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# THE SELECTION OF THE TOURISM LOGISTICS CENTER LOCATION WITH AHP: A WEST MEDITERRANEAN APPLICATION [1]

# AHP İLE TURİZM LOJİSTİK MERKEZİ KONUMUNUN SEÇİLMESİ: BATI AKDENİZ UYGULAMASI

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## ABSTRACT

*In an effective logistics system, it is important to link logistics centers with manufacturers, distributors and customers to improve product flow. A well-designed logistics center reduces material handling costs, while increasing productivity and profit. In the study, five settlements (Antalya, Isparta, Burdur, Alanya and Manavgat) located in the Western Mediterranean Region are compared with each other by using the Analytic Hierarchy Process (AHP) method. The study which aims to found an ideal tourism logistics center has a proposal character indicated the importance of the proposed logistics center which will be founded in a suitable place in the compared settlements in terms of the regional and national economy. As a conclusion, Manavgat becomes a prominent settlement to found the logistics center as a result of AHP calculations. It is emphasized that a tourism logistics center to be established in Manavgat will be efficient and effective.*

**Keywords:** *Tourism Logistics, Logistics Center, Analytic Hierarchy Process*

**Jel Codes:** *Z32, M11, C61.*

## ÖZ

*Etkili bir lojistik sisteminde, ürün akışını iyileştirmek için lojistik merkezlerini üreticiler, distribütörler ve müşterilerle bağlamak önemlidir. İyi tasarlanmış bir lojistik merkezi, üretkenliği ve kârı artırırken malzeme taşıma maliyetlerini azaltmaktadır. Bu araştırmada Batı Akdeniz Bölgesi'nde yer alan beş yerleşim yeri(Antalya, Isparta, Burdur, Alanya ve Manavgat) Analitik Hiyerarşi Süreci (AHP) yöntemi kullanılarak birbirleriyle karşılaştırılmıştır. İdeal bir turizm lojistik merkezi yeri belirlenmeyi hedefleyen bu çalışma, karşılaştırmalı yerleşim yerleri arasında kurulması önerilen lojistik merkezinin bölge ve ülke ekonomisi açısından önemini ortaya koymuştur. Sonuç olarak, Manavgat, AHP hesaplamaları sonucunda lojistik merkezi kurmak için önemli bir yerleşim yeri haline gelmiştir. Turizm için Manavgat'ta kurulacak bir lojistik merkezinin verimli ve etkili olacağı vurgulanmıştır.*

**Anahtar Kelimeler:** *Turizm Lojistiği, Lojistik Merkezi, Analitik Hiyerarşi Süreci.*

**Jel Kodları:** *Z32, M11, C61.*

[1] This Study is derived from Kazım Aykut ÖZMEN's Master Thesis Study.

## 1. INTRODUCTION

The commitment to logistics is increasing day by day as the world is accepted as a market due to competition goes beyond the borders of the country, and commercial activities take a global dimension. Increasing commitment to logistics brings with it the necessity of uninterrupted logistics activities.

Having special zones where all activities are provided from the same place ensures that activities take place without interruption.

Logistics is an important part of the business economic system and is a major global economic activity (Mohan, 2013:39). The market size of the logistics sector, which is becoming more and more important every day, varies according to the location, geography, opportunities and level of development of that country.

Especially today, competition is not limited with the region or city we are in, but made against the whole country and even with the world as global competition. It should not be forgotten that there are global competitors depending on the work done. Attention should be paid to support customers after sales as well as paying attention to costs, distribution and transportation in order to achieve competitive advantage (Barlın, 2009:106). With the developments and changes in business life in recent years, more complex logistics problems have started to emerge. For businesses, while having a successful and effective logistics management plays an important role in dealing with these problems, it also creates key opportunities to increase the success and competitive performance of businesses (Kherbach and Mocan, 2016:408).

Logistics activities have a very big and important role here. The reason for this is that a disruption in logistics activities will negatively affect competition and other activities of the company. In order to be mentioned events or phenomena to be logistics, more than one related operations evaluated under the name of logistics activities must be performed (Keskin, 2015:18).

When it comes to logistics, the following definitions come to mind briefly;

- "Logistics is the management of all activities which facilitate movement and the co-ordination of supply and demand in the creation of time and place utility (Farahani et al., 2011:3).
- Another definition of logistics is the definition that is known as 'Seven Rights' and has been widely used recently. This definition is as follows; delivering the right material, in the right size, in the right situation, in the right place, at the right time, to the right consumer, at the right price (Kır, 2016:3).
- Logistics is carrying out all the operations required from the point where a manufactured product or any material goes out up to the destination point. These operations are activities in which all activities such as storage, transportation, and keep as ready to use are implemented in a planned manner (Barlın, 2009:9).

### 1.1. The Importance of Logistics

Our world takes a global dimension. Commercial relations, local and regional, go further, turning into beyond-border and even intercontinental trade relations and competitions. Now, trade relations and competition are increasing day by day, regardless of distances. Sending products from one end of the world to the other has become a part of everyday life. It is for this reason that logistics activities are taken into consideration as time goes on and their importance increases day by day (Ecer, 2014:7).

