Determining the Districts That can be a Province in Turkey Using Analytic Hierarchy Process

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Abstract: It is very important problem objectively determining districts which will become province. It will be appropriate to use AHP to search an efficient solution to this problem. In this study. In this study, AHP is used to determine priority ranking of districts which is eligible to become a province in Turkey. According to the result of this AHP application, Alanya is the most eligible candidate district with 33% importance degree. The following districts based on the ranking are; Bandırma, Fethiye, Elbistan, Ereğli, Bergama, Ödemiş and Erciş.

Introduction

There are many districts that desire to become a province in Turkey. Districts' desire for becoming a province have been continuing for a long time. This demand is also used for election argument by politicians and political parties before the elections. Some of these districts achieved their wants, and finally became a province. With the rapid development of Turkey, some districts growed much more than some cities. As a result of this growth, these districts have the potential of being a province. However, there are some criterias which districs must have in order to become a province. Factors, such as socio-economic development, population, geographical structures of districts, need to be taken into consideration.

The aim of the study is to compare 10 candidate district which desire to become a province according to the criterias that researchers has determined, and to choose the best candidate based on this comparison by using The Analytic Hierarchy Process.

According to 126. article of The Constitution of the Republic of Turkey 1982, in terms of central administrative structure, Turkey is divided into provinces on the basis of geographical situation and economic conditions, and public service requirements; provinces are further divided into lower levels of administrative districts.

In accordance with the provisions of constitute article, in Province Administration Law 5442 criterias are determined to established provinces while stating that Turkey divided into provinces, provinces divided into districts, and districts divided into sub-districts. But there are not defined criterias about the issue of administrative status change of a place in Turkey. And also status change of provinces, particularly change to provinces, is not mostly

based on the detailed social, economical and demographical researchs . It was based generally on some properties of the places that were made provinces during the years 1989-1999, such as the economical development or undevelopment, geographical positon, the historical background, the migration, the population density, and the security of the place. But like all these and other factors also are valid for the districts[38].

As there are not clear and obvious laws concerning with establishing new provinces in Turkey, the reasoning of establishing new provinces mostly based on the mentioned Constitution Article, and related articles of Province Administration Law. Since mentioned articles state only three criteria which are on the initiative of the government, it is the role of the government to fill the content of those unclear concepts. Although the desire of the people, geographical position, transportation and security factors generally play very crucial role on establishing provinces in Turkey, some places which come to the position of being a province according to economical situation, and population have forced governments which have voting concerns. Those governments change administrative position of the places mainly based on their political objectives. It is asserted that the use of the demand of becoming a province in recent years as a political pressure and gain on politicians have much more influence on the increasing number of the provinces than the public service requirements in Turkey[39].

It is very important problem objectively determining districts which will become province. The evaluation of this subject without making it as a domestic political argument, will be easier and more convincing for both political parties and governments. It will be possible to show more fairly, scientifically and objectively behavior with the use of AHP at the solution of this problem.

In the second part of this study, a brief information was given about AHP. In the third part, how the application was implemented, how the data was prepared, how the criterias were determined, and the results of the study were explained and reported.

Analytic Hierarchy Process

When decision makers face with a multicriteria problem, they decompose it in hieararchic levels acccording to importance of criterias. The decision making process involves developing priorities for alternatives based on the decision maker's judgements and selecting the best alternative that satisfies the objective. One of the techniques used for this process is Analytic Hierarcy Process (AHP) which allows pairwise comparisons.

AHP is widely used as one of the major methods in solving a wide range of problems that involve complex criteria accross different levels where the interaction of criteria is common (Hsu ve Pan, 2009, p. 2311). AHP, developed by Saaty, is a decision aiding method provides a way to rank the alternatives of a problem by deriving priorities (Saaty, Peniwati ve Shang, 2007, s. 1041). It is a very useful tool for multicriteria decision making where the objective is to select the best alternative taken into consideration.

