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Research Article

Determination of the Suitable Areas for The Investment of the Wind Energy Plants (WEP) in Osmaniye Using Analytical Hierarchy Process (AHP) and Geographic Information Systems (GIS)

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Abstract

Renewable energy sources are considered as clean energy sources. They have a much lower environmental impact than other energy sources. Among the renewable energy sources, the wind is an important energy source. In many countries the wind power production is so popular and many alternative research techniques related to wind energy are applied. Wind energy comes to the forefront today due to the increasing population of countries and the increase in energy needs. In our country the studies about the renewable energy has evolved rapidly over the past decade. The cost of initial installation of Wind Energy Plants (WEP) is high and they can only be installed if certain conditions are met. Site selection for wind turbine installation is not a technical process only, also a complex process is necessary for involving social, economic, physical and environmental sanctions. Therefore, site selection of wind energy plants is a very complex spatial decision problem for decision makers. For the different site selection studies multi criteria evaluation methods are often used. In the study, potential WEP investment areas of Osmaniye province were determined by using, Geographical Information Systems (GIS), Analytic Hierarchy Process (AHP) method and remote sensing. The criteria selected according to the general characteristics of the study area were combined with ArcGIS software using the weight values obtained with AHP and suitable areas for the WEP installation were determined. The land suitability index maps for the WEP siting is created in the ArcGIS program. The weighted Sum analysis of the Spatial Analyst Tool is used for this purpose. According to the results, 14.30% of the study area are suitable, 15.84% are moderate suitable and 69.86% are not suitable for wind energy plant siting.

Keywords: Wind Energy Plant, Multi Criteria Analysis, AHP, GIS, Osmaniye.

Analitik Hiyerarşi Prosesi (AHP) ve Coğrafi Bilgi Sistemleri (CBS) kullanılarak Osmaniye'deki Rüzgar Enerjisi Santrallerinin (RES) Yatırımına Uygun Alanların Belirlenmesi

Yenilenebilir enerji kaynakları, temiz enerji kaynakları olarak kabul edilirler. Yenilenebilir enerji kaynaklarının çevresel etkileri, başka enerji kaynaklarına göre çok daha düşüktür. Yenilenebilir enerji kaynakları arasında bulunan rüzgar önemli bir enerji kaynağıdır. Birçok ülkede rüzgar enerjisi üretimi çok popülerdir ve rüzgar enerjisi ile ilgili birçok alternatif araştırma tekniği uygulanmaktadır. Rüzgar enerjisi, artan ülke nüfusu ve enerji ihtiyaçlarındaki artış nedeniyle günümüzde ön plana çıkmaktadır. Türkiye'de son on yılda yenilenebilir enerji ile ilgili çalışmalar hızla gelişmektedir. Rüzgar Enerjisi Santrallerinin (RES) ilk kurulum maliyeti yüksektir. Rüzgar Enerjisi Santralleri sadece belirli koşullar yerine getirildiğinde kurulabilirler. Rüzgar türbini kurulumu için yer seçimi sadece teknik bir süreç değildir, aynı zamanda fiziksel, ekonomik, sosyal, çevresel yaptırımları dahil etmek için karmaşık bir süreç gereklidir. Bu sebeple, rüzgar enerjisi santrallerinin yer seçimi karar vericiler için çok karmaşık bir mekânsal karar problemi olarak düşünülebilir. Farklı yer seçim çalışmaları için genellikle çok kriterli değerlendirme yöntemleri kullanılmaktadır. Bu çalışmada Osmaniye ilinin potansiyel Rüzgar Enerjisi Santralleri yatırım alanları belirlenmek istenmiştir. Bu amaç için, Coğrafi Bilgi Sistemleri (CBS), Analitik Hiyerarşi Süreci (AHP) yöntemi e uzaktan algılama kullanılmıştır. Çalışma alanının genel özelliklerine göre seçilen

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kriterlerin, ağırlık değerleri AHP ile belirlenmiştir. AHP ile elde edilen ağırlık değerleri ArcGIS yazılımında çok kriterli değerlendirme yöntemi kullanılarak birleştirilmiş ve çalışma alanındaki Rüzgar Enerjisi Santralleri kurulumu için uygun alanlar belirlenmiştir. ArcGIS programındaki, Spatial Analyst Tool menüsündeki, Weighted Sum analysis adındaki Ağırlıklı Toplam analizi alt menüsü bu amaçla kullanılmıştır. Çalışma alanındaki Rüzgar Enerjisi Santrallerinin kurulumu için oluşturulan arazi uygunluk endeksi haritalarından elde edilen sonuçlara göre; çalışma alanının %14.30'u RES yatırımı yapmaya uygundur ve çalışma alanının %15.84'ü RES yatırımı yapmaya orta derecede uygundur. Yapılan çalışmada, çalışma alanının %69.86'sının RES yatırımı yapmak için uygun olmadığı belirlenmiştir.

Anahtar Kelimeler: Rüzgar Enerji Santrali, Çoklu Kriter Analizi, AHP, CBS, Osmaniye.

