



**DETERMINATION OF MARINE SELECTION CRITERIA FOR FOREIGN
YACHTERS BY AHP METHOD**

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ABSTRACT

Marine Tourism and Marina Management is developing rapidly in the global sense after the 1980s and the impact of this development is also seen in our country. Sector stakeholders are discussing the preference of foreign yachts for marinas of our country or the reasons for preferring competitor marinas. In this study, the criteria of preference of foreign yachtsmen in marinas of our country tried to be determined by using Analytic Hierarchy Process (AHP), which is one of the multi criteria decision-making methods. Security and location are the two most effective criteria compared to other criteria.

Keywords: *Marina Selection, Analytic Hierarchy Process, Tourism of Marine, Mariner.*

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1. INTRODUCTION

Marine tourism has made great progress in our country in recent years. Important parts of these advances are occurred by the modernization of the newly built marinas and existing marina facilities that can serve all kinds of boats by renewing their technologies. Our country has become a center of attraction especially for European (British and German) yachtsmen with its climate, sheltered bays, maritime routes suitable for yachts and cultural heritage. Marinas are spread over the Mediterranean, Marmara and Aegean coasts of our country, surrounded by inland seas and are concentrated in Istanbul, North Aegean, South Aegean and Western Mediterranean regions.

Local tourists realized the availability of yachting, which was discovered by foreign tourists in the 1960s with the intention of visiting the bays where no land transportation was available, in time, thus the marina and yachting activities in Bodrum, Marmaris gained momentum (Sezer, 2012).

According to the yacht statistics published by the Ministry of Culture and Tourism, the number of foreign private yachts coming to Bodrum Port in 2007 for example increased from 816 to 3691 in 2016 and increased by 452% (Ministry Of Culture and Tourism, 2019).

In this study, the problem of marina selection in accordance with individual expectations and boat characteristics of foreign private yacht owners who intend to visit Turkey permanently or in transit is examined.

Analytical Network Process (AHP), which is a multi-criteria decision making method, is preferred as the method. The Analytic Hierarchy Process is the decision mechanism that human beings have not been taught to, but instinctively adopts from the beginning and uses it when faced with the decision-making problem (Saaty, 2003). The instinctive mechanism is characterized by qualitative and quantitative criteria. The Analytic Hierarchy Process is difficult or impossible to deal with in most other approaches, but it is also highly applicable to many decision-making problems encountered in everyday life, since it can also address qualitative features that affect decisions.

2. AIM AND SCOPE OF RESEARCH

The aim of this study is to examine the usability of multi-criteria decision-making methods in marina selection, and to provide an alternative method for the marinas to evaluate their qualifications and handicap in a healthy way.

When the national publications in the literature are examined, it is seen that the factors that affect the service quality of marinas are determined, the application of service quality factors to marina enterprises and the choice of marina facility location are concentrated (Dikeç & Töz, 2017; Maglic, 2019; Sezer, 2012). Although the quality of service for yachtsman seems to be a very important criterion, when the occupancy rates of the marinas on our coasts are examined to include all marinas, there may be more important technical criteria.

The decision alternatives are 3 private marina enterprises located in Muğla province, all three with 5

anchors, blue flags and occupancy rate of 85% or more in summer season. The decision makers are the foreign yachtsmen in which the Ministry of Culture and Tourism deals with the status of foreign yachtsmen. Since the ranking of decision alternatives will be evaluated with a more comprehensive study, this study is not included in this study.

3. TOURISM OF YACHTING

The yachts that have a share in yacht tourism can be defined as structures where private and commercial yachts can safely approach, professional mooring services are provided, the safety of the yacht and the yacht owner are provided, and there are various boat handling and maintenance equipment, as well as social facilities and various cultural activities (Işık & Cerit, 2007). There are two basic elements of yacht tourism. These are yachts and marinas that these yachts are fastened. When we look at the official definitions of the yacht:

“It is not a cargo, passenger and fishing vessel, it has a cabin, a toilet, a sink, a kitchen, it is used commercially or non-commercially for the purpose of travel and sports, the number of passengers it carries is not more than twelve or it is limited to one hundred miles on a cabotage journey, not more than twenty miles from the nearest land. The number of passengers carried by the ship does not exceed thirty-six and the yacht is stated in the tonnage document” (Turkish Tourism Incentive Law No. 2634).

“It is suitable for use in sea tourism trade for the purpose of travel, sport and entertainment, the number of passengers carried does not exceed twelve, differs from cargo, passenger and fishing vessels, not having the cabin, toilet and kitchen” (Marine Tourism Regulation, 2009) found in literature.

Yachts are classified according to propulsion system, hull structure and construction methods in traditional classification. According to their functions, motor yachts, sailing yachts, sports and recreational vehicles are classified as private yachts and commercial yachts. Private yachts; refers to boats used for recreational and sporting purposes, which are limited to 12 persons. Commercial yachts mean boats that do not have the status of cargo, passenger or fishing ships, can travel up to 20 nautical miles away from the nearest land or do not make more than 100 miles in cabotage and carry more than 36 people (Kan, 2014).

