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Determination of short-term trailer park amenities using a fuzzy method

Ece Doğantan [1]*, Željko Stević [2] and Çağlar Karamaşa [3]

[1] Department of Hospitality Management, Anadolu University, Eskişehir, Turkey. E-mail: edogantan@anadolu.edu.tr

[2] Faculty of Transport and Traffic Engineering, University of East Sarajevo, Doboj, Bosnia and Herzegovina E-mail: zeljko.stevic@sf.ues.rs.ba

[3] Department of Business Administration, Anadolu University, Eskişehir, Turkey. E-mail: ckaramasa@anadolu.edu.tr

*Corresponding author

Abstract

Campgrounds are an essential part of the camping experience due to the attractions and facilities they offer to campers. The factors that motivate campers to travel have increasingly become more complex making it vital to take camper expectations into account for effective planning of campgrounds. The present study aimed to determine the trailer park amenities based on expert opinion. The paper systematically applied the Fuzzy Pivot Pairwise RElative Criteria Importance Assessment (Fuzzy PIPRECIA) Method in the selection of the trailer park criteria. Four main criteria and 20 sub-criteria were considered. In the findings the amenities were structured as follows: primarily, 'location,' followed by 'necessities' and 'campground attributes' and finally 'facilities and camping tools.' Spearman and Pearson correlation coefficients were employed to determine the consistency of the proposed model.

Keywords: Camping, caravan, trailer parks, trailer park amenities, fuzzy PIPRECIA method

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Introduction

Camping is a form of outdoor recreation that includes both accommodation and activities set in nature. Over time it has developed to include different forms of accommodation other than tents. A range of choices for comfort, style, and originality has contributed to the popularity of camping in Europe, North America, and Australia in particular (Brooker and Joppe, 2013). As a result of the COVID-19 pandemic, the popularity of camping has now increased in many other countries. More holiday-makers have declared an intention to go camping/glamping after the pandemic (45.9%) than hotel/resort travel plans (24.7%). Research has also revealed that holiday-makers plan to go on twice as many post-COVID-19 camping trips as they took in 2019 (21.4%) (Craig and Karabas, 2021).

Camping is one of the most popular recreational activities globally and perhaps the oldest form of accommodation. Hunters and gatherers, conquerors, explorers, and traveling communities were all campers at a point in time. In the modern-day, most campers visit campgrounds for recreational purposes due to the nature and range of accommodation options offered regardless of the socio-economic status of the camper. Depending on the destination, campgrounds differ in size, ownership, location, accommodation facilities, and available activities. In the USA, campgrounds can be divided into two groups: primitive (unplanned) and commercial (organized) campgrounds. Primitive camps are random, lack facilities and predetermined activities, are surrounded by nature, and are more adventure-oriented. These campsites can be reached by horse, on foot, or by mountain bike. In primitive camps, activities such as hunting, hiking, and fishing are prevalent. These camps are generally free. However, there are specific regulations and property restrictions in place. Some primitive camps charge visitors to access public land. Private individuals or organizations operate most camps in the USA. Unlike the USA, primitive camps do not exist in Europe, and people can set up camps wherever they want. Commercial campgrounds provide necessities such as showers, hot water, and power. In addition to these amenities, they may also have tennis courts, saunas, spas, mini-golf courses, swimming pools, and cafeterias (Timothy and Teye, 2009: 227; Doğantan, 2014).

Organized campgrounds offer economical and natural accommodation alternatives for nature enthusiasts. The leading accommodation alternative is to stay in a trailer, a vehicle manufactured particularly for travel, camping, and short or long-term accommodation. In contrast to the hotels commonly preferred in mass tourism, trailers provide an accommodation model that preserves the natural balance and provides natural views free from urban buildings. Trailers (caravans) are motor vehicles with various technical equipment that fulfill campers' (caravanners) minimum travel requirements and are both a means of transportation and an accommodation option (Patterson *et al.*, 2015). Trailers are also self-contained units that provide shelter when connected to adequate systems and cleaning installations (Davidson, 1973: 4).

Caravanning tourists travel to destinations (campgrounds) with specific motivations such as escape from the daily routine, self-renewal, and self-realization, relaxation, economic factors, socialization, participation in certain activities, learning and exploring, freedom, distancing themselves from technology, as well as reducing their environmental impact (Doğantan, 2014). Considering that motivations play an essential role in holiday-makers' decision on destination and the level of development of these destinations (Sirakaya and Woodside, 2005), it may be that trailer parks provide certain facilities and services above and beyond the traditional campgrounds. Thus, the present study aims to determine the different amenities campers expect to find in trailer parks compared to when they go on a classic camping trip. It also aims to assess which of these amenities are most important to campers.

Caravanning is a relatively neglected area of study (Mikkelsen and Cohen, 2015). As popular and broad-natured as camping and outdoor hospitality is, it has received minimal attention in the literature (Brooker and Joppe, 2013). Previous studies have indicated that camping and caravanning tourism requires greater scholarly scrutiny (Rogerson and Rogerson, 2020). Furthermore, studies on trailers focus on long-stay trailer home parks, and only a limited number of studies address short-stay recreational trailer parks. The current research focuses on short-stay recreational trailer parks from the supply angle.

Most of the previous studies on camping amenities have relied on qualitative methods in their assessment. In contrast, the present study employs the Fuzzy PIPRECIA (PIvot Pairwise RElative Criteria Importance Assessment) method, which is preferable when the data involves many decision-makers. In further studies, the tool of rapid rural assessment, which could be developed by Fuzzy method, could be used as a guide in assessing the suitability of the destinations for trailer parks.

Literature review

Campgrounds are additional facilities put in by investors to complement natural attributes such as beaches, mountains, prairies, lakes, hunting grounds, fresh air, vegetation, and archeological sites with cultural features. Investors also offer various activities in campgrounds to ensure repeat visits and camper satisfaction. For example, sports activities are among the most popular activities in campgrounds. Campgrounds offer sports activities such as riding trails, swimming pools, mini-golf courses, tennis courts, and basketball and volleyball courts. Furthermore, tournaments, games, and other sports activities create opportunities for socialization and ensure active participation by the campers. Campgrounds often also provide cultural activities such as arts and crafts, access to historical artifacts and architectural remains, and ethnographical education. The more organized the activities are, the more tourists are encouraged to participate in them and the entertainment on offer (Gračan *et al.* 2010). Recreational trailer parks, like campgrounds, offer private and social areas. Studies emphasize the fact that the basic infrastructural requirements for trailers include power, water, and bathrooms. These infrastructural requirements are simple, cheap, and easy to establish. Trailer parks also provide basic amenities such as power, access to clean water, and wastewater discharge, in addition to safe and healthy accommodation amenities (Ötügen, 2010; Doğantan, 2014).

There are many studies in the literature that have classified the key criteria by which campers choose a campground. Doğantan and Emir (2019) determined the five key criteria in trailer park destination planning as "environmental factors", "natural factors", "recreational activities", "recreational elements", and "sociocultural factors". Similarly, Topay and Koçan (2009) categorized camping selection criteria based on "natural" and "cultural" factors and grouped these factors as the first and second levels in each category. Daniels and Marion (2006) determined the key criteria for a campground as being "utility," "environmental factors," and "social factors." White *et al.* (2001) categorize the key campsite criteria as "locational," "social," "impact condition," and "scenic managerial." In various studies, camping services are categorized under four criteria: people, service, tangible, and bathroom. "People" refers to the softer and more personal, people-oriented aspect of the camping experience. "Service" relates to the process-oriented elements in service delivery, while tangible reflects the more physical-oriented aspects of the camping experience (O'Neill *et al.*, 2010).

