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O PAPEL DA ANÁLISE DE CLUSTERS NA PROMOÇÃO DO DESENVOLVIMENTO SUSTENTÁVEL EM DESTINOS DE BAIXA DENSIDADE

THE ROLE OF CLUSTER ANALYSIS IN PROMOTING SUSTAINABLE DEVELOPMENT IN LOW-DENSITY DESTINATIONS

EL PAPEL DEL ANÁLISIS DE CLÚSTERES EN LA PROMOCIÓN DEL DESARROLLO SOSTENIBLE EN DESTINOS DE BAJA DENSIDAD

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RESUMO

Introdução: A investigação sobre as perceções dos residentes em relação ao desenvolvimento turístico sustentável (DTS) tem-se concentrado principalmente em áreas de alta densidade, prestando pouca atenção aos destinos emergentes. Este estudo analisa as perspetivas dos residentes em Lamego, uma cidade histórica no norte de Portugal, inserida na área do Património Mundial do Douro.

Objetivo: Utilizando a análise de clusters, este estudo pretende segmentar os residentes com base nas perceções do envolvimento da comunidade, da gestão do turismo pelo governo local (LGMT), dos impactos do turismo, da ligação à comunidade, da dependência económica, do risco percebido (COVID-19) e do apoio às DST, e analisar as diferenças nas variáveis sociodemográficas entre estes grupos.

Métodos: Este estudo utiliza uma abordagem quantitativa com um questionário dirigido aos residentes de Lamego. A análise de clusters foi aplicada para categorizar 250 residentes em grupos distintos com base nas suas opiniões sobre turismo sustentável e governança.

Resultados: Foram identificados três clusters de residentes: Moderadamente Envolvidos, Altamente Envolvidos e Desconectados. Estes grupos apresentam diferenças significativas no seu nível de envolvimento com iniciativas de DTS e na perceção da eficácia da governança local.

Conclusão: Os resultados destacam a necessidade de integrar as perceções dos residentes no planeamento e na formulação de políticas de DTS. Este estudo oferece insights para a gestão do turismo em destinos emergentes e de baixa densidade, contribuindo para estratégias de desenvolvimento mais eficazes e inclusivas.

Palavras-chave: desenvolvimento turístico sustentável; envolvimento/ligação da comunidade; gestão do governo local; perceção de risco; impactos do turismo; dependência económica

ABSTRACT

Introduction: Research on residents' perceptions of sustainable tourism development (STD) has focused mainly on high-density areas, with little attention to emerging destinations. This study analyzes residents' perspectives in Lamego, a historic town in northern Portugal within the Douro World Heritage area.

Objective: Using cluster analysis, this study aims to segment residents based on perceptions of community involvement, local government management of tourism (LGMT), tourism impacts, community attachment, economic dependence, perceived risk (COVID-19), and support for STD, and to analyze differences in sociodemographic variables across these groups.

Methods: This study uses a quantitative approach with a questionnaire for Lamego residents. We applied cluster analysis to categorize 250 residents into distinct groups based on their views on support for STD and related variables.

Results: Three resident clusters were identified: Moderately Involved, Highly Involved, and Disconnected. These groups show significant differences in their engagement with STD initiatives and perceptions of local governance effectiveness.

Conclusion: Findings emphasize the necessity of integrating residents' perceptions into STD planning and policy. This study provides insights for tourism management in emerging, low-density destinations, contributing to more effective and inclusive development strategies.

Keywords: sustainable tourism development; community involvement/attachment; local government management of tourism; perceived risk; tourism impacts; economic dependence

RESUMEN

Introducción: La investigación sobre las percepciones de los residentes respecto al desarrollo turístico sostenible (DTS) se ha centrado principalmente en áreas de alta densidad, prestando poca atención a los destinos emergentes. Este estudio analiza las perspectivas de los residentes en Lamego, una ciudad histórica en el norte de Portugal, dentro del área del Patrimonio Mundial del Duero.

Objetivo: Utilizando el análisis de cluesters, este estudio pretende segmentar a los residentes en función de sus percepciones de la implicación de la comunidad, la gestión del turismo por parte del gobierno local, los impactos del turismo, el apego a la comunidad, la dependencia económica, el riesgo percibido (COVID-19) y el apoyo a la DTS, y analizar las diferencias en las variables sociodemográficas entre estos grupos.

Métodos: Este estudio utiliza un enfoque cuantitativo con un cuestionario para los residentes de Lamego. Se aplicó el análisis de clústeres para categorizar a 250 residentes en distintos grupos en función de sus opiniones sobre el apoyo a las DTS y las variables relacionadas.

Resultados: Se identificaron tres clústeres de residentes: Moderadamente Implicados, Altamente Implicados y Desconectados. Estos grupos muestran diferencias significativas en su nivel de compromiso con iniciativas de DTS y en su percepción sobre la eficacia de la gobernanza local.

Conclusión: Los hallazgos destacan la necesidad de integrar las percepciones de los residentes en la planificación y formulación de políticas del DTS. Este estudio proporciona información valiosa para la gestión del turismo en destinos emergentes y de baja densidad, contribuyendo a estrategias de desarrollo más eficaces e inclusivas.

Palabras Clave: desarrollo turístico sostenible; implicación/apego de la comunidad; gestión del turismo por los gobiernos locales; percepción de riesgo; impactos del turismo; dependencia económica

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INTRODUCTION

The tourism sector significantly contributes to the Sustainable Development Goals (SDGs) through job creation, revenue generation, and conservation efforts (Birendra et al., 2021). This study focuses on Target 12.b of Goal 12 of the 2030 Agenda, which emphasizes monitoring sustainable tourism impacts (United Nations, 2015). However, global crises like COVID-19, climate change, and the war in Ukraine have hindered SDG progress (United Nations, 2022).