The importance of logistics increases related with the diversity in production, financial crises and contractions in the market, increase in transportation costs, the presence of high-priced products, the

widespread use of the internet and the presence of it in every sector (Şekkeli, 2016:15). Strengthening and maintaining the logistics system is an investment that pays off in three ways. (1) It reduces losses due to overstock, waste, expiry, damage, pilferage, and inefficiency; (2) it protects other major program investments; and (3) it maximizes the potential for cost recovery (Usaid | Deliver Project, 2011:2).

### 1.2. Logistics Performance Index

The Logistics Performance Index (LPI) is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade (Who, 2018). According to Turkey's rankings and scores 2007-2018 year LPI criteria are available as detailed in Table 1.

Table 1: According to Turkey's 2007-2018 Year of Logistics Performance Index Score and Ranking Criteria

| | | 2018 | 2016 | 2014 | 2012 | 2010 | 2007 |
|---|---|---|---|---|---|---|---|
| **LPI Rank** | | 47 | 34 | 30 | 27 | 39 | 34 |
| **LPI Score** | | 3,15 | 3,42 | 3,50 | 3,51 | 3,22 | 3,15 |
| **Customs** | **LPI Score** | 2,71 | 3,18 | 3,23 | 3,16 | 2,82 | 3,0 |
| **Infrastructure** | **LPI Score** | 3,21 | 3,49 | 3,53 | 3,62 | 3,08 | 2,94 |
| **International shipments** | **LPI Score** | 3,06 | 3,41 | 3,18 | 3,38 | 3,15 | 3,07 |
| **Logistics competence** | **LPI Score** | 3,05 | 3,31 | 3,64 | 3,52 | 3,23 | 3,29 |
| **Tracking & tracing** | **LPI Score** | 3,23 | 3,39 | 3,77 | 3,54 | 3,09 | 3,27 |
| **Timeliness** | **LPI Score** | 3,63 | 3,75 | 3,68 | 3,87 | 3,94 | 3,38 |

**Source:** (World Bank, 2018)

### 1.3. Organization and Placement of Logistics System Components

It is important to deliver the right products and services to the right customers on time in an effective logistics system. In logistics systems, logistics centers and manufacturers and customers must be connected to improve product flow. Well-designed logistics centers not only reduce material handling costs, but also increase productivity and profit (Kauf and Tłuczak, 2018:1). At the same time, in order to comply with free market rules, distribution centers, storage areas, offices, truck services etc. should be able to access the logistics centers of all companies that operate (Hruška, et al., 2007:71). For these reasons, the establishment of a logistics center is a strategic decision, mainly due to irreversible effects arising from site selection (Kauf and Tłuczak, 2018:1).

As a component of a logistics system, logistics centers can serve the industry by offering services (storage, transport, distribution, assembly, consolidation, sorting, cross-docking, e-commerce, etc.).

For this reason, location selection is very important in the establishment of logistics

centers. At this stage, the issues of how to choose the locations of logistics centers from alternatives and how to move products from distribution centers to customers are taken into consideration in order to minimize the total related cost (Yang et al., 2007:303). The location problem plays also a crucial role in logistics, where it refers to finding the most desirable location of logistics facilities. During the last three decades, a great number of methods that solve location problems have been developed (Żak and Węgliński, 2014:556). Logistics center location selection can be considered as a multi-criteria decision making problem (Pramanik et al., 2016:161). The choice of the logistics center location is based on an integrated decisions and risk methodology for the selection of the best locations which involves general steps as listed below: the initial step forms a schedules collection and acceptable spatial alternatives. Step 1 defines a set of criteria for decision making, step 2 identifies the initial weight of the relevant criteria, step 3 uses the AHP as one of the techniques (MCDM), step 4 establishes a ranking list of alternatives (Stević et al., 2015:87).

### 1.4. Concept of Tourism Logistics Center

The logistic activities in the tourism companies contribute to the improvement in the experience and satisfaction of customers, workers, businessmen, suppliers and community, where tourism activity is developed, constituting an effective business management tool, adding value to tourism (https://logisticsmgepsupv.wordpress.com/2018/04/27/logistics-inside-tourism/). For the organizations which are involved in tourism, efficiency is conditioned, among other determinants, by the coordination and harmonization of all participants' efforts from the specific activities chain: tourism services suppliers, tour-operators, travel agencies and tourists themselves (Muhcina and Popovici, 2008:122). Tourism Logistics aims to understand the relationships between tourism and transport in the context of their development, organization and management (Nayak and Aggarwal, 2013:39).

The relationship between tourism and logistics is basically focused on provisioning, supply and provision activities, activities that are reflected in the transportation of passengers, food, accommodation and material support to tourism programs, being fundamental to consider them when planning and organize a tourist activity or event (https://logisticsmgepsupv.wordpress.com/2018/04/27/logistics-inside-tourism/).
Tourism logistics in general; it refers to all units related to material flow caused by tourism, including transportation, property maintenance, transportation of goods, and their relations and product circulation. This perspective focuses on the concept of consumer satisfaction (Ling, 2017:2)

The concept of Tourism Logistics Center, which can be defined as a sub-concept of the definition of Logistics Center, usually causes some confusion in the literature. Generally, it is equated with the definition of Supply Chain Management or product storage. In the literature, with the concept of Supply Chain Management, the mobility of suppliers and users as well as goods and service products are also discussed.

