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Exploring the Tourism Effects in Sal Island, Cape Verde: A Combined Analysis of Clusters and Predictive Models

Norberto Fernandes¹; Elaine Scalabrini²

¹ Instituto Politécnico de Bragança. a54241@alunos.ipb.pt

² UNIAG, Instituto Politécnico de Bragança. elaine@ipb.pt. [ORCID: 0000-0001-7164-2471](https://orcid.org/0000-0001-7164-2471)

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Abstract: Residents represent a fundamental stakeholder group in tourism development, including in insular destinations. The purpose of this study was to investigate residents' perceptions of tourism on Sal Island, Cape Verde, using cluster analysis and predictive modelling. To achieve this aim, the 210 respondents participating in the study were divided into two clusters: Optimists and Moderately Optimistic. The predictive model revealed that residents with basic education or no formal education are significantly more likely to support tourism growth, contrary to findings reported in previous literature. Limitations include statistical outliers in the age variable and the use of non-probability snowball sampling. Practical contributions highlight the need for tourism strategies and communication campaigns tailored to the specific perceptions of distinct resident segments. Theoretically, the study innovates by combining cluster analysis with predictive models and by challenging existing generalisations regarding the influence of education and gender, emphasising the importance of contextual specificities in island destinations.

Keywords: residents' perceptions; tourism effects; tourism development; cluster analysis; predictive models

Análisis de los efectos del turismo en la isla de Sal, Cabo Verde: un análisis combinado de clústeres y modelos predictivos

Resumen: Los residentes constituyen un grupo de interés fundamental en el desarrollo turístico, incluidos los destinos insulares. El objetivo de este estudio fue investigar las percepciones de los residentes sobre el turismo en la isla de Sal, Cabo Verde, mediante el uso de análisis de conglomerados y modelos predictivos. Para ello, los 210 encuestados que participaron en el estudio fueron clasificados en dos conglomerados: optimistas y moderadamente optimistas. El modelo predictivo reveló que los residentes con educación básica o sin educación formal tienen una probabilidad significativamente mayor de apoyar el crecimiento turístico, en contraste con lo señalado por la literatura previa. Entre las limitaciones del estudio se encuentran la presencia de valores atípicos en la variable edad y el empleo de un muestreo no probabilístico por bola de nieve. Las contribuciones prácticas incluyen la necesidad de estrategias turísticas y campañas de comunicación adaptadas a las percepciones específicas de los distintos segmentos de residentes. Desde el punto de vista teórico, el estudio aporta innovación al combinar el análisis de conglomerados con modelos predictivos y al cuestionar las generalizaciones existentes sobre la influencia de la educación y el género, subrayando la importancia de las especificidades contextuales en los destinos insulares.

Palabras Clave: percepciones de los residentes; efectos del turismo; desarrollo turístico; análisis de conglomerados; modelos predictivos

1. INTRODUCTION

Tourism stands as a pivotal sociocultural and economic phenomenon that structures and transforms destinations worldwide. Its capacity to generate positive and negative impacts makes it a complex and multidimensional subject of academic and policy-oriented interest. Over the past few decades, a growing body of literature has examined the consequences of tourism development, particularly through the lens of residents' perceptions, which are recognised as a crucial stakeholder in the planning and sustainability of tourism (E. C. B. Scalabrini & Remoaldo, 2020).

The perceived effects of tourism are usually classified into economic, sociocultural, and environmental categories. On the positive side, tourism can catalyse job creation, especially in regions where employment opportunities are limited. This is observed among individuals directly or indirectly involved in the tourism sector (Andereck et al., 2005; Costa et al., 2020; Ouyang et al., 2019; Roberts et al., 2022; Yoon et al., 2001). Additional benefits include stimulating local markets, contributing to national economic performance, diversifying regional economies, and strengthening territorial cultural pride (Scalabrini et al., 2023). Tourism can also catalyse public and private investments, enhancing local infrastructure and services. For instance, the organisation of cultural events such as arts festivals often contributes to urban revitalisation and promotes residents' sense of belonging and pride in their communities (Lopes et al., 2019).

However, tourism development can present negative effects. Those frequently cited in the literature encompass rising prices for goods and services, environmental degradation, and conflicts between visitors and host communities. Other common concerns include the loss of local identity, noise pollution, overuse of natural resources, landscape transformation, and biodiversity loss. Additionally, increased traffic congestion, perceived insecurity, and negative attitudes towards tourists may further compromise residents' quality of life (Lopes et al., 2019).

Given these dualities, research has increasingly focused on understanding how residents perceive the effects of tourism. Different theoretical and methodological approaches have been adopted to explore these dynamics, with cluster analysis gaining prominence in the last years (Scalabrini & Remoaldo, 2022). Segmenting residents based on their perceptions allows for the identification of heterogeneous groups within a community, each with distinct attitudes, expectations, and levels of support for tourism development. This nuanced understanding is essential for formulating more effective, context-sensitive strategies that enhance the benefits of tourism and mitigate its negative repercussions. Such strategies may include tailored communication campaigns, participatory planning mechanisms, and targeted mitigation measures (Cadima Ribeiro et al., 2023; Gu et al., 2021).

In recent years, research focusing on small island developing states has highlighted the particular vulnerability and dependency that such destinations face in managing tourism growth. Within the Cape Verdean archipelago, studies examining residents' attitudes towards tourism have gained relevance. Santos et al. (2024), for instance, investigated resident empowerment and support for sustainable tourism in Sal and Boa Vista, evidencing the importance of psychological, economic, social, political and environmental dimensions in shaping community responses to tourism expansion. Although approaching the topic through empowerment theory and scale development, their findings reinforce the need for a deeper understanding of how Cape Verdean residents perceive tourism and its long-term implications.