Existing studies explore residents' perceptions of tourism development, community involvement, tourism impacts, and economic dependence. However, research lacks focus on residents' participation in sustainable tourism planning and implementation. A key prerequisite for sustainable tourism is understanding community engagement, ensuring stakeholder education, and fostering strong political leadership (UNWTO, 2022).

This study examines residents' perceptions of sustainable tourism development (STD) in a historic city in northern Portugal, a World Heritage Site in a low-density region. The objectives are: (1) to segment residents based on perceptions of community involvement, local government management of tourism (LGMT), tourism impacts, community attachment, economic dependence, perceived risk (COVID-19), and support for STD; (2) to analyze differences in sociodemographic variables across these groups.

While segmentation analysis is a common tool in tourism research, few studies have incorporated a comprehensive set of criteria such as community involvement, perceptions of local government tourism management (LGMT) effectiveness, tourism impacts, community attachment, economic dependence, perceived risk, and support for sustainable tourism development (STD). This study fills that gap by adopting a multidimensional segmentation approach, directly addressing recent calls for research on perceived risk (Joo et al., 2021) and the influence of global crises on residents' support for tourism (Vinerean et al., 2021). To our knowledge, this is the first study to apply these variables to identify segments of residents. As it is critical to assess the impact of global crises on residents' lives and their support for STD in their communities (Vinerean et al., 2021), this study addresses the conditions that impede progress towards achieving the SDGs. These variables were selected because they represent complementary dimensions of residents' attitudes and behaviors toward STDs. This is supported by prior research (e.g., Lee, 2013; Ribeiro et al., 2017; Joo et al., 2021; Vieira et al., 2024). Integrating these dimensions within a single cluster analysis enables the identification of distinct resident profiles, which have practical relevance for participatory policy-making and tourism planning. This approach is aligned with Styliadis (2018), who emphasizes the importance of segmentation analysis to better understand residents' diverse perceptions. The theoretical grounding of these segmentation variables is associated with some relevant sociopsychological frameworks, namely Social Exchange Theory (SET), Place Attachment Theory, and Stakeholder Theory.

The document includes a literature review, methodology, key results, discussion, and conclusions.

1. LITERATURE REVIEW

1.1 Sustainable Tourism Development (STD) and Resident Support

STD considers economic, social, and environmental impacts, requiring stakeholder participation and strong governance (UNWTO, 2022). Local authorities, policymakers, and heritage managers recognize the need for resident involvement in tourism planning (Sirakaya-Turk et al., 2008), yet innovative approaches that encourage the active participation of residents in tourism decisions, planning, and management remain limited (Uslu et al., 2023). Community support is vital for STDs and is closely related to their perceptions of tourism, community engagement, trust in various actors, and, importantly, how local government manages the sector (Rodrigues et al., 2020; Vieira et al., 2024). Understanding residents' perspectives on STDs can enable the development of policies that minimise negative impacts and maximise benefits (Prayag et al., 2013; Rodrigues et al., 2020; Vieira et al., 2024).

1.2 Community Involvement

Community involvement is crucial for establishing a sustainable tourism model (Gannon et al., 2021). Many issues related to tourism management are connected to how actively residents participate in the development of a destination (Lee, 2013). The value of involving all stakeholders in participatory planning has been emphasised in several studies over the years (Gursoy et al., 2002; Lee, 2013; Vieira et al., 2024). Local community involvement in planning and strategy development is a decisive factor (Eslami et al., 2019) and can significantly influence support for STD (Lee, 2013; Vieira et al., 2024).

1.3 Local Government's Role

Local governments play a crucial role in STD by performing essential functions, creating and executing development plans, and enforcing sustainability standards (Beeri et al., 2019). Effective local governance can enhance the economic, social, cultural, and environmental aspects of a region, making local authorities pivotal in addressing capacity issues, which are significant for sustainability in tourist destinations. Cavalheiro et al. (2020) point out that while STD planning involves local government actors, there is often a lack of strategic direction and multi-stakeholder involvement in the planning process. In this context, local governments have been criticised for their lack of strategic vision and the use of policies that focus on short-term goals (Sargeson, 2018). Residents' perceptions of local government performance in tourism management are likely to shape their views on the impacts of tourism and on their support for STD (Rodrigues et al., 2020).

1.4 Perceived Risk (COVID-19)

The tourism industry is highly sensitive to crises (Ritchie & Jiang, 2019). Perceived risk refers to an individual's subjective evaluation of potential negative consequences associated with tourism, particularly in the context of external crises such as health pandemics (e.g., COVID-19), environmental degradation, or economic instability (Joo et al., 2021; Vieira et al., 2024). It captures the extent

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to which individuals feel that tourism may pose threats to their personal well-being, the community's safety, or the local environment. Much of the literature focuses on the visitors' viewpoint, paying less attention to the host communities. Thus, it is crucial to conduct research that addresses the perceptions of the local population (Joo et al., 2021), as only with the contribution of this group can inclusive management plans be developed that incorporate the principles of STD. Therefore, understanding the impact of COVID-19 on tourist destinations is essential, as it is well-known that the pandemic caused significant disruptions to tourism activities (UNWTO, 2021; Hallaj et al., 2022; Joo et al., 2021).

