# A hybrid-fuzzy segmentation analysis of residents' perception towards tourism in Gran Canaria.

**Juan Carlos Martín**

Institute of Tourism and Sustainable Economic Development (TIDES), University of Las Palmas de Gran Canaria, Las Palmas, Spain

jcarlos.martin@ulpgc.es


**Pedro Moreira**

Institute of Tourism and Sustainable Economic Development (TIDES), University of Las Palmas de Gran Canaria, Las Palmas, Spain

pedro.moreira@ulpgc.es


**Concepción Román**

Institute of Tourism and Sustainable Economic Development (TIDES), University of Las Palmas de Gran Canaria, Las Palmas, Spain

concepcion.roman@ulpgc.es

**ABSTRACT**

Tourist destinations have evolved throughout the world because governments invest on developing a tourist sector. The ultimate goal is to improve the quality-of-life of the local residents. For this reason, the impacts of tourism, both positive and negative, need to be measured from the local residents' perspective. This study segments local residents according to their perception on tourism. A hybrid fuzzy segmentation method was applied to a sample of 504 local residents in Gran Canaria. Three representative profiles are obtained for two scenarios: (1) extreme tourist lovers, extreme tourist haters, and ambivalents; and (2) lovers, haters and ambivalents. Contributions to the body of knowledge and policy implications are discussed. A future research agenda is given.

**Keywords:** Fuzzy Logic, Triangular fuzzy numbers, TOPSIS, Fuzzy-hybrid cluster; Residents' perception.

# 1   Introduction

There is certainly a plethora of tourism research devoted to examine the impacts on host communities and local residents. Tourism for some destinations like Gran Canaria is an important driver of socio-economic development as the industry has a central role in creating jobs. Accordingly, Uysal, Perdue and Sirgy (2012) contend that "…increases in tourism jobs within the destination area should play a significant role in increasing the economic and consumer well-being of the destination residents. Increases in jobs and sales should also generate more tax revenues for the destination, which in turn allows increases in public sector spending. Public sector spending enhances residents' economic, consumer, social, health, and environmental well-being" (p. 2).

The residents' acceptance of tourism is linked to a good balanced situation between tourists, residents, and the main stakeholders of these two groups regarding the impacts on the culture, the environment and the economy. Tourism represents an important industry in terms of income, trade balance, taxes and jobs that facilitates and promotes the economic growth and development for some areas. Sharpley (2014) contends that the benefits cannot be achieved without costs, and that host communities usually face an important dilemma when evaluating these benefits and costs as some of them are intangible and do not have a market value. Nevertheless, the success of the development of the tourist industry usually resides in the acceptability of the host communities (Andriotis and Vaughan, 2003; Jurowski and Gursoy, 2004; Aguiló and Rosselló, 2005; Snaith and Haley, 1999).

Ap (1992) highlights the issue of monitoring the attitudes and perceptions of local residents in order to anticipate antagonistic behaviour towards tourism. In an ideal world, Vargas-Sánchez, Plaza-Mejía and Porras-Bueno (2009) contend that tourism planning should be guided by the participation of local residents in what is termed as community-driven planning. If planners ignore the local residents' perception in the decision-making, it is likely that some antagonistic tourism attitudes and behaviour appear (Olya & Gavilyan, 2017). Nowadays, the finding by Doxey (1975), regarding that antagonistic behaviour towards tourist and tourism is not supported by the literature, seems history. Zerva, Palou, Blasco and Donaire Benito (2018) find that extreme hate positions are enduring in time analysing the hosts' public narratives over time in the case of Barcelona.

Tourism is a remarkable industry for the sustained growth, the internationalization and for the economic significance for some regions. The arrivals of international tourists registered a remarkable increase of 7% in 2017 until reaching a total of 1.322 million, according to the last World Tourism Barometer (UNWTO, 2018). Gran Canaria is a well-known mature mass tourism destination in the European Union. In 2017, the island set a new historical record for tourist arrivals with more than 4.5 million visitors, representing an increase of 8.6 per cent over the previous year (ISTAC, 2017). The Nordic countries together, Sweden, Norway, Finland and Denmark, was the primary market with more than 1 million visitors. German and British are the next markets in importance. Undoubtedly, tourism is an important economic sector in the island, so the knowledge of the local residents' perception seems to be a priority as the perception does not only influence the attitude towards tourism but also tourists (Martín, García de los Salmones Sánchez and Herrero, 2017). A balance situation between tourists and local residents can only be achieved managing adequately the local residents' perceptions (Zhang, Inbakaran and Jackson, 2006). Sharpley (2014) concludes that in spite of the scale, scope and significance of the nowadays Tourism industry, the residents' perception research is not still reflected.

In this context, the aim of this paper is to contribute to the extant literature in the field by applying a hybrid fuzzy segmentation method to segment the residents into three representative profiles for two scenarios: (1) extreme tourist lovers, extreme tourist haters, and ambivalents; and (2) lovers, haters and ambivalents. This article sheds some light in a topic in which qualitative scales have not been converted into fuzzy numbers before applying any segmentation method, and the fuzzy hybrid method to find the segments seems also an adequate technique of segmentation in which the local residents are not forced to belong to one particular cluster (Zhang, Prater and Lipkin, 2013).

The remainder of the paper is organized as follows: Section 2 offers some insights from the literature, section 3 describes the data section, section 4 details the methodology,

section 5 presents and discusses the results, and section 6 offers some concluding remarks.


## 2 Literature review

The main positive and negative impacts of tourism have been analysed by different scholars from different perspectives and angles. Sharpley (2014) finds that there are 1070 published articles in three journals (Tourism Management, Annals of Tourism Research and Journal of Travel Research) dealing with ("residents", "attitudes", "perceptions" and "tourism") and that the academic research has been focused in the social, economic and environmental impacts. The author concludes that "the roots of the now considerable body of research into resident perceptions of tourism lie, of course, in the early recognition of tourism's negative consequences" (p. 39). Jafari (2005) is one of the most cited studies, in which the two following broad positive impacts are found: (1) economic benefits, such as employment creation, generation of currencies, infrastructures, consumption of local products, economic development, multiplier effects in other economic activities; and (2) sociocultural benefits, such as the improvement of education for employment, the reductions of important sociocultural barriers like racial, religious, political or linguistic; the increase of the awareness or the self-perception of the own culture and identity that ultimately favours the local heritage within a global trend of cosmopolitanism and international understanding. The negative impacts are also based on these two global categories: (1) economic costs such as inflation, increase of superfluous imports, seasonality and contribution to unemployment, unbalanced development, external dependence, destruction of natural resources and pollution; (2) sociocultural costs like growth of stereotypes and prejudices, xenophobia, commercialization of communities and local cultures, weakening of the family structure, crime and conflicts.

Harrill (2004) emphasizes the importance of the support of the local communities in the success of tourist development, and therefore the investigations that aim to know the opinions and attitudes of the residents in this topic are fundamental. He classifies the factors that influence the attitude toward the tourist development into three large groups: (1) socio-economic factors; (2) spatial factors; and (3) economic dependence. The discourse on the socioeconomic factors that has been commonly employed to explain the attitudes of the residents toward tourism has been to a certain extent dominated by variables like income, ethnicity and the social structure of residents. Regarding spatial factors, the author concludes that the closeness of residential areas to the core of tourist activities in the destinations increases the negative residents' perception on tourism. On the economic dependency, the author concludes that there exists a positive relationship between this dependency and the residents' perception. The author uses the "Irridex Model" as an explanatory model on the perception of the residents according to the different stages of the life cycle of a destination. Thus, the

residents' perception changes along with the different stages of the cycle of life of the tourist destination. A virtuous circle is usually observed from the initial stage of euphoria, to the subsequent stages of apathy and indifference, discomfort and inconvenience and a final stage of antagonism or incompatibility.