Some studies have investigated the criteria involved in the choice of the campground from the demand angle. For example, White *et al.* (2007) explained how trailer park users' expectations are normally linked to the "general properties," including price, availability, and location; "specific characteristics," including acceptance of pets, good site location within the park, and "service and facility

characteristics," including clean bathrooms and shower facilities. Lee *et al*. (2019) identify the five attributes that affect visitors' choices when it comes to glamping as "price" (glamping price), "atmosphere" (provision of convenience tools), "cleanliness" (condition of room, private shower), "congestion," and "security" (the presence of a security guard). Gursoy and Chen (2012) determined the factors that likely influence the choice of the campground as "necessities," "campground attributes," "facilities," "camping tools," and "location." Fjelstul *et al*. (2012) categorized the key criteria under six themes; "campground attributes", "campsite attributes", "outdoor activities", "vicinity", "campground policies", and "staff".

A review of that studies that have focused on campground amenities based on supply and demand reveals the expectations of holiday-makers regarding campground/trailer park amenities can be classified under five main categories, namely “necessities”, “campground attributes”, “facilities”, “camping tools”, and “location”, as summarized by Gursoy and Chen (2012). This study follows the five factor categorization outlined in Table 1.

Table 1. *Amenities of campgrounds*

Necessities	Water taps (drinking water), sewage dump facilities, caravan shade, security and safety, flush toilets/restrooms, shower, recycle, electricity/energy, privacy
Campground attributes	Parking for the second car, reasonable camping fee, park cleanliness, park maintenance, quality of accommodation, staff efficiency/friendliness, kitchen for campers, cleaning service
Facilities	Swimming, playground, shops, laundry facilities, dishwashing, fishing, sport course, camping, social activities/interactions, sportive facilities, events, health/sanitary facility, game room/entertainment, restaurant, recreation activities, healthy, organic, and fresh food, walking, trekking, quiet/private/uncrowded, water sports
Camping tools	Camping tools, campfire, picnic units tables for BBQs, cookers, trash bin, fountain, camping equipment, additional services such as gas station, market, recreational vehicle (RV) hookups, cable, wifi
Location	Closer to a water supply, scenic, accessible, closer to urban development, closer to the beach and nature, natural surroundings, good transportation networks

Previous studies related to campground amenities in terms of criteria are presented in Appendix 1.

Methodology

The study aims to determine the level of importance given to each of the outlined factors based on expert opinions. The study is exploratory i.e., it is borne from the need to understand and examine a social phenomenon thoroughly. Purposive sampling was preferred on account that it allows researchers to select the most suitable samples for the purpose of the study. Initiatives supporting camping and caravanning in Turkey are organized by the Turkish National Camping and Caravanning Federation. Five members of the society were therefore included in the study as experts in order to gain from their experience in the field of caravanning. Furthermore, opinion was also sought from six academics working in Turkish universities who have conducted studies on rural destinations, recreation, camping, and caravanning. In February 2020, the researchers sent out online questionnaires by email and received responses from 11 experts. The term “expert” here is taken to mean a participant who is “knowledgeable” about the topic being researched, as well as someone who is “competent and in a position to speak about the subject” (Hasson *et al*., 2000: 1010).

Table 2. *Demographic characteristics of the experts*

Code	Gender	Age	Occupation
E1	Male	72	Retired engineer
E2	Female	36	Housewife
E3	Male	69	Factory owner
E4	Male	45	Engineer
E5	Female	52	Manager
E6	Male	34	Academic
E7	Female	40	Academic
E8	Female	61	Academic
E9	Female	34	Academic
E10	Male	35	Academic
E11	Male	44	Academic

Operations on fuzzy numbers

A fuzzy number $\bar{B}$ on R could be a triangular fuzzy number (TFN) if its membership function $\mu_{\bar{B}}(x)$: $R \rightarrow [0,1]$ is equal to Equation (1):

$$\mu_{\bar{B}}(x) = \begin{cases} \frac{x-d}{e-d} & d \leq x \leq e \\ \frac{f-}{of-e} & e \leq x \leq f \\ 0 & otherwise \end{cases} \quad (1)$$

According to Equation (1), while d and f show the lower and upper bound of the fuzzy number $\bar{B}$, respectively, e could be considered as the modal value for $\bar{B}$. The TFN could be written as $\bar{B} = (d, e, f)$.

The operational laws of TFN for $\overline{B_1} = (d_1, e_1, f_1)$ and $\overline{B_2} = (d_2, e_2, f_2)$ are shown below:

Addition:

$$\overline{B_1} + \overline{B_2} = (d_1, e_1, f_1) + (d_2, e_2, f_2) = (d_1 + d_2, e_1 + e_2, f_1 + f_2) \quad (2)$$

Multiplication:

$$\overline{B_1} x \overline{B_2} = (d_1, e_1, f_1) x (d_2, e_2, f_2) = (d_1 x d_2, e_1 x\, e_2, f_1 x f_2) \quad (3)$$

Subtraction:

$$\overline{B_1} - \overline{B_2} = (d_1, e_1, f_1) - (d_2, e_2, f_2) = (d_1 - f_2, e_1 - e_2, f_1 - d_2) \quad (4)$$

Division:

$$\frac{\overline{B_1}}{\overline{B_2}} = \frac{(d_1, e_1, f_1)}{(d_2, e_2, f_2)} = \left(\frac{d_1}{f_2}, \frac{e_1}{e_2}, \frac{f_1}{d_2}\right) \quad (5)$$

Reciprocal:

$$\overline{B_1}^{-1} = (d_1, e_1, f_1)^{-1} = \left(\frac{1}{f_1}, \frac{1}{e_1}, \frac{1}{d_1}\right) \quad (6)$$

Fuzzy PIvot Pairwise RElative Criteria importance assessment- Fuzzy PIPRECIA method

The PIPRECIA method was developed by Stanujkic *et al.* (2017) to provide criteria that will be evaluated without sorting them by importance as different from the fuzzy SWARA method (Vesković *et al.*, 2018).

PIPRECIA model provides benefits, especially with an increase in the number of decision-makers. Therefore, this model could be useful for multi-criteria decision-making problems that are solved mostly through group decision-making. PIPRECIA method has been used in a number of disciplines such as e-learning course selection (Jaukovic Jocic *et al*. 2020), prioritization of road transportation risks (Memiş *et al*. 2020), information technology implementation (Stević *et al*. 2018), logistics performance measurement (Đalić *et al*. 2020a), green supplier selection (Đalić *et al*. 2020b), and website quality evaluation (Stanujkić *et al*. 2018).