1. Introduction

After the industrial revolution, the energy need of the world and Turkey has increased day by day. This increase has continued exponentially. The need to initiate studies on the use of alternative energy sources as well as existing energy sources has emerged due to the increasing need for energy. The renewable energy studies are most concentrated on sources such as solar, hydroelectric, wind, wave energy and geothermal,. The wind is abundant in most parts of the world among these sources. Wind energy is one of the most renewable energy types that are clean, whose costs are decreasing day by day, have low environmental impact and are commercially available [1]. In addition to these positive factors, wind energy helps reduce the greenhouse effect, one of the biggest environmental problems of our time, by reducing the release of hazardous air pollutant gases. In addition, it saves water and creates financial gain for real estate owners. Since it is a developing sector, it paves the way for employment. For these reasons, wind energy continues to increase in popularity and financial investments both in the world and in our country [2].

Renewable energy technologies such as wind, biomass, solar and geothermal are becoming more and more important day by day as they are unlimited energy sources. As known, most of the renewable energy projects and productions are large-scaled. Sometimes, renewable technologies are also suited to small off-grid applications in rural and remote areas. In many areas, renewable energy is an economical power resource, especially in rural areas of the country [3].

Institutions, organizations and governments are trying to find more efficient technologies and new and renewable energy sources to generate energy in the natural environment, due to limited fossil fuel reserves and negative environmental impacts. Recently, wind power is known to be a growing energy source in the world. Also the wind energy is one of the most widely used alternative energy sources [1]. Projects that provide production with wind and solar energy among the sustainable energy projects are the most popular investments in our country.

Wind energy is known to be an environmentally friendly renewable energy source. Wind energy has many advantages, such as cleanliness, abundance and low cost. It is a known fact that, harmful emissions released from various sources have been causing negative effects on the atmosphere. Renewable energy sources are free, clean and inexhaustible. Since the fuel is not burned, wind farms do not cause fuel or air pollution. For this reason, it can be said that wind energy is a clean fuel. To utilize the wind energy, high technology do not require and also there is no need to transport. The technology converting wind energy to mechanical and electrical energy is more economical compared to other energy conversion systems. It must be converted into mechanical energy first, and then to electrical energy in order to benefit from wind energy. In regions with sufficient wind density, it is possible to obtain great economic benefits by installing wind energy conversion systems [3].

Wind energy projects are one of the most suitable energy production methods for sustainable energy development projects. Since large-scale wind power plant projects are very costly, long-term wind feasibility is very important to get effective and efficient results from wind energy before power plant construction. Before feasibility, suitable areas should be determined and examined, especially according to wind potential. With the help of economic, physical, environmental, social factors and a decision making mechanism that should be considered for proper location selection. Many systems such as remote sensing data with high resolution, Geographic Information Systems (GIS) that support the decision making process should be used in such complex applications [4]. In order to choose between main and sub criteria by examining the criteria to be selected in central location applications, it becomes easier to weight the criteria with the functionality of decision making mechanisms. The ability to combine and analyze the data obtained with geographic information systems, to solve complex problems and to achieve the desired result makes these systems an indispensable element [2].

The location selection of wind turbines requires the analysis of many spatial factors such as topography, land cover, slope, aspect, protection areas (protected area, etc.), settlement centers. GIS, which has been developing rapidly in recent years and its usage area has increased, is also widely used in the field of wind energy. New generation wind energy atlases, which can be integrated with geographic information systems (GIS), have significant benefits both in terms of time and money, in determining the most suitable areas for wind energy applications. In Turkey, to prepare the information on the qualifications demanded of the wind energy sector and to provide services to the sector's new Wind Energy Potential Atlas (WEPA) was prepared in 2006. With this atlas, which is prepared on a GIS basis, wind information can be provided in 3 dimensions for every 200x200 m areas of our country's land and sea areas [5]; [6]. However, this atlas is still not enough. Because problems such as sharing of spatial information among institutions, inadequate or outdated data, causes decision-makers make wrong decisions. For example, in determining potential wind tribune areas, the local factors such as fault line, distance from residential areas, slope, etc. should also be included in the assessment [6].

In this study, it is aimed to obtain suitable lands for WEP investment in a selected study area in the Eastern Mediterranean Basin by using many variables. The study was carried out in Osmaniye province. In the study area, Wind Energy Potential Atlas of the Turkey General Directorate of Renewable Energy (GDRE) may give investors an idea for the investments can be made, but it was aimed to create a more comprehensive Land

Suitability Index Map in GIS environment. The different variables obtained for SPP investment fields and Analytic Hierarchy Process (AHP) method are used for this purpose [7]; [8]). A Multi-criteria evaluation based on Geographic Information System (GIS) were applied for SPP site selection in Osmaniye province For being guide to investors and researchers hereafter, the suitable areas, alternative areas and unsuitable areas for WEP siting in the study area were determined in terms of GIS.