Recent studies have followed this line of investigation, attempting to understand how perceived risks by citizens (external factors) influence support for tourism development. The findings from studies conducted by Joo et al. (2021) and Qui et al. (2020) revealed a significant negative association between perceived risk and residents' support for tourism development. Vieira et al. (2024) identify a strong positive association between perceived risk and perceived costs, indicating that as residents' sense of risk increases, so does their perception of tourism-related costs.

1.5 Key Variables in Resident Perceptions

In addition to factors such as community involvement, LGMT, and perceived risk, several other variables play a crucial role in shaping residents' perceptions and attitudes toward tourism. Notably, community attachment, perceived tourism impacts, and economic dependence on tourism are key dimensions frequently examined in the literature.

- Community Attachment: Grounded in Place Attachment Theory — which emphasizes the emotional bonds individuals form with specific places — community attachment refers to the strength of the relationship between individuals and their community (Lee, 2013), encompassing key elements such as emotional ties, affective meaning, unity, and the perceived value attributed to the community (Nicholas et al., 2009; Ramkissoon, 2015). The degree of community attachment is crucial in influencing, perceiving, and shaping residents' attitudes towards tourism development in their locality (Lee, 2013; Rodrigues et al., 2020). Residents' attachment to their community can act as a driving force for collective organization, supporting local differentiation and long-term sustainability (Vieira et al., 2024). This attachment is often reflected in proactive and collaborative actions, a common vision for the future, and targeted investments in community development.

- Tourism Impacts: The term "tourism impacts" has had various interpretations over time, reflecting the evolution and growth of tourism, its specifics, and its understanding (Postma & Schmuecker, 2017). Recently, several studies have been conducted on this topic (Vieira et al., 2024; Rodrigues et al., 2020). Based on social exchange theory (SET), support for STD will always depend on the views of different population groups. If they perceive the exchange as positive for the community's well-being, they will support the sector, whereas if they perceive it as negative, they are likely to reject it (Chang & Huang, 2017). The way residents perceive the impacts of tourism, including economic, social, cultural, and environmental aspects—both positive and negative—affects their level of support and their involvement in promoting sustainable tourism (Vieira et al., 2024; Rodrigues et al., 2020).

- Economic Dependence: This factor assesses the extent to which the local economy relies on the tourism sector (Hung & Wu, 2017). Understanding this variable is crucial for assessing how residents perceive the impacts of tourism and their support for STD, as their attitudes may vary based on their level of economic dependence on tourism (Rodrigues et al., 2020). Residents economically reliant on tourism tend to have a more positive view of its impacts (Rodrigues et al., 2020).

1.6 Segmentation Studies

Segmentation, originally rooted in marketing theory, involves dividing a heterogeneous population into relatively homogeneous subgroups based on shared characteristics or behaviors (Kotler & Keller, 2016). This process helps to identify patterns and trends in a dataset, which can then be used for decision-making or forecasting. It is commonly used in various domains such as market segmentation, customer segmentation, and customer behaviour analysis. In tourism studies, behavioral and psychographic segmentation—focused on motivations, attitudes, and perceptions—has gained prominence due to its capacity to inform tailored policy and planning interventions (Dolnicar, 2008). Research on segmentation in the tourism industry has primarily focused on tourists rather than the local populations of tourist destinations (Stylidis, 2018), and remains an emerging field (Da Silva Lopes et al., 2019). However, applying cluster analysis to residents can be a crucial element in decision-making that promotes STD (Sirakaya-Turk et al., 2008). Our approach aligns with this tradition by using perceptual and attitudinal variables (e.g., community involvement, risk perception, attachment) to capture the psychological diversity of residents, providing insights that go beyond demographic profiling and contribute to more effective destination management strategies. Cluster analysis can provide insights into how residents perceive different aspects, and this analysis can then inform policymakers on the best ways to address public concerns and improve the quality of life within the community (Sirakaya-Turk et al., 2008). Group analysis can also help identify areas that may require additional resources to enhance residents' quality of life.

In summary, although previous studies have explored residents' attitudes toward tourism through variables such as perceived impacts, involvement, or support (e.g., Lee, 2013; Gursoy et al., 2019, 2002, 2020; Rodrigues et al., 2020; Vieira et al., 2024), few have integrated these constructs within a segmentation framework that captures both psychosocial and contextual dimensions. Furthermore, while segmentation is widely applied to tourists, its use to differentiate resident perspectives remains relatively limited (Dolnicar, 2008; Stylidis, 2018), especially when incorporating variables such as perceived risk or economic dependence, factors increasingly relevant in the context of global disruptions. This study addresses that gap by applying a theoretically grounded, multi-dimensional segmentation analysis to a low-density heritage destination, offering a new lens to understand how resident subgroups perceive and support STD. This study is anchored in theoretical frameworks such as Place Attachment Theory and Social Exchange Theory (SET), which offer insights into how residents' emotional ties to their communities (Gannon et al., 2021; Lee, 2013) and their assessments of tourism's perceived costs and benefits (Rodrigues et al., 2020) influence their support

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for tourism development. Additionally, Stakeholder Theory underpins the analysis, emphasizing the importance of involving diverse stakeholder groups in sustainable tourism planning. From this perspective, residents are conceptualized not merely as passive recipients or adversaries of tourism impacts, but as active stakeholders whose participation is essential to inclusive and effective governance.

2. METHODS

This study uses a quantitative approach with a questionnaire for Lamego residents. Lamego, a historic city in Portugal's Douro Valley, has 24,313 inhabitants (12,073 in the urban center) (PORDATA, 2022). Tourism has surged due to its inclusion in the Douro World Heritage site, with overnight stays increasing by 180% from 2012 to 2019 (PORDATA, 2022). It is now a key emerging destination in Portugal (Sousa & Manfredo, 2021).