The fuzzy version of the PIPRECIA method was developed by Stević *et al*. (2018) and has also been used in different fields. Stanković *et al*. (2020) integrated fuzzy PIPRECIA with fuzzy Measurement Alternatives and Ranking according to the Compromise Solution (MARCOS) to examine road traffic risk. Stević *et al*. (2018) considered the fuzzy PIPRECIA in the analysis of the criteria for the implementation of information technology in warehouse systems following the Strengths, Weaknesses, Opportunities, and Threats (SWOT) dimension. Marković *et al*. (2020) integrated fuzzy PIPRECIA with Criteria Importance Through Intercriteria Correlation (CRITIC) in prioritizing banks based on business excellence and sustainability. Đalić *et al*. (2020b) used fuzzy PIPRECIA in integration with rough Simple Additive Weighting (SAW) method to evaluate green suppliers. Vesković *et al*. (2020) applied the fuzzy PIPRECIA method to prioritize the criteria for evaluating and selecting a reach stacker for the container terminal. Tomašević *et al*. (2020) examined the criteria for the implementation of high-performance computing in Danube region countries using fuzzy PIPRECIA. The fuzzy PIPRECIA method follows the 11 steps explained below (Stević *et al*. 2018; Đalić *et al*. 2020a):

Step 1: Criteria set, and decision-making team is formed. The criteria are sorted according to the marks from the first to the last as unclassified, and significance does not play any role in this step.
Step 2: Each decision-maker examines the pre-sorted criteria starting from the second criterion to determine the relative importance of criteria as shown in Equation (7):

$$\overline{s_j^r} = \begin{cases} > \overline{1} \;\; if \quad C_j > C_{j-1} \\ = \overline{1} \;\; if \quad C_j = C_{j-1} \\ < \overline{1} \quad if \quad C_j < C_{j-1} \end{cases} \qquad (7)$$

where $\overline{s_j^r}$ shows the assessment of criterion j made by decision-maker r.
The geometric mean is performed by averaging the matrix $\overline{s_j^r}$ in order to obtain matrix $\overline{s_j}$. Decision-makers evaluate the criteria by applying the defined scales in Tables 3 and 4.

Table 3. *Scale 1-2 for the assessment of criteria*

Linguistic Scale		**Fuzzy Number**				
			l	m	U	PDF
Almost equal value	**Scale 1-2**	1	1.000	1.000	1.050	1.008
Slightly more significant		2	1.100	1.150	1.200	1.150
Moderately more significant		3	1.200	1.300	1.350	1.292
More significant		4	1.300	1.450	1.500	1.433
Much more significant		5	1.400	1.600	1.650	1.575
Dominantly more significant		6	1.500	1.750	1.800	1.717
Absolutely more significant		7	1.600	1.900	1.950	1.858

Table 4. *Scale 0-1 for the assessment of criteria*

	Fuzzy Number				Linguistic Scale
		l	m	u	PDF	
Scale 0-1	1	0.667	1.000	1.000	0.944	weakly less significant
	1/2	0.500	0.667	1.000	0.694	moderately less significant
	1/3	0.400	0.500	0.667	0.511	less significant
	1/4	0.333	0.400	0.500	0.406	really less significant
	1/5	0.286	0.333	0.400	0.337	much less significant
	1/6	0.250	0.286	0.333	0.288	dominantly less significant
	1/7	0.222	0.250	0.286	0.251	absolutely less significant

If *Cj* is more important in comparison to Cj_{-1}, evaluation should be performed applying the scale in Table 2. If *Cj* is less important in comparison to $Cj_{-1,}$ evaluation should be performed using the scale in Table 4.

Step 3: The coefficient $\overline{k_j}$ is determined:

$$\overline{k_j} = \begin{cases} = \overline{1} & if \quad j = 1 \\ 2 - \overline{s_j} & if \quad j > 1 \end{cases} \tag{8}$$

Step 4: The fuzzy weight $\overline{q_j}$ is determined:

$$\overline{q_j} = \begin{cases} = \overline{1} & if \quad j = 1 \\ \frac{\overline{q_{j-1}}}{\overline{k_j}} & if \quad j > 1 \end{cases} \tag{9}$$

Step 5: The relative weight of the criterion $\overline{w_j}$ is determined:

$$\overline{w_j} = \frac{\overline{q_j}}{\sum_{j=1}^{n} \overline{q_j}} \tag{10}$$

The inverse fuzzy PIPRECIA method needs to be applied in the following steps.

Step 6: The assessment of the applicable scale defined above, but this time starting from the penultimate criterion.

$$\overline{s_j}' = \begin{cases} > \overline{1} & if \quad C_j > C_{j+1} \\ = \overline{1} & if \quad C_j = C_{j+1} \\ < \overline{1} & if \quad C_j < C_{j+1} \end{cases} \tag{11}$$

Where $\overline{s_j}'$ shows the assessment of criterion j made by decision-maker j.

The geometric mean is obtained by averaging the matrix $\overline{s_j}$.

Step 7: The coefficient $\overline{k_j}'$ is determined:

$$\overline{k_j}' = \begin{cases} = \overline{1} & if \quad j = n \\ 2 - \overline{s_j}' & if \quad j > n \end{cases} \tag{12}$$

where n shows the total number of criteria, which means that the value of the last criterion equals (1,1,1).

Step 8: The fuzzy weight $\overline{q_j}'$ is determined as:

$$\overline{q_j}' = \begin{cases} = \overline{1} & if \quad j = n \\ \frac{\overline{q_{j+1}}'}{\overline{k_j}'} & if \quad j > n \end{cases} \tag{13}$$

Step 9: The relative weight of the criterion $\overline{w_j}'$ is determined as:

$$\overline{w_j}' = \frac{\overline{q_j}'}{\sum_{j=1}^{n} \overline{q_j}'} \quad (14)$$

Step 10: Defuzzification of the fuzzy values $\overline{w_j}$ and $\overline{w_j}'$ is used in calculating the final weights:

$$\overline{w_j}'' = \frac{1}{2}(w_j + w_j') \quad (15)$$

Step 11: Spearman and Pearson correlation coefficients are applied to check the results obtained (Rauch, 2007; Stević *et al*., 2017).

Results

In this study, four main criteria for examining the short-term trailer park amenities were determined based on a review of the literature. Each main criterion has related sub-criteria and is coded as shown in Table 5. The opinions of the 11 decision-makers on trailer park amenities were evaluated following these criteria.

Table 5. *Main and sub-criteria for trailer park amenities*

Main criteria	Mark	Sub criteria	Mark
Basic Necessities (BN)	C1	Availability of restrooms and shower	BNC1
		Availability of water and electricity	BNC2
		Security in the caravan site	BNC3
		Open spaces in the caravan site	BNC4
		Availability of recycling bins and sewage dump	BNC5
Campground Attributes (CA)	C2	Cleanliness of the caravan site	CAC1
		The quietness of the campground during the night	CAC2
		Friendly staff	CAC3
		Low price	CAC4
		Availability of repair and maintenance services	CAC5
Facilities and Camping Tools (F)	C3	Availability of laundry facilities	FC1
		Availability of a cafeteria	FC2
		Availability of recreational facilities such as basketball courts, tennis courts, swimming pools, etc.	FC3
		Availability of indoor recreation areas such as playing machines, billiards, etc.	FC4
		Availability of BBQ grill and other related equipment such as a table, cooker, trash bin	FC5
Location (L)	C4	Accessibility of the caravan site	LC1
		Proximity to a city center	LC2
		Proximity to a village	LC3
		Proximity to attractions (lake, sea, river, forestland, etc.)	LC4
		Setting of the park in a good landscape	LC5

After the initial evaluation process of the Fuzzy PIPRECIA method, Table 6 shows the assessment of the criteria using DMs and the average values (AV) and includes the further steps. In comparison to the original Fuzzy PIPRECIA steps, AV is used here to average the preferences of the DMs (Đalić *et al*. 2020a; Vesković *et al*. 2020; Tomašević *et al*. 2020; Stanković *et al*. 2020). This ensures more precise inputs in the model.