2. Material and Method

2.1. Study Area

Osmaniye is a province that located in the eastern part of the Mediterranean Region (Figure 1.). Gaziantep province is located in the east of Osmaniye province, Hatay province in the south, Adana province in the west and Kahramanmaraş province in the north. While the eastern and southeastern parts of Osmaniye province are surrounded by Amanos Mountains, the parts from west to north are surrounded by the Taurus Mountains. The surface area of Osmaniye province is 3.767 km^2. Osmaniye is at the crossroads of important roads and railways connecting Europe to the Middle East. Osmaniye is located at an energy crossroads formed by electricity, natural gas and oil pipelines in the Eastern Mediterranean. This has recently made the province a center of attraction [9].

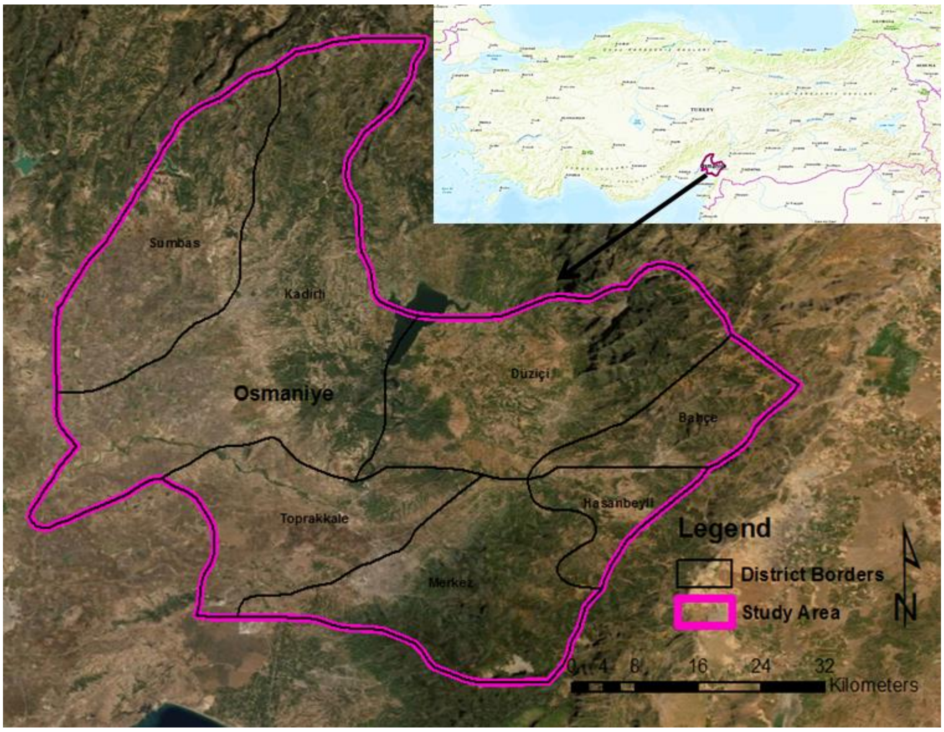

Figure 1. Map of Turkey and the Study Area

In this study, initially, the criteria that are capable to describe different restrictions related to wind energy plant (WEP) site selection is tried to identify. Corresponding to each constraint, the individual map layers were created then. The study area was divided into 30 m. - 30 m. grid cells. Thus, each grid cell represented an alternative place for a WEP site. The factors accepted to be effective in the selection of RES areas were determined according to the criteria specified in the related literature. (Table 1.).

In the study, the elevation data were collected from ASTER Global Dem V.3 with a resolution of 30 m. Slope data were derived from ASTER Global Dem V.3 and resampled to 30 m. resolution [10]. Distance, Roads and Transmission data were derived from OpenStreetMap and resampled to 30 m. resolution [11]. Fault line data were obtained from the General Directorate of Mineral Research and Exploration (GDMRE)'s Turkey active fault map and resampled to 30 m. resolution [12].

Table 1. Data set chosen for MCDA modelling. [10], [11], [12].

Criteria Name	Description	Source
Distance	Distance from Residential areas (m)	Derived from OpenStreetMap
Slope	Slope in degrees obtained from altitude (%)	Derived from ASTER/ASTGTM.003
Faults	Distance from Faults (m)	Derived from GDMRE
Roads	Distance from Roads (m)	Derived from OpenStreetMap
Transmission	Distance from Transmission Lines (m)	Derived from OpenStreetMap
Capacity	Capacity Factor (%)	Derived from Global Wind Atlas

2.1. Analytic Hierarchy Process

In this study, the AHP technique, a frequently used multi-criteria decision-making technique in the literature, will be used for the determination of suitable places for Wind Energy Plants. The selected criteria will be weighted according to this method. AHP technique is a structural technique used to analyze interrelated criteria in solving complex problems. In this model, the binary comparison matrix is obtained based on the binary comparisons between the criteria. After that, the weights of the criteria are determined.

Table 2. AHP evaluation scale [7].