As a result of this general understanding, a logistics center definition related to tourism is also perceived in this sense. However, when the most important component of the subject is tourism itself, it is useful to make this definition more specific. Because tourism is an activity chain that is very affected by geography and socio-culture and requires each phase to be detailed without harming the general integrity.

In this context, while creating new tourism areas, the goals and wishes of political decision-makers and local administrators will definitely be at the forefront. However, it is necessary to make the existing structure more competitive in terms of service quality and price in places where mass tourism is made where tourism activities reach a certain maturity.

It has a great importance to supply all kinds of material requirements on time and at reasonable prices of large-volume accommodation businesses in places where the service period is long and mass tourism is carried out. It is also very important that the maintenance and repair services of the equipment used in these facilities should be economical, at predicted quality and fast.

It is of great importance that suppliers and maintenance services are close and integrated with tourism centers in order to perform these effectively. It is also important in terms of sustainability that these businesses can serve the local people in periods when tourism mobility is low. A tourism logistics center to be formed by businesses that are well positioned for access and potential growth in the future will be able to provide effective and efficient service in the context of international and regional tourism for 12 months and contribute more to the regional economy.

In the light of these declarations regarding the definition of Tourism Logistics Center, it was preferred to carry out this analytical study in the Western Mediterranean Region, where mass tourism is concentrated.

In the study, five settlements (Antalya, Isparta, Burdur, Alanya and Manavgat) selected from the Western Mediterranean Region were compared with each other and it was aimed to determine the most suitable place for establishing a tourism logistics center. Considering the advantages of the compared five settlements over each other, it is aimed to deploy the tourism logistics center in the most suitable region and to provide information that this center will operate effectively.

## 2. LITERATURE REVIEW

Case studies for the Literature Review on the Use of Analytic Hierarchy Process in the Logistics Sector are given in Table 2.

Table 2: Logistics Industry Literature Review of AHP Usage

| Author | Description |
|---|---|
| Stević et al. (2015) | In this study, Doboj was determined as the most suitable location choice by evaluating six criteria and three alternatives with AHP for the construction of the logistics center in Bosnia and Herzegovina. |
| Acer (2009) | Istanbul and its surroundings were evaluated in the selection of the companies' warehouse locations, and it was tried to carry out the process of selecting the best warehouse. Fuzzy AHP method was used while finding the best place. |
| Hong and Xiaohua (2011) | In the logistics center location selection, a multipurpose location selection model based on AHP theory was applied. Considering the environment, economy and technical factors, implementation was made in line with the target of time and cost minimization. |
| Chou and Yu (2013) | The proposed hybrid fuzzy AHP model is applied to the location choices of international distribution centers in international ports from the view of multiple-nation corporations. The proposed model is an appropriate tool to solve the decision-making problems in an uncertain and multiple-criteria environment. |

| Author | Description |
|---|---|
| Tomić et al. (2014) | Mathematical methods such as Greedy heuristic algorithm and Analytic Hierarchy Process (AHP) were used in the study, which aimed at a more precise analysis of environmental impact to find the proper location of Logistics centers in the Balkan peninsula region. |
| Fettahlıoğlu and Birin (2016) | Reverse logistics activities and sustainable marketing issues are handled together. In order to identify the factors affecting sustainable logistics activities of the companies with reverse logistics, AHP method was used in multi-criteria decision making methods. |
| Acar and Gürol (2017) | Strategic positions and orientations of firms and companies dealing with logistics in Turkey were determined and suggestions were made to provide competitive advantage as a result of the determinations obtained as a result of the determination. While making these determinations, AHP and SPACE analyzes were integrated with Delphi technique and applied. |

## 3. METHODOLOGY

It is considered that the significance of logistics phenomenon showing a growing importance day by day with globalization in particular is not adequately taken into account by administrators of the important localities of Antalya, Isparta, Burdur, Alanya and Manavgat, which are the heart of tourism in Turkey's Western Mediterranean Region, and tourism centers and their potential-supplying immediate environment. In this context, the appropriateness of establishing such a logistics center in which of these five settlements, especially referred to as tourism logistics in the Western Mediterranean Region, represents our research problem.

Analytic Hierarchy Process (AHP) method was used as the method of the study. Basic information about AHP is given below.