Table 6. *Assessment of the main criteria by experts*

PIPR.	**C1**		**C2**			**C3**			**C4**	
DM1		0.333	0.400	0.500	0.500	0.667	1.000	1.300	1.450	1.500
DM2		0.400	0.500	0.667	0.333	0.400	0.500	1.300	1.450	1.500
DM3		0.500	0.667	1.000	0.400	0.500	0.667	1.100	1.150	1.200
DM4		1.000	1.000	1.050	0.400	0.500	0.667	1.600	1.900	1.950
DM5		1.200	1.300	1.350	0.400	0.500	0.667	1.400	1.600	1.650
DM6		1.000	1.000	1.050	0.400	0.500	0.667	1.600	1.900	1.950
DM7		1.200	1.300	1.350	1.200	1.300	1.350	1.600	1.900	1.950
DM8		1.300	1.450	1.500	1.300	1.450	1.500	1.200	1.300	1.350
DM9		0.400	0.500	0.667	0.333	0.400	0.500	1.500	1.750	1.800
DM10		0.286	0.333	0.400	0.400	0.500	0.667	1.400	1.600	1.650
DM11		0.222	0.250	0.286	1.400	1.600	1.650	0.286	0.333	0.400
AV		0.713	0.791	0.893	0.642	0.756	0.894	1.299	1.485	1.536
PIPR-I	**C4**		**C3**			**C2**			**C1**	
DM1		0.333	0.400	0.500	1.100	1.150	1.200	1.300	1.450	1.500
DM2		0.333	0.400	0.500	1.300	1.450	1.500	1.200	1.300	1.350
DM3		0.500	0.667	1.000	1.200	1.300	1.350	1.100	1.150	1.200
DM4		0.222	0.250	0.286	1.200	1.300	1.350	0.667	1.000	1.000
DM5		0.286	0.333	0.400	1.200	1.300	1.350	0.400	0.500	0.667
DM6		0.222	0.250	0.286	1.200	1.300	1.350	0.667	1.000	1.000
DM7		0.222	0.250	0.286	0.400	0.500	0.667	0.400	0.500	0.667
DM8		0.400	0.500	0.667	0.333	0.400	0.500	0.333	0.400	0.500
DM9		0.250	0.286	0.333	1.300	1.450	1.500	1.200	1.300	1.350
DM10		0.286	0.333	0.400	1.200	1.300	1.350	1.400	1.600	1.650
DM11		1.400	1.600	1.650	0.286	0.333	0.400	1.600	1.900	1.950
AV		**0.405**	**0.479**	**0.573**	**0.974**	**1.071**	**1.138**	**0.933**	**1.100**	**1.167**

Based on the evaluation of the criteria and their averaging, Equation (7), a matrix s_j is formed.

$$s_j = \begin{bmatrix} \dots \\ 0.713, 0.791, 0.893 \\ 0.642, 0.756, 0.894 \\ 1.299, 1.485, 1.536 \end{bmatrix}$$

By applying Equation (8), those values are subtracted from number 2. Following the rules of operations with fuzzy numbers, the k_j matrix is obtained as follows:

$$k_j = \begin{bmatrix} 1.000, 1.000, 1.000 \\ 1.107, 1.209, 1.287 \\ 1.106, 1.244, 1.358 \\ 0.464, 0.515, 0.701 \end{bmatrix}$$

According to Equation (8), the value $\overline{k_1} = (1.000, 1.000, 1.000)$

$\overline{k_2} = (2-0.893, 2-0.791, 2-0.713) = (1.107, 1.209, 1.287)$

Applying Equation (9), the value *qj* is obtained as follows:

$$q_j = \begin{bmatrix} 1.000, 1.000, 1.000 \\ 0.777, 0.827, 0.903 \\ 0.572, 0.665, 0.816 \\ 0.816, 1.291, 1.761 \end{bmatrix}$$

$$\overline{q_1} = (1.000, 1.000, 1.000)$$

$$\overline{q_2} = \left(\frac{1.000}{1.287}, \frac{1.000}{1.209}, \frac{1.000}{1.107}\right) = (0.777, 0.827, 0.903)$$

$$\sum_{j=1}^{n} \overline{q_j} = (3.165, 3.783, 4.480)$$

By applying Equation (10), the relative weights are calculated:

$$\overline{w_1} = \left(\frac{1.000}{4.480}, \frac{1.000}{3.783}, \frac{1.000}{3.165}\right) = (0.223, 0.264, 0.316)$$

and then it is necessary to defuzzify the obtained value by using the expression $df_{crisp} = \frac{l + 4m + u}{6}$ to obtain the number df_{crisp} as follows:

$$df_{w1-crisp} = \frac{0.223 + 4 \times 0.264 + 0.316}{6} = 0.266$$

In order to determine the final weights of the criteria, it is necessary to apply Equations (11) – (15) or the methodology of the inverse fuzzy PIPRECIA method. Based on the evaluation by the decision-makers and the application of the average value, the matrix *sj'* is obtained.

$$s_j' = \begin{bmatrix} 0.933, 1.100, 1.167 \\ 0.974, 1.071, 1.138 \\ 0.405, 0.479, 0.573 \\ \cdots \end{bmatrix}$$

By applying Equation (12), the values of matrix *kj'* are obtained:

$$k_j' = \begin{bmatrix} 0.833, 0.900, 1.067 \\ 0.862, 0.929, 1.026 \\ 1.427, 1.521, 1.595 \\ 1.000, 1.000, 1.000 \end{bmatrix}$$

$$\overline{k_4'} = (1.000, 1.000, 1.000)$$

$$\overline{k_3'} = (2 - 0.573, 2 - 0.479, 2 - 0.405) = (1.427, 1.521, 1.595) \text{ etc.}$$

By applying Equation (13), the following values are obtained:

$$q_j' = \begin{bmatrix} 0.573, 0.787, 0.976 \\ 0.611, 0.708, 0.813 \\ 0.627, 0.657, 0.701 \\ 1.000, 1.000, 1.000 \end{bmatrix}$$

$$\overline{q_4}' = (1.000, 1.000, 1.000)$$

$$\overline{q_3}' = \left(\frac{1.000}{1.595}, \frac{1.000}{1.521}, \frac{1.000}{1.427}\right) = (0.627, 0.657, 0.701) \quad \text{etc.}$$

$$\sum_{j=1}^{n} \overline{q_j}' = (2.811, 3.152, 3.490)$$

Next, Equation (14) is applied in order to calculate the relative weights for the fuzzy Inverse PIPRECIA method.

$$\overline{w_4}' = \left(\frac{1.000}{3.490}, \frac{1.000}{3.152}, \frac{1.000}{3.490}\right) = (0.287, 0.317, 0.356)$$

and then it is again necessary to defuzzify the obtained value by using the expression $df_{crisp} = \frac{l + 4m + u}{6}$ to obtain the number df_{crisp} as follows:

$$df_{w4'-crisp} = \frac{0.287 + 4 \times 0.317 + 0.356}{6} = 0.319$$

The obtained results for main criteria: basic necessities (BN), campground attributes (CA), facilities and camping tools (F), location (L) are shown in Table 7. The weights for all sub-criteria are obtained in the same way. Applying Equation (15), the final weights of the main criteria are obtained