Numerical value of Pij	Definition
1	Equal importance of i and j
3	Moderate importance of i over j
5	Strong importance of i over j
7	Very strong importance of i over j
9	Extreme importance of i over j)
2,4,6,8	Intermediate values

The AHP, is a mathematical method. It is developed by Saaty in 1977. The aim of the method is to analyze complex decisions involving many criteria (Table 2). AHP method, is one of the most effective methods used in spatial planning in recent years [13]; [14]). In this method, the criteria are weighted between 1 and 9, taking into account the scale of importance [15]. The weight of the criteria is important in obtaining the result in AHP method and the weights can be different, depending on the decision makers' preferences.

In this study, the six criteria (Distance from Residential Areas, Slope, Distance from Faults, Distance from Roads, Distance from Transmission Lines and Capacity Factor) determined for AHP analysis were evaluated in the AHP analysis software. This software is prepared by [16] and it is provided on the internet. In this context, a binary comparison was made primarily for AHP priorities. Depending on the importance of the criteria, selections were made in the range of 1-9 on the AHP scale and were calculated automatically [17].

2.2. Criteria

For this study the following factors were considered in the determination of the suitable areas for wind energy plants: Distance from Residential Areas, Slope, Distance from Faults, Distance from Roads, Distance from Transmission Lines and Capacity Factor.

Each criteria are explained below.

2.2.1. Distance from Residential Areas

The proximity to residential areas of wind energy plants can be taken as an economic factor. For this reason, WEP siting should be done in places close to the residential areas.

In the study, for residential areas, with a <500 m. buffer zone is given as 1, 500-1000 buffer zone is given as 2, 1000-1500 m. buffer zone is given as 3, 1500-2000 m. buffer zone is given as 4, 2000-2500 m. buffer zone is given as 5, 2500-3000 m. buffer zone is given as 6, 3000-3500 m. buffer zone is given as 7, 3500-4000 m. buffer zone is given as 8 and > 4000 m. buffer zone is given as 9 (Figure 2.).

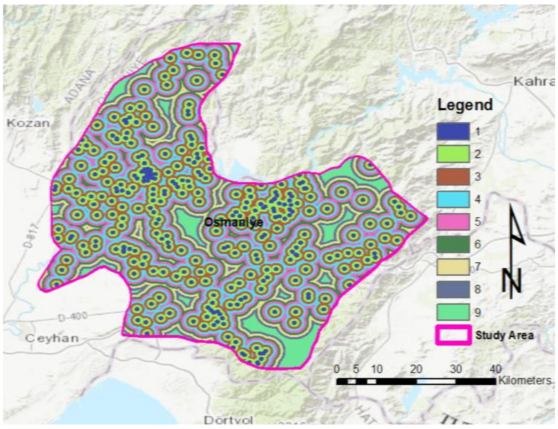

Figure 2. Suitibility Index Map of the Distance from Residential Areas of the Study Area

2.2.2. Slope

Inclined and hilly regions prevent the stable wind regime. For this reason, WEP siting should be done in places where the slope is low. The slope was divided into nine parts in the study. 0–1% buffer zone is given as 9, 1–2% buffer zone is given as 8, 2–4% buffer zone is given as 7, 4–8% buffer zone is given as 6, 8–12% buffer zone is given as 5, 12–16% buffer zone is given as

4, 16–20% buffer zone is given as 3, 20–24% buffer zone is given as 2 and >24% buffer zone is given as 1. (Figure 3.).

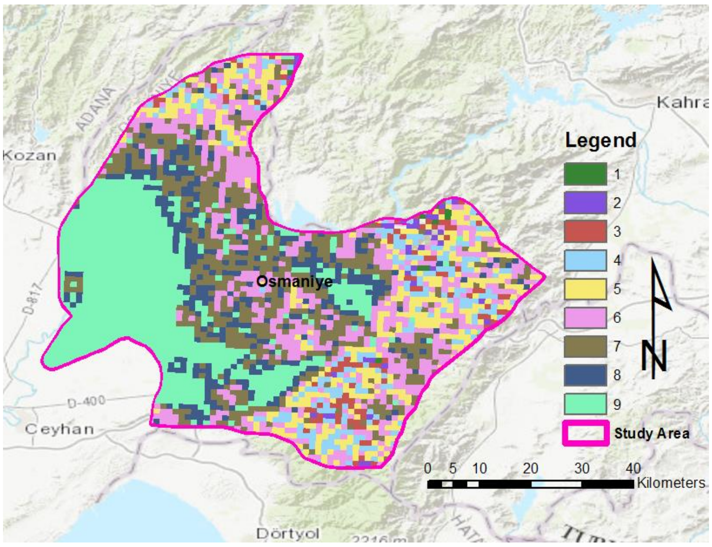

Figure 3. Suitibility Index Map of Slope of the Study Area

2.2.3. Distance from Faults

It is necessary not to choose the location of wind turbines close to places with high earthquake risk. This situation was taken into consideration in the evaluation. In the study, for distance from faults, with a <1000 m. buffer zone is given as 1, 1000-2000 buffer zone is given as 2, 2000-3000 m. buffer zone is given as 3, 3000-4000 m. buffer zone is given as 4, 4000-5000 m. buffer zone is given as 5, 5000-6000 m. buffer zone is given as 6, 6000-7000 m. buffer zone is given as 7, 7000-8000 m. buffer zone is given as 8 and > 8000 m. buffer zone is given as 4 (Figure 4.).