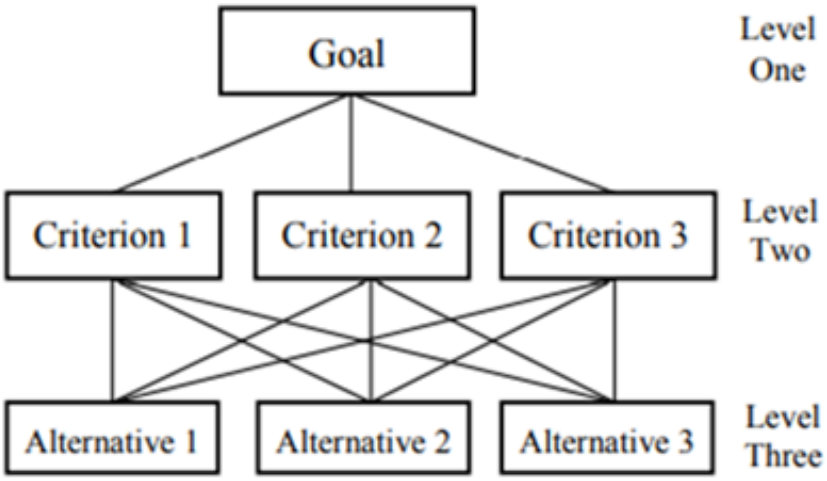
### 3.1. Analytic Hierarchy Process (AHP)

The analytic hierarchy process (AHP) is a decision making procedure originally developed by Saaty (1977, 1980 and 1986). Its primary use is to offer solutions to decision and estimation problems in multivariate environments. The AHP establishes priority weights for alternatives by organizing objectives, criteria, and sub criteria in a hierarchic structure (Bernasconi et al., 2010:699). AHP is a method used to solve complex multi-criteria decision making problems by giving systematic priority ranking (Wang et al., 2018:5). AHP is used to derive ratio scales from both discrete and continuous paired comparisons. These comparisons may be taken from actual measurements or from a fundamental scale which reflects the relative strength of preferences and feelings (Saaty, 1987:161).

#### 3.1.1. Modeling the Decision Problem into a Hierarchical Structure

At the first stage, the issue and goal of decision making brought hierarchically into the scene of the related decision elements. Decision making elements are decision indicators and decision choices. The group established a hierarchy according to Figure 1 which should reflect the understudy problem (Taherdoost, 2017:244).

Figure 1: Sample Hierarchical Tree




Source: (Taherdoost, 2017:244)

### 3.1.2. Making Binary Comparison and Creating a Matrix of Comparisons

In a decision process using typical AHP, the goals and the constraints are defined binary and the relative measurements are expressed as numbers located on the scale from 1 to 9 (Liu et al, 2017:129). Pairwise comparisons are fundamental in the use of the AHP (Saaty, 1987). The relative importance between two criteria is measured according to a numerical scale from 1 to 9, as shown in Table 3.

Table 3: The Fundamental Scale

| Intensity of importance on an absolute scale | Definition | Explanation |
|---|---|---|
| 1 | Equal importance | The two activities contribute equally to the objective |
| 3 | Moderate importance of one over another | Experience and judgment slightly favor one of the activities over the other |
| 5 | Strong importance | Experience and judgment strongly favor one of the activities over the other |
| 7 | Very strong importance | One activity is favored very strongly over the other; this dominance has been demonstrated in practice |
| 9 | Extreme importance | The evidence favoring one activity over another is of the highest possible order of affirmation |
| 2-4-6-8 | İntermediate values | When compromise is needed |

**Source:** (Wang et al.,. 2018:6)

### 3.1.3. Calculating Weights and Consistency Ratio (CR) of All Elements in the Hierarchical Model

After the pairwise comparisons have been completed, a weight value is assigned to the element that has a higher importance in the pair. As for the lesser important element in the pair, a reciprocal of the value will be assigned to it. Normalization and followed by the averaging of the weights are then done to obtain the relative weight for each of the elements in the hierarchical model (Yap et al., 2017:5).

After weights are calculated, it is determined whether the matrix of binary comparisons is consistent, which is an important step. Errors and consistencies should be tested when grading criteria, sub-criteria, and alternatives based on criteria. Where RI is the average value of CI for random matrices using the Saaty scale accepts a matrix as a consistent one if CR < 0,1. If CR exceeds 0,10, the degrees that the decision maker enters into the matrix should be reviewed. The CR value being close to and approaching zero will increase the consistency (Ömürbek and Şimşek, 2014:310). For this purpose, Saaty defined the consistency ratio (CR) as:

Consistency ratio (CR) = Consistency index (CI) / Random Index (RI)

Also, Saaty (1987) defines a random index (RI) that is calculated from 500 examples as the CI of n max mean for each order n. In Table 4, we show the values of RI for different orders of matrices (Lamata and Peláez, 1999:2).

Table 4: Values of the Random Index (RI)

| **Order** | **1-2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|
| RI | 0 | 0.58 | 0.9 | 1.12 | 1.24 | 1.32 |

### 3.1.4. Determining the Most Appropriate Option

In the last stage of AHP, a matrix is organized with the criteria in the row and the alternatives in the column (Akar, 2018:345). Calculations are made according to this matrix. After calculating the general importance, the alternative with the highest value will be the most preferred.

## 4. APPLICATION THE AHP METHOD IN SOLVING THE PROBLEM OF THE LOCATION SELECTION OF A TOURISM LOGISTICS CENTER

Criteria and alternatives are determined with AHP method. In this study, the Purpose is determined to be “in which residential area the most suitable tourism logistics center should be established”. What is meant by the logistics center is the fact that all kinds of site logistics are provided in it. In this context, alternative information about the researched areas is given in Table 5.