A series of residents' typology according to the different feelings of acceptance or rejection of the tourism has been suggested. The extreme and first classification is based on haters and lovers, with more intermediate classes between these two who love or hate tourism for a motive or a reason.

Sharpley (2014) finds that quantitative methods are by far more employed than qualitative or mixed methods in the majority of the research dealing with residents' perceptions of tourism, but, in turn, the author points to one of the main limitations of this type of studies, the value-action gap. This limitation is related to what respondents say they will do and what at the end they finally do. Some residents can answer very negatively towards tourism development but at the end can demonstrate a sort of soft-tolerance as they do not participate in any public demonstration against it. Thus, some authors consider that the field would benefit from moving from the first layer of residents' perceptions to a second layer of actions or responses (Carmichael, 2000).

Regarding the methodological approach, Nunkoo, Smith, and Ramkissoon (2013) analyse 140 articles dealing with the topic and find that the more frequent quantitative methods are: (1) Descriptive statistics; (2) Factor analysis (EFA and PCA); (3) Regression analysis; (4) ANOVA; (5) t-tests; (6) Confirmatory factor analysis; (7) Structural equation models; (8) Chi-square test; (9) Correlation analysis; and (10) Cluster analysis. Typically, the research is based on the administration of a questionnaire to a sample of residents containing different questions and answer formats that measure specific constructs of research interest. Sharpley (2014) finds "that the use of quantitative methods is understandable, the objective of most studies being to identify and test the relationship between variables that influence resident perceptions of tourism or, in some cases, to segment residents through cluster analysis" (p. 42)

## 2.1  Theoretical approaches

The theoretical perspectives have also been analysed by different theories like for example the Community Attachment, the Social Exchange or the Growth Machine. The Community Attachment Theory is based on the degree, the model, the intensity and the type of social participation and integration in the life of the community. The Social Exchange Theory analyses how the resources and services between the individuals and the social groups are shared and exchanged so it is assumed that tourism development entails not only economic benefits but also involve some environmental and social costs. The net exchange needs to be positive valued in order to have a positive residents' perception. The Social Exchange Theory was proposed by Morales (1978) as

a general interaction theory. The social behaviour is based on an exchange of views in which individuals are rewarded by the interactions, and the conformity is achieved by the continuous interaction flow between all the individuals of the community. Rational choice and utilitarianism are based on these mutual and beneficial interactions. Thus, Ap (1992) considers that the reciprocity of the expected benefits in the tourism exchange is crucial to observe a continuous relationship of mutual interdependence. The benefits and costs must be balanced and permeated through different social classes, and it is well known that those sectors directly involved in tourism tend to be a lover typo. The rationality in the relationship of mutual benefit between "host and guest" or "tourists and residents" needs to exist without tension and antagonism between both parties. If this is the case, the positive impacts of tourism in the resident population (employment generation, infrastructure maintenance, greater supply of leisure and more cosmopolitan atmosphere) outweigh all the negative impacts (overcrowding, inflation, spatial segregation, gentrification, conflicts and pollution).

The Growth Machine Theory is based on the factors and allies that support the economic growth. This theory has been particularly useful to understand the attitude differences that exist between the residents and the local economic elites. If the tourism development is controlled by a minority of powerful elites rather than by the majority of residents, then the rationality of a higher growth and tourist development is going to be fiercely stressed (Martin, 1999). The author adopts a systemic perspective in which tourist development should happen in harmony between all types of capital: financial, social, human, infrastructural, environmental, patrimonial and symbolic. There are numerous studies that find empirical evidence between tourism and economic growth (Brida et al., 2010; Kumar & Kumar, 2012; Jayaraman et al., 2014). Recently, Kumar et al. (2019) find, analysing the effects in the Cook Islands, that the relationship between tourism arrivals and economic growth presents asymmetries.

Another series of studies can be classified according to the perspective of "Other Social Theories": (1) the Ethnicity Marginality Theory, whose focus is on investigating the influence of differences in perceptions according to ethnic and racial groups; (2) The Host Guest Paradigm has its origin in Anthropology and considers that the phenomenon of the interaction between residents and tourists needs to be analysed under more complex theories; (3) People´s Quality of Life highlights the role of the influence of tourism and the perception of the quality of life and the support of the community to the tourist activity, as well as the participation in tourism planning and standard of living. The quality of life and the level of development of tourism in the destination are studied in a comprehensive manner with the general level of satisfaction in life; (4) Place Identity Theory analyses the influence of the senses of distinctiveness, continuity, self - esteem and self-efficacy in the views of the residents; (5) The Resident´s Place Image affects the views of residents on the support towards tourism development plans, considering therefore that this image could benefit the

community; and (6) the Social Conflict Theory studies the external implementation of the tourist business in a small and traditional communities where ethnic conflicts between businessmen, residents and tourists need to be analysed.

## 2.2  Empirical analysis

With the objective to have a more accurate idea of the recent studies on social perception of tourism and focusing on empirical cases, a recent selection shows that the case studies are from different countries and analyse diverse types of tourist products: cruise, mountain and beach tourism. As in the theoretical part, it was observed that a common model or a general theory has not been applied. Although, the most used explanatory theories are the Social Exchange Theory, the Community Attachment Theory and the Quality of Life Theory. The conclusions cannot be generalizable and depend very much on the tourist product, the type of destination, as well as the stage in the life cycle.

Regarding cruise tourism, three studies are summarized. First, McCaughey et al. (2018) analyse the case of local residents in Esperance, Western Australia and find that, in general, residents are supportive towards the presence of cruise tourists in the city. Nevertheless, they also find that some residents show a dissent attitude with the management of the visits to the city and the treatment given by the cruise liners to the local businesses.  Second, Del Chiappa et al. (2018) analyse a sample of residents in the Spanish city of Valencia, and, applying a cluster analysis method, the authors find three distinct groups: "pessimists", "cautious supporters" and "optimists". The clusters show differences according to the age, the proximity to the port and the tourist zone. One of the main concerns of the residents is that a large part of the profits goes to non-local companies, so this should be corrected or reverted in order to induce a more favourable perception towards these tourists. The authors also find some contradictory conclusions with respect to other studies and conclude that local residents' perceptions towards cruise tourism depend on the specific destination and generalizations of results are not possible. And finally, Brida et al. (2014), through a survey in two Italian ports of the Mediterranean Sea (Messina in Sicily and Olbia in Sardinia), find that both residents have very similar opinions: a general positive attitude about the development of cruise tourism. However, the authors also highlight the negative impact on the environment, as well as the congestion and some crime.

Regarding mountain tourism, we refer to four case studies. First, Peters et al. (2018) analyse an Austrian mountain destination (Urlaubsregion Murtal - URM), and find that a positive attitude towards tourism development, highlighting that the advantages overcome the disadvantages. The authors consider the interest of studying local community involvement through theories such as Community Attachment Theory or Quality of Life Theory. Second, Šegota et al. (2017) study the case of the city of Bled, a Slovenian mountain and lake destination. The authors find that highly informed and

highly involved residents have better perceptions of the positive impacts of tourism than all other groups. While those residents poorly informed and little involved have more negative perceptions of the impacts. Third, Muresan et al. (2016) analyse the factors that influence the support to the development of sustainable tourism in the region of Nord-Vest (Romania). The authors find that rural residents perceive tourism development in a positive way and that the environmental component of sustainable development is the most important. The tourist activity is perceived as beneficial for the diversification of recreational activities and the improvement of the general infrastructure. The local community is ready to support the development of sustainable tourism if the perceived personal benefits are important. The higher the perception of the economic and socio-cultural benefits, the greater will be the support of the local community to build future tourism strategies. And finally, Brida et al. (2014) analyse the mountainous area of Folgaria, Italy. The authors identify groups of residents concerned about or opposing to planning and developing tourism in their communities. The development of winter tourism would only be supported by the community if the environmental and sociocultural impacts are kept to the minimum.