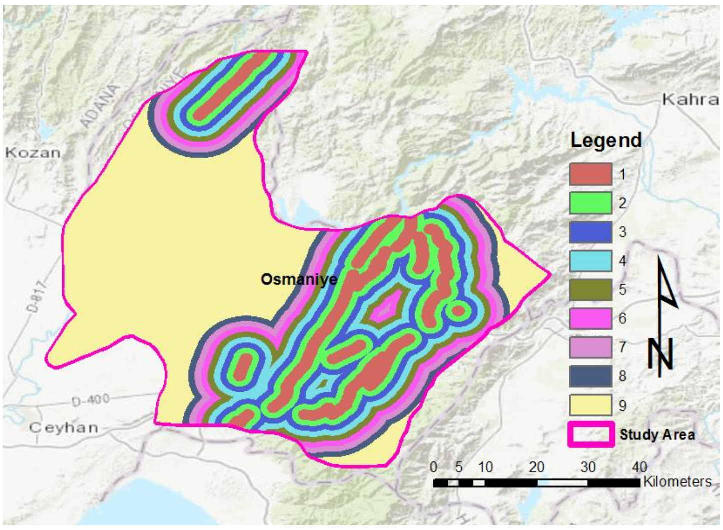

Figure 4. Suitibility Index Map of Distance from Fault Lines of the Study Area

2.2.4. Distance from Roads

Roads are an important criterion for an economical and efficient in WEP site selection. The cost may decrease in the infrastructure works that carried out in areas close to the main roads [14]; [2]. In the evaluations it has been a lot of attention to this situation. In the study, for distance from roads, with a <250 m. buffer zone is given as 9, 250-500 buffer zone is given as 8, 500-1000 m. buffer zone is given as 7, 1000-1500 m. buffer zone is given as 6, 1500-2000 m. buffer zone is given as 5, 2000-2500 m. buffer zone is given as 4, 2500-3000 m. buffer zone is given as 3, 3000-3500 m. buffer zone is given as 2 and > 3500 m. buffer zone is given as 1 (Figure 5.).

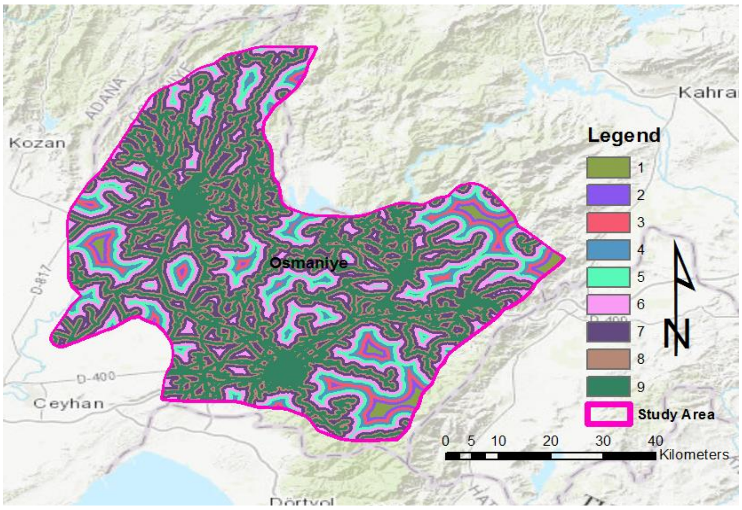

Figure 5. Suitibility Index Map of Distance from Roads of the Study Area

2.2.5. Distance from Transmission Lines

The transmission of energy produced in the wind turbine to the transmission network should be easy. For this reason, WEP siting should be done in places close to transmission lines. In the study, for distance from transmission lines, with a <1000 m. buffer zone is given as 9, 1000-2000 buffer zone is given as 8, 2000-3000 m. buffer zone is given as 7, 3000-4000 m. buffer zone is given as 6, 4000-5000 m. buffer zone is given as 5, 5000-6000 m. buffer zone is given as 4, 6000-7000 m. buffer zone is given as 3, 7000-8000 m. buffer zone was is given as 2 and > 8000 m. buffer zone is given as 1 (Figure 6.).