Recent contributions on tourism in Cape Verde contextualise the dynamics addressed in this study. Research across the archipelago has revealed that tourism development interacts with socioeconomic structures, identity formation and territorial change in different contexts. On Boa Vista Island, Bernardo and Jorge (2019) demonstrate how rapid mass tourism expansion has produced both positive and negative impacts, generating opportunities for employment while simultaneously aggravating concerns related to urban transformation and unequal benefit distribution. In order, Popinsky (2019), studying rural tourism dynamics in Chã das Caldeiras, Fogo Island, demonstrated how tourism activities became integrated into diversified household economies shaped by longstanding uncertainties and limited resources.

Complementarily, Marcelino and Oca González (2019) analyse tourism branding and the construction of territorial identity across Cape Verde, showing how tourism development intersects with cultural representation, heritage valuation and spatial reorganisation. Together, these studies reveal that the Cape Verdean tourism context is heterogeneous and distinct by island-specific realities, offering a relevant comparative foundation for examining residents' perceptions in Sal Island.

In this context, the present study aims to investigate the residents' perceptions towards tourism on Sal Island, Cape Verde. This is a destination that has experienced rapid tourism growth in recent years and where the phenomenon of tourism is understudied, mainly in terms of residents' perceptions. By applying cluster analysis to a dataset derived from 210 resident questionnaires, the study identified distinct profiles regarding tourism effects. Furthermore, a predictive modelling approach is employed to examine residents' preferences for tourism growth, tolerance levels, and support for further investments in tourism promotion. This methodological complementarity is particularly relevant given that predictive models remain underutilised in tourism perception studies. By incorporating this approach, the study aspires to contribute to a more comprehensive and dynamic understanding of community responses to tourism, offering insights that may inform public policy and strategic planning on the island.

This paper is organised into five main sections. Following the introduction, the theoretical framework is presented, focused on previous studies utilising the resident segmentation model. The subsequent section details the methodology adopted for data collection and analysis. The results are then presented and discussed, highlighting key patterns and implications. Finally, the paper concludes with a synthesis of the main findings, reflections on limitations, and recommendations for future research.

2. SEGMENTING RESIDENTS' PERCEPTIONS TOWARDS TOURISM

Although many studies have been dedicated to understanding residents' perceptions of tourism, the concept of segmentation is still gaining popularity among researchers. A recent systematic literature review (Scalabrini & Remoaldo, 2022), which analysed documents published in the 10 main tourism journals between 1978 and 2019, evidenced that out of 260 articles studied, only 19 (7.3%) applied the cluster analysis technique, which allows residents to be grouped into different segments, taking into account their opinions and attitudes towards the effects of tourism (Cadima et al., 2023; Gu et al., 2021).

In these studies, residents can be segmented based on their perceptions of the economic, social, cultural and environmental effects of tourism. Recent studies have been carried out in different global contexts and indicate different segments according to their perceptions, which can be associated with the residents' socio-demographic profile or their attitudes. It is undeniable that this technique should be used, since residents may have different understandings of how tourism works, which could lead them to accept or deny tourism (Muler González et al., 2023), as has been observed in different destinations, with different characteristics, and where tourism is often too massive and can lead to residents' aversion to this activity, as is the case in destinations such as Lisbon, Barcelona, Venice, Paris and others. (Drápela et al., 2025).

In a study focusing on the Gran Canaria Islands, Spain, with 504 residents, the hybrid-fuzzy clustering method was used, and three representative profiles were identified in two different scenarios (Martín et al., 2020). In the extreme scenario, extreme tourist lovers were identified, characterised by perceiving most of the impacts of tourism as highly positive, except access to affordable housing. Also identified in this scenario were extreme tourist haters, the group with the highest perception of negative impacts, and ambivalent, an intermediate group that perceives both the benefits and costs of the activity. In the real scenario, residents were segmented into lovers, who perceive most of the positive attributes, haters, who perceive most of the negative impacts, and ambivalent, an intermediate group who perceive both positive and negative attributes. In this study, it is interesting to note that socio-demographic characteristics, such as gender and living in a tourist area, did not show significant differences between the clusters identified.

In a different context, the reality of southern Brazil was described in the case of Joinville (Santa Catarina), an industrial city where tourism is increasing (Scalabrini & Remoaldo, 2020). The non-hierarchical cluster analysis of 498 residents revealed four segments. The moderate optimists, the smallest group, comprised mostly residents with limited contact with tourism and lower educational ability, who expressed concern about tourism's negative effects. The optimists, predominantly male and younger residents, demonstrated a strong belief in tourism economic benefits. The sceptics, with mostly young women, demonstrated the lowest levels of approval for tourism development. Lastly, the Enthusiasts, including older people with a higher level of education, many of them employed in tourism, indicated the most favourable perceptions regarding sociocultural and environmental benefits.

Nguyen (2022) focused attention on explaining Kinh and Ethnic minorities' perceptions toward tourism in Sapa, Vietnam. The 357 residents were categorised into three clusters. The supporters comprise mainly young, female and less-educated respondents who support tourism development due to their employment and income. However, the pessimist group, which mostly consists of highly educated and older respondents, demonstrates more concerns about tourism development. The neutralists maintained an intermediate position, neither fully endorsing nor rejecting tourism development.