To end this section, two case studies related to sun and beach destinations will be commented. First, Franzidis & Yau (2018) analyse the relationship between hosts and guests in the case of a small beach community in the United States (Wilmington, North Carolina). Using focus groups, the authors find that the majority of the residents support tourism in the community, and recognize their economic dependence on the sector. Residents recognize improvements in recreational activities, infrastructure, and various events. In exchange for the benefits, residents are ready to tolerate certain negative impacts, such as increased traffic, crowds and trash. The study finds that the attitudes are closely aligned with the Social Exchange Theory, and that residents' attitudes are not static and can change over time, being unique in each destination and community. And finally, Cardona et al. (2019) study the overall attitude towards tourism in the case of Punta del Este, a well-known sun and beach tourism destination in Uruguay. The authors, through a partial least squares (PLS) regression method, find that the perceived benefits and costs do not have a direct effect on the support to more arrival tourists, but the positive economic and the negative sociocultural impacts have a significant effect on the overall attitude towards tourism.

## 3    The questionnaire and data

Nunkoo et al. (2013) recognize that residents' perceptions on tourism have been analysed by different constructs according to positive and negative impacts mainly over economic, social, cultural and environmental aspects. There are a number of factors that influence the residents' perceptions of these impacts. There are a number of studies that have developed in the past years scales to measure residents' perceptions on tourism (e.g., Ap and Crompton 1998; Delamere 1998; Godfrey 1998;

Gursoy, Jurowski, and Uysal 2002; Lankford and Howard 1994; Lindberg and Johnson 1997; Sirakaya, Jamal and Choi 2001; Yu, Chancellor, and Cole, 2011). Based on this earlier research, it can be seen that there are a number of factors and attributes that appear more frequently like the economic growth, the creation of jobs, the improvement of Infrastructures, the generation of wealth, the conservation of the environment, among others.

The research instrument of this study was a structured questionnaire comprising three sections to measure different constructs. Section A was about the importance of tourism in Gran Canaria and the residents' perception on 10 items (Table 1) using a semantic 5-points Likert scale (1: very negatively; 2: negatively; 3: neutral; 4: positively; and 5: very positively) (Bujosa and Rosselló, 2007). The ten items selected cover the four dimensions proposed by Jafari (2005). Section B covered the measures of other constructs and variables like, for example, the interaction with the tourists, whether the residents work directly in the industry, the perceptions on the tourists regarding the expenditure, the general behaviour and the behaviour towards the environment, or whether they have a particular preference for some type of tourist segments. Part C included questions that measured the residents' perceptions on 12 items using some positive or negative statement regarding the impacts of tourism using a semantic 5-points Likert scale that ranges from 1 (totally disagree) to 5 (totally agree). The section also included additional questions that measures other constructs more related with public policy and controversial issues like the possibility of oil extraction in front of the coast of Fuerteventura. And finally some basic socio-demographic variables, like gender, age and residential place, were also included. The survey was administered between 6 and 29 of June of 2012 to 504 residents in the island of Gran Canaria. The face-to-face interviews were first preferred by the research team but this option was finally discarded by the costs. At the end, the researchers selected one of the three companies which are specialized in administering social and economic surveys by telephone that presented the best alternative in terms of price, time and experience. The questionnaire was finally administered telephonically by instructed interviewers using a computer-assisted telephone instrument (CATI) to record the answers. In order to reduce the non-response behavior, interviewers were instructed to present the research as part of an investigation carried out by the University of Las Palmas de Gran Canaria. Thus, the respondents' motivation was increased and the non-response rate was almost insignificant (less than 2 percent). The sample was stratified according to the municipality of residence (tourist and not tourist) and gender. Confidence level was determined at 95 %, with the more unfavorable assumption in the distribution P=Q=0.5. An English translation of the questionnaire can be consulted in Annex 1.

<Insert Table 1 about here>

Gran Canaria was chosen as the case destination for the study as it is one of the leading destinations in the European Union, and can also be considered a paradigm for the mature destinations of mass tourism based on sun, sand and sea. Thus, there is an interesting issue to highlight as destinations with major tourist developments, the closer it is to the final stages in the life cycle model of a destination (Butler, 1980), the more defined is the perception of the impacts of tourism. Almeida García, Balbuena Vázquez and Cortés Macías (2015) contend that the consequences of living with daily tourism cause residents to better evaluate the positive and negative impacts of tourism.

Table 2 shows some descriptive statistics of the distribution for some demographic variables of the respondents. It can be seen that: (1) there are more females (51.98%) in the sample than males; (2) the two more numerous groups regarding the age are those whose age is between 46 and 55 years old (28.17%) and over 56 (25%); (3) the sample is also characterized by workers (47.42%) and unemployed people who have worked before (21.43%); (4) the two largest segments regarding the birthplace are the province of Las Palmas (82%) and those who have born in Spain out of the Canary Islands (9%); and (5) the respondents have as representative educational degrees primary school (34.72%) and Upper Secondary School or Professional Formation II (26.79%).

[Insert Table 2 about here]

## 4   Methodology

This section presents a brief description of the proposed hybrid-fuzzy method that calculates the residents' perception on tourism development (RPTD). Interested readers can consult Saayman et al. (2016) to have a further explanation of the model. The semantic Likert scale for the answers and the scale based on 10 items to measure RPTD in Gran Canaria are used as the primary information that nurtures the model. As previously explained, the questionnaire uses a 5-points bipolar semantic scale, and RPTD is based on a list of 10 attributes that contains information about three important dimensions that measure the impacts of tourism: economic, social and cultural. The questionnaire measures the potential impacts very vaguely as it is difficult to determine what the residents try to mean when they answer to some specific attribute that they consider that the impact of tourism is neutral. Objectively, neutral can be considered an adequate answer when the residents consider that the social costs are equal to the social revenues, making the social benefits equal to zero. Nevertheless, the social preferences of the society are not homogeneous, so therefore, this is a highly subjective information. In Gran Canaria, as in any other destination, there are segments of residents who see more or less social benefits depending on the values given to some social and cultural attributes. For example, the acculturation, the

loss of local traditions and the mercantilism over the cultural heritage fostered by some tourist activities can be seen by some residents very negatively (Osagie and Buzinde, 2011).

Zadeh (1965) is considered the father of the pillars of the fuzzy set theory which was developed as a way to deal with the vagueness of the information provided by the semantic Likert scales, which are by far the most common method employed to gather information in the field (Sharpley, 2014). Researchers usually convert the semantic term into a real value figure to represent the information provided by the respondents. Bhat and Dubey (2014) contend that "the latent constructs (or variables) themselves are viewed as being manifested through the attitudinal and perception indicator variables in a latent measurement equation model, which recognizes the presence of measurement error in capturing the intrinsic latent constructs. In the event that one of more of the indicators are not observed on a continuous scale, but observed on an ordinal or nominal scale, the measurement equation also serves the role of mapping the continuous latent constructs to the ordinal or nominal scale of the observed attitudinal indicator variables" (p. 69). Differently to this approach, other researchers propose the use of fuzzy-hybrid multi-criteria decision-making (MCDM) methods (Bai et al., 2014; Saayman et al., 2016; Saeida Ardakani et al., 2015). The fuzzy methods present some advantages using the semantic Likert scales in resolving some concerns raised by Dickson & Albaum (1977) "…consisting of adjectives and phrases which seem appropriate or relevant to the specific concept being studied without really testing the new scales to insure that they meet the various underlying assumptions which are critical for proper use of semantic differential instruments" (p. 87).