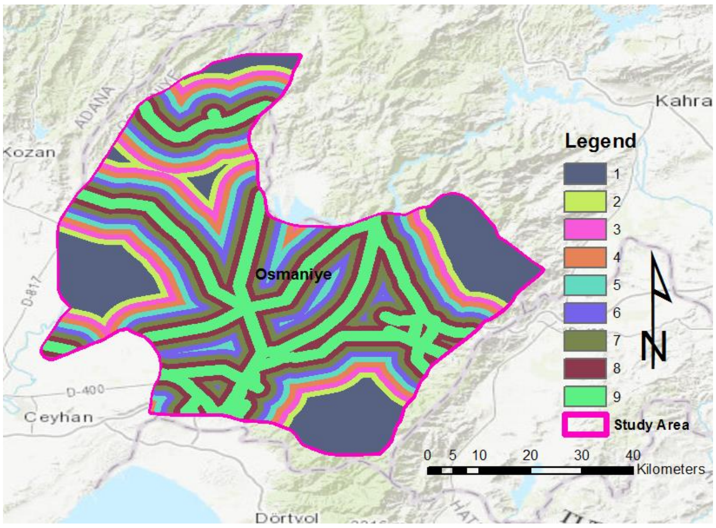

Figure 6. Suitibility Index Map of Distance from Transmission Lines of the Study Area

2.2.6. Capacity Factor

The capacity factor is the ratio of the power produced by a power plant within a certain period to the power that it can produce at maximum capacity. In the wind power plant to be installed in places with higher capacity factor, more power and income is obtained compared to places with lower capacity factor. The capacity factor was divided into nine parts in the study. 1–6% buffer zone is given as 1, 6–12% buffer zone is given as 2, 12–18% buffer zone is given as 3, 18–24% buffer zone is given as 4, 24–30% buffer zone is given as 5, 30–36% buffer zone is given as 6, 36–42% buffer zone is given as 7, 42–48% buffer zone is given as 8 and >48% buffer zone is given as 9. (Figure 7.).

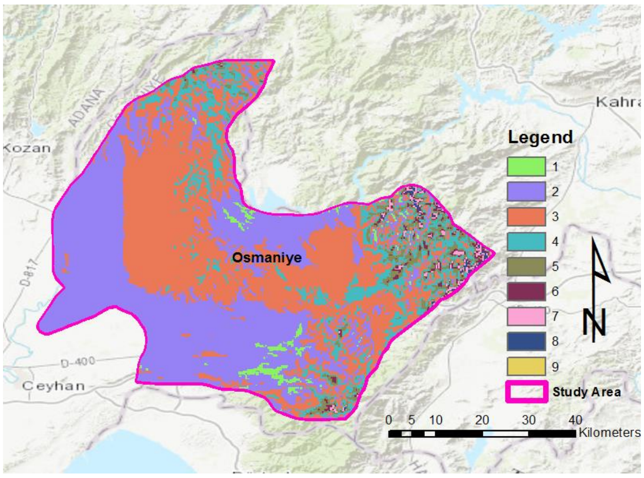

Figure 7. Suitibility Index Map of Capacity Factor of the Study Area

The obtained factors were evaluated in a GIS environment. Then all the obtained raster data resampled to 30 m. resolution. For creating the Land Suitability Index Map for WEP siting, the Weighted Sum analysis of the Spatial Analyst Tool in the ArcGIS program is used. The weights obtained in AHP method is used in the analysis (Figure 9.).

3. Results and Discussion

AHP method is an important multi-criteria decision making method. It is one of the most effective methods used in spatial planning in recent years. In the AHP method, users are enable to determine the weights of the parameters in the solution of a multi-criteria problem. In the AHP method, a hierarchical model is used for every problem, consisting of objectives, criteria, sub-criteria and alternatives [15]. In this study, it was focused on the use of GIS together with MCE methods for the site selection of wind energy plants. The weights of the criteria, that used in the site selection process are determined separately by binary comparisons with the AHP. Determination of the weights with the AHP method gives quite positive results. In this method, the criteria are weighted between 1 and 9 considering the scale of importance. The weights of the criteria forming the hierarchy are calculated, after the problem is set in a hierarchical structure [18].

In the study, scoring is made with the utilization of the preference scale suggested by [7], for evaluating the criteria included in a level compared with other criteria included in the next hierarchy level (Table 2). A pairwise comparison matrix is then created [7], [15]. The pairwise comparison matrix consists of $n(n-1)/2$ comparisons, for n number of elements [18]; [19].

In this study, six criteria (distance from residential areas, slope, distance from faults, distance from roads, distance from transmission lines and capacity factor) determined for AHP analysis are evaluated in the free online software [20], prepared for making AHP analysis by [16].

Initially, a double comparison was made for AHP priorities (Figure 8). Depending on the importance of the criteria, 1-9 selections were made in the AHP scale and calculated automatically. As a result of the calculation, the Consistency Ratio was determined as 4.40% and the weights of the criteria were determined as a result of the double comparison (Table 3). It is considered that the judgments exhibit a sufficient degree of consistency and that the assessment can be continued, in the case where the consistency ratio calculated for the judgments is below 0.10 [21]; [22].