A recent study focused on the Azores archipelago, where 950 residents were segmented through a non-hierarchical k-means cluster analysis, identifying three segments (Cadima Ribeiro et al., 2025). The optimistic residents, the largest group, are composed mostly of men aged between 45 and 64 with basic education and stable employment. They highlight the benefits and minimise the costs of tourism. The moderately optimistic residents acknowledged benefits but also expressed some concerns about tourism development. This group tended to be men aged 35–44. Lastly, there are the unconvinced residents, who have the lowest assessment of the benefits of tourism. This segment is composed predominantly of older women with limited contact with tourism, who expressed the lowest level of perceived benefits.

It is particularly noteworthy that the findings from the studies by Martín et al. (2020) and Cadima Ribeiro et al. (2025) derive from island and archipelagic contexts, which bear socio-territorial similarities to Sal Island, Cape Verde. These parallels are instrumental in informing the discussion of our results, especially given the shared challenges of insularity, limited space, and tourism dependency. Furthermore, despite the growing use of cluster analysis techniques, there remain studies combining this with predictive modelling approaches. This methodological approach can offer a novel contribution to the literature, providing a more comprehensive and dynamic understanding of residents' perceptions and their implications for tourism planning and policy in insular contexts such as Cape Verde.

3. METHODS

3.1. Study Site

The island of Sal in Cape Verde significantly depends on tourism as a crucial component of its economy. Its noteworthy natural attractions, including extensive sandy beaches and an arid climate, are highly coveted by tourists globally. These features serve as the island's main appeal, establishing essential tourism infrastructure such as hotels, restaurants, and recreational facilities (Fernandes & Scalabrini, 2025). Consequently, substantial growth in the tourism sector has occurred, playing a pivotal role in the island's economic development by increasing local income and generating employment opportunities.

Tourism is transformative, instigating significant changes in the local community. The sector has facilitated infrastructure expansion, increased employment, and enhanced residents' living standards. However, it is crucial to manage the growth of sustainable tourism to prevent potential adverse effects on the island's natural and cultural heritage (Barros, 2007).

Tourism catalyses development, generates employment, increases revenue, and enhances local infrastructure in a socio-economic context. Nevertheless, managing the island's resources and tourism capacity is essential to mitigate the potential negative impacts of uncontrolled sector expansion. Addressing issues such as water resource pressure, waste management, and the preservation of local ecosystems is fundamental to ensuring the sustainability of tourism on Sal Island (Fernandes & Scalabrini, 2025)

3.2. Data Collection

Based on the study's aim, the first step was to apply, between January and February 2024, a questionnaire to the residents of Sal Island, Cape Verde, aged 18 and above, in different locations on the island. Thus, a non-probabilistic snowball sample was chosen, where each respondent indicated a new respondent. A total of 236 answers were received, and after discarding 36 incomplete questionnaires, 210 valid responses were collected and analysed. This sample is aligned with previous studies (Shapley, 2014).

The questionnaire included 15 questions divided into four sections. The first, with eight questions, was dedicated to understanding the residents' relationship with tourism, including the time that they live in the island, the fact to work or not with tourism and the interaction with tourists. The following section was presented to analyse the perceptions towards the effects of tourism, with six statements related to economic effects, eighteen to sociocultural effects and six to environmental effects. All thirty items were categorised according to a 5-point Likert scale (1 – totally disagree: 5 – totally agree). The third section was dedicated to analysing opinions about the reality of tourism, namely about the actual number of tourists, the number of tourists in the future, and the money spent with publicity. This section is important to allow to conduct the predictive models. The last section was the socioeconomic and professional profile of the sample. The questionnaire was based on and adapted from previous studies applied in different territorial contexts (e.g., Scalabrini & Remoaldo, 2020; Scalabrini et al., 2023; Cadima Ribeiro et al., 2025) and validated in other papers (e.g. Norberto & Scalabrini, 2025).

3.3. Data analysis

The first step was the descriptive analysis, making it possible to identify the sociodemographic profile of the sample, as well as the mean and standard deviation of the tourism effects.

The second step was to conduct the cluster analysis to identify the residents' segments according to tourism perceptions. Considering the thirty statements related to economic, sociocultural and environmental effects, the Squared Euclidean distance was adopted, using the squared distance as a measure of dissimilarity between cases (Hair et al., 2014). This is the recommended distance to Ward's Method (Hair et al., 2014). In this case, two clusters were found. Also, a visual method, known as the Elbow Method, was applied to confirm the number of clusters (e.g., Humaira and Rasyidah, 2020; Shi et al., 2021), validating the ideal number. A combination using the hierarchical approach followed by a non-hierarchical clustering method is often advisable (Hair et al., 2014). In this case, the K-means algorithm, which transfers an individual to the cluster whose centroid is located at the shortest distance (Hair et al., 2014) was used. In this step, the two clusters were also confirmed. Considering the hypothesis of this study, which posits significant differences within clusters regarding the effects of tourism, the decision to test the hypothesis was based on parametric tests. Assuming the normality of the data, a t-test was run, considering the significance level (0.05) and homogeneity of variances. Based on previous studies (Cadima Ribeiro et al., 2025; Cardona & Serra Cantallops, 2015; Lopes et al., 2019; Nguyen, 2022; E. C. B. Scalabrini & Remoaldo, 2020), the names of the clusters were defined.

The last step was to apply the predictive model, implemented as an extension of cluster analysis, to identify the factors determining residents' preferences regarding future tourism development on Sal Island. After identifying and validating the clusters, a multinomial logistic regression was applied to predict the probability of belonging to different categories of preference for tourism in the future (2 = less, 3 = the same,

4 = More and 5 = Much more). The model parameters included sociodemographic variables (age group, gender, educational qualifications and income) and cluster membership as predictors, with the category same (3) defined as the reference. The model was validated using k-fold cross-validation (k=10), evaluating predictive accuracy through fit metrics (Nagelkerke's $R^2=0.638$, $AIC=161$) and likelihood ratio tests ($\chi^2=121$, $gl=36$, $p<.001$), ensuring statistical robustness and minimising overfitting (Hair et al., 2014).