The marina is defined as the facility that contains the equipment and materials that can accommodate all kinds of yachts' accommodation (TDK, 2019). The number of certified tourism businesses coastal marinas in Turkey 27, the total capacity is 11.715't. Number of yachts with tourism operation certificate is 6 and total mooring capacity is 967. The number of marinas with a tourism investment certificate is 8 and the total mooring capacity is 3530. The cruise ship port with a tourism investment certificate is 1 and the overall total of all maritime tourism facilities is 42 and the total mooring capacity is 16.212 (Marine Tourism Report, Maritime Trade Magazine, 2019).

3. METHODOLOGY

In the study, Analytical Hierarchy Process (AHP) was used to weight the criteria. The definition of the criteria which is one of the main elements of the Analytical Hierarchy Process, have been obtained through literature research. Face-to-face interviews with three academicians and a marina senior manager finalized it. The relevant expert opinion was also applied to form and weight the binary comparison matrices of the criteria. In order to score the decision alternatives for each criterion, questionnaire forms that were created for qualitative criteria were applied to marina visitors and managers. Data were collected via internet websites and e-mail for quantitative criteria. The implementation of the scoring of decision alternatives will be discussed in another more comprehensive study.

3.1. Analytic Hierarchy Process

Although the Analytic Hierarchy Process was first proposed by Myers and Alpert in 1968, Thomas Lorie Saaty developed it as a model in 1977 and made it

available to decision-making processes (Yaralioglu, 2001). The Analytic Hierarchy Process allows decision makers to model problems, decision alternatives, criteria and sub-criteria, if any, and the relationship between them in a hierarchical structure. In the Analytic Hierarchy Process, the subjective interpretations and objective evaluations of the decision-maker at the decision stage are included together.

The first step in the Analytic Hierarchy Process is to establish a hierarchical model. The aim of the problem, respectively, the main criteria, if any sub-criteria, decision alternatives are listed in a hierarchical manner as in Fig. 1.

After the hierarchy table is created, in the second step, the criteria are compared between each other and sub-criteria, if any, and their importance levels and weights are determined. In binary comparison, square matrix is obtained by utilizing the scale graded 1-9 by Saaty in Table 1. The effectiveness of the 1-9 comparison scale was determined by comparisons with other scales and the use of the scale in different areas (Kuruüzüm & Atsan, 2001).

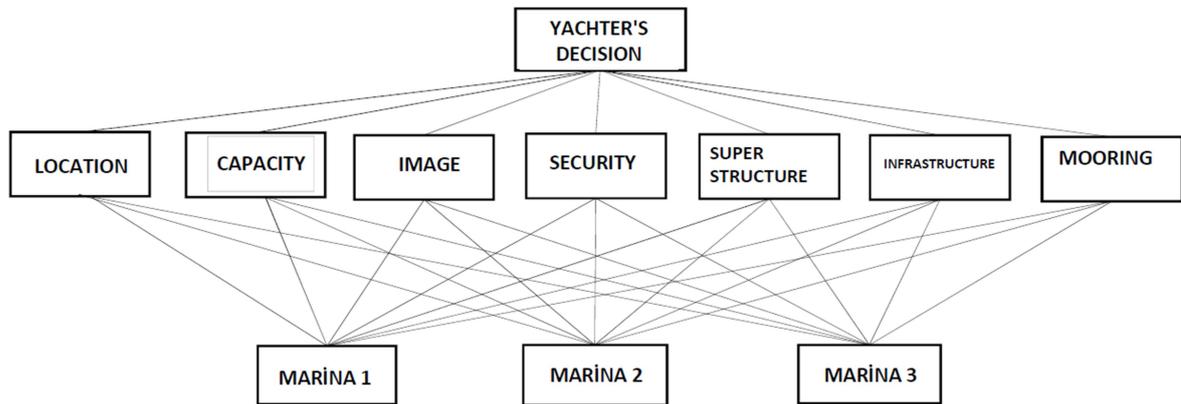


Fig. 1. Marina Selection Problem - AHP Hierarchy Model

Table 1. Thomas Saaty's 1-9 degree AHP scale (cleren, 2006).

Importance Level	Definition	Importance Level	Definition
1	Equal Importance	1	Equal Importance
3	Moderately More Important	1/3	Moderately Less Important
5	Strongly More Important	1/5	Strongly Less Important
7	Very Strongly More Important	1/7	Very Strongly Less Important
9	Extremely Strong Importance	1/9	Extremely Less Important
2-4-6-8	Intermediate Values	½, 1/4, 1/6, 1/8	Intermediate Values

In step 3, the normalization of the scores in the square matrix is made and the normalized square matrix

Normalization:

$$b_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (1)$$

Definition of Priority Vector:

is formed. Each line is averaged to obtain a priority vector.

$$w_i = \frac{\sum_{j=1}^n C_{ij}}{n} \quad (2)$$

In step 4, matrix consistency is determined. For a matrix to be consistent, its maximum eigenvalue (λ_{max}) must be equal to the matrix size (n). To find λ_{max} , each column element in the comparison matrix is divided by the sum of the column. Thus, the matrix is normalized. Then, each row is averaged for the priority vector calculation. The Whole Priority Matrix "is calculated by multiplying the priority vector and initial matrix. The values obtained are divided by the Priority Vector values. λ_{max} the average of these values is

CI is calculated as follows:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

Once CI is calculated, the consistency ratio (CR) is calculated by the following formula.

$$CR = \frac{CI}{RI} \quad (4)$$

RI represents the randomness indicator. The Randomness Indicator is determined by selecting the appropriate value from Table 2.