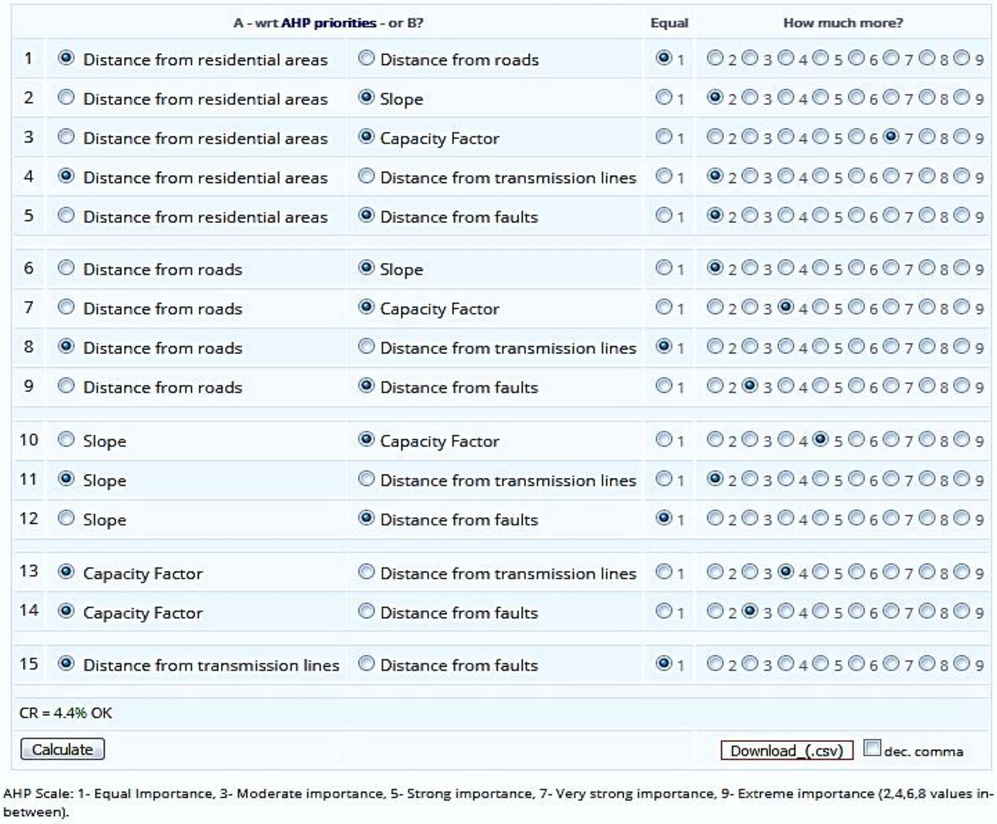

Figure 8. The pairwise comparison module in the software [20]; AHP Evaluation Scale: 1- Equal importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance, 2,4,6,8- Intermediate values

Table 3. Resulting weights for the criteria based on pairwise comparison

Category	Priority	Rank
Capacity Factor	% 45.90	1
Distance from Faults	% 14.90	2
Slope	% 14.10	3
Distance from Residential Areas	% 8.70	4
Distance from Transmission Lines	% 8.60	5
Distance from Roads	% 7.70	6

In the study, selected criteria weights are calculated with AHP method. Resulting weights for the criteria based on pairwise comparison was calculated as 45.9% for Capacity Factor, 14.9% for Distance from Faults, 14.1% for Slope, 8.7% for Distance from Residential Areas, 8.6% for Distance from Transmission Lines and 7.7% for Distance from Roads (Table 3). The obtained weights factors were evaluated in GIS. For creating the land suitability index maps for the WEP siting, the Weighted Sum analysis of the Spatial Analyst Tool in the ArcGIS program is used (Figure 9.). With the locations of the present WEP sites in the study area, the validity of the created map was checked.

The criteria selected according to the general characteristics of the study area were combined with ArcGIS software using the weight values obtained with AHP and suitable areas for the WEP installation were determined. The land suitability index map is created in the range of 1-9. Then the land suitability index map is divided into three categories: "unsuitable areas", "alternative areas" and "suitable areas". According to the results obtained, 14.30% of the working area are suitable for the establishment of a solar power plant. 15.84% of the study area are in an alternative suitability and 69.86% of the area is not suitable for building a wind energy plant.