Table 5: Criterion Values of Alternative Logistics Centers

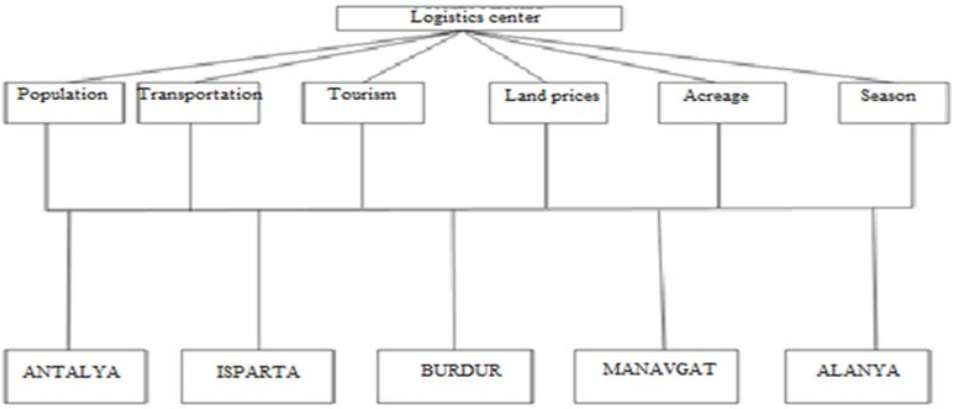
| | **Manavgat** | **Alanya** | **Antalya** | **Isparta** | **Burdur** |
|---|---|---|---|---|---|
| Acreage (sq. km) | 2.283 | 1.577 | 2.170,3 | 773 | 1.567 |
| Population growth percentage (%)<br>Average population growth in last 7 years | 2,93<br>5894,29 | 2,72<br>7311,14 | 2,58<br>55151,84 | -0,41<br>-2066,86 | 0,34<br>844,43 |
| Average distances between settlements (km) | 123,7 | 170,75 | 134,42 | 157,58 | 167,13 |
| Average annual temperature (C°)<br>Average highest temperature (C°)<br>Average lowest temperature (C°) | 18,7<br>24,1<br>13,6 | 18,7<br>24,1<br>13,6 | 18,7<br>24,1<br>13,6 | 12,2<br>18,3<br>6,1 | 13,2<br>19,3<br>7,5 |
| Tourism bed capacity | 250.000 | 188.160 | 89.778 | 3.990 | 547 |

Based on the data presented in the table above and using the AHP method, the results are presented in the headings below.

### 4.1. Creating a Decision Hierarchy

In order to create an appropriate decision hierarchy, the hierarchical structure of a decision problem should be created by first determining the goals, criteria and sub-criteria and options, if any (Akar, 2018:340). Therefore, the decision hierarchy of the study is shown in Figure 2.

Figure 2: Creating a Decision Hierarchy




Our aim to create the decision hierarchy is to decide where to establish the most suitable tourism logistics center. As can be seen in Figure 2, the criteria of our decision hierarchy, population, transportation, tourism, land prices, surface area, and season were evaluated on six basic criteria. Our alternatives to be compared here are five settlements, which are selected from the Mediterranean region. These are Antalya, Isparta, Burdur, Alanya and Manavgat.

### 4.2. AHP Application to Basic Criteria

The binary comparison matrix of the importance of basic criteria relative to each other is given in Table 6.

Table 6: Binary Comparison Matrix of Basic Criteria

| | **Population** | **Transportation** | **Tourism** | **Land Prices** | **Acreage** | **Season** |
|---|---|---|---|---|---|---|
| **Population** | **1** | 1/9 | 1/5 | 1/3 | 1/7 | 1/7 |
| **Transportation** | 9 | **1** | 5 | 7 | 3 | 3 |
| **Tourism** | 5 | 1/5 | **1** | 3 | 1/3 | 1/3 |
| **Land Prices** | 3 | 1/7 | 1/3 | **1** | 1/5 | 1/5 |
| **Acreage** | 7 | 1/3 | 3 | 5 | **1** | 1 |
| **Season** | 7 | 1/3 | 3 | 5 | 1 | **1** |

Later, based on the comparison matrix, the weight calculations of the basic criteria are shown in Table 7.

Table 7: Finding Weight Values by Squaring the Binary Comparison Matrix

| **Criteria** | Population | Transportation | Tourism | Land Prices | Acreage | Season | **Total Row** | **Weight** |
|---|---|---|---|---|---|---|---|---|
| Population | 6,0000 | 0,4051 | 1,9238 | 3,4730 | 0,8952 | 0,8952 | 13,5923 | 0,0249 |
| Transportation | 106,0000 | 6,0000 | 32,1333 | 62,0000 | 13,3524 | 13,3524 | 232,8381 | 0,4268 |
| Tourism | 25,4667 | 1,6063 | 6,0000 | 12,4000 | 2,9143 | 2,9143 | 51,3016 | 0,0940 |
| Land Prices | 11,7524 | 0,8190 | 3,1810 | 6,0000 | 1,5683 | 1,5683 | 24,8890 | 0,0456 |
| Acreage | 54,0000 | 3,0921 | 13,7333 | 28,6667 | 6,0000 | 6,0000 | 111,4921 | 0,2044 |
| Season | 54,0000 | 3,0921 | 13,7333 | 28,6667 | 6,0000 | 6,0000 | 111,4921 | 0,2044 |
| **Total** | | | | | | | **545,5062** | **1,0000** |