2.1 Sample

Due to cost and time constraints, the sample for the study was selected using a convenience sampling technique. Only residents of Lamego who had lived in the city for at least one year were chosen to participate in the survey. The questionnaire was made available online from April to August 2021. After excluding incomplete questionnaires, 250 valid responses were considered.

2.2 Data collection instruments

The questionnaire covered community involvement, attachment, perceived tourism benefits/costs, economic dependence, LGMT, perceived risk, and support for STD. Scales were adapted from existing studies, using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Items were based on Lee (2013) for involvement, attachment, and STD support; Látková & Vogt (2012) for tourism impacts; Ribeiro et al. (2017) for economic dependence; Assante et al. (2012) for LGMT; and Joo et al. (2021) for perceived risk. The final section included sociodemographic variables.

Statistical analysis was conducted using IBM SPSS 26. Descriptive statistics (mean, standard deviation, frequencies) were applied, and Cronbach's Alpha assessed scale reliability. Cluster analysis identified groups, beginning with hierarchical clustering (nearest neighbor, squared Euclidean distance), followed by K-Means (Marôco, 2011). ANOVA tested differences in continuous variables, with Tukey HSD for multiple comparisons. The Chi-square test assessed associations with categorical variables, using standardized residuals (>1.96 or <-1.96) for significance. The analysis adopted a 5% significance level ($p < 0.05$), following the guidelines of Pestana and Gajairo (2008).

2.3 Statistical analysis

Table 1 provides a summary of the descriptive statistics for the study participants. The sample consists of 250 residents of the city of Lamego who have lived in the city for at least one year, with ages ranging from 18 to 68 years ($M = 38.3$, $SD = 14.9$). The majority of participants are female (63.6%) and hold higher education degrees (62.4%). In terms of occupation, most are salaried employees (47.6%), followed by students (32.0%) and self-employed individuals (14.0%). Regarding household composition, the average household size is 3.2 members, with 24.0% having a family member involved in the tourism sector.

Table 1 - General characteristics of respondents

Variable		N	%
Gender	Female	159	63.6%
	Male	91	36.4%
Age (years)	Minimum = 18, Maximum = 68, Average = 38.3, Standard deviation = 14.9		
Education	High school or less	8	3.2%
	Secondary school	86	34.4%
	University degree	156	62.4%
Professional status	Employee	119	47.6%
	Employed - self-employed	35	14.0%
	Domestic workers	6	2.4%
	Student	80	32.0%
Monthly income (in euros)	Retired	10	4.0%
	Up to 500 euros	18	7.2%
	From 501 to 1000 euros	65	26.0%
	From 1001 to 1500 euros	56	22.4%
	From 1501 to 2000 euros	58	23.2%
Do you have a relative linked to the tourism sector?	More than 2000 euros	53	21.2%
	No	190	76.0%
	Yes	60	24.0%
Number of people in the household	Minimum = 1, Maximum = 6, Average = 3.2, Standard deviation = 1.0		
Time in the community (years)	Minimum = 1, Maximum = 68, Mean = 27.7, Standard deviation = 18.7		

Source: Own elaboration

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Among the 250 respondents, 18 (7.2%) belong to households with a net monthly income of up to 500 euros, 65 (26.0%) have incomes between 501 and 1000 euros, 56 (22.4%) between 1001 and 1500 euros, 58 (23.2%) between 1501 and 2000 euros, and 53 (21.2%) with incomes exceeding 2000 euros. On average, residents have lived in the Lamego municipality for 27.7 years (SD = 18.7).

3. RESULTS

3.1. Cluster Analysis

We conducted a cluster analysis using all the variables considered (Table 2). A confirmatory factor analysis (CFA) was carried out to validate the underlying structure of the segmentation variables prior to the cluster analysis. The cluster analysis was based on raw scale means rather than factor scores. This decision was guided by both practical and interpretive considerations. First, the constructs demonstrated strong internal consistency and were theoretically well-defined, making the use of raw scale means appropriate and easily interpretable. Second, using raw means ensures greater transparency and comparability with similar studies in the literature (Sirakaya-Turk et al., 2008), particularly when presenting descriptive statistics and cluster profiles. The clustering process began with hierarchical cluster analysis using the nearest neighbour method and squared Euclidean distance as the measure of dissimilarity between subjects. Solutions with two or more clusters were evaluated. Solutions with four or more clusters were discarded due to the presence of clusters with few individuals ($n = 5$). We selected the three-cluster solution because it was the most significant and interpretable. Classification of individuals into the final three clusters was then performed using the non-hierarchical k-Means procedure.

Table 2 - Cluster constitution (N = 250)

Variables	Cluster 1 n = 115	Cluster 2 n = 71	Cluster 3 n = 64	p
Community Involvement	3.45 (0.67)a	3.94 (0.81)a	2.15 (0.74)b	< 0.001(1)
Community Attachment	3.87 (0.80)a	4.33 (0.68)a	2.77 (1.02)b	< 0.001(1)
Perceived Benefits	4.40 (0.51)a	4.56 (0.42)a	3.80 (0.85)b	< 0.001(1)
Perceived Costs	2.39 (0.96 b)	3.20 (1.11)a	2.69 (0.77)a	< 0.001(1)
Economic dependence	1.74 (0.77)a	3.95 (0.78)a	1.70 (0.88)b	< 0.001(1)
LGMT	2.70 (1.00)c	3.20 (1.05)a	2.83 (0.77)b	0.003(1)
Support for STD	3.18 (0.69)c	3.97 (0.75)a	2.32 (0.69)b	< 0.001(1)
Perceived risk	2.78 (1.10) b	3.40 (1.12) a	3.02 (1.02) a	0.001(1)

Source: Own elaboration

NOTES: results presented as mean (standard deviation); (1) ANOVA significance value; a,b,c there are no significant differences between clusters with a common letter in each variable: $p > 0.05$ in the Tukey HSD multiple comparison tests.