## 4.1   Triangular fuzzy numbers

This section presents how the information vagueness provided by the residents is conveniently converted to a popular fuzzy logic set, the triangular fuzzy numbers. Following Zadeh (1975, 1984) and Mamdani and Assilian (1975), the universe of discourse X can be described as the subset of real numbers R, $X = \{x_1, x_2, x_3, \ldots, x_n\}$. A fuzzy set $\tilde{A} = \{(x, \mu_A(x)) \mid x \in X\}$ in X is a set of ordered pairs, where $\mu_A(x)$ is a membership function and $\mu_A(x) : X \to [0,1]$. The membership function for fuzzy sets can take any value within the closed interval [0,1] and gives the strength of belonging that a particular element of the discourse has. Thus, the greater $\mu_A(x)$ is, the more truth of the statement that element x belongs to set A has. The membership function is quite appropriate to adjust the vague information to some subjective inferential judgment as everything is relative. For example, when respondents are answering whether the impact of tourism affects positively or very positively the creation of jobs in Gran Canaria, they can give some probability value to both answers. It is straightforward

that there is not a unique objective function that exists to measure this concept. The essence of the application of the fuzzy set theory resides in this.

In this paper, the triangular fuzzy numbers $\tilde{A}$ are parameterized using a triplet $(a_1, a_2, a_3)$ with the following membership function $\mu_A(x)$:

$$\mu_A(x) = \begin{cases} \dfrac{x - a_1}{a_2 - a_1}, & a_1 \leq x \leq a_2, \\ \dfrac{x - a_3}{a_2 - a_3}, & a_2 \leq x \leq a_3, \\ 0, & otherwise. \end{cases} \tag{1}$$

Thus, for example, very negatively and the rest of the semantic answers provided by the residents is then translated to a triangular fuzzy number (TFN) that represents a relative value in a range between 0 and 100. Researchers are now in the position of determining a set of TFNs that represent the vagueness associated to the information obtained from the survey instrument. Table 3 shows the selected TFNs selected in the study. The relative strength can be calculated according to equation (1) that represents the membership function.

[Insert Table 3 about here]

The aggregation of TFNs through different segments, like for example do or do not work directly in the tourism sector, is based on the algebra of TFNs, in which the average fuzzy number of *n* TFNs $\tilde{A}_i = \left(a_1^{(i)}, a_2^{(i)}, a_3^{(i)}\right)$, where $i = 1, 2, 3, \ldots, n$, can be calculated as follows:

$$\tilde{A} = (a_1, a_2, a_3) = \left(\frac{1}{n}\right) \bullet \left(\tilde{A}_1 \oplus \tilde{A}_2 \oplus \cdots \tilde{A}_n\right) = \left(\frac{\sum_{i=1}^{n} a_1^{(i)}, \sum_{i=1}^{n} a_2^{(i)}, \sum_{i=1}^{n} a_3^{(i)}}{n}\right), \tag{2}$$

The $\bullet$ operator denotes the external multiplication of a scalar and a TFN, and $\oplus$ is the internal addition of TFNs. The properties of the algebra of the fuzzy sets serve to show that the aggregated value for each of the segments can also be seen as a new TFN (Buckley, 1985).

## 4.2   Crisp information matrix

The aggregate TFN can be obtained for each of the segments of interest in the study, and it normally depends on the extension of the instrument. In this study, there are 150 different segments that can be analysed. Thus, a matrix (10, 150) of TFNs is obtained straightforward by applying eq. 2. This matrix, known as the information

matrix, contains a lot of information and it is difficult to analyse. Thus, the information matrix is processed through a clarification or defuzzification method in order to synthesize the information before applying other type of analysis, like, for example, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) or the segment-attribute analysis (SAA). A good overview of the different existing defuzzification techniques that exist can be consulted in Kumar (2017). In essence, the idea is to convert the fuzzy information into a plausible or credible real number -crisp information. Some methods are more neutral than others, meanwhile others tend to favour more extreme opinions.

The defuzzification method in this study is based on Chen (1996), and it is calculated as a weighted average of the interval defined by the TFN $(a_1, a_2, a_3)$ giving more weight to the value which contents more truth according to the fuzzy ideas. Thus, the defuzzified value is obtained as $v_{\tilde{A}} = (a_1 + 2a_2 + a_3)/4$. The simplicity and the good properties of the proposal make this method, also known as a centroid method, as a good candidate that has been extensively used in many empirical applications (Benítez at al., 2007; Martin, Marrero-Rodríguez, Moreira, Román, & Santana, 2016). The method is highly robust and it is grounded on the ideas of Kaufmann and Gupta (1988). The centroid method is equivalent to the total integral value method when neutrality function is applied over other judgments either optimistic or pessimistic.

## 4.3 Similarity to ideal solutions

The step to obtain a synthetic RPTD index for each of the segments is based on the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) (Hwang and Yoon, 1981; Zeleny, 1982). Behzadian et al. (2012) find that TOPSIS is still one of the most popular MCDM methods. The method is computed as follows:

$$A^+ = \left\{ \left( \max V_{ij} \,|\, j \in J \right), \left( \min V_{ij} \,|\, j \in J' \right), i = 1, 2, \ldots, m \right\} \tag{3}$$

$$A^- = \left\{ \left( \min V_{ij} \,|\, j \in J \right), \left( \max V_{ij} \,|\, j \in J' \right), i = 1, 2, \ldots, m \right\} \tag{4}$$

where $J$ and $J'$ divide the different attributes included in the RPTD scale according to the benefit or cost characteristic. In our case, it is clear that all the 10 attributes included in the RPTD scale are considered as a benefit.

Once the ideal solutions are calculated, the relative RPTD index for each segment can be calculated through the distances of each segment to these obtained ideal solutions observed in the dataset as follows:

$$S_i^+ = dist(V_i, A^+) = \sqrt{\sum_{j=1}^{n} \left( V_{ij} - A_j^+ \right)^2} \quad i = 1, 2, \ldots, m \tag{5}$$

$$S_i^- = dist(V_i, A^-) = \sqrt{\sum_{j=1}^{n} \left( V_{ij} - A_j^- \right)^2} \quad i = 1, 2, \ldots, m \tag{6}$$

$$RPTD_i = \frac{S_i^-}{S_i^+ + S_i^-} \quad i = 1, 2, \ldots, m,$$ (7)

where $0 \le RPTD_i \le 1$. A particular segment of residents perceives the tourist activities as more positive whenever the relative index is closer to 1. Thus, RPTD synthetic indicator by a set of segments can be sorted according to the descending order to rank which segment perceives more or less positively the tourist activities. The rationale of the ranking provided by the synthetic indicator is clear, as RPTD is higher for a particular segment when the defuzzified vector for the segment is closer to the virtual positive ideal solution and/or further from the virtual negative solution.

## 4.4 Hybrid fuzzy clustering

D'Urso, Disegna, Massari and Osti (2016) justify this method for profiling postmodern consumers by adapting the fuzzy set theory to the classical consumer theory. In our case, this can also be extended for the more general construction of social preferences in the community of local residents. As the authors contend, it is not always a plausible assumption that consumers can only belong to only one cluster (Kotler, 1988; Li et al., 2013). In fact, researchers lose some important information when they assign consumers to one cluster and the probabilities of belonging to two or more clusters do not differ significantly (Chaturvedi, Carroll, Green, & Rotondo, 1997; Chiang, 2011; Li et al., 2013). Thus, the adoption of a fuzzy hybrid segmentation methods presents as one of the main advantages that the requirement of the segmentation of consumers in only one segment is dropped. Thus, a membership function is assigned to each consumer, in which the strength of belonging can determine whether there are pure or more ambivalent consumers (Kruse, Döring and Lesot, 2007).