Table 2. Randomness Index

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51	1,48	1,56	1,57	1,59

If the obtained consistency ratio is less than 10%, the criteria weighting and/or decision-making process is consistent. The decision is applied.

4. APPLICATION

In this study, the criteria that foreign yachtmen will take into consideration in order to determine the most suitable marina for their own yacht from the marinas in Muğla province are determined by Analytical Hierarchy Process (AHP). Questionnaire forms were created by using the scale that 1-9 graded by Saaty to be used in paired comparisons of criteria and evaluation of each alternative according to criteria.

4.1. Definition of Criteria

The criteria of the study were obtained by face-to-face interview with 3 academicians and 1 marina official after the literature research. Determined criteria are location, capacity, prestige, security, superstructure, infrastructure and mooring fee.

determined to calculate. This is the average λ_{max} value (Long and Kazan, 2016). This should be done after finding the value; As stated above, the consistency of the hierarchical table is determined by calculating the consistency ratio. The consistency ratio is calculated to prevent the expert from making mistakes when performing binary comparisons. If this value is greater than 0.1, the comparison should be revised. To calculate consistency, the consistency index (CI) is first calculated.

4.2. Determination of Criterion Weights

In weighting the criteria by pairwise comparison, expert opinion was used. Criterion weights and alternatives were evaluated by interviews with 3 academicians and 1 marina manager. In order to score the decision alternatives for each criterion, questionnaire forms created for qualitative criteria were used and data were collected via internet websites/e-mail communications for quantitative criteria.

Table 3. AHP Score / Criteria Weight

Criteria	Ahp Scores / Criteria Weight
Location	0,307
Capacity	0,032
Prestige	0,027
Security	0,27
Superstructure	0,086
Infrastructure	0,151
Mooring Fee	0,126

Table 4. Comparison Matrix

Criteria	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Location	1	7	9	1	5	3	3
Capacity	1/7	1	1	1/9	1/3	1/5	1/3
Prestige	1/9	1	1	1/7	1/5	1/7	1/5
Security	1	9	7	1	5	1	3
Superstructure	1/5	3	5	1/5	1	1	1/3
Infrastructure	1/3	5	7	1	1	1	1
Mooring Fees	1/3	3	5	1/3	3	1	1

Table 5. Normalized Matrix

Criteria	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Location	0,320447	0,241379	0,257143	0,2640402	0,3218	0,408560	0,338346
Capacity	0,045778	0,034483	0,028571	0,0293378	0,0214	0,027237	0,037594
Prestige	0,035605	0,034483	0,028571	0,0377200	0,0128	0,019455	0,022556
Security	0,320448	0,310345	0,200000	0,2640402	0,3218	0,136187	0,338346
Superstructure	0,064089	0,103448	0,142857	0,0528080	0,064377	0,136187	0,037594
Infrastructure	0,106816	0,172414	0,200000	0,2640402	0,064377	0,136187	0,112782
Mooring Fees	0,106816	0,103448	0,142857	0,0880134	0,193133	0,136187	0,112782

Table 6. Grading of criteria and percent consistency

%	CA	Criteria	λ_{max}	CI/RI	Consistency Percentage
37%	0,95929	Location	7,4303	0,0543	%5 < %10
3,2%	0,92991	Capacity			
2,7%	0,95633	Prestige			
27%	1,02325	Security			
8,60%	1,33445	Superstructure			
15,10%	1,10837	Infrastructure			
12,60%	1,11877	Mooring Fees			

According to the above criteria weights, the criteria with the highest weight value were determined as position and safety respectively. Location and security criteria are followed by infrastructure, mooring fee, superstructure, capacity and prestige criteria.

Since the consistency indicator (CR) is determined as 5% (0.0543), it is seen that the consistency indicator is less than the upper limit of 0.1. In this case, since it is 5% < 10%, it can be said that experts make comparisons consistently.

5. CONCLUSION

Marine tourism and marina management are developing day by day in the global sense and the activities in this field are increasing in our country. With increasing investments and employment in the sector, the number of scientific studies should increase day by day.

When the factors affecting the choice of foreign yachtsmen are taken from a wide perspective, location and safety are the most important factors. The criteria for infrastructure, mooring fee, superstructure, capacity and prestige that follow these two criteria are also very important. For example, it is possible to encounter interesting results between a marina operation in the Eastern Mediterranean and two marinas in the North Aegean, for example due to the large score difference

in the security criteria.

It is in the interest of the sector and yachts to determine criteria, taking into account the socio-economic characteristics of each yacht, the purpose of use of the marina and the size of the yacht, and the use of Multi-Criteria Decision Making Methods, where other quantitative and qualitative criteria can be taken into account.

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