The clusters obtained were labelled "Moderate", "Highly Involved", and "Disconnected", considering not only the empirical patterns in the data but also aligning with established theoretical frameworks in the literature on resident perceptions and attitudes toward tourism. For example, the label "Highly Involved" draws on the concept of residents as active stakeholders, commonly described in the literature as individuals with high community attachment, strong economic ties to tourism, and active support for STD (Gursoy et al., 2002; Styliadis, 2018). Also, the term "Moderate" aligns with resident typologies such as "ambivalent supporters" or "conditional participants" found in models of social exchange theory (Ap, 1992), where individuals display a balanced perception of tourism impacts and moderate involvement in community dynamics. Finally, the label "Disconnected" is supported by scholarship on resident disengagement or alienation in the context of tourism development (Perdue et al., 1990; Da Silva Lopes et al., 2019). These residents typically have lower levels of community attachment, perceive fewer benefits, and are less likely to participate in tourism planning or endorse its expansion.

Next, we'll describe each of the three segments.

Table 2 shows that Cluster 1 comprises 115 individuals (46%) and is labeled 'Moderate.' This group demonstrates moderate community involvement and a relatively strong sense of attachment. These residents perceive considerable benefits from community and tourism activities, while their perceptions of associated costs remain comparatively low. The economic dependence on tourism of this group is low, indicating that they do not rely heavily on tourism activities for their livelihood. They hold a moderate view of LGMT activities, believing that public administration plays a reasonably effective role. In this group, support for STD is moderate. Additionally, within this group, risk perception is low, suggesting that residents perceive a low level of risk.

Cluster 2 includes 71 individuals and represents 28.4% of the total sample, and is labelled as "Highly Involved". This group shows strong involvement and a deep attachment to the community. In this group, the perception of benefits is more significant, and regarding the costs of tourism, this group is most aware of them. The economic dependence on tourism of this group is high, indicating that they rely heavily on tourism activities for their livelihood. They have a positive view of LGMT activities, believing

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that public administration plays an important role. Within this group, support for STD is high. Also, risk perception is relatively high, indicating that the residents perceive several significant risks. The "Highly Involved" group has a stronger connection to the community, which may be related to their greater economic dependence and the presence of family members in the tourism sector. This group perceives more benefits and costs, possibly due to their higher economic dependence and involvement in the tourism sector. Cluster 3, consisting of 64 individuals, is referred to as "Disconnected" and represents 25.6% of the total sample. This group has low involvement and attachment to the community, perceiving fewer benefits from community and tourism activities. This group sees tourism as having moderate associated costs. The economic dependence on tourism of this group is low, indicating that they tend not to rely heavily on tourism activities for their livelihood. They have a less favourable view of LGMT activities, believing that public administration does not play a significant role. In this group, support for STD is low, suggesting a weak commitment to long-term practices. Also, in this group, risk perception is moderate, indicating that they see some risks but are not excessively concerned. Figure 1 visually provides an intuitive profile of each resident cluster across the eight segmentation variables (Community involvement, Community attachment, Perceived tourism impacts, Economic dependence, LGMT, Perceived risk, and Support for STD).

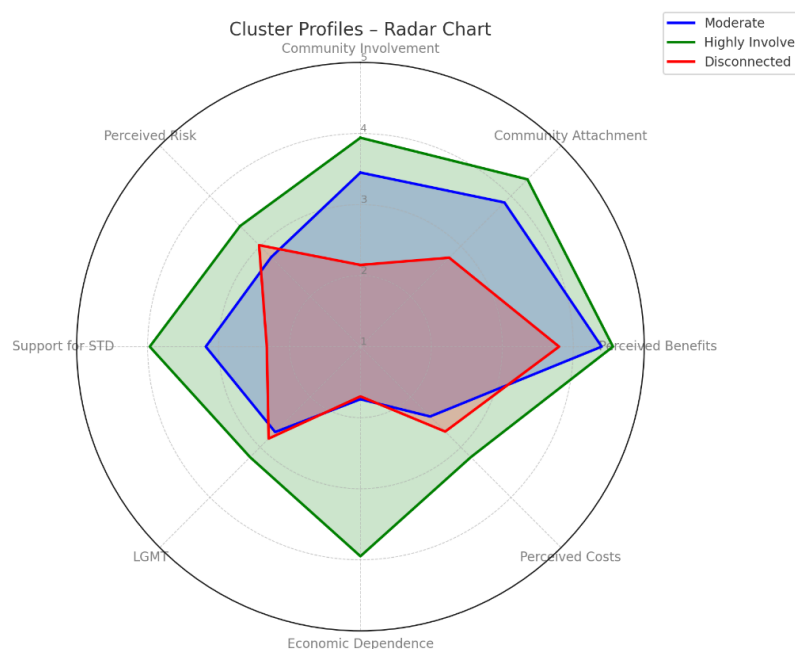


Figure 1 - Radar Chart of each cluster across the eight measured dimensions

Source: Own elaboration

In the Radar Chart, each axis represents one of these variables, and the distance from the center (1 = low, 5 = high) shows the mean score for that dimension within each cluster. As we can see, Cluster 1 ("Moderate") shows moderate scores across most dimensions. This group perceives moderate benefits, low costs, and low economic dependence on tourism, with a balanced perspective on LGMT and STD support. Cluster 2 ("Highly Involved") consistently scores highest across nearly all dimensions, especially in community attachment, perceived benefits, and economic dependence. These residents are deeply engaged and have a vested interest in tourism, both socially and economically. Cluster 3 ("Disconnected") scores lowest on community involvement, community attachment, tourism benefits, and support for STD, reflecting a more distant and critical view. They show low economic dependence and a relatively negative view of LGMT, which explains their more skeptical attitude toward tourism.