The statistical significance of the predictors was assessed using Wald tests (Z) with a significance level of $\alpha=0.05$, and 95% confidence intervals were calculated for all estimates, allowing us to accurately identify which sociodemographic variables and cluster characteristics have the highest predictive influence on residents' preferences regarding the future of tourism on the island.

4. RESULTS AND DISCUSSION

The assessment of the established clusters commences with an examination of sociodemographic and professional distinctions. As indicated in Table 1, Cluster 1 (optimists) is predominantly composed of males (67%) and individuals who are not native to the island. Half of the respondents in this cluster are aged between 27 and 36 years and are significantly engaged in the tourism sector (84%). In contrast, Cluster 2 (moderately optimistic) exhibits a more balanced gender distribution, with 54.5% male and 45.5% female participants. This cluster also includes a higher proportion of island natives (44%) and demonstrates less involvement in tourism (70%), referring to residents who are currently or have previously been employed in the sector. The most prevalent age group (43%) in this cluster is consistent with that of Cluster 1, comprising individuals aged between 27 and 36 years.

Table 1. Clusters Sample Profile

Sample profile	Clusters			
	1 - Optimistic		2 – Moderately optimistic	
	n= 86		n=81	
	n	%	n	%
<i>Gender</i>				
Female	28	33.0	36	45.0
Male	58	67.0	44	55.5
<i>Natural from the Island</i>				
Yes	19	22.0	35	44.0
No	67	78.0	45	56.0
<i>Age</i>				
18 to 26 years	19	22.0	21	26.0
27 to 36 years	43	50.0	35	43.0
37 to 46 years	20	23.0	18	22.0
47 to 56 years	4	5.0	3	4.0
More than 57 years	0	0.0	4	5.0
<i>Work or not work with tourism</i>				
Yes	72	84.0	57	70.0
No	14	16.0	24	30.0

After analysing the socio-demographic profiles of respondents, descriptive statistics were calculated for the tourism-related attributes within each cluster (Table 2).

Regarding the question “Tourism is good for Sal Island”, Cluster 1 (Optimists) recorded a very high mean score ($M = 4.85$, $SD = 0.36$), reflecting a strong agreement on the positive role of tourism. Cluster 2 (Moderately Optimistic) also displayed a generally positive perception, though with a lower average ($M = 4.40$, $SD = 0.70$). Concerning the statement “I benefit myself from the development of tourism”, Cluster 1 again reported a higher level of agreement ($M = 4.85$, $SD = 0.36$), compared to Cluster 2 ($M = 4.00$, $SD = 0.97$). When these results are compared to those of a similar study conducted in the Azores (Cadima-Ribeiro et al., 2025), it becomes evident that residents of Sal Island expressed stronger positive perceptions regarding these two items than their Portuguese counterparts. However, the underlying reasons for this divergence remain unclear and warrant further investigation.

The analysis of positive economic impacts revealed consistent and highly favourable evaluations within Cluster 1, with mean scores ranging from 4.85 to 4.87. The most positively rated attribute was “Gives more visibility to the destination, attracting more tourists” ($M = 4.87$, $SD = 0.34$), followed closely by strong recognition of “Opportunities for local businesses” ($M = 4.86$, $SD = 0.35$), “Increase the residents' income” ($M = 4.86$, $SD = 0.35$), and “Create jobs” ($M = 4.85$, $SD = 0.36$). In contrast, Cluster 2 showed more moderate assessments, with mean values ranging from 3.96 to 4.32. The highest-rated attribute in this group was also “Gives more visibility to the destination, attracting more tourists” ($M = 4.32$, $SD = 0.72$), followed by more cautious but still positive views on “Create jobs” and “Opportunities for local businesses” (both $M = 4.27$, $SD = 0.79$), and a notably lower perception of increase the residents' income ($M = 3.96$, $SD = 0.99$).

Regarding the negative economic effects, both clusters acknowledged potential drawbacks, although with varying degrees of intensity. Cluster 1 expressed strong concern regarding the “Increase in prices of goods and services” ($M = 4.85$, $SD = 0.36$) and “Job vacancies are occupied by people who did not previously reside in the destination” ($M = 4.86$, $SD = 0.35$). Meanwhile, Cluster 2 showed a more moderate concern, particularly with “Increase prices” ($M = 4.20$, $SD = 0.83$), and considerably less concern with “Job vacancies are occupied by people who did not previously reside in the destination” ($M = 3.68$, $SD = 1.10$).

These results are concordant with those obtained by Martin et al. (2020) in the Canarian Islands, Spain, and by Cadima-Ribeiro (2025) in the Azores Islands. These studies find that the economic impact of tourism is positively evaluated, generating employment, attracting investment and generating business opportunities for residents.

Concerning positive sociocultural impacts, Cluster 1 presented highly favourable evaluations. The highest-rated attributes were “Increases the number of people circulating through shops, restaurants, hotels, and services” ($M = 4.79$, $SD = 0.56$) and “Improvement of infrastructure and local facilities” ($M = 4.74$, $SD = 0.60$). Additional positive perceptions were observed regarding “The quality of services is better” ($M = 4.73$, $SD = 0.47$) and “Increases the sense of pride of the residents” ($M = 4.71$, $SD = 0.67$), indicating a strong alignment between tourism development and perceived community benefits.