AHP performs pairwise comparisons to measure relative importance of the elements in each level of the hierarchy and evalutes alternatives in the lowest level of the hierarcy in order to make the best decision among multiple candidates (Sipahi and Esen, 2010, p. 300)

In AHP, the hierarchic structure must be built by determining important criterias and subcriterias belonging to each criteria according to the decision maker's objective. First of all, the objective is determined and then the criterias for this objective will be pointed out. After this, alternatives for each criteria will be determined. In this way the hierarchic structure for decision making has been constructed. (Scholl et all., 2005, p.763)

AHP is a mathematical method which considers group's or individual's characteristics, and evaluates quantitative and qualitative variables together in the decision making process (Dağdeviren et all., 2004, p.132). At the same time, it provides more efficient decision making oppurtunities (Ecer and Dündar, 2008 , p. 198). This method has been widely used in solving real life complex decision making problems in recent literature, especially in effectiveness analysis and performance measurement problems (Peters and Zelewski, 2008, p.1040).

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The AHP approach was developed in the early 1970s in response to military contingency planning, scarce resources allocation, and the need for political participation in disarmament agreements (Yang and Shi, 2002, p. 30). AHP is not only a decision making method that decomposes a complex multi-criteria decision problem into a hierarchy but also a measurement theory that prioritizes the hierarchy and consistency of the judgmental data provided by a group of decision makers agreements (Hsu ve Chen, 2008, p. 46)

The use of AHP in order to solve a decision making problem involves the following steps (Al-Harbi, 2001, p. 20):

1. Define the decision making problem and determine its goal.

2. Structure the hierarchy from the top (the objectives from a decision-maker's point of view) through the intermediate levels (criteria on which subsequent levels depend) to the lowest level which usually contains the list of alternatives.

3. Construct a set of pair-wise comparison matrices (n x n square matrix) for each of the lower levels with one matrix for each element in the level immediately above by using the relative scale measurement shown in Table 1 The pair-wise comparisons are done in terms of of which element dominates the other.

4. The number of judgements equals to n(n-1)/2. Judgements required to develop the set of matrices which should be both transitive and reciprocal in step 3.

5. Hierarchical synthesis is now used to weight the eigenvectors by the weights of the criteria and the sum is taken over all weighted eigenvector entries corresponding to those in the next lower level of the hierarchy.

6. Having made all the pair-wise comparisons, the consistency is determined by using the eigenvalue, λ_{max}, to calculate the consistency index, CI as follows:

   CI = (λ_{max} - n)/(n- 1), where n is the matrix size. Judgement consistency can be checked by taking the consistency ratio (CR) of CI with the appropriate value in Table 2. The (CR) is acceptable if it is less than 0.10. Otherwise the the judgement matrix is inconsistent. To obtain a consistent, judgements should be reviewed and improved.

7. Steps 3-6 are performed for all levels in the hierarchy.

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate İmportance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance 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	Intermediate values when compromise is needed	

Table 1: The Fundamental Scale of Absolute Numbers (Saaty, 2008, p. 125)

n	1	2	3	4	5	6	7	8	9	10
Average random index	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

Table 2: Random Consistency Index (Saaty, Vargas and Dellmann, 2003, p. 174)

The Study

People have troubles while making decisions about any issue in the time of they living. Contradictory results may also appear on the decisions about same issue made by people. The most important reason of for this is the intention of selecting best decisions over the alternatives. Same situation is also valid for the decisions taken by the government. Since the government must make the best decision for its public. Because of demand of individuals that live in the country about changing their districst in which they live to provinces, one of the most important decisions is which districts will become province. At this time, this decision is very important as it burden additional expenses to the budget.

In this study, AHP is used to determine priority ranking of districts which is eligible to become a province in Turkey. Candidate districts are determined by preselection with this application. Above mentioned criterias are taken into consideration for preselection:

- Population of the center must be greater than 50 000,
- Population of district must be greater than 100 000,
- Distance from the province must be greater than 100 km.

Values of above mentioned criteria for each of the candidate districts determined by preselection, are obtained from municipality's and governer's official websites and shown in Table 3.