The basics of the hybrid fuzzy cluster algorithm are presented below. The method is an extension of the Bagged Cluster algorithm introduced by Leisch (1999). Interested readers are referred to D'Urso et al. (2013, 2015, 2016) to get more information. The fuzzy C-means algorithm for fuzzy data (FCM-FD) is adopted and it can be expressed as follows:

$$
\begin{aligned}
\min : & \sum_{i=1}^{n} \sum_{c=1}^{C} u_{ic}^m d_F^2(\tilde{x}_i, \tilde{p}_c) = \sum_{i=1}^{n} \sum_{c=1}^{C} u_{ic}^m [w_2^2 \left\| a_2^i - p_2^c \right\|^2 + \\
& + w_1^2 (\left\| a_1^i - p_1^c \right\|^2 + \left\| a_3^i - p_3^c \right\|^2)] \\
& s.t. \quad m > 1, u_{ic} \geq 0, \sum_{c=1}^{C} u_{ic} = 1, \\
& \quad w_1 \geq w_2 \geq 0, w_1 + w_2 = 1
\end{aligned}
$$ (8)

Where, $d_F^2(\tilde{x}_i, \tilde{p}_c)$ represents the squared fuzzy distance between the *ith* resident and the profile of the *cth* cluster; the $\tilde{x}_i \equiv \{\tilde{x}_{ik} = (a_{1ik}, a_{2ik}, a_{3ik}) : k = 1 \ldots K\}$ denotes the TFN vector for the ith resident obtained from the observation of the K attributes, in our

case 10; $\tilde{p}_c \equiv \{\tilde{p}_{ck} = (p_{1ck}, p_{2ck}, p_{3ck}) : k = 1 \ldots K\}$ represents the fuzzy profile of the cth cluster; $\left\| a_2^i - p_2^c \right\|^2$ is the squared Euclidian distances between the centres of the TFN vectors of the ith resident and profile of the cth cluster; $\left\| a_1^i - p_1^c \right\|^2$ and $\left\| a_3^i - p_3^c \right\|^2$ are the squared Euclidian distances between the left and right extreme components of the TFN vectors of the ith resident and profile of the cth cluster, respectively; $w_1 \geq w_2 \geq 0$ are suitable weights for the center and extreme components for the fuzzy distance considered; $m > 1$ is a weighted exponent that controls the fuzziness of the obtained partition; $u_{ic}$ gives the membership degree of the ith resident in the cth cluster. The discussion of cluster validation and cluster profiles is omitted and interested readers are referred again to D'Urso et al. (2013, 2015, 2016).

## 5   Results and discussion

Table 4 shows the TFNs and defuzzified values that correspond to the total, the residents who do and do not work directly on tourism. It can be seen that the TFN matrix contains a lot of information that cannot be easily interpreted and this is usually a source for tension and stress of the readers who are not familiar with the fuzzy set theory. Looking at the values of the respective TFNs, it can be seen that the majority of the TFNs overlap, showing the essence of the fuzzy set theory when the information is extracted from the uncertainty generated by the Likert scales. Nevertheless, analysing the crisp information provided in the table, it can be inferred that for the average resident, the more positive impacts are observed in the generation of wealth and economic growth and the creation of jobs. On the other hand, the more negative impacts are observed in the containment of prices and the availability of affordable housing. A similar pattern is also observed for each of the segments.

The results are clearly concordant with those obtained by Aguiló and Rosselló (2005). The authors, analysing the residents' perception in the Balearic Islands, find that the economic impact of tourism is positively evaluated as 91%, 83% and 86% of the sample agrees that it generates employment, attracts investment, and generates business opportunities for local residents, respectively. On the other hand, they also find that there is a general perception that tourist development is also responsible for high price levels. Akis, Peristianis, and Warner (1996) find that the creation of jobs is not the only positive economic impact that matters, as, in Cyprus, the authors find that the local residents show a negative perception on tourism development because the local wage distribution changes replacing high-wage with low-wage jobs, and the tax liabilities increase.

[Insert Table 4 about here]

The positive and negative ideal solutions (PIS and NIS) are now calculated according to equations (3) and (4). Table 5 shows the ideal solutions, and for the sake of exposition, the segment of local residents which is more aligned with the most positive and negative perception towards tourism development is omitted. Nevertheless, it is observed that the more supportive segment is characterized for those who do not have ever an encounter with tourists On the other hand, the negative ideal solution is more characterized by those residents who totally disagree about the excessive dependence of air transport and the excessive tourist construction that exists in the south of the island. It is not easy to find a plausible conjecture for these comments, especially the last one. On one hand, regarding the encounters between tourists and local residents, it seems evident that the first observation explains in part the right part of the continuum of tourist-host encounters (Sharpley, 2014). In this part, the contact between local residents and tourists does never exist, and the author concludes that the tourist experience is not affected contrarily to the host perception. On the other hand, the observed segments for the negative ideal solution cannot be easily explained.

[Insert Table 5 about here]

The analysis of the vectors of these extreme observations gives very valuable information. First, it can be observed that there is only one attribute that is valued by some segment with the highest positive impact, i.e. all the local residents of a particular segment have answered very positively the impacts of tourism on "generation of wealth and economic growth". However, on the negative ideal solution, there are always some residents whose perception is higher than very negatively, as all the attributes show figures higher than 7.5. Another interesting result to highlight is that the positive ideal solution is characterized because all the attributes show figures higher than 50 (positive impacts), and the negative solution only has one attribute, the "generation of wealth and economic growth", which shows positive impacts. The rest of the attributes shows negative impacts. Analysing the fourth column of the table, it can be seen that, again, "the generation of wealth and economic growth" shows more homogeneity, and that "the improvement of public services" is seen as more heterogeneous.  This last observation can be handled by introducing a tourist tax earmarked for improving public services. Earmarking tourist taxes, normally named eco-taxes, is a frequent practice (Dwyer, Forsyth, & Dwyer, 2010). Nevertheless, the eco-taxes are not easily traced and sometimes they are used for very diverse policies: (1) to fund tourism promotion; (2) to renovate some public or private facilities; (3) to improve the environment; and (4) to be part of the general regional or national budget. Do Valle, Pintassilgo, Matias and André (2012) contend that, in spite of the use

of the taxes, the introduction usually create conflicting perceptions among local residents, the local tourist stakeholders and tourists, as the agents usually have very different objectives and preferences. Normally, taxes usually face strong opposition from the direct taxpayers.

## 5.1   The fuzzy clusters

In this study, the three-clusters solution is going to be considered for 2 different scenarios: (1) extreme; and (2) real. The first scenario is characterized by using as the prototypes of the profiles of each of the clusters non-real observations obtained from the ideal solutions of the TOPSIS method, and the ambivalent prototype is the average of the positive and negative ideal solutions. The second scenario is characterized by real observations in which the prototypes are selected according to the minimum, the maximum and the median of the synthetic RPTD index. D'Urso et al. (2016) contend that the three-clusters solution usually permit researchers to obtain a better image of the market segment independently of the best solution obtained by some statistical indicator based on the within clusters variability. Table 6 shows the three profiles or prototypes for the two scenarios, and for the sake of exposition, the fuzzy conversion is reversed to present the crisp information. Thus, the table shows a vector of 10 values, instead of the respective representative TFN vector. It can be seen that the names of the prototypes are as follows: (1) Lovers; (2) Haters; and (3) Ambivalent. The meaning of the names is clear as the first cluster is characterized by those residents whose RPTD synthetic indicator is closer to 1. The second cluster, on the other hand, is characterized by those residents who observe more negative impacts than positive impacts. And finally, the third cluster is an intermediate cluster characterized by some positive and negative impacts at the same time. The difference between the two scenarios is based on the selection of the positive and negative individual ideal solutions for the first scenario, meanwhile the second scenario is characterized by real observations in the sample of residents. This difference will be more clear in the discussion of the membership function.