After creating the binary comparison matrix, the binary comparison matrix is squared and the weight values are calculated. After calculating the weight value of the basic criteria, the consistency ratio should be calculated. In this context, the matrix is obtained by multiplying the weights we obtained with the binary comparison matrix. As a result of the calculation we made based on this, the matrix of our study is presented in Table 8 below.

Table 8: Matrix Multiplication

| | | | | | |
|---|---|---|---|---|---|
| 0,1647 | 2,6665 | 0,5769 | 0,2944 | 1,2354 | 1,2354 |

To be able to calculate the eigenvalue, the corresponding matrix line is divided by the respective weight. Afterwards, eigenvalue is obtained by averaging the results obtained. The eigenvalue calculation in our study is as follows.

0,1647 / 0,0249 = 6,6145

2,6665 / 0,4268 = 6,2477

0,5769 / 0,0940 = 6,1372

0,2944 / 0,0456 = 6,4561

1,2354 / 0,2044 = 6,0440

1,2354 / 0,2044 = 6,0440

6,2573 Maximum eigenvalue

After all these processes are done, consistency calculation is started. The consistency calculation of the relevant data is as follows:

((6,2573 - 6) / 5) / 1,24 = 0,0415

When we look at the result obtained, it is observed that the number is consistent since it is less than 0,10.

### 4.3. AHP Application to Alternatives According to Population Basic Criteria

In the context of population, alternatives are subjected to a binary comparison matrix. In this comparison, the degree of importance was determined by looking at the population increase. After making binary comparisons, they are squared and weight values were determined. These values are in Table 9.

Table 9: Weight Value of Alternatives According to Population Criteria

| | Antalya | Isparta | Burdur | Manavgat | Alanya | **Total Row** | **WEIGHT** |
|---|---|---|---|---|---|---|---|
| Antalya | 5,0000 | 33,0000 | 21,8333 | 2,4444 | 3,3988 | 65,6765 | 0,1928 |
| Isparta | 0,9524 | 5,0000 | 3,6349 | 0,3948 | 0,6151 | 10,5972 | 0,0311 |
| Burdur | 1,2798 | 7,4345 | 5,0179 | 0,5992 | 0,8690 | 15,2004 | 0,0446 |
| Manavgat | 12,4524 | 69,0000 | 52,5000 | 4,8750 | 7,6250 | 146,4524 | 0,4300 |
| Alanya | 7,9762 | 50,5000 | 35,5000 | 3,5556 | 5,1429 | 102,6747 | 0,3015 |
| **TOTAL** | | | | | | **340,6012** | **1,0000** |

After this process, the population matrix multiplication values were calculated. After calculating the maximum eigenvalue of the population criterion, the consistency calculation of the population criterion is as follows:

((5,1610 - 5) / 4) / 1,12 = 0,0357

Considering the result, the data obtained is consistent because it is less than 0,10.

Similar to the population criteria, eigenvalues were calculated by applying AHP to the other five basic criteria. After determining the maximum eigenvalue, consistency calculation was started. As a result of AHP, the maximum eigenvalues and consistency ratios of all criteria are shown in Table 10.

Table 10: Maximum Eigenvalues and Consistency Ratios of Basic Criteria

| **Criterias** | **Population** | **Transportation** | **Tourism** | **Land Prices** | **Acreage** | **Season** |
|---|---|---|---|---|---|---|
| **Maximum Eigenvalue** | 5,1610 | 5,0001 | 4,9992 | 5,0683 | 5,0000 | 5,0003 |
| **Consistency Ratio** | 0,0357 | 0,00002 | -0,0001 | 0,0152 | 0,000 | 0,00007 |

When Table 9 is analyzed, it is seen that the consistency ratios of all basic criteria are less than 0,10. In this case, the values obtained are said to be consistent according to the basic criteria determined.

## 5. RESULTS

After the necessary measurements were made, the data obtained were brought together and the appropriate location was selected. The combination of results is shown in Table 11.

Table 11: Combination of Results

| **Criteria** | **Antalya** | **Isparta** | **Burdur** | **Manavgat** | **Alanya** | **WEIGHT** |
|---|---|---|---|---|---|---|
| **Population** | 0,1928 | 0,0311 | 0,0446 | 0,4300 | 0,3015 | 0,0249 |
| **Transportation** | 0,2207 | 0,1883 | 0,1775 | 0,2398 | 0,1737 | 0,4268 |
| **Tourism** | 0,1686 | 0,0075 | 0,0010 | 0,4695 | 0,3534 | 0,0940 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Land Prices** | 0,0609 | 0,2640 | 0,4193 | 0,1597 | 0,0961 | 0,0456 |
| **Acreage** | 0,2593 | 0,0924 | 0,1872 | 0,2727 | 0,1884 | 0,2044 |
| **Season** | 0,2941 | 0,0588 | 0,0588 | 0,2941 | 0,2941 | 0,2044 |
| **OVERALL SCORE** | 0,2307 | 0,1248 | 0,1464 | **0,2803** | 0,2179 | |

When the general scores are evaluated according to Table 10, it is seen that the settlement with the highest score is Manavgat. As a result, as it will be processed in more detail, Manavgat is the most suitable settlement for the logistics center that is planned to be established.