3.2 Profiling the Clusters by Sociodemographic Characteristics of the Residents

To profile the three-cluster solution, each cluster was cross-referenced with sociodemographic variables, including gender, age, educational qualifications, employment status, monthly income, family members involved in the tourism sector, etc. (Table 3).

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Table 3 - Sociodemographic characterisation of the groups (N = 250)

N	Moderate 115	Highly Involved 71	Disconnected 64	p
Sex				
Female	73 (63.5%)	39 (54.9%)	47 (73.4%)	0.083(2)
Male	42 (36.5%)	32 (45.1%)	17 (26.6%)	
Age				
Mean (SD)	39.97 (15.21)a	41.39 (13.30)a	31.80 (14.30)b	< 0.001(1)
Education				
Primary/secondary education	37 (32.2%)	27 (38.0%)	30 (46.9%)	0.150(2)
Higher Education	78 (67.8%)	44 (62.0%)	34 (53.1%)	
Labour situation				
Employee	71 (61.7%)	54 (76.1%)(+)	29 (45.3%)(-)	0.005(2)
Student	36 (31.3%)	13 (18.3%)(-)	31 (48.4%)(+)	
Domestic + Retired	8 (7.0%)	4 (5.6%)	4 (6.3%)	
Net monthly household income				
Up to 500 euros	10 (8.7%)	3 (4.2%)	5 (7.8%)	0.070(2)
From 501 to 1000 euros	25 (21.7%)	20 (28.2%)	20 (31.3%)	
From 1001 to 1500 euros	23 (20.0%)	17 (23.9%)	16 (25.0%)	
From 1501 to 2000 euros	26 (22.6%)	13 (18.3%)	19 (29.7%)	
More than 2000 euros	31 (27.0%)	18 (25.4%)	4 (6.3%)	
Has a family member in the tourism sector				
No	104 (90.4%)(+)	30 (42.3%)(-)	56 (87.5%)	< 0.001(2)
Yes	11 (9.6%)(-)	41 (57.7%)(+)	8 (12.5%)	
Number of people in the household				
Mean (SD)	3.19 (0.94)	3.37 (1.01)	3.06 (1.10)	0.219(1)
Number of years living in the municipality				
Mean (SD)	29.81 (19.50)b	30.65 (16.79)a	20.69 (17.49)b	0.002(1)

Source: Own elaboration

Notes:(1) ANOVA significance value; (2) Chi-Square test of independence significance value; a,b no significant differences between clusters with a common letter in each variable: p > 0.05 in Tukey HSD multiple comparison tests;(+) cells with a value significantly higher than the mean (adjusted standardised residuals > 1.96);(-) cells with a value significantly lower than the mean (adjusted standardised residuals < 1.96).

The Moderate group consists of 115 individuals, predominantly female (63.5%), with an average age of approximately 40 years. Most have higher education (67.8%) and are employed (61.7%), while others are students or retired. Household incomes vary, with over half earning above €1500 monthly. The vast majority (90.4%) do not have family in the tourism sector, households average just over 3 people, and residents have lived in the municipality for nearly 30 years on average. The Highly Involved group includes 71 individuals, slightly more women (54.9%) than men, with an average age of about 41 years. Most hold higher education degrees (62%) and are primarily employed (76.1%). Household income is distributed across all levels, with over 43% earning above €1500. Notably, 57.7% have family members working in the tourism sector. On average, households consist of 3.37 people, and residents have lived in the municipality for over 30 years. The Disconnected group comprises 64 individuals, predominantly female (73.4%), with a younger average age of 31.8 years. Concerning education, 46.9% have basic or secondary education, while 53.1% have higher education. Most are either students (48.4%) or employed (45.3%). The majority have modest household incomes, with only 6.3% earning over €2000 monthly. The majority (87.5%) have no family members working in the tourism sector. Households average 3.06 people, and residents have lived in the municipality for about 21 years on average.

4. DISCUSSION

The results help to understand how sociodemographic characteristics influence attitudes and perceptions towards the community and tourism, allowing for a more targeted approach to meet the needs of each group. To support the discussion of the results, Table 4 presents a summary of the main characteristics and profiles of each segment.