CRITERIAS	ALANYA	BANDIRMA	BERGAMA	FETHİYE	ERCİŞ	EREĞLİ	ELBİSTAN	ÖDEMİŞ
DISTANCE (KM)*	138	100	102	124	103	153	158	113
CENTER POPULATION**	134056	113851	58570	72003	74858	95056	85642	73310
DISTRICT'S POPULATION**	241451	132077	100802	183184	158795	135008	135386	129260
SURFACE AREA(KM^2)	1827	690	1688	3055	2115	2260	2546	1082
NUMBER OF VILLAGES	3	0	0	3	3	0	0	2
NUMBER OF CONNECTED DISTRICTS	5	4	7	3	3	3	7	6
CON.TOTAL POPULATION.**	152649	208340	332353	95653	238131	63563	238450	312937
TEMPORARY POPULATION****	1377146	74548	21186	252726	3440	9500	5934	2935
REAL WAGE***	558996	706831	84714	123754	21024	83628	91169	85191

Table 3: Quantitative values of criterias for each of the districts

*http://www.kgm.gov.tr/Sayfalar/KGM/SiteTr/Uzakliklar/ililcelerArasiMesafe.aspx

** http://tuikapp.tuik.gov.tr/adnksdagitapp/adnks.zul

*** http://ekutup.dpt.gov.tr/bolgesel/gosterge/2004/ilce.pdf

**** http://www.turizm.gov.tr

DISTRICTS	DISTANCE	NORMALIZED VALUE OF DISTANCE
ALANYA	138,0000	0,1393
BANDIRMA	100,0000	0,1009
BERGAMA	102,0000	0,1029
ELBİSTAN	158,0000	0,1594*
ERCİŞ	103,0000	0,1039
EREĞLİ	153,0000	0,1544
FETHİYE	124,0000	0,1251
ÖDEMİŞ	113,0000	0,1140
TOTAL	**991,0000**	**1,0000**

Table 4: Distance Criteria

According to distance criteria most appropriate district to become a city is Elbistan with approximately %16. Bandırma district is in the last rank with % 10.

DISTRICTS	CENTER'S POPULATION	CENTER'S POPULATION NORMALIZED VALUE
ALANYA	134056,000	0,1895*
BANDIRMA	113851,000	0,1610
BERGAMA	58570,000	0,0828
ELBİSTAN	85642,000	0,1211
ERCİŞ	74858,000	0,1058
EREĞLİ	95056,000	0,1344
FETHİYE	72003,000	0,1018
ÖDEMİŞ	73310,000	0,1036
TOTAL	**707346,000**	**1,0000**

Table 5: Center's Population Criteria

Alanya district is in the first rank with %19 accoding to the center's population criteria and Bergama is the last with %8.

DISTRICTS	DISTRICT'S POPULATION	NORMALIZED VALUE OF DISTRICT'S POPULATION
ALANYA	241451,000	0,1986*
BANDIRMA	132077,000	0,1086
BERGAMA	100802,000	0,0829
ELBİSTAN	135386,000	0,1113
ERCİŞ	158795,000	0,1306
EREĞLİ	135008,000	0,1110
FETHİYE	183184,000	0,1506
ÖDEMİŞ	129260,000	0,1063
TOTAL	**1215963,000**	**1,0000**

Table 6: District's Population Criteria

For district's population criteria the most important district is Alanya and the least is Bergama.

DISTRICTS	SURFACE AREA	NORMALIZED VALUE OF SURFACE AREA
ALANYA	1827,000	0,1197
BANDIRMA	690,000	0,0452
BERGAMA	1688,000	0,1106
ELBİSTAN	2546,000	0,1668
ERCİŞ	2115,000	0,1386
EREĞLİ	2260,000	0,1481
FETHİYE	3055,000	0,2002*
ÖDEMİŞ	1082,000	0,0709
TOTAL	**15263,000**	**1,0000**

Table 7: Surface Area Criteria

According to surface area criteria most appropriate district to become a city is Fethiye with approximately %20. Bandırma district is in the last rank with % 4.

DISTRICTS	NUMBER OF VILLAGES	NORMALIZED VALUE OF VILLAGE NUMBERS
ALANYA	3,000	0,2727*
BANDIRMA	0,000	0,0000
BERGAMA	0,000	0,0000
ELBİSTAN	0,000	0,0000
ERCİŞ	3,000	0,2727*
EREĞLİ	0,000	0,0000
FETHİYE	3,000	0,2727*
ÖDEMİŞ	2,000	0,1818
TOTAL	**11,000**	**1,0000**

Table 8: Number of Villages Criteria

Alanya , Fethiye and Erciş districts together are in the first rank with %27 accoding to the number of villages criteria.