On the other hand, Cluster 2 expressed more moderate views regarding sociocultural benefits. Although lower in comparison to Cluster 1, certain attributes still reflected a positive orientation. The highest-rated was “Promotes contact with different cultures” ($M = 3.91$, $SD = 0.66$), followed by “Increased circulation of

people” ($M = 3.90$, $SD = 0.82$), and a more cautious perception of “More public investment in the cultural sector” ($M = 3.54$, $SD = 0.96$).

It is noteworthy that Cluster 1 employed a greater value on infrastructure-related benefits, whereas Cluster 2 demonstrated greater appreciation for cultural aspects. This distinction suggests that different resident profiles prioritise different dimensions of tourism development, which may inform more nuanced and pointed policy interventions. The analysis revealed significant differences between the clusters in terms of perceptions of the negative sociocultural effects of tourism. Cluster 1 demonstrated higher levels of concern, particularly regarding behavioural changes among locals ($M = 4.77$, $SD = 0.42$) and the difficulty in preserving local values, customs and traditions ($M = 4.65$, $SD = 0.76$). This group also expressed strong worry about the potential for increased conflict between residents and tourists ($M = 4.65$, $SD = 0.70$) and the increase the stress levels among the local population ($M = 4.63$, $SD = 0.63$). Such concerns reflect a heightened sensitivity to the disruptive effects that tourism may have on the host community’s social structure, potentially altering daily routines, eroding cultural authenticity, and generating social tensions. In contrast, Cluster 2 adopted a more moderate attitude. Their primary sociocultural concern related to increases in crime rates ($M = 3.99$, $SD = 0.68$), whereas issues such as parking difficulties ($M = 2.63$, $SD = 1.04$) and traffic congestion ($M = 2.98$, $SD = 1.14$) were considered less problematic. This indicates that residents in Cluster 2 may perceive tourism-related sociocultural pressures as less intrusive or may be more accustomed to coexisting with tourism flows.

Regarding positive environmental effects, both clusters acknowledged certain benefits associated with tourism, albeit to varying degrees. Cluster 1 presented more favourable evaluations, particularly concerning the improvement of natural areas ($M = 4.33$, $SD = 0.54$) and the provision of consciousness for the preservation of natural areas ($M = 4.29$, $SD = 0.51$). These findings suggest that residents in this group perceive tourism as a potential stimulus for environmental improvement, especially through increased investment in infrastructure and education initiatives. Meanwhile, Cluster 2 expressed a more reticent perspective, attributing lower scores to both the improvement of infrastructure ($M = 3.70$, $SD = 0.91$) and preservation awareness ($M = 3.49$, $SD = 1.05$). This more cautious evaluation may reflect either a more critical stance regarding tourism contributions to environmental quality or limited personal experience with such improvements.

Perceptions of negative environmental effects also differed between the two clusters. Once again, Cluster 1 exhibited stronger concerns across several dimensions. The most pressing issues for this group included the reduction in water supply ($M = 4.33$, $SD = 0.90$), air and water pollution ($M = 4.29$, $SD = 0.89$), and the increase in waste generation ($M = 4.20$, $SD = 0.79$). These findings indicate a strong environmental consciousness and possibly a direct experience with resource strain and environmental degradation attributed to tourism growth. Conversely, Cluster 2 registered more moderate levels of concern. While they did identify the pressure on water resources ($M = 3.70$, $SD = 1.06$) as a relevant issue, other environmental aspects, such as excessive noise levels ($M = 2.73$, $SD = 1.20$), were perceived with relatively less worry. This disparity may reflect differing degrees of exposure to environmental impacts or divergent expectations regarding environmental management and regulation in tourist areas.

When examining the distribution of attributes related to the effects of tourism, a clear difference emerges in the intensity of perceptions between the two clusters. Cluster 1 consistently reports higher mean scores

across both positive and negative aspects, indicating a broader and more integrated understanding of tourism effects. This group appears to accept a more general perspective, acknowledging the benefits but also the tourism costs. In contrast, Cluster 2 exhibits a more moderate attitude across all dimensions, suggesting a more cautious and reserved attitude towards tourism development.

Notably, the most pronounced divergences between the clusters are observed in the sociocultural and environmental dimensions, whereas the differences in perceptions of positive economic effects are less evident. These findings point to variations not only in the degree of effects recognised by each group but also in the areas residents deem most affected by tourism.

All results are statistically significant (p -value $< .001$ in most cases), reinforcing the conclusion that the observed differences between the clusters are statistically meaningful distinctions in residents' perceptions.

Table 2. Cluster analysis per effects

Effects of tourism	Clusters				P-value
	1 - Optimistic		2 – Moderately optimistic		
	n= 86		n=81		
	Mean	SD	Mean	SD	
Tourism is good for Sal Island	4.85	0.36 0	4.40	0.70 0	<.001
I benefit myself from the development of tourism	4.85	0.36 0	4.00	0.97 0	<.001
Positive economic					
Create jobs for residents	4.85	0.36 0	4.27	0.97 0	<.001
Gives more visibility to the destination, attracting more tourists	4.87	0.34 0	4.32	0.72 0	<.001
Opportunities for local businesses	4.86	0.35 0	4.27	0.79 0	<.001
Increases the residents' income	4.86	0.35 0	3.96	0.99 0	<.001
Negative economic					
Increase in prices of goods and services	4.85	0.36 0	4.20	0.83 0	<.001
Job vacancies are occupied by people who did not previously reside in the destination	4.86	0.35 0	3.68	1.10 0	<.001
Positive sociocultural					
Encourages residents to be more culturally active	4.19	0.74 0	3.36	0.93 0	<.001
Promotes contact with different cultures	4.44	0.52 0	3.91	0.66 0	<.001
Encourages local culture and handicrafts	4.62	0.56 0	3.65	0.87 0	<.001
The quality of services is better	4.73	0.47 0	3.81	0.79 0	<.001
More public investment in the cultural sector	4.63	0.63 0	3.54	0.96 0	<.001
Increase cultural offers	4.56	0.75 0	3.57	1.00 0	<.001
Improve infrastructure and local facilities	4.74	0.60 0	3.56	1.01 0	<.001
Increases public security	4.63	0.75 0	3.52	1.07 0	<.001
Increases the number of people circulating through shops, restaurants, hotels, and services	4.79	0.56 0	3.90	0.82 0	<.001
Increases the sense of pride of the residents	4.71	0.67 0	3.77	0.93 0	<.001
Negative sociocultural					
Increase crime rates	3.80	0.50 0	3.99	0.68 0	0.046

