADM.20050402007.

Gomes, E. L., Gândara, J. M., & Ivars-Baidal, J. (2017). É importante ser um destino turístico inteligente? A compreensão dos gestores públicos dos destinos do Estado do Paraná. *Revista Brasileira de Pesquisa Em Turismo*, 11(3), 503–536. https://doi.org/10.7784/rbtur.v11i3.1318.

Gössling, S., Scott, D., Hall, C. M., Ceron, J. P., & Dubois, G. (2012). Consumer behaviour and demand response of tourists to climate change. *Annals of Tourism Research*, *39*(1), 36–58. https://doi.org/10.1016/j.annals.2011.11.002.

Gupta, A., Zhu, H., Bhammar, H., Earley, E., Filipski, M., Narain, U., Spencer, P., Whitney, E., & Taylor, J. E. (2023). Economic impact of nature-based tourism. *PLoS ONE*, 18(4 April), 1–16. https://doi.org/10.1371/journal.pone.0282912.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2009). *Análise multivariada de dados* (6th ed.). Bookman.

Instituto Brasileiro de Geografia e Estatística. (2024). *Pesquisa Nacional por Amostra de Domicílios Contínua - PNAD: Rendimento de todas as fontes 2023*. IBGE. https://biblioteca.ibge.gov.br/visualizacao/livros/liv101379_informativo.pdf.

Ko, T. G. (2005). Development of a tourism sustainability assessment procedure: A conceptual approach. *Tourism Management*, 26(3), 431–445. https://doi.org/10.1016/j.tourman.2003.12.003.

Lee, J. S., Hsu, L. T., Han, H., & Kim, Y. (2010). Understanding how consumers view green hotels: How a hotel's green image can influence behavioural intentions. *Journal of Sustainable Tourism*, 18(7), 901–914. https://doi.org/10.1080/09669581003777747.

Lee, T. H., Jan, F. H., & Liu, J. T. (2021). Developing an indicator framework for assessing sustainable tourism: Evidence from a Taiwan ecological resort. *Ecological Indicators*, 125, 107596. https://doi.org/10.1016/j.ecolind.2021.107596.

McDonald, R. P. (2011). *Test Theory: A Unified Treatment*. Routledge. https://doi.org/10.2307/2669496.

Moyle, B., Moyle, C. lee, Ruhanen, L., Weaver, D., & Hadinejad, A. (2020). Are we really progressing sustainable tourism research? A bibliometric analysis. *Journal of Sustainable Tourism*, *29*(1), 106–122. https://doi.org/10.1080/09669582.2020.1817048.

Nikolić, T. M., Pantić, S. P., Paunović, I., & Filipović, S. (2021). Sustainable travel decision-making of europeans: Insights from a household survey. *Sustainability (Switzerland)*, 13(4), 1–21. https://doi.org/10.3390/su13041960.

Oliveira, F. S. (2019). Turismo Sustentável E Riqueza Social: Bases Para O Desenvolvimento Da Economia Local. *Revista Gestão e Desenvolvimento*, 16(2), 3–28. https://doi.org/10.25112/rgd.v16i2.1772.

Oliveira, L. V. C., Silva, C. R. M. da, & Romero, C. B. A. (2021). Costume de casa vai à praia? *Revista Brasileira de Pesquisa Em Turismo*, 15(2), 1991. https://doi.org/10.7784/rbtur.v15i2.1991.

Pearce, P. L. (2005). *Tourist Behaviour: themes and conceptual schemes*. Channel View Publications. http://www.channelviewpublications.com.

Pérez León, V. E. (2023). Assessment of the sustainability of Cuban nature-based tourism destinations with the DEA approach under different weighting schemes. *Journal of Environmental Planning and Management*, 0(0), 1–20. https://doi.org/10.1080/09640568.2023.2168523.

Qian, J., Shen, H., & Law, R. (2018). Research in sustainable tourism: A longitudinal study of articles between 2008 and 2017. *Sustainability (Switzerland)*, 10(3), 1–13. https://doi.org/10.3390/su10030590.

Reinsberg, C., & Vinje, L. T. (2010). *Characterizing environment friendly tourists*. http://hdl.handle.net/11250/185115.

Rogers, P. (2022). Best Practices for Your Exploratory Factor Analysis: A Factor Tutorial. *Journal of Conemporary Administration*, 26(6). https://doi.org/10.1590/1982-7849rac2022210085.en.