<Insert Table 6 here>

It can be observed that the profile for the extreme lovers is characterized for perceiving nine attributes of the scale as very positive. The unique exception is the availability of affordable housing which is perceived by the prototype as positive. Regarding the extreme haters, the prototype is characterized by perceiving the impacts of tourism as negative or very negative. There is an apparent duality between the impacts on the economy which are perceived as negative from the other two dimensions, sociocultural and the environment, which are perceived as very negative. Analysing now the real scenario, it is observed that the lovers have less love than the extreme case, as there are four additional impacts that are perceived as only positive: (1) creation of jobs; (2) improvement of infrastructures; (3) conservation of the

environment; and (4) improvement of cultural offer and leisure. There is a balance between the positive (5) and the very positive impacts (5). Similarly, the haters do not hate tourism development as much as the extreme haters. Now, the distribution of the residents' perception for the hater prototype shows only 2 very negative impacts for the conservation of the environment and the containment of prices; and the impact for the generation of wealth and economic growth is perceived as neutral; for the rest of the seven impacts of the scale, the perception of the prototype is negative. The ambivalent prototype for the real scenario is characterized by: (1) three neutral impacts for generation of wealth and economic growth, improvement of cultural offer and leisure and availability of affordable housing; (2) two negative impacts for containment of prices and improvement of public services; and (3) 5 positive impacts for the rest of the impacts not mentioned above.

It is out of the scope of the current paper to compare statistically the fuzzy clustering method with other more conventional cluster methods such as k-means or hierarchical. Nevertheless, unlike these conventional methods, the fuzzy clustering technique does not partition data into mutually exclusive clusters, which is an advantage for the purpose of our study, and the profiles for each of the representative clusters are primarily selected. Table 6 shows that applying the k-means cluster method for 3 clusters, the obtained solution is very different from the one obtained by the fuzzy clustering method, as the clusters are now characterized by lovers, cautious lovers and haters. The main change is produced in the intermediate cluster in which the fuzzy clustering does not select any particular attribute as the main direction for showing ambivalence. Meanwhile, in the k-means method, the cautious-lovers are characterized by seeing as positive all the attributes included in the scale except those related to the conservation of the environment, the availability of affordable housing and the containment of prices. Interestingly, the profiles of the prototypes of the real case scenario are correctly included in the plausible clusters, that is, the fuzzy lover prototype is included in the lovers cluster, the ambivalent prototype is included in the cautious-lovers cluster, and the haters prototype is included in the haters cluster.

Figure 1 shows the ternary plot for the two scenarios. The ternary plots are an adequate tool to represent graphically the distribution of the residents according to the membership degree when the analysis is based on the three-clusters solution. The graph permits a better understanding on how the residents are distributed among the three clusters. Analysing the left graph (extreme case scenario), it is observed that there is a considerable group of residents who belong to the "ambivalent perception" with a high membership degree (between 80% and 100%). The majority of the residents are situated in the small triangle of the right vertex where the pure ambivalent prototype is situated. This triangle is characterized because the complementarity probability is split between the other two clusters, "lovers" and "haters". There is also a small group of "lovers" and "ambivalents" characterized by

laying in the line that joins both vertices. Similarly, there is also a more numerous group of residents characterized by being "haters" and "ambivalents". It is not a surprise that there are no residents laying in the line that joins "haters" and "lovers". Calculating the average probability of the membership degree, it is obtained that "lovers" are in average represented by 9 per cent, "haters" by 7 per cent, and "ambivalents" by 84 per cent. Thus, it can be concluded that in Gran Canaria, the residents are aware of the positive and negative impacts of tourism as they have been living with the sector for more than 60 years.

<Insert Fig. 1 here>

The right graph represents the second scenario (real) in which the prototypes are chosen from the sample as observed residents. Thus, it can be seen that there are three pure cases which correspond to these real observations and lay in the vertices of the triangle. Interestingly, it can be seen that this scenario presents a higher heterogeneity, but the same pattern is still observed regarding the most representative group of residents which lays still in the small triangle nearest to the vertex of "ambivalents". The mixed groups of "lovers" and "ambivalents" and "haters" and "ambivalents" are still present but with a higher degree of dispersion than in the first scenario. A small new mixed group of "lovers", "haters" and "ambivalents" exists as there are some residents who lay in the central small triangles characterized by more balanced membership degrees among the three clusters. In this case, the distribution of the membership degree is more balanced than in the first scenario, as "lovers", "haters" and "ambivalents" are represented now by 19.6 %, 21.8 % and 58.6 %, respectively. It is interesting to remark that the average distribution of "lovers" and "haters" has now increased, and that the magnitude between them has been reversed as now there are more "haters" than "lovers". A very preliminary analysis of some factors that can affect the cluster membership as the gender or residing in a tourist municipality shows that the clusters are not highly differentiated for these factors. For example, for residents in a tourist municipality, the clusters are represented by 19.1 %, 19.2 % and 61.7 %, respectively; meanwhile for those who do not reside in a tourist area, the percentages are very similar: 20 %, 23.9 % and 56.1 %. Any test to compare the means for the clusters according to the two variables allow to determine that clusters do not have significant different means according to the gender or the tourist residential area.

In summary, the real case scenario seems to discriminate less than the extreme case scenario, but in both cases, it is clear that the residents of Gran Canaria seem to be really aware of the benefits and the costs associated with tourism development. The results can also be used by DMO managers or other industrial stakeholders, like hoteliers and chamber of commerce, to analyse with other research studies whether the more negative impacts seen for each cluster, especially for the group of "haters",

are or not real. Thus, it would be necessary to analyse the environmental costs and degradation produced by the tourist activities. Similarly, an analysis of the containment of prices would also be necessary. Thus, residents could be better informed and the perception towards tourism development would be better decided.

# 6   Conclusions

The analysis of the host communities' support for tourism development is crucial for the own success of tourism development. The scale to measure the residents' perception towards tourism is still debatable. Our study, after an extensive literature review, develops a RPTD scale based on 10 attributes that contains the main positive and negative impacts studied in previous research. The study does not develop or refine a residents' perception scale as this is not the main objective of the paper.

The paper applies for the first time a fuzzy hybrid clustering method to analyse the residents' perception towards tourism development in Gran Canaria, Spain. Gran Canaria is seen as a remarkable case study to analyse the topic from two well established theories used in the field: (1) The Social Exchange Theory; and (2) the Tourism Area Life Cycle. The paper proposes a fuzzy hybrid method to calculate a synthetic RPTD index and a fuzzy hybrid clustering method to obtain three clusters named as "lovers", "haters" and "ambivalents". Important insights from the results have been discussed and might be of interest for different for different stakeholders, mainly politicians, residents, policy makers and the main tourist associations. Specifically, our findings show that the main benefits of the tourism development are associated to economic benefits, and that, on the other hand, the negative impacts are more related with the environment. The Butler's Tourism Area Life Cycle (TALC) in Gran Canaria makes that the majority of the residents can be considered "ambivalents". Nevertheless, a word of caution is given to the authorities, as the group of "haters" is not negligible in the second scenario. The negative residents' perception may decrease the tourist competitiveness of the area (Diedrich and García-Buades, 2009).

From the four key generic strategic objectives that should be addressed by destination marketing organizations (DMOs) (Buhalis, 2000): (1) Enhance the long-term prosperity of local people; (2) Delight visitors by maximising their satisfaction; (3) Maximise profitability of local enterprises and maximise multiplier effects; (4) Optimise tourism impacts by ensuring a sustainable balance between economic benefits and socio-cultural and environmental costs (p.100). The results of our study can help DMOs in the first and fourth objectives.

In this regard, politicians and policy makers need to envisage strategies leading to have happy hosts (Snaith and Haley, 1999), as these are crucial for the destination to be competitive in this global industry. The research agenda also needs to incorporate

more quantitative analysis to evaluate the impacts of the sector, as part of the discourse that prevails in the formation of residents' perception is more grounded in ideological positions. Similarly, Harrill (2004) contends that those in charge of tourism planning and development need to focus more in the well-being of the local communities minimizing the negative impacts.