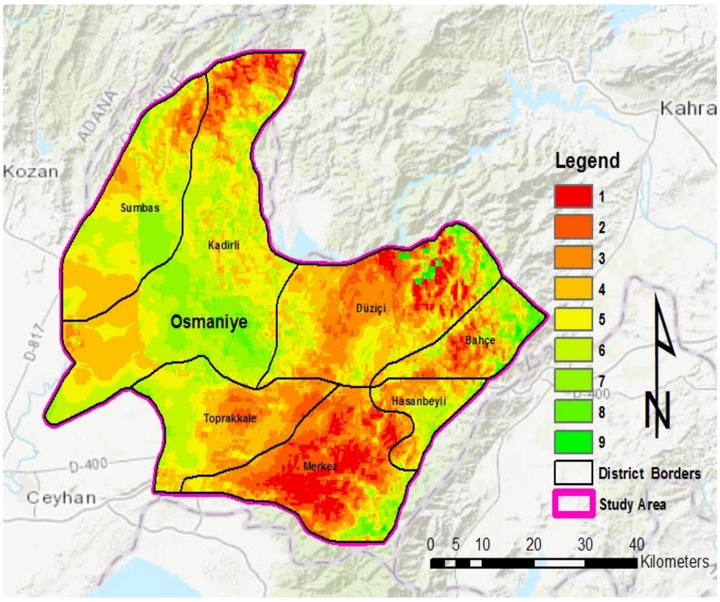

Figure 9. Land suitability index map of the study area

Osmaniye has 3 wind energy power plants, two in Bahçe and one in Hasanbeyli districts. In the land suitability index map, it was seen that a large part of Bahçe and Hasanbeyli districts consisted of suitable and alternative areas for the installation of a solar power plant. In accordance with the land suitability index map, in addition to Bahçe and Hasanbeyli districts, Northeast parts of Düziçi district, central parts of Sumbas and Kadirli districts, south east parts of Merkez district, north and west parts of Toprakkale district have suitable or alternative areas for WEP siting. In the study area, Merkez district is, the less suitable district for WEP siting.

General Directorate of Renewable Energy (GDRE), has made up Turkey Wind Energy Potential Atlas (REPA) based on various factors. The map of "Wind Energy Power Plant Installable Areas" in the Osmaniye province report of this atlas was examined. It is seen that the findings obtained in both studies are close to each other and overlap. This shows that the results of the study are valid and meaningful.

4. Conclusions and Recommendations

According to the researches conducted in various countries, one third of CO_2 emissions are caused by electricity generation. For this reason, it seems an imperative to turn to the renewable energy sources in electricity production. It is envisaged that wind energy plants (WEP), whose numbers are increasing rapidly, can meet 12% of the world's electricity production within 20 years.

The first wind farm in our country was founded in Izmir in 1998. Although the first wind farm was established in 1998, serious breakthroughs in this area took place after 7 years. Today, there are 172 Wind Power Plants in our country. The total installed capacity of 172 Wind Power Plants in Turkey is 5789.39 MW. In 2016, 16,000,000,000 kilowatt-hours of electricity were produced by Wind Power Plants. Today, approximately 6.3% of the energy we consume in our country is met by wind power plants.

Some of the 195 power plants put into operation have not yet reached the installed capacity as much as the license installed power, and the construction continues. In this context, with the commissioning of some of the power plants put into operation, an additional wind turbine with a capacity of 562 MW will be activated and the power of the installed plants will reach 7.626 MW capacity.

In addition, the license capacity of 75 power plants, that have not been commissioned yet, but progressed in their installation, is 940 MW. In this context, the partially commissioned and completed all of the progress of construction projects Turkey is seen to rise to the level of 8566 MW of wind power installed capacity. Today, when all wind power plants that receive license and preliminary license come into operation, the wind installed power of our country will increase and almost 13% of all electricity consumption will be covered by wind power plants. This study is important for new applications for wind power plants will be accepted to achieve this goal.

Osmaniye's power plant installed power is 1,057 MW. There are a total of 22 power plants in Osmaniye, and these power plants produce approximately 3,307 GW of electricity annually. When the power plants of Osmaniye are examined; Hydroelectric power plants generate 815.16 MW (77.1%) energy. Wind energy plants generate 235 MW (22.2%) of energy. It is observed that 4.10 MW (0.4%) produced from solar power plants and 3.12 MW (0.3%) are produced from biogas. From the results, we understand that the share of wind energy plants in Osmaniye has a great share in general electricity production. This share may increase over time. For this reason, this study is important for the province.

The important thing to consider when investing in the global wind energy market is the cost of a 1 MW wind power plant. The price of wind turbines and other equipment is gradually falling. This price decrease reduces the fixed investment amount of wind power plants, which makes investment more attractive. Also, as it is worldwide, it is also in Turkey under the guarantee of the state's purchases of the electricity produced from the renewable energy sources.

In this article, a site selection study for WEP investment in the Osmaniye province of the Eastern Mediterranean region with

GIS based AHP method, based on six different criteria is conducted. It has been determined that the areas suitable for WEP determined in this study are largely compatible with the current WEP locations. This shows that the criteria used in the study are generally sufficient for evaluations. The conformity obtained WEP conformity map can be used in preliminary evaluations for investors. By increasing the criteria, investment areas can be determined much more precisely. This can contribute to feasibility studies.

Turkey offers attractive investment opportunities for domestic and foreign investors, especially in the fields of wind and solar energy. With the development and improvement of investment environment, providing energy reforms, it will become an increasingly attractive market for investors in Turkey in the coming period. For this reason, this study is important for the investors, who will invest in the Osmaniye province.

In order to increase our existing installed wind power capacity to the level of developed countries, incentives should be increased by the state. Investing in wind turbine technology is necessary for both creating job opportunities and making cheaper use of our wind energy potential in the long time period. The use of the existing wind energy potential is of great importance in terms of both its economic and environmental aspects.

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