## 6. CONCLUSION

Based on the importance of the logistics sector, in our study, five settlements in the Western Mediterranean Region (Antalya, Isparta, Burdur, Alanya and Manavgat) were compared using the AHP method to establish the most appropriate logistics tourism center. Our aim to compare these five settlements is that these centers are settlements that form the West of the Mediterranean Region and they are close to each other. Our goal was to state that Manavgat is a transit route, to specify its tourism bed capacity, its acreage size, and that its percentage of population growth is better than others.

We have six main criteria: population, transportation, tourism, land prices, acreage and season. Transportation is of great importance for the logistics center compared to others. Along with the good transportation possibility, it is necessary to find land for the place to be established and to have a place to expand in the future (acreage), and in addition, the climate must be suitable for our purpose. Since tourism logistics is our target, tourism data becomes our next important evaluation criterion. Then, land prices and population growth percentages of the place where it will be established will be considered. Transportation, the size of acreage and unchangeable climate show that these are the more important factors while the others in the model are tourism, land prices and population, respectively.

After comparing the main criteria, alternatives were compared with each other according to the main criteria. According to the main criteria of transportation, population, tourism and acreage, Manavgat is important than other settlements and has the same importance as Antalya and Alanya in the season, but it is determined as more important than Isparta and Burdur. It comes after Burdur and Isparta in terms of land prices.

When all the results are combined, Manavgat has been determined as the most suitable logistics center installation place by getting higher scores than others. Such a logistics center to be established in Manavgat will be an example to other cities and regions. Considering this example, other Logistics Centers to be built will enable the country to grow in the field of logistics, while growing in the field of logistics, foreign currency input will be provided to the country and employment will increase. As a result, it is seen that a tourism logistics center to be established in Manavgat will increase the welfare of the local people and contribute to the development of the region. With the positive impact on the region, a continuous contribution related to tourism can be provided to the national economy. It will help increase employment and will ensure that the times described as low season and dead season will be more productive.

## REFERENCES


1. ACAR, A.Z. and GÜROL, P. (2017). "Türk Lojistik ve Taşımacılık Firmalarının Stratejik Pozisyon ve Aksiyonlarının Değerlendirmesi", International Journal of Economic and Administrative Studies, 767-780.
2. ACER, A. (2009). Bulanık AHP Yöntemi ile Lojistik Yönetimine Çözüm Yaklaşımı ve Bir Uygulama, Master Thesis, Marmara University Institute of Social Science, İstanbul.
3. AKAR, C. (2018). İş Analitiği Excel Uygulamalı Yönetsel Karar Verme ve Veri Analizi, Dora Basım Yayım Dağıtım, İstanbul.
4. BARLIN, A. (2009). Lojistikte Dış Kaynak Kullanımı ve Maliyetlerin Kontrolü, Master Thesis, Marmara University Institute of Social Sciences, İstanbul.
5. BERNASCONI, M., CHOIRAT, C. and SERI, R. (2010). "The Analytic Hierarchy Process and the Theory of Measurement", Management Science, 56(4): 699-711.
6. CHOU, C.C. and YU, K. W. (2013). "Application of a New Hybrid Fuzzy AHP Model to the Location Choice", Mathematical Problems in Engineering, 1: 1-12.
7. ECER, B. (2014). Güvenilir Lojistik Ağ Tasarımı İçin Çok Amaçlı Optimizasyon Modeli, Master Thesis, Gazi University Institute of Science and Technology, Ankara.
8. FARAHANI, R., REZAPOUR, S. and KARDAR, L. (2011). Logistics Operations and Management: Concepts and Models, Elsevier, London.
9. FETTAHLIOĞLU, H. S. and BİRİN, C. (2016). "Sürdürülebilirlik Açısından Tersine Lojistik Faaliyetlerini ve Sürdürülebilir Pazarlamayı Etkileyen Faktörlerin Analitik Hiyerarşi Yöntemi ile Belirlenmesi", Kahramanmaraş Sütçü İmam Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 6(2): 89-114.
10. HONG, L. and XIAOHU, H. (2011). "Study on Location Selection of Multi-Objective Emergency Logistics Center based on AHP", Procedia Engineering, 15: 2128-2132.
11. HRUŠKA, R., PRŮŠA, P. and FRANSSILA, T. (2007). "Logistic Centre and Information Technology", Scientific Papers of the University of Pardubice, 13: 68-77.
12. KAUF, S., and TŁUCZAK, A. (2018). "Solving The Problem of Logistics Center Location Based on The AHP Method", MATEC Web of Conferences, 184(4): 1-6.
13. KESKİN, H. (2015). Kavramlar, Prensipler, Uygulamalar Lojistik El Kitabı Küresel Aktörlerin Lojistik Pratikleri, Nobel Yayıncılık, İstanbul.
14. KHERBACH, Q. and MOCAN, M. (2016). "The Importance of Logistics and Supply Chain Management in the Enhancement of Romanian, SMEs Procedia - Social and Behavioral Sciences, 22: 405-413.
15. KIR, F. (2016). Türkiye'nin Konumu Açısından Lojistik Köylerin Önemi: Kars Lojistik Köy Örneği. Master Thesis, 7 Aralık University Institute of Social Science, Kilis.
16. LAMATA, T.M., and PELÁEZ, I. J. (1999). "Preference Graph and Consistency in AHP", Conference: 4th Meeting of the EURO Working Group of Fuzzy Sets EUROFUSE'99, Budapest, Hungría.
17. LING, D. K.(2017). "A Study of Relationship between Tourism Logistics and Domestics Self-driving Tour", International Journal of Managerial Studies and Research, 5(4): 1-4.
18. LIU, F., PENG, Y. N., and ZHANG, W. G. (2017). "On Consistency in AHP and Fuzzy AHP", Journal of Systems Science and Information, 5(2): 128-147.