Table 7. *Calculation and results obtained by the application of proposed method*

P.	$\overline{s_j}$			$\overline{k_j}$			$\overline{q_j}$			$\overline{w_j}$			DF
C1				1.000	1.000	1.000	1.000	1.000	1.000	0.223	0.264	0.316	0.266
C2	0.713	0.791	0.893	1.107	1.209	1.287	0.777	0.827	0.903	0.173	0.219	0.285	0.222
C3	0.642	0.756	0.894	1.106	1.244	1.358	0.572	0.665	0.816	0.128	0.176	0.258	0.181
C4	1.299	1.485	1.536	0.464	0.515	0.701	0.816	1.291	1.761	0.182	0.341	0.556	0.351
SUM							3.165	3.783	4.480				
P-I	$\overline{s_j}'$			$\overline{k_j}'$			$\overline{q_j}'$			$\overline{w_j}'$			DF
C1	0.933	1.100	1.167	0.833	0.900	1.067	0.573	0.787	0.976	0.164	0.250	0.347	0.252
C2	0.974	1.071	1.138	0.862	0.929	1.026	0.611	0.708	0.813	0.175	0.225	0.289	0.227
C3	0.405	0.479	0.573	1.427	1.521	1.595	0.627	0.657	0.701	0.180	0.209	0.249	0.211
C4				1.000	1.000	1.000	1.000	1.000	1.000	0.287	0.317	0.356	0.319
SUM							2.811	3.152	3.490				

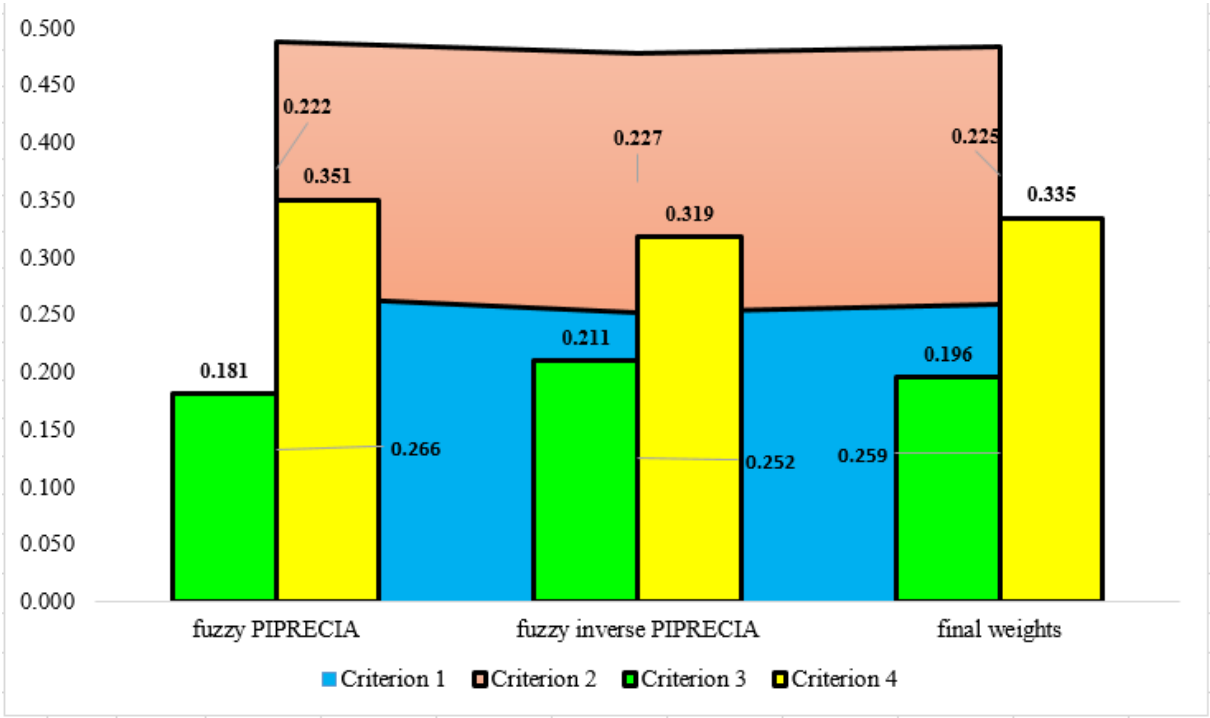

Figure 1. *Main criteria weights obtained*
Criterion 1: Basic amenities, Criterion 2: Campground attributes, Criterion 3: Facilities and camping tools, Criterion 4: Location

The final results are shown in Figure 1. The importance of the criteria was calculated using the Fuzzy PIPRECIA method based on the evaluation of the 11 experts. A defuzzification was then performed to calculate the final values of all the main criteria. According to obtained results, we could conclude that the most important criterion is C4 (location) – w_4=0.335. The second most important criterion is C1 (basic amenities) with a weight of 0.259 C2 (campground attributes) with 0.225, and C3 (facilities and camping tools) with a weight of 0.196 complete the list in that order.

The calculated Spearman's correlation coefficient (SCC) for criteria ranks for the proposed methods is 1.00, and it can be concluded that these ranks are in full correlation. The Pearson's correlation coefficient (PCC) was also calculated for the values of the criteria and as 0.996. The values of all sub-criteria were obtained as shown in Tables 8,9, 10, and 11.

Table 8. *Calculation and results for the sub-criteria of the BN group*

P.	$\overline{s_j}$			$\overline{k_j}$			$\overline{q_j}$			$\overline{w_j}$			DF
C1				1.000	1.000	1.000	1.000	1.000	1.000	0.139	0.172	0.215	0.174
C2	1.117	1.212	1.264	0.736	0.788	0.883	1.132	1.269	1.358	0.158	0.219	0.292	0.221
C3	0.932	1.086	1.217	0.783	0.914	1.068	1.061	1.389	1.734	0.148	0.239	0.373	0.246
C4	0.448	0.503	0.603	1.397	1.497	1.552	0.683	0.928	1.241	0.095	0.160	0.267	0.167
C5	1.109	1.238	1.324	0.676	0.762	0.891	0.767	1.218	1.837	0.107	0.210	0.396	0.224
SUM							4.643	5.805	7.170				
P-I	$\overline{s_j^{'}}$			$\overline{k_j^{'}}$			$\overline{q_j^{'}}$			$\overline{w_j^{'}}$			DF
C1	0.553	0.734	0.808	1.192	1.266	1.447	0.490	0.900	1.213	0.081	0.177	0.322	0.185
C2	0.758	0.868	0.931	1.069	1.132	1.242	0.709	1.139	1.446	0.117	0.225	0.384	0.233
C3	1.221	1.423	1.464	0.536	0.577	0.779	0.880	1.289	1.546	0.146	0.254	0.411	0.262
C4	0.542	0.656	0.794	1.206	1.344	1.458	0.686	0.744	0.829	0.114	0.147	0.220	0.153
C5				1.000	1.000	1.000	1.000	1.000	1.000	0.166	0.197	0.266	0.203
SUM							3.765	5.072	6.035				

SCC for the ranks within the BN group is 0.900, which represents a high correlation. PCC for the values of the criteria is 0.923.