	Clusters				
Limits residents' access to leisure sites	4.34	0.83 0	3.00	1.04 0	<.001
Local people change their behaviour to mimic the tourists	4.77	0.42 0	3.67	0.74 0	<.001
Increase the stress	4.63	0.63 0	3.23	0.97 0	<.001
Increases traffic	3.56	1.13 0	2.98	1.14 0	<.001
Parking is difficult	3.56	1.13 0	2.63	1.04 0	<.001
It is more difficult to preserve local values, customs, and traditions	4.65	0.76 0	3.38	1.11 0	<.001
Conflicts between tourists and residents	4.65	0.70 0	3.02	1.21 0	<.001
Positive environmental					
Provides consciousness for the preservation of natural areas	4.29	0.51 0	3.49	1.05 0	<.001
Infrastructure and visits to natural areas are improved	4.33	0.54 0	3.70	0.91 0	<.001
Negative environmental					
Generates excessive noise	3.59	1.08 0	2.73	1.20 0	<.001
Increase in air and water pollution	4.29	0.89 0	3.49	1.04 0	<.001
Increase in rubbish	4.20	0.79 0	3.27	1.06 0	<.001
Decreased water supply	4.33	0.90 0	3.70	1.06 0	<.001

Related to the opinion about tourism (Table 3), the analysis segmented by cluster reveals distinctions between the Optimistic (Cluster 1) and Moderately Optimistic (Cluster 2), particularly concerning their perceptions of current and future tourism flows, and the adequacy of financial investment in promoting Sal Island.

Regarding the perceived number of tourists currently visiting the island, Cluster 1 exhibits a positive view, with nearly half of the respondents (48%) rating the volume as moderate, and another 51% perceiving it as high. Only 1% classified it as much higher. This suggests that the Optimistic cluster considers the current tourism intensity as appropriate. In Cluster 2, however, perceptions are more varied. A smaller proportion (32%) rated the number of tourists as moderate, while 48% considered it high and 12% as much higher, indicating a greater sensitivity to tourism pressure. Notably, 5% of this cluster described the number as low, and 2% reported no opinion, reflecting a more heterogeneous and less consensual assessment than observed in Cluster 1.

Expectations about future tourism growth further highlight the distinction between the two clusters. An overwhelming 97% of Cluster 1 respondents expressed a desire for more tourists, with only 1% preferring the same level. This underscores a strong openness to continued tourism development, albeit within controlled or incremental bounds. A similar result was identified in the reality of the Azores (Cadima-Ribeiro

et al., 2024), indicating that in both cases, tourism is not yet widespread and does not directly affect the lives of residents.

In contrast, Cluster 2 presents a more fragmented opinion. While a majority (56%) also supported an increase, 32% were in favour of a much larger influx of tourists, and 11% preferred maintaining current levels. This distribution suggests that although this cluster remains generally favourable towards growth, it is more cautious and includes segments inclined towards stability or even more aggressive development. This is consistent with the analysis of the mean effects of tourism and corroborates the reason why this cluster has been labelled as moderately optimistic.

When asked about the adequacy of revenue allocated for promoting Sal Island as a tourism destination, Cluster 1 predominantly evaluated the current level as moderate (66%) or high (28%). These responses reflect a perception that investment in promotion is generally sufficient or nearly so within this group. Conversely, Cluster 2 demonstrated greater scepticism. 40% considered the revenue to be moderate, 17% rated it as high, and 4% as much higher. A notable 22% judged the revenue as either low or much lower. Furthermore, a considerable 17% reported no opinion, suggesting less certainty or engagement with tourism promotion policy among members of this cluster.

Overall, the findings indicate that Cluster 1 (Optimistic) is characterised by a cohesive and strongly positive outlook on tourism, both in its current state and future potential, coupled with relative satisfaction regarding promotional investment. In contrast, Cluster 2 (Moderately Optimistic) reflects a more nuanced and divided position, with greater variability in perceptions of tourist volumes, openness to growth, and the adequacy of financial investment in marketing the destination. These distinctions highlight the importance of tailoring tourism policies and communication strategies to the specific perceptions of different resident segments, particularly when addressing expectations for growth and investment priorities. The heterogeneity observed within Cluster 2 may point to a need for more inclusive community engagement and clearer information on the economic returns and carrying capacity of the island.