The study is not exempt from some limitations. First, the study does not analyse other scenarios considering more clusters. "Ambivalents" is a wide cluster that can include other important segments that have been analysed in other studies like, for example, "cynics", "prudents" or "romantics" (Sharpley, 2014). Similarly, the cautious-lovers found by applying the k-means method is also a hybrid of this ambivalent situation. Second, RPTD can be affected by the instrumental scale used in the study, and for this reason, a further analysis regarding different scales is urgently needed. It would be difficult, if not possible, to find a unique universal scale that measures RPTD in all the contexts. Third, the study finds that the residents are not homogenous regarding RPTD, but knowing the relationship between the membership degree for each cluster and other socio-demographic variables would also be a promising area for future research, especially now, that some tourism phobia is appearing as a reaction in areas where the implementation of the sharing economy apartments is very strong. Fourth, the analysis could also be improved with a longitudinal vision considering, for example, the administration of the survey before and after giving the results of the benefits and costs of the tourist industry.

## Ackowledgements

## 7   References

Aguiló, E., & Rosselló, J. (2005). Host community perceptions: a cluster analysis. Annals of Tourism Research, 32(4), 925-941.

Akis, S., Peristianis, N., & Warner, J. (1996). Residents' attitudes to tourism development: the case of Cyprus. *Tourism Management*, 17(7), 481-494.

Almeida García, F., Balbuena Vázquez, A., & Cortés Macías, R. (2015). Resident's attitudes towards the impacts of tourism. *Tourism Management Perspectives*, 13, 33–40. http://doi.org/10.1016/j.tmp.2014.11.002

Andriotis, K., & Vaughan. (2003). Urban residents' attitudes toward tourism development: the case of Crete. Journal of Travel Research, 42(2). 172-185.

Ap, J. (1992). Residents' perceptions on tourism impacts. *Annals of Tourism Research*, 19(4), 665-690.

Ap, J., & Crompton, J. L. (1998). Developing and testing a tourism impact scale. *Journal of Travel Research*, *37*(2), 120-130.

Bai, C., Dhavale, D. & Sarkis, J. (2014). Integrating Fuzzy C-Means and TOPSIS for performance evaluation: An application and comparative analysis. *Expert Systems with Applications*, 41(9), 4186-4196.

Behzadian, M., Khanmohammadi Otaghsara, S., Yazdani, M., & Ignatius, J. (2012). A state-of the-art survey of TOPSIS applications. *Expert Systems with Applications*, 39(17), 13051-13069.

Bénitez, J. M., Martín, J. C., & Román, C. (2007). Using fuzzy number for measuring quality of service in the hotel industry. *Tourism management*, *28*(2), 544-555.

Bhat, C. R., & Dubey, S. K. (2014). A new estimation approach to integrate latent psychological constructs in choice modeling. *Transportation Research Part B: Methodological*, 67, 68–85. http://doi.org/10.1016/j.trb.2014.04.011

Brida, G., Chiappa, G., Meleddu, M., and Pulina, M. (2014). A comparison of residents' perceptions in two cruise ports in the Mediterranean Sea. International Journal of Tourism Research, 16(2), 180-190.

Brida G., Lanzilotta, B. and Lionetti, S. (2010). Research note: the tourism-led growth hypothesis for Uruguay. *Tourism Economics,* 16(3), 765–771.

Brida, G., Disegna, M. and Osti, L. (2014). Residents' attitudes and perceptions of tourism impacts and their policy implications. TOURISMOS: An International Multidisciplinary Journal of Tourism 9(1): 37-72.

Buckley, J. J. (1985). Ranking alternatives. Using fuzzy numbers. *Fuzzy Sets and Systems*, 15(1), 21–31.

Buhalis, D. (2000). Marketing the Competitive Destination of the Future. *Tourism Management*, *21*(1), 97–116.

Bujosa, A., & Rosselló, J. (2007). Modelling environmental attitudes toward tourism. *Tourism Management*, 28,688–695.

Butler, R. W. (1980). The concept of a tourist area cycle of evolution: implications for management of resources. *Canadian Geographer/Le Géographe canadien*, *24*(1), 5-12.

Cardona, J. R., Bassi, D. Á., & Dolores Sánchez-Fernández, M. (2019). The residents' attitudes towards incoming tourism in Punta Del este, Uruguay. In M. A. Camilleri (Ed.), *Tourism Planning and Destination Marketing* (pp. 99-119). Bingley, UK: Emerald Publishing Limited.

Carmichael, B. (2000). A matrix model for resident attitudes and behaviours in a rapidly changing tourist area. *Tourism Management*, 21(6), 601-611

Chaturvedi, A., Carroll, J. D., Green, P. E., & Rotondo, J. A. (1997). A feature-based approach to market segmentation via overlapping k-centroids clustering. *Journal of Marketing Research*, 34, 370-377.

Chen, S.M. (1996). Evaluating weapon systems using fuzzy arithmetic operations. *Fuzzy Sets and Systems,* 77(3), 265-276

Chiang, W.-Y. (2011). Establishment and application of fuzzy decision rules: an empirical case of the air passenger market in Taiwan. *International Journal of Tourism Research*, 13, 447-456.

Del Chiappa, G., Lorenzo-Romero, C., and Gallarza, M. (2018). Host community perceptions of cruise tourism in a homeport: A cluster analysis. Journal of Destination Marketing & Management, 7, 170-181.

Delamere, T. A. (1998). Development of a scale to measure local resident attitudes toward the social impact of community festivals. Unpublished PhD dissertation, University of Alberta.

Dickson, J., & Albaum, G. (1977). A Method for Developing Tailormade Semantic Differentials for Specific Marketing Content Areas. *Journal of Marketing Research*, 14(1), 87-91.

Diedrich, A., & Garcia-Buades, E. (2009). Local perceptions of tourism as indicators of destination decline. *Tourism Management*, 30(4), 512-521

Do Valle, P. O., Pintassilgo, P., Matias, A., & André, F. (2012). Tourist attitudes towards an accommodation tax earmarked for environmental protection: A survey in the Algarve. *Tourism Management*, 33(6), 1408–1416. http://doi.org/10.1016/j.tourman.2012.01.003

Doxey, G. (1975). A causation theory of visitor-resident irritants: methodology and research inferences. In Proceedings of the sixth annual conference of the travel research association (pp. 195-198). San Diego, CA: Travel and Tourism Research Association.

D'Urso, P., De Giovanni, L., Disegna, M., & Massari, R. (2013). Bagged clustering and its application to tourism market segmentation. *Expert Systems with Applications*, 40, 4944-4956. http://dx.doi.org/10.1016/j.eswa.2013.03.005.

D'Urso, P., Disegna, M., Massari, R., & Osti, L. (2016). Fuzzy segmentation of postmodern tourists. *Tourism Management*, 55, 297–308. http://doi.org/10.1016/j.tourman.2016.03.018

D'Urso, P., Disegna, M., Massari, R., & Prayag, G. (2015). Bagged fuzzy clustering for fuzzy data: an application to a tourism market. *Knowledge-Based Systems*, 73, 335-346.

Dwyer, L., Forsyth, P., & Dwyer, W. (2010). *Tourism economics and policy* (Vol. 3). Bristol (UK): Channel View Publications.

Franzidis, A., & Yau, M. (2018). Exploring the differences in a community's perception of tourists and tourism development. Tourism Planning & Development, 15(4), 382-397.

Godfrey, K. B. (1998). Attitudes towards 'sustainable tourism'in the UK: a view from local government. *Tourism Management*, *19*(3), 213-224.

Gursoy, D., Jurowski, C., & Uysal, M. (2002). Resident attitudes: A structural modeling approach. *Annals of tourism research*, *29*(1), 79-105.

Harrill, R. (2004). Residents' attitudes toward tourism development: a literature review with implications for tourism planning. *Journal of Planning Literature*, 18(3), 251-266.

Hwang, C. & Yoon, K. (1981). *Multiple attribute decision making: Methods and application*. New York: Springer.