Ruhanen, L. (2013). Local government: Facilitator or inhibitor of sustainable tourism development? *Journal of Sustainable Tourism*, 21(1), 80–98. https://doi.org/10.1080/09669582.2012.680463.

Schianetz, K., & Kavanagh, L. (2008). Sustainability indicators for tourism destinations: A complex adaptive systems approach using systemic indicator systems. *Journal of Sustainable Tourism*, 16(6), 601–628. https://doi.org/10.1080/09669580802159651.

Schliephack, J., & Dickinson, J. E. (2017). Tourists' representations of coastal managed realignment as a climate change adaptation strategy. *Tourism Management*, 59, 182–192. https://doi.org/10.1016/j.tourman.2016.08.004.

Serra, L. S., & Alfinito, S. (2020). Comportamento do consumidor de turismo: uma revisão sistemática da produção científica brasileira. *Revista Brasileira de Pesquisa Em Turismo*, 14(3), 109–133.

Sharpley, R. (2006). Ecotourism: A consumption perspective. *Journal of Ecotourism*, 5(1–2), 7–22. https://doi.org/10.1080/14724040608668444.

Sharpley, R. (2021). On the need for sustainable tourism consumption. *Tourist Studies*, 21(1), 96–107. https://doi.org/10.1177/1468797620986087.

Sijtsma, K. (2009). On the use, the misuse, and the very limited usefulness of cronbach's alpha. *Psychometrika*, *74*(1), 107–120. https://doi.org/10.1007/s11336-008-9101-0.

Sijtsma, K., & Pfadt, J. M. (2021). Part II: On the Use, the Misuse, and the Very Limited Usefulness of Cronbach's Alpha: Discussing Lower Bounds and Correlated Errors. *Psychometrika*, *86*(4), 843–860. https://doi.org/10.1007/s11336-021-09789-8.

Silva, N. G. da, & Monticelli, J. M. (2016). O Turismo sustentável na percepção do viajante Gaúcho. *Revista de Turismo Contemporâneo*, 4(2), 262–285.

Stojanović, T., Trišić, I., Brđanin, E., Štetić, S., Nechita, F., & Candrea, A. N. (2024). Natural and Sociocultural Values of a Tourism Destination in the Function of Sustainable Tourism Development—An Example of a Protected Area. *Sustainability (Switzerland)*, *16*(2). https://doi.org/10.3390/su16020759.

Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered polytomous items with parallel analysis. *Psychological Methods*, *16*(2), 209–220. https://doi.org/10.1037/a0023353.

Torres-Delgado, A., & Palomeque, F. L. (2014). Measuring sustainable tourism at the municipal level. *Annals of Tourism Research*, *49*, 122–137. https://doi.org/10.1016/j.annals.2014.09.003.

Trišić, I., Privitera, D., Ristić, V., Štetić, S., Milojković, D., & Maksin, M. (2023). Protected Areas in the Function of Sustainable Tourism Development—A Case of Deliblato Sands Special Nature Reserve, Vojvodina Province. *Land*, 12(2), 487. https://doi.org/10.3390/land12020487.

Vujko, A., & Gajic, T. (2014). Opportunities for tourism development and cooperation in the region by improving the quality of tourism services – the 'Danube Cycle Route' case study. *Economic Research-Ekonomska Istrazivanja* , 27(1), 847–860. https://doi.org/10.1080/1331677X.2014.975517.

World Tourism Organization. (2023). Tourism: A Driver for Shared Prosperity – Key insights. In *World Tourism Organization*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284424788.

World Tourism Organization. (2024). World Tourism Barometer. *World Tourism Barometer and Statistical Annex*, 22(2). https://doi.org/10.18111/wtobarometereng.2024.22.1.2.

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1. Definition of research problem	√	√	√	√	√
2. Development of hypotheses or research questions (empirical studies)	√	√	√	√	√
3. Development of theoretical propositions (theoretical work)	√	√	√	√	√
4. Theoretical foundation / Literature review	√	√	√	√	√
5. Definition of methodological procedures	√	√	√	√	√
6. Data collection	√	√	√		
7. Statistical analysis	√	√	√	√	√
8. Analysis and interpretation of data	√	√	√	√	√
9. Critical revision of the manuscript		√	√	√	√
10. Manuscript writing	√	√			
11. Other (please specify)					

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