Table 4 - Summary of key characteristics of the clustered constitution and profiling

Cluster group Key Characteristics	Moderate group (n=115; 46%)	Highly Involved group (n=71; 28.4%)	Disconnected group (n=64; 25.6%)
Demographic profile:	This is the largest group, mostly female, with a middle-aged average (40 years).	Slightly older (average age 41), with a gender balance.	Youngest group (average 32 years), mostly female.
Education and work:	Majority have higher education and are employed.	High employment (76.1%) and significant education levels.	Many are students (48.4%), with lower income levels.
Tourism dependence:	Very minimal family ties to tourism (only 9.6%).	High - over half (57.7%) - have family in the tourism sector.	Limited tourism ties (only 12.5%).
Stability	Long-term residents (nearly 30 years).	Longest municipal residency (31 years).	The least time living in the municipality (20.7 years).
Attitudes and perceptions:	<ul style="list-style-type: none"> - Community attachment: Moderate, with a reasonably strong connection - Tourism benefits: Perceived as significant - Tourism costs: Viewed as relatively low - Economic dependence on tourism: Low - LGMT: Moderate trust in LGMT effectiveness - Support for STD: Moderate - Risk perception: Low 	<ul style="list-style-type: none"> - Community attachment: High - Tourism benefits: Perceived as high - Tourism costs: Also highly recognized - Economic dependence on tourism: High - LGMT: Positive perception of local government's role - Support for STD: High - Risk perception: High 	<ul style="list-style-type: none"> - Community attachment: Low - Tourism benefits: Low perception - Tourism costs: Perceived as moderate - Economic dependence on tourism: Low - LGMT: Low trust - Support for STD: Low - Risk perception: Moderate
Conclusion	Balanced and Established This group represents a balanced and stable group, generally supportive of tourism with limited economic dependency. Their moderate involvement makes them a reliable but not deeply engaged segment in tourism governance.	Economically Tied and Committed A deeply connected and economically invested group. Their dual perception of benefits and risks reflects a nuanced understanding. They are ideal partners for participatory tourism planning, motivated by both personal and community stakes.	Young and Detached This group is socially detached, economically marginal, and largely uninvolved in community and tourism matters. Their detachment may translate to lower participation in tourism discourse or community planning. Their limited engagement suggests challenges in mobilizing their support but also potential for targeted awareness and inclusion strategies.

Source: Own elaboration

To our knowledge, no other studies segment residents based on this specific combination of criteria. Therefore, the results of this study can only be compared with segmentation research conducted within the context of tourism development, which uses different segmentation bases, such as residents' perception of place image (Stylidis, 2018) or tourism impacts (Da Silva Lopes et al., 2019; Jani, 2018).

Firstly, in the present study, the majority of respondents fall into a group (Moderate - n = 115) that has moderate perceptions rather than more positive (Highly Involved) or more distant (Disconnected) views. Secondly, the Highly Involved cluster corresponds to residents who generally have a positive view of the benefits of tourism, show greater economic dependence on the sector, and support STD. These characteristics have been observed in previous studies, albeit with different labels or segmentation bases (Da Silva Lopes et al., 2019; Vareiro et al., 2013). Conversely, the Disconnected tend to be critical of LGMT, which may be related to their age, student status, and low dependence on tourism. It is worth noting that the Disconnected group is the smallest. Thirdly, a significant conclusion of this study is that the Highly Involved and Moderate groups demonstrate greater support for STD, unlike the Disconnected, who do not show this support. These findings corroborate previous research (Stylidis, 2018; Vareiro et al., 2013), which also indicated that residents with more positive perceptions tend to support STDs more. Similar to what was observed in the study by Vareiro et al. (2013), the emerging nature of this low-density city may explain these favourable opinions. Fourthly, the Disconnected cluster presents characteristics similar to those identified in other studies regarding sociodemographic profiles, such as the 'Indifferent' cluster in the study by Da Silva Lopes et al. (2019).

In summary, these clusters illustrate that residents' views and engagement with tourism are not monolithic. Age, education, employment, and direct ties to tourism strongly shape attitudes and perceptions. For instance, the employment rate is higher among the "Highly Involved", while the "Disconnected" group has a higher proportion of students. The "Disconnected" group tends to have lower incomes, which may influence their lower attachment and involvement with the community. Both the "Highly Involved" and "Moderate" groups tend to have lived in the municipality longer, which may contribute to a stronger community connection. Understanding these segments can support more inclusive and targeted tourism planning that reflects the needs and expectations of each group. For example, the Moderate group can be strengthened with targeted communication, potentially receptive to balanced tourism messaging. The Highly Involved group should be engaged in participatory planning; they have

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insights, stake, and willingness to support tourism initiatives. And, lastly, the Disconnected group requires inclusion strategies—educational campaigns, youth engagement programs, and trust-building with local institutions could increase their involvement.

CONCLUSION

Achieving the Sustainable Development Goals (SDGs) through a focus on STD is, to some extent, inevitable for all tourist destinations. However, for low-density regions, this task is challenging given the heritage, cultural characteristics, and competitive disadvantages of these emerging tourist destinations. To support the development of tourism plans based on sustainability, the participation and support of various stakeholders, especially residents and local authorities, are crucial.

This study aimed to identify relatively homogeneous segments of residents and to profile these groups using a factor-cluster analysis approach. By integrating multiple criteria, the study offers an innovative segmentation framework that, to the best of our knowledge, has not been previously applied in the literature. The findings reveal the emergence of three distinct resident segments—Moderates, Highly Involved, and Disconnected—offering empirical support for the effectiveness of the selected criteria in differentiating the local population within a tourism destination context. The selection of these variables for segmentation is grounded in their strong explanatory potential. Notably, the inclusion of perceived risk—an aspect not previously used to differentiate resident perception groups—represents a key contribution of this study, expanding the analytical scope beyond that of earlier research. In this context, the study builds upon existing research by showing that the selected criteria are particularly relevant for conducting cluster analysis, thereby supporting the development of tourism planning and management strategies that prioritize residents' perspectives and foster inclusive, community-based decision-making.

Furthermore, this study demonstrates how the use of clustering techniques can aid in advancing research on how residents feel about STDs. As argued by Vareiro et al. (2013), cluster analysis can be used to identify groups of local residents with similar opinions on the effects of tourism, which can help inform and shape a tourism planning and management approach. While this study is context-specific, the cluster analysis approach — grounded in theoretically relevant constructs such as community involvement, perceived impacts, community attachment, LGMT, perceived risk, economic dependence, and support for STD — can offer a replicable framework for analyzing resident segmentation in other tourism destinations.