Table 3. Opinion about tourism per cluster

Opinion about tourism	Clusters				χ^2	Sig
	1 - Optimistic		2 – Moderately optimistic			
	n	%	n	%		
<i>Actual number of tourists</i>					17.9	0.001
Low	0	0.0	4	5.0		
Moderate	41	48.0	26	32.0		
High	44	0.0	39	48.0		
Much High	1	1.0	10	12.0		
I don't have opinion	0	0.0	2	2.0		
<i>Number of tourists in future</i>					43.6	<0.001
The same	1	1.0	9	11.0		
More	83	97.0	45	56.0		
Much more	0	0.0	26	32.0		
I don't have opinion	2	2.0	1	1.0		
<i>Revenue to publish Sal Island</i>					30.4	<0.001
Much low	1	1.0	9	11.0		
Low	2	2.0	9	11.0		
Moderate	57	66.0	32	40.0		
High	24	28.0	14	17.0		
Much high	0	0.0	3	4.0		
I don't have opinion	2	2.0	14	17.0		

Summarising the results obtained for Sal Island identified two resident segments with positive perceptions of tourism, although with different degrees of optimism. When examined comparatively with existing literature on tourism in Cape Verde, particularly studies conducted on other islands, these findings are further interpretative.

Bernardo and Jorge (2019) indicate that in Boa Vista, where mass tourism has expanded rapidly, residents recognise substantial economic benefits, such as employment, infrastructure and income diversification, and simultaneously express concerns regarding unequal benefit distribution, socio-cultural pressures and accelerated territorial transformation. This analysis demonstrates that local communities tend to adopt heterogeneous positions toward tourism, alternating between adaptation to forms of resistance. When contrasted with the clusters in Sal Island, the predominance of positive perceptions on Sal is consistent with Bernardo and Jorge (2019), who identified a strong economic dependence on tourism. However, Sal residents seem less concerned about sociocultural change than Boa Vista residents, likely due to Sal's long-standing role as a consolidated sun-and-sand destination.

The innovative aspect of this study lies in combining cluster analysis with a predictive model, utilising sociodemographic aspects, and posing the question, 'Do you want more tourism on the island in the future?' The predictive model was run on Jamovi software and will be explained below.

The model demonstrates a strong overall fit (Table 4), with a deviance of 84.9 and an AIC of 161. The pseudo-R² values (Cox-Snell = 0.588; McFadden = 0.220; Nagelkerke = 0.638) indicate that the model

explains a substantial proportion of the variance in respondents' preferences for future tourism development. The global chi-square test ($\chi^2 = 121$, $df = 36$, $p < .001$) confirms the model's statistical significance.

Table 4. Goodness-of-Fit Measures for the Predictive Model

Model	Deviance	AIC	Cox-Snell R ²	McFadden R ²	Nagelkerke R ²	Test to global model		
						χ^2	gl	p
1	84.9	161	0.588	0.220	0.638	121	36	<.001

Note: Model estimated using sample size of n=162

The omnibus test reveals that several predictors significantly influence residents' opinions about future tourism levels (Table 5). Interestingly, age group ($\chi^2 = 4.73$; $df = 10$; $p = 0.908$) was not a statistically significant predictor, suggesting that support for tourism growth is not associated with age.

Table 5. Omnibus Test of Model Coefficients – Cluster Membership

Predictor	χ^2	gl	p
Clustering	55.0	3	<.001
Age	4.73	10	0.908
Gender	23.52	2	<.001
Education level	15.93	8	0.043
Income	28.52	14	0.012

The reference category for comparisons is assumed to be category 3 (the same number of tourists for the future). The model presents two contrasts. The first one considered the contrast between more tourism (4) and the same (3). In this case, residents in Cluster 2 (moderately optimistic) are less likely to support somewhat more tourism than those in Cluster 1, this effect is marginally significant ($B = -2.091$, $p = 0.081$). Related to the gender, females showed no statistically significant difference in this contrast. In terms of education, respondents with basic or no formal education are significantly more likely to support tourism growth compared to those with higher education ($p < .001$). This result contradicts previous literature, which usually indicates that residents with higher levels of education tend to be more supportive of tourism. (Renner et al., 2022; E. C. B. Scalabrini & Remoaldo, 2020; Vareiro et al., 2013) On the other hand, studies conducted in the Azores, Portugal, and Besalú, Spain, indicate that both residents with high and low levels of education may have a higher perception of the benefits of tourism (Cadima Ribeiro et al., 2025; Muler González et al., 2023). The lower and higher income brackets (e.g., under 15,000 CVE or over 90,000 CVE) also show significant positive associations with support for growth ($p < .001$), suggesting a non-linear income effect. This may indicate that low-income groups tend to support tourism because they associate it with employment opportunities and improved living standards, while high-income groups may see tourism as a business opportunity, an investment, or a way to enhance the image of the destination. As age did not reveal any significant differences, we chose not to present the results in the two contrasts.

In the second contrast, the factor much more tourism (5) with the same (3). In this case, the influence of being in Cluster 2 is highly significant and positive ($B = 67.962$, $p < .001$), indicating a strong predisposition

of Cluster 2 residents to support much more tourism. This contradicts earlier expectations and may reflect a polarised segment within this group. In this case, the women are more likely than men to support much more tourism ($B = 5.091$, $p = 0.003$) it is interesting to note that in previous studies, women tend to be more negative about supporting tourism (e.g. Scalabrini & Remoaldo, 2020). One of the factors we could identify is the difference in realities between the destinations studied. In the case of the island, women may see tourism as an alternative for development and growth. Similar to the first contrast, individuals with lower educational attainment are significantly more likely to express strong support ($p < .001$). Related to the incomes, respondents in the lowest (under 15,000 CVE) and highest (over 90,000 CVE) income groups are significantly more supportive of tourism growth than the middle-income group (35,000–50,000 CVE). These results are statistically significant with very high effect sizes