Table 9. *Calculation and results for the sub-criteria of the CA group*

P.	$\overline{s_j}$			$\overline{k_j}$			$\overline{q_j}$			$\overline{w_j}$			DF
C1				1.000	1.000	1.000	1.000	1.000	1.000	0.133	0.192	0.253	0.192
C2	0.704	0.821	0.997	1.003	1.179	1.296	0.772	0.848	0.997	0.102	0.163	0.252	0.168
C3	0.921	1.105	1.258	0.742	0.895	1.079	0.715	0.947	1.343	0.095	0.182	0.339	0.194
C4	1.100	1.226	1.327	0.673	0.774	0.900	0.795	1.224	1.997	0.105	0.235	0.504	0.258
C5	0.829	0.965	1.094	0.906	1.035	1.171	0.679	1.182	2.204	0.090	0.227	0.557	0.259
SUM							3.960	5.202	7.542				1.072
P-I	$\overline{s_j^{'}}$			$\overline{k_j^{'}}$			$\overline{q_j^{'}}$			$\overline{w_j^{'}}$			DF
C1	0.944	1.065	1.179	0.821	0.935	1.056	0.462	0.646	0.951	0.100	0.166	0.279	0.174
C2	0.769	0.840	0.890	1.110	1.160	1.231	0.488	0.604	0.781	0.105	0.155	0.229	0.159
C3	0.577	0.664	0.802	1.198	1.336	1.423	0.601	0.701	0.867	0.130	0.180	0.255	0.184
C4	0.830	0.932	1.038	0.962	1.068	1.170	0.855	0.937	1.039	0.184	0.241	0.305	0.242
C5				1.000	1.000	1.000	1.000	1.000	1.000	0.216	0.257	0.294	0.256
SUM							3.406	3.888	4.639				

SCC for the ranks within the CA group is also 1.00, while PCC for the weights of the criteria is 0.990.

Table 10. *Calculation and results for the sub-criteria of the F group*

P.	$\overline{s_j}$			$\overline{k_j}$			$\overline{q_j}$			$\overline{w_j}$			DF
C1				1.000	1.000	1.000	1.000	1.000	1.000	0.152	0.186	0.239	0.189
C2	0.610	0.673	0.773	1.227	1.327	1.390	0.719	0.753	0.815	0.109	0.140	0.195	0.144
C3	1.218	1.364	1.424	0.576	0.636	0.782	0.920	1.184	1.415	0.140	0.220	0.339	0.227
C4	0.511	0.561	0.656	1.344	1.439	1.489	0.618	0.823	1.053	0.094	0.153	0.252	0.160
C5	1.327	1.491	1.541	0.459	0.509	0.673	0.918	1.616	2.294	0.140	0.301	0.549	0.315
SUM							4.176	5.376	6.578				
P-I	$\overline{s_j^{'}}$			$\overline{k_j^{'}}$			$\overline{q_j^{'}}$			$\overline{w_j^{'}}$			DF
C1	1.039	1.224	1.302	0.698	0.776	0.961	0.486	0.929	1.198	0.100	0.216	0.366	0.222
C2	0.467	0.596	0.641	1.359	1.404	1.533	0.467	0.721	0.837	0.096	0.168	0.255	0.170
C3	1.155	1.368	1.405	0.595	0.632	0.845	0.716	1.012	1.137	0.148	0.235	0.347	0.239
C4	0.348	0.435	0.523	1.477	1.565	1.652	0.605	0.639	0.677	0.125	0.149	0.207	0.154
C5				1.000	1.000	1.000	1.000	1.000	1.000	0.206	0.233	0.305	0.240
SUM							3.275	4.300	4.848				

SCC for the ranks within the CA group is also 0.900, while PCC for the weights of the criteria is 0.800.

Table 11. *Calculation and results for the sub-criteria of the L group*

P.	$\overline{s_j}$			$\overline{k_j}$			$\overline{q_j}$			$\overline{w_j}$			DF
C1				1.000	1.000	1.000	1.000	1.000	1.000	0.096	0.142	0.216	0.147
C2	0.731	0.858	1.023	0.977	1.142	1.269	0.788	0.875	1.023	0.076	0.124	0.222	0.132
C3	0.855	0.968	1.117	0.883	1.032	1.145	0.688	0.848	1.158	0.066	0.120	0.251	0.133
C4	1.381	1.608	1.659	0.341	0.392	0.619	1.110	2.162	3.398	0.107	0.307	0.736	0.345
C5	0.926	1.002	1.105	0.895	0.998	1.074	1.034	2.165	3.795	0.100	0.307	0.822	0.358
SUM							4.619	7.052	10.374				
P-I	$\overline{s_j^{'}}$			$\overline{k_j^{'}}$			$\overline{q_j^{'}}$			$\overline{w_j^{'}}$			DF
C1	0.944	1.071	1.126	0.874	0.929	1.056	0.376	0.598	0.738	0.094	0.163	0.243	0.164
C2	0.792	0.936	0.999	1.001	1.064	1.208	0.397	0.556	0.645	0.099	0.151	0.212	0.152
C3	0.362	0.416	0.469	1.531	1.584	1.638	0.480	0.591	0.646	0.119	0.161	0.213	0.162
C4	0.729	0.932	0.989	1.011	1.068	1.271	0.787	0.936	0.990	0.196	0.254	0.325	0.256
C5				1.000	1.000	1.000	1.000	1.000	1.000	0.249	0.272	0.329	0.277
SUM							3.040	3.681	4.020				

SCC for the ranks within the L group is 1.00, while PCC for the weights of the criteria is 0.995.
The final values of the criteria were obtained by multiplying the values of the main criteria with the values of the weights obtained within separate groups. Figure 2 shows the final weight results obtained using the fuzzy PIPRECIA method.