DISTRICTS	NUMBER OF DISTRICTS TO BE CONNECTED	NORMALİZED VALUE OF NUMBER OF DISTRICTS TO BE CONNECTED
ALANYA	5,000	0,1316
BANDIRMA	4,000	0,1053
BERGAMA	7,000	0,1842*
ELBİSTAN	7,000	0,1842*
ERCİŞ	3,000	0,0789
EREĞLİ	3,000	0,0789
FETHİYE	3,000	0,0789
ÖDEMİŞ	6,000	0,1579
TOTAL	**38,000**	**1,0000**

Table 9: Number of Districts to be Connected Criteria

According to this criteria, Bergama and Elbistan have the highest importance percentage with approximately %18.

DISTRICTS	CONNECTED TOTAL POPULATION	NORMALIZED VALUE OF CONNECTED TOTAL POLULATION
ALANYA	152649,000	0,0930
BANDIRMA	208340,000	0,1269
BERGAMA	332353,000	0,2024*
ELBİSTAN	238450,000	0,1452
ERCİŞ	238131,000	0,1450
EREĞLİ	63563,000	0,0387
FETHİYE	95653,000	0,0583
ÖDEMİŞ	312937,000	0,1906
TOTAL	**1642076,000**	**1,0000**

Table 10: Connected Total Population Criteria

According to connected total population criteria, Bergama has the highest importance percentage with approximately %20 and the last is Ereğli.

DISTRICTS	TEMPORARY POPULATION	NORMALIZED VALUE OF TEMPORARY POPULATION
ALANYA	1377146,000	0,7926*
BANDIRMA	64548,000	0,0372
BERGAMA	21186,000	0,0122
ELBİSTAN	5934,000	0,0034
ERCİŞ	3440,000	0,0020
EREĞLİ	9500,000	0,0055
FETHİYE	252726,000	0,1455
ÖDEMİŞ	2935,000	0,0017
TOTAL	**1737415,000**	**1,0000**

Table 11: Temporary Population Criteria

According to the temporary population criteria, the most eligible candidate is Alanya with % 79 and the last is Ödemiş.

DISTRICTS	REAL WAGE	NORMALIZED VALUE OF REAL WAGE
ALANYA	558,9960	0,3185
BANDIRMA	706,8310	0,4027*
BERGAMA	84,7140	0,0483
ELBİSTAN	91,1690	0,0519
ERCİŞ	21,0240	0,0120
EREĞLİ	83,6280	0,0476
FETHİYE	123,7540	0,0705
ÖDEMİŞ	85,1910	0,0485
TOTAL	**1755,3070**	**1,0000**

Table 12: Real Wage Criteria

According to real wage criteria, Bandırma has the highest importance percentage with approximately %40, Alanya is in the second rank with %32 and the last is Erciş.

GENERAL	DISTANCE	CENTER'S POPULATION	DISTRICT'S POPULATION	SURFACE AREA	NUMBER OF VILLAGES	NUMBER OF DISTRICT'S TO BE CON	TOTAL POPULATION TO BE CON.	TEMPORARY POPULATION	REAL WAGE
DISTANCE	1,0000	0,3333	0,5000	1,0000	0,5000	0,5000	0,3333	0,2500	0,1429
CENTER'S POPULATION	3,0000	1,0000	2,0000	4,0000	3,0000	3,0000	2,0000	0,3333	0,2000
DISTRICT'S POPULATION	2,0000	0,5000	1,0000	3,0000	2,0000	2,0000	1,0000	0,3333	0,2000
SURFACE AREA	1,0000	0,2500	0,3333	1,0000	0,3333	0,3333	0,2500	0,2500	0,1429
NUMBER OF VILLAGES	2,0000	0,3333	0,5000	3,0000	1,0000	1,0000	0,3333	0,3333	0,1667
NUMBER OF DISTRICT'S TO BE CONN.	2,0000	0,3333	0,5000	3,0000	1,0000	1,0000	0,3333	0,2500	0,2000
TOTAL POPULATION TO BE CON.	3,0000	0,5000	1,0000	4,0000	3,0000	3,0000	1,0000	0,5000	0,2500
TEMPORARY POPULATION	4,0000	3,0000	3,0000	4,0000	3,0000	4,0000	2,0000	1,0000	0,2500
REAL WAGE	7,0000	5,0000	5,0000	7,0000	6,0000	5,0000	4,0000	4,0000	1,0000
Total	**25,0000**	**11,2500**	**13,8333**	**30,0000**	**19,8333**	**19,8333**	**11,2500**	**7,2500**	**2,5524**