ISTAC (2017). http://gobiernodecanarias.org/istac/. Accessed on 01 June 2018.

Jayaraman T.K., Chen, H. and Bhatt, M. (2014). Research note: Contribution of foreign direct investment to the tourism sector in Fiji: an empirical study. *Tourism Economics,* 20(6), 1357–1362.

Jurowski, C., & Gursoy, D. (2004). Distance effects on residents' attitudes toward tourism. Annals of Tourism Research, 31(2), 296-312.

Kaufmann, A., & Gupta, M. (1988). *Fuzzy mathematical models in engineering and management science.* New York, NY: Elsevier Science.

Kotler, P. (1988). *Marketing management* (6th ed.). Englewood Cliffs, NJ: Prentice Hall.

Kruse, R., Döring, C. & Lesot, M.-J. (2007). Fundamentals of fuzzy clustering. In J. V. de Oliveira, & W. Pedrycz (Eds.), Advances in fuzzy clustering and its applications (pp. 3-30). John Wiley & Sons.

Kumar, H. (2017). Some Recent Defuzzification Methods. In D-F Le (Ed.), *Theoretical and Practical Advancements for Fuzzy System Integration* (pp. 31-48). Hershey, PA: IGI Global.

Kumar, N., Kumar, R.R., Kumar, R. and Stauvermann, P.J. (2019). Is the tourism–growth relationship asymmetric in the Cook Islands? Evidence from NARDL cointegration and causality tests. Tourism Economics (forthcoming), 1-24.

Kumar, R.R. and Kumar, R. (2012). Exploring the nexus between information and communications technology, tourism and growth in Fiji. *Tourism Economics*, 18(2), 359–371.

Lankford, S. V., & Howard, D. R. (1994). Developing a tourism impact attitude scale. *Annals of tourism research*, *21*(1), 121-139.

Leisch, F. (1999). Bagged clustering. Working paper 51 SFB Adaptive Information Systems and Modelling in Economics and Management Science WU Vienna University of Economics and Business.

Li, X., Meng, F., Uysal, M. and Mihalik, B. (2013). Understanding China's long-haul outbound travel market: an overlapped segmentation approach. *Journal of Business Research*, 66, 786-793.

Lindberg, K., & Johnson, R. L. (1997). Modeling resident attitudes toward tourism. *Annals of Tourism Research*, *24*(2), 402-424.

Mamdani, E. & Assilian, S. (1975). An experiment in linguistic synthesis with a fuzzy logic controller. *International Journal of Man-Machine Studies*, 7(1), 1-13.

Martin, B. S. (1999). The efficacy of growth machine theory in explaining resident perceptions of community tourism development. *Tourism Analysis*, *4*(1), 47-55

Martín, H. S., de los Salmones Sánchez, M. M. G., & Herrero, Á. (2017). Residents' attitudes and behavioural support for tourism in host communities. *Journal of Travel & Tourism Marketing*, 00(00), 1–13. http://doi.org/10.1080/10548408.2017.1357518

Martin, J. C., Marrero-Rodríguez, J. R., Moreira, P., Román, C., & Santana, A. (2016). How access transport mode to a world Heritage City affects visitors' experienced quality. *Tourism Economics*, 22(2). http://doi.org/10.5367/te.2016.0550

McCaughey, R., Mao, I., & Dowling, R. (2018). Residents' perceptions towards cruise tourism development: the case of Esperance, Western Australia. Tourism Recreation Research, 43(3), 403-408.

Muresan, I., Oroian, C., Harun, R., Arion, F., Porutiu, A., Chiciudean, G and Lile, R. (2016). Local residents' attitude toward sustainable rural tourism development. Sustainability, 8(1), 100.

Nunkoo, R., Smith, S. L. J., & Ramkissoon, H. (2013). Residents' attitudes to tourism: a longitudinal study of 140 articles from 1984 to 2010. *Journal of Sustainable Tourism*, 21(1), 5–25. http://doi.org/10.1080/09669582.2012.673621

Olya, H. G., & Gavilyan, Y. (2017). Configurational models to predict residents' support for tourism development. *Journal of Travel Research*, 56(7), 893-912.

Osagie, I., & Buzinde, C. N. (2011). Culture and postcolonial resistance: Antigua in Kincaid's A Small Place. *Annals of Tourism Research*, *38*(1), 210-230.

Peters, M., Chan, C. S., and Legerer, A. (2018). Local perception of impact-attitudes-actions towards tourism development in the Urlaubs region Murtal in Austria. Sustainability, 10(7), 2360.

Saayman, M., Martín, J. C., & Román, C. (2016). There is no fuzziness when it comes to measuring service quality in national parks. *Tourism Economics*, *22*(6), 1207-1224.

Saeida Ardakani, S., Nejatian, M., Farhangnejad, M. A. & Nejati, M. (2015). A fuzzy approach to service quality diagnosis. *Marketing Intelligence & Planning*, 33(1), 103-119.

Šegota, T., Mihalič, T., and Kuščer, K. (2017). The impact of residents' informedness and involvement on their perceptions of tourism impacts: The case of Bled. Journal of destination marketing & management, 6(3), 196-206.

Sharpley, R. (2014). Host perceptions of tourism: A review of the research. *Tourism Management*, 42, 37–49. http://doi.org/10.1016/j.tourman.2013.10.007

Sirakaya, E., Jamal, T. B., & Choi, H. S. (2001). Developing indicators for destination sustainability. In D.B. Weaver (Ed.), *The encyclopedia of ecotourism* (pp. 411-432). New York: CAB International.

Snaith, T., & Haley, A. (1999). Residents' opinions of tourism development in the historic city of York, England. *Tourism Management*, 20(5), 595–603. http://doi.org/10.1016/S0261-5177(99)00030-8

UNWTO (2018). World Tourism Barometer, 18(3). Madrid: UNWTO.

Uysal, M., Perdue, R., & Sirgy, M. J. (Eds.). (2012). Handbook of tourism and quality-of-life research: Enhancing the lives of tourists and residents of host communities. Berlin: Springer Science & Business Media.

Vargas-Sánchez, A., Plaza-Mejía, M., & Porras-Bueno, N. (2009). Understanding residents' attitudes toward the development of industrial tourism in a former mining community. *Journal of Travel Research*, 47(3), 373-387.

Yu, C.P., Chancellor, H.C., & Cole, S.T. (2011). Measuring residents' attitudes toward sustainable tourism: A re-examination of the sustainable tourism attitude scale. *Journal of Travel Research, 50*, 57–63.

Zadeh, L. A. (1965). Fuzzy sets. *Information and Control*, 8(3) 338-353.

Zadeh, L. A. (1975). The concept of a linguistic variable and its application to approximate reasoning: I. *Information Science,* 8(3), 199-249.

Zadeh, L. A. (1984). Making computers think like people. *Spectrum, IEEE*, 21(8), 26–32.

Zeleny, M. (1982). *Multiple Criteria Decision Making*. New York: McGraw-Hill.

Zerva, K., Palou, S., Blasco, D., & Donaire Benito, J. A. (2018). Tourism-philia versus tourism-phobia: residents and destination management organization's publicly

expressed tourism perceptions in Barcelona. *Tourism Geographies*, 0(0), 1–24. http://doi.org/10.1080/14616688.2018.1522510

Zhang, J., Inbakaran, R., & Jackson, M. (2006). Understanding community attitudes towards tourism and host-guest interaction in the urban-rural border region. *Tourism Geographies: An International Journal of Tourism Space, Place and Environment*, 8(2), 182–204. doi:10.1080/14616680600585455

Zhang, J., Prater, E., & Lipkin, I. (2013). Feedback reviews and bidding in online auctions: an integrated hedonic regression and fuzzy logic expert system approach. *Decision Support Systems*, 55, 894-902. http://dx.doi.org/10.1016/