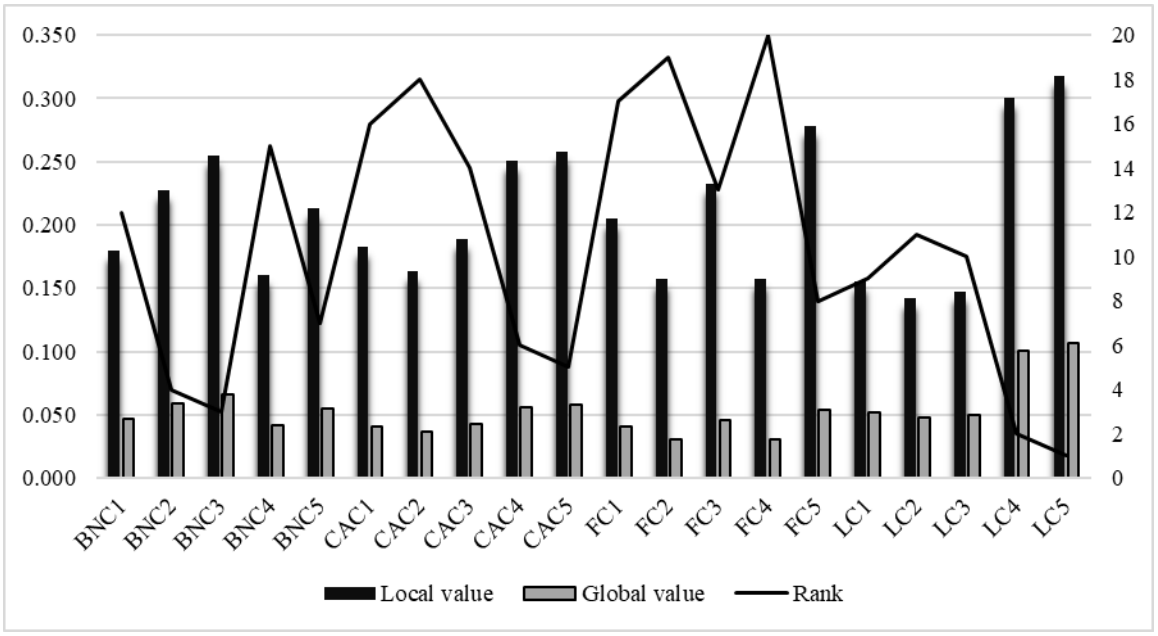

Figure 2. *The final values of the criteria from the Fuzzy PIPRECIA method*

According to Figure 2, the first five most important sub-criteria were found to be setting the park in a good landscape (LC5), proximity to attractions (LC4), security in the caravan site (BNC3), availability of water and electricity (BNC2), and availability of repair and maintenance services (CAC5) respectively. On the other hand, the five least important sub-criteria were determined to be the availability of indoor recreation areas (FC4), availability of a cafeteria (FC2), quietness of the campground during the night (CAC2), availability of laundry facilities (FC1) and cleanliness of the caravan site (CAC1) respectively.
There were four groups of criteria that had a total of 20 sub-criteria distributed equally; thus, we conclude that values are objective. In most of the hierarchical structures of MCDM problems, the number of elements in the second level isn't the same, so it causes some non-precise criteria weights. Further explanation is given as proof.

Sensitivity analysis
Testing the obtained results of the criteria weights using the Full Consistency Method (FUCOM) (Pamučar *et al.*, 2018) is a part of the sensitivity analysis. As the FUCOM method (Durmić, 2019; Badi and Abdulshahed, 2019; Bozanic *et al.*, 2019; Erceg and Mularifović, 2019) has been exploited in the literature, detailed algorithms are not presented. Figure 3 shows the final weight results obtained from the FUCOM method.

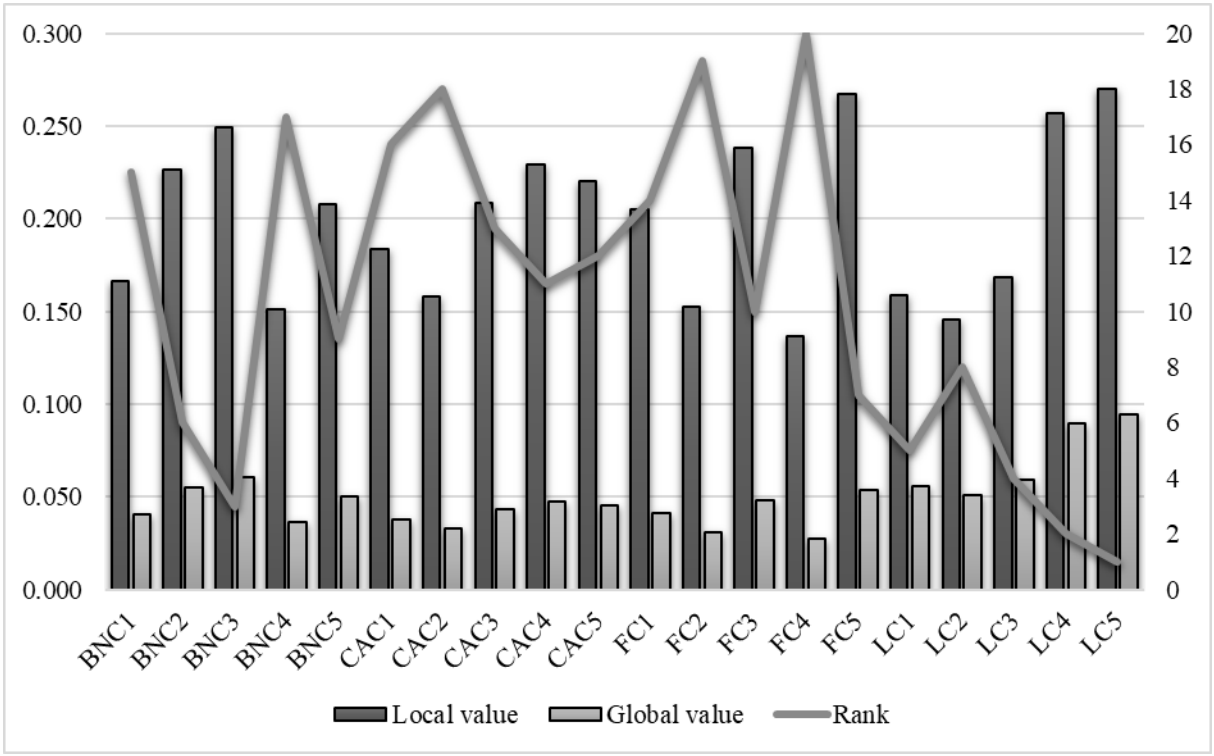

Figure 3. *Criteria weights obtained by FUCOM method*

According to Figure 3, the first five most important sub-criteria are setting the park in a good landscape (LC_5), proximity to attractions (LC_4), security in the caravan site (BNC_3), (LC_3) proximity to the village, and accessibility of the caravan site (LC_1) respectively. On the other hand, the five least important sub-criteria are defined as the availability of indoor recreation areas (FC_4), availability of a cafeteria (FC_2), quietness of the campground during the night (CAC_2), open spaces in the caravan site (BNC_4) and cleanliness of the caravan site (CAC_1) respectively. According to the results of the sensitivity analysis, the first three most important sub-criteria are found to be the same in both fuzzy PIPRECIA and FUCOM methods. Similar findings were found for the three least important ones.

Additionally, Spearman's correlation coefficient for obtained ranks of criteria by fuzzy PIPRECIA and FUCOM method was computed as 0.868 as seen in Appendix 2. That shows the nearly complete correlation between the ranks.

Conclusion and discussion

Campgrounds are an important part of the camping experience due to the amenities and attractions they offer to campers. Trailer parks have certain distinctive features compared to campgrounds which offer accommodation alternatives such as bungalows, tents, lodges, park cabins, holiday apartments, bunkhouses, and chalets. The significant criteria for planning trailer parks in this study were thus determined using the PIPRECIA method based on expert opinion. While the research focuses on distinctive features and basic requirements in trailer parks, it also tackles the differences between camping areas that offer various accommodation alternatives.

The study determines the key criteria in trailer parks as "location," "necessities," "campground attributes," and "facilities and camping tools." In line with the above, the most important considerations that should be made in trailer park planning are "setting the park in a good landscape," "proximity to attractions," "security in the caravan site," "proximity to a village," and "accessibility of the caravan site," in that order. The findings corroborate the literature review which indicated that the most important factors affecting campground preference are the presence of features in the landscape such as a river, sea, lake, or beautiful scenery (Holdnak and Rodgers, 2004; White *et al*., 2007; Hayllar *et al*., 2006; Koca *et al*., 2007; Viallon, 2012; Gürsoy & Chen, 2012; Birdir *et al*., 2015; Doğantan & Emir, 2019; Lee *et al*., 2019). The present study demonstrates that safety and security are also required in trailer parks in addition to the above-mentioned necessities. While most studies make a point of noting that "campground attributes," "facilities," and "camping tools" are key camping requirements (Gračan *et al*., 2010; Gursoy and Chen, 2012; Fjelstul *et al*., 2012), the present study shows that technical systems such as clean water, and waste and power systems are of top priority among caravanners. This is due to the fact that trailers are motor vehicles with external source requirements (Doğantan, 2014).