19. MOHAN, J. B. (2013). "The Impact of Logistic Management on Global Competitiveness", International Journal of Business and Management Invention, 2(3): 39-42.
20. MUHCINA, S. and POPOVICI, V. (2008). "Logistics and Supply Chain Management in Tourism", the Amfiteatru Economic Journal, Academy of Economic Studies-Bucharest, Romania, 10(24): 122-132.
21. NAYAK, H. and AGGARWAL, M. (2013). Minor Project Report on Role of Logistics in Tourism. New Delhi.
22. ÖMÜRBEK, N. and ŞİMŞEK, A. (2014). "Analitik Hiyerarşi Süreci ve Analitik Ağ Süreci Yöntemleri ile Online Alışveriş Site Seçimi", Yönetim ve Ekonomi Araştırmaları Dergisi, 22: 306-327.
23. PRAMANIK, S., DALAPATI, S., and TAPAN, K. (2016). Logistics Center Location Selection Approach Based on Neutrosophic Multicriteria Decision Making, New Trends in Neutrosophic Theory and Applications, Chapter 12, Pons Editions, Brussels.
24. SAATY, R. W. (1987). "The Analytic Hierarchy Process – What It Is and How It Is Used", Mathematical Modelling, 9(3): 161-176.
25. STEVIĆ, Z., VESKOVIĆ, S., VASILJEVIĆ, M., and TEPIĆ, G. (2015). "The Selection of the Logistics Center Location Using AHP Method", 2nd Logistics International Conference, Belgrade, Serbia, 21-23 May 2015. 86-91.
26. ŞEKKELİ, Z. H. (2016). Lojistik Stratejilerinin Rekabet Avantajı ve Lojistik Performansına Olan Etkileri Üzerinde Türkiye Ölçeğinde Bir Araştırma. PhD Thesis, Sütçü İmam University Institute of Social Science, Kahramanmaraş.
27. TAHERDOOST, H. (2017). "Decision Making Using the Analytic Hierarchy Process (AHP); a Step by Step Approach", International Journal of Economics and Management Systems, 2: 244-246.
28. TOMIĆ, V., MARINKOVIĆ, D.,and Marković, D. (2014). "The Selection of Logistic Centers Location Using Multi-Criteria Comparison: Case Study of the Balkan Peninsula", Acta Polytechnica Hungarica, 11(10): 97-113.
29. USAID | DELİVER PROJECT (2011). The Logistics Handbook: A Practical Guide for the Supply Chain Management of Health Commodities. Arlington: Usaid | Deliver Project.
30. YANG, L., JI, X., GAO, Z., and LI, K. (2007). "Logistics Distribution Centers Location Problem and Algorithm under Fuzzy Environment", Journal of Computational and Applied Mathematics, 208(2): 303-315.
31. YAP, J., HO, C. C., and TING, C. (2017). "Analytic Hierarchy Process (AHP) for Business Site Selection", Proceedings of the Sixth International Conference on Computer Science & Computational Mathematics, 26(1): 1-7.
32. ŻAK, J., and WĘGLIŃSKI, S. (2014). "The Selection of the Logistics Center Location Based on MCDM/A Methodology", Transportation Research Procedia, 3: 555-564.
33. WANG, S., SHENG, Z., XI, Y., MA, X., (2018). "The Application of the Analytic Hierarchy Process and a New Correlation Algorithm to Urban Construction and Supervision Using Multi-Source Government Data in Tianjin", International Journal of Geo-Information, 7(2): 1-14.
34. https://logisticsmgepsupv.wordpress.com/2018/04/27/logistics-inside-tourism/, 15.09.2020.
35. World Bank, (2018), https://www.worldbank.org, https://databank.worldbank.org/reports.aspx?source=2&country=TUR, 10.09.2020.