These findings can be further interpreted through the lens of stakeholder theory, which emphasizes the role that residents of communities in low-density areas can play in decision-making and planning STD programs. The distinct resident profiles identified in this study illustrate the heterogeneity of stakeholder interests and perceptions, reinforcing the need for inclusive, participatory governance approaches. Additionally, insights from place attachment theory help explain the differences in support for STD across clusters, with stronger attachment associated with greater engagement and support. By empirically validating these theoretical perspectives in the context of a low-density heritage destination, the study contributes to a more nuanced understanding of residents' roles in shaping STD trajectories.

These conclusions have several practical implications for local authorities, suppliers, and tourism planners. The cluster analysis revealed three groups of residents with distinct perspectives, which can guide a more targeted approach by the local government in planning and promoting this tourist destination. Understanding these segments enables the development of a Strategic Communication Plan customized to the needs and interests of each group. The findings from this case study suggest the relevance of promoting a participatory governance model in similar low-density destinations, where residents' involvement and perceptions play a critical role in shaping STD strategies. The application of this management model has shown positive results in some destinations focusing on STD (Erdmenger, 2022). In this context, adopting a strategic "collaborative governance" model where the population is involved in the process is a good example to follow in other low-density destinations with similar characteristics.

Finally, with regard to Goal 12 of the 2030 Agenda for Sustainable Development (United Nations, 2015), this study has enhanced the understanding of the residents of this local community, and the information gathered has enabled the monitoring of their diverse opinions. It is evident from the empirical results that there is an opportunity to give residents of Lamego, both those with positive perceptions (Moderates and Highly Involved) and those without (Disconnected), a clearer view of how the tourism industry can benefit their success and that of their community, contributing to achieving the SDGs and creating a sustainable city in terms of tourism. In addition to its alignment with SDG 12.b of the 2030 Agenda, the study's findings also resonate with national and EU-level tourism strategies. For instance, Portugal's Tourism Strategy 2027 emphasizes the role of residents in shaping sustainable destinations and promotes inclusive governance as a pillar of long-term competitiveness. At the European level, the EU Tourism Transition Pathway (2022) highlights the need for data-driven, community-based approaches to tourism planning that ensure environmental sustainability, local well-being, and economic resilience. The segmentation model presented here supports these policy goals by offering a practical tool for local authorities to tailor interventions based on residents' diverse perceptions and levels of engagement, contributing to more targeted and participatory tourism governance.

This study presents several limitations that should be acknowledged. First, since we conducted the research in a single tourist destination—Lamego—caution is needed when generalizing the findings to other regions or tourism contexts, especially those with different socio-economic or cultural dynamics. Second, this study employed a convenience sampling method with data collected through an online survey, which introduces potential selection bias. While this approach facilitated access to a broad

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segment of the resident population, it may have inadvertently underrepresented individuals with limited internet access—a group that often includes older adults, rural residents, and those with lower levels of digital literacy. As such, the findings may not fully reflect the views of these demographics, particularly in communities where digital divides are still prevalent. However, while the segmentation analysis presented here was based on an online survey, its core structure could be adaptable to more resource-constrained or rural settings. Municipalities without access to online infrastructure could implement simplified versions of the survey using in-person interviews, paper-based questionnaires, or partnerships with local schools, community centers, or civil society organizations. Future research should consider mixed-mode data collection strategies (e.g., combining online and in-person surveys) to enhance representativeness and inclusivity.

Furthermore, the data were collected during the final phase of pandemic-related restrictions, a context that may have temporarily influenced residents' perceptions, particularly regarding risk, mobility, and economic dependency on tourism.

Future studies should consider adopting longitudinal designs, ideally spanning a decade or more, to track shifts in residents' perceptions and support for STD over time. This would provide valuable insight into how broader societal or environmental changes—such as economic crises, policy reforms, or climate impacts—shape public engagement with sustainability initiatives. Additionally, important forward-looking questions emerge: How might tourism dynamics evolve in low-density destinations like Lamego in the post-pandemic era, especially as travellers seek less crowded and more nature-based experiences? Could the segmentation approach used here be effectively applied to other stakeholder groups, such as visitors, tourism entrepreneurs, or public officials, to explore their levels of support for STD? How do inter-stakeholder perceptions align or diverge, and what implications does that have for policy, planning, and community cohesion? Addressing these questions would not only strengthen the external validity of the current findings but also contribute to a more inclusive and integrated understanding of sustainable tourism governance across multiple levels.

Future studies could apply the same set of variables to different geographic and cultural contexts to test the consistency of the identified resident profiles or adapt the segmentation analysis by integrating locally salient factors. Such comparative studies would not only validate the robustness of this segmentation analysis but also contribute to building a more generalizable typology of resident attitudes toward STDs.

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AUTHORS' CONTRIBUTION

Conceptualization, I.V.; data curation, A.R.; formal analysis I.V., A.R. and D.F.; funding acquisition, I.V.; investigation, I.V., A.R. and D.F.; methodology, I.V.; project administration, I.V., A.R. and D.F.; resources, I.V., A.R. and D.F.; software, I.V., A.R. and D.F.; supervision, I.V., A.R. and D.F.; validation, I.V., A.R. and D.F.; visualization, I.V., A.R. and D.F.; writing-original draft, I.V., A.R. and D.F.; writing-review and editing, D.F.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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