Table 13: Pair-wise Comparison Matrix of Criterias

These values are obtained from expert view of a vice governer.
Consistency Ratio (CR) is acceptable if CR is less than 0,10 . Otherwise the judgements of the decision maker are inconsistent.

T1	Weights
Distance	0,0344
Center's Population	0,1213
District's Population	0,0791
Surface Area	0,0295
Number of Villages	0,0542
Number of Districts to be connected	0,0543
Connected Total Population	0,1032
Temporary Population	0,1715
Real Wage	0,3525

Table 14: Weights of criterias

After calculating weights for criterias, it is come to stage of solving decision problem, in other words last stage of the AHP. At this stage, a matrix consists of calculated relative priority values (table 14) was created and then by multiplying with Matrix of Weighted Criteria (Table 16), Decision Matrix (Table 17)was created.

Table 15: Final Table

Distance	Center's Population	District's Population	Surface area	Number of villages	Number of Districs to be conn.	Total Population to be conn.	Temporary Population	Real Wages	Weight Points
0,1393	0,1895	0,1986	0,1197	0,2727	0,1316	0,093	0,7926	0,3185	0,0344
0,1009	0,161	0,1086	0,0452	0	0,1053	0,1269	0,0372	0,4027	0,1213
0,1029	0,0828	0,0829	0,1106	0	0,1842	0,2024	0,0122	0,0483	0,0791
0,1594	0,1211	0,1113	0,1668	0	0,1842	0,1452	0,0034	0,0519	0,0295
0,1039	0,1058	0,1306	0,1386	0,2727	0,0789	0,145	0,002	0,012	0,0542
0,1544	0,1344	0,111	0,1481	0	0,0789	0,0387	0,0055	0,0476	0,0543
0,1251	0,1018	0,1506	0,2002	0,2727	0,0789	0,0583	0,1455	0,0705	0,1032
0,114	0,1036	0,1063	0,0709	0,1818	0,1579	0,1906	0,0017	0,0485	0,1715
									0,3525

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S_{ij} x T

Eligibility ranking for becoming a province	Districts	Coefficients
1	Alanya	% 33
2	Bandırma	% 18
3	Fethiye	% 11
4	Ödemiş	% 8
5	Elbistan	% 8
6	Bergama	% 7
7	Erciş	% 7
8	Ereğli	% 6

Table 16: Order of Preference

Results

AHP is a mathematical method, which evaluates quantitative and qualitative variables together in the solution of decision problems and enables efficient decision making . This method has been widely used in solving real life complex decision making problems in recent literature, especially in effectiveness analysis and performance measurement problems.

It is an important problem to determine the districts which are eligible to become province. To handle this issue without makig it a domestic politics material will be more easy and persuasive for both of the political parties and goverments. More fair, scientific and objective attitude can be possible by using AHP in the solution of this problem. Therefore in this study, AHP is used to determine priority ranking of districts which are eligible to become a province in Turkey. According to the result of this AHP application, Alanya is the most eligible district with %33 importance degree and Bandırma is in the second place with a 15 point difference. Fethiye has the third rank and Ödemiş has the forth rank.

Suggestions

It is shown with this study that AHP method can be applicable to determine the priority ranking of districts to become province. When new provinces are in agenda, more current data and criterias must be used in a Project with Ministry of Interriors and other relevant govermental institutions in order to help political authorithy on decision making about this subject.

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