Table 6. Model Coefficients – Preference for Increased Tourism in the Future

Contrast	Predictor	B	95% CI	p-value
4 vs 3	Cluster 2 vs 1	-2.091	[-4.44; 0.26]	0.081
	Education: Basic vs Higher	39.539	[37.56; 41.52]	< .001
	Education: No qualifications vs Higher	57.564	[55.28; 59.84]	< .001
	Education: Professional vs Higher	-67.926	[-67.93; -67.93]	< .001
	Income \leq 15,000 CVE vs 35,000–50,000 CVE	35.370	[33.50; 37.24]	< .001
	Income 15,000–20,000 CVE vs 35,000–50,000 CVE	42.595	[40.87; 44.32]	< .001
	Income 50,000–65,000 CVE vs 35,000–50,000 CVE	71.013	[68.88; 73.15]	< .001
	Income 65,000–80,000 CVE vs 35,000–50,000 CVE	57.218	[55.20; 59.24]	< .001
	Income \geq 90,000 CVE vs 35,000–50,000 CVE	-34.847	[-34.85; -34.85]	< .001
5 vs 3	Cluster 2 vs 1	67.962	[65.55; 70.37]	< .001
	Sex: Female vs Male	5.091	[1.69; 8.49]	0.003
	Education: Secondary vs Higher	2.944	[0.03; 5.86]	0.048
	Education: Basic vs Higher	39.173	[37.20; 41.15]	< .001
	Education: No qualifications vs Higher	59.959	[57.68; 62.24]	< .001
	Education: Professional vs Higher	-21.415	[-21.41; -21.41]	< .001
	Income \leq 15,000 CVE vs 35,000–50,000 CVE	35.943	[34.07; 37.81]	< .001
	Income 15,000–20,000 CVE vs 35,000–50,000 CVE	42.722	[41.00; 44.44]	< .001
	Income 50,000–65,000 CVE vs 35,000–50,000 CVE	71.726	[69.59; 73.86]	< .001
	Income 65,000–80,000 CVE vs 35,000–50,000 CVE	62.159	[60.14; 64.18]	< .001
Income \geq 90,000 CVE vs 35,000–50,000 CVE	83.679	[83.68; 83.68]	< .001	

Note: Notes: 3 = the same; 4 = More; 5 = Much more; CVE = Cape Verdean escudo. The exchange rate is fixed at approximately 110.265 CVE = 1 EUR (July 2025).

It is important to observe that the differences between residents' support for increased tourism on Sal Island and previous literature may be related to the socioeconomic characteristics of the destination, in addition to the specific cultural and historical aspects of this important island destination.

5. FINAL CONSIDERATIONS

This study aimed to investigate residents' perceptions of tourism on Sal Island, Cape Verde. To achieve this objective, a cluster analysis was conducted on a sample of 210 respondents, enabling the segmentation of

residents into two perceptual groups. This segmentation facilitated a deeper understanding of the heterogeneity of opinions within the local community. Furthermore, a predictive model (multinomial logistic regression) was applied to explore how sociodemographic characteristics and perceptual profiles influence residents' support for future tourism development on the island.

The results underscore the importance of considering socioeconomic diversity and perceptual segmentation in tourism planning and policymaking. Strategies for tourism development on Sal Island should not only take into account community-wide perceptions but also address the specific motivations, concerns, and capacities of different social groups. Residents with lower educational attainment and in economically vulnerable positions may view tourism as an essential opportunity for inclusion and upward mobility, while more educated or mid-income groups may adopt more cautious or critical perspectives.

Notably, the divergent behaviour observed between clusters depending on the scale of tourism growth proposed (more vs much more) suggests that public consultation processes would benefit from a scenario-based approach, allowing residents to react to specific projections rather than general tourism concepts.

In addition to the specific contributions derived from the case of Sal Island, the findings gain further relevance when situated within the archipelagic context of Cape Verde. Studies conducted on other islands indicate that residents' perceptions of tourism are shaped by distinct socio-territorial dynamics. For instance, in Boa Vista, Bernardo (2019) identifies ambivalent attitudes influenced by rapid urban transformation and concerns over unequal benefits distribution. The convergence and divergence between these island realities and the present results reinforce the importance of adopting a place-sensitive approach to tourism planning in Cape Verde. The generally optimistic perceptions identified in Sal, combined with differentiated levels of support for future tourism growth, suggest that policy strategies must acknowledge island-specific conditions while also considering the structural challenges shared by the archipelago, such as dependency on tourism, vulnerability to external shocks and the need to safeguard cultural and environmental assets. By integrating these perspectives, this study contributes to a more comprehensive understanding of tourism development in Cape Verde and offers evidence that can support public policies.

It is also important to note that belonging to a cluster is a strong and consistent predictor of support for tourism growth. Cluster 2 (moderately optimistic) is less likely to support any increase in tourism than Cluster 1 (margin of significance), but, paradoxically, has a strong predisposition to support much more tourism.

One methodological limitation concerns the age variable, which presented statistical outliers. This may indicate the need to recode, group categories, or use resampling methods (such as bootstrapping) for a better estimate. In addition, the non-probability snowball sampling methodology, although in line with previous studies, may limit the generalisation of the results.

Regarding the theoretical contributions of this study, the results, which contradict previous literature on the influence of education and gender on support for tourism, highlight the importance of considering the specific characteristics of each destination, enriching the theoretical understanding of residents' perceptions and suggesting future studies that explore the relationship between the variables in greater depth. It should also be noted that the combination of cluster analysis with a predictive model (multinomial logistic regression) is an innovative aspect that is still underused in studies of tourism perception. This approach

offers a more comprehensive and dynamic understanding of the community's responses to tourism and also enables future studies that make better use of these predictive models.

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