On the other hand, the amenities deemed as the least important by the experts considered for this study were "the availability of indoor recreational areas," "availability of a cafeteria," "quietness of the campground during the night," "open spaces in the caravan site," and "cleanliness of the caravan site". Studies on camping demonstrate the significance of indoor recreational areas and outdoor recreational areas (Holdnak and Rodgers, 2004; Sildoja and Eagles, 2004; White *et al*., 2007; Shin *et al*, 2017). The present study shows that the availability of indoor recreational areas is not an essential criterion for trailer parks. The fact that indoor activities are not considered an important criterion could be due to caravanners' desire to be in close contact with nature, discover new places, and integrate with local people in their places rather than participating in trailer park activities. Furthermore, the fact that trailers are mobile motor vehicles allows the campers to travel to different locations outside the trailer park for short periods.

Practical implications

Considering the fact that caravanners are often seeking to enjoy a simpler lifestyle, discover new places, learn about different cultures, and perhaps most importantly, establish permanent friendships, the present study findings can help guide planners in the development of standardized trailer parks, which in turn will contribute to the development of caravanning tourism. Research findings also provide some insight that can be taken into consideration when trailer park facilities are established or upgraded in specific destinations. The attractiveness of a region and the activities it offers are among the most important factors that affect whether tourists decide to visit. Trailer park managers should pay close attention to the "proximity to attractions" when planning a new site.

It is important to illuminate caravan parks at night while isolating them from the environment with arrangements such as fences, walls, and greenery that provide internal and external security. In addition, where there are no sales units such as cafeterias or snack bars in a trailer park, it is important that the park is close to small settlements such as villages in order to meet the camper's basic needs. Also, depending on the terrain and climate, caravans are motor vehicles that require the roads on the site to be laid out, so that does not mean dust is brought up on other campers who are already settled in.

Limitations and recommendations for future studies

Despite the important implications presented in the study, the research also has certain limitations. Firstly, the scope of the present study is limited to only one accommodation model (trailer parks). Thus,

future studies should analyze other types of camping accommodation using the same methodology. Secondly, the study sample size is limited to caravanners and academics. Similar studies with different and larger expert groups would yield different findings on the topic. Despite these limitations, it is hoped that the present study will contribute to the improvement of campgrounds and caravan sites.

The review of the caravanning literature demonstrates that most studies concentrate on consumer demographics (Glover and Prideaux, 2009), motivation (Hardy and Gretzel, 2011), mobility and travel models (Cridland, 2008), satisfaction levels (McClymont *et al.*, 2011), and lifestyles (Patterson *et al.*, 2015). The present study partially addresses the lack of studies on supply in caravanning tourism literature. However, further comprehensive studies are required. Furthermore, it is seen that camping and caravanning tourism receives little attention in academic research, despite its popularity and significance within niche tourism (Foghagen, 2014). Thus, in future supply-side studies, various weighting methods other than PIPRECIA, such as the Fuzzy, Hesitant Fuzzy, Intuitively Fuzzy, Spherical Fuzzy, or Neurotrophic Media methods could also be employed.

Furthermore, the quality of service and level of efficiency in trailer parks are being discussed more in line with an increase in demand. It is thus recommended that future studies be conducted on areas of contemporary management and marketing such as quality, product development, resilience, and sustainability. At a time when trailer parks are increasing in popularity due to the pandemic, such studies would guide the industry in trailer park planning, an area that has been relatively neglected compared to that of campgrounds

Appendix 1. *Previous studies related to campground amenities in terms of criteria*

	Basic necessities	**Campground attributes**	**Facilities**	**Camping tools**	**Location**
White *et al.* (2001)	√		√		√
Choi and Dawson (2002)	√	√	√	√	√
Holdback and Rodgers (2004)		√	√		√
Reed and Greenhalgh (2004)					√
Sildoja and Eagles (2004)	√	√	√		√
Warnken *et al.* (2005)	√		√		
Winter (2005)					√
Daniels and Marion (2006)	√		√	√	√
Hayllar *et al.* (2006)	√				√
Koca *et al.* (2007)			√		√
Oh *et al.* (2007)	√	√			
White *et al.* (2007)	√	√	√	√	√
Today and Koçan (2009)			√	√	√
Van Hyfte (2009)	√	√			
Collins and Kearns (2010)		√	√		√
Gržinić *et al.* (2010)		√	√		√
O'Neill *et al.* (2010)	√	√			
Van Heerden (2010)			√		√
Fjelstul *et al.* (2012)		√	√	√	
Gültekin and Gültekin (2012)	√		√	√	
Gursoy and Chen (2012)				√	√
Viallon (2012)		√			√

	Basic necessities	Campground attributes	Facilities	Camping tools	Location
Caldicott and Scherrer (2013)		√	√		
Lillywhite *et al.* (2013)	√	√		√	
Poudel (2013)	√		√	√	
Mahadevan (2014)			√		
Wu and Pearce (2014)	√	√		√	√
Birdir *et al.* (2015)			√		√
Severt and Fjelstul (2015)	√	√	√	√	
Wellner (2015)			√		
Cheng (2016)					√
Brochado and Pereira (2017)			√		
Çelik *et al.* (2017)			√		
Ceylanlar *et al.* (2017)			√		
Cvelić-Bonifačić *et al.* (2017)		√			√
Doğantan *et al.* (2017)			√		
Göktaş *et al.* (2017)	√		√		
Kearns *et al.* (2017)		√	√		√
Mikulić *et al.* (2017)	√		√	√	
Olcay and Turhan (2017)	√		√		
Shin *et al.* (2017)	√	√	√	√	
Templeton *et al.* (2017)		√	√		
Choo *et al.* (2017)	√	√		√	
Şalk *et al.* (2018)			√		
Doğantan and Emir (2019)	√	√			√
Lee *et al.* (2019)	√	√			√

Appendix 2. Calculation of spearman's correlation coefficient for obtained ranks of criteria by Fuzzy PIPRECIA and FUCOM method

	BN C1	BN C2	BN C3	BN C4	BN C5	CA C1	CA C2	CA C3	CA C4	CA C5	FC 1	FC 2	FC 3	FC 4	FC 5	LC 1	LC 2	LC 3	LC 4	LC 5
Fuzzy PIPRECIA	12	4	3	15	7	16	18	14	6	5	17	19	13	20	8	9	11	10	2	1
FUCOM	15	6	3	17	9	16	18	13	11	12	14	19	10	20	7	5	8	4	2	1
d	-3	-2	0	-2	-2	0	0	1	-5	-7	3	0	3	0	1	4	3	6	0	0
d2	9	4	0	4	4	0	0	1	25	49	9	0	9	0	1	16	9	36	0	0
COUNT										20										
POWER(20;3)-20										7980										
6*SUM(d2)										1056										
SCC=(1-1056/7980)										0.868										

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