

DETERMINATION OF THE MOST SUITABLE SITES FOR SHOPPING CENTERS IN GEOGRAPHICAL REGIONS WITH GIS

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Abstract Being a part of social life, Shopping Centers become more popular and they represent the environments where consumption comes into prominence. However, in the recent years, Shopping Centers are seen as places combining consumption activities and time killing activities. Since number of Shopping Centers is at peak in big cities, attempts are made to open Shopping Centers in places other than big cities in accordance with population density, economic and social data. However, it is observed that geographical location and neighborhood relations are not taken into consideration in location surveys in cities other than major cities. Yet, such variables have major role at decision making stage. In this study a model based on geographical information system (GIS) was created and decision making process was analysed with the purpose of location survey of Shopping Centers to be opened across the geographical regions by taking population density, economic and social data, quality of life, geographical and spatial data. In analysis, ESRI software, ArcGIS software pack, ArcCatalog, ArcMap, ArcToolbox tool boxes and software required for topology development, data conversion and geographical (spatial) analysis.

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1. INTRODUCTION

Evaluations planned for shopping malls across the country by considering the location selection data and parameters can also be executed by considering all of the settlement areas, in other words, geographical regions of the country. However, interaction of settlement areas with others in their own geographical regions can be stronger than that of the interaction across the country. Under the light of this assumption, it has been planned to make an evaluation on geographical region basis. The data collected in our research titled "GIS BASED SITE SELECTION FOR SHOPPING CENTERS IN TURKEY" were also used in this study and the same method was implemented for evaluation of the data. Initially, settlement areas (cities) in 7 different geographical regions of the country gathered together and evaluation charts were created. The approaches and the modeling formula implemented for site selection across the country were used in the same manner and the cities were evaluated on regional basis.

2. RESULTS

2.1. Evaluation and Presentation of Results

Evaluation of the data indicated to be used at the country level shall increase chance of the rational decision makings of decision makers on geographical region basis. For this reason, considering the total number of shopping centers in a region, their distribution by the cities in the region and other parameters on regional basis, it was evaluated separately for 7 different geographical regions of the country. Furthermore, the areal size, total population, population density, economic development, contribution to national income, population growth rate and similar data were taken into consideration.

Presentation of the evaluation results is in below order:

- a. Geographical (spatial) and socio economic (semantic) data used in evaluation
- b. The location of the geographical region in Turkey and graphic (two dimensional) presentation of site selection results for the region
- c. Graphic presentation (two dimensional) of site selection results of the geographical region.

2.2. Marmara Region

Covers 8.5% of the country with an area of 67.308 km². Population is about 20 million and population density is 320 people/km². Economy of the region is

a developed economy and 20% of the country national income is provided from this region. 79% of the populations live in cities. Population growth rate is 0.27%.

Marmara Region is the most developed region of the country on socio economic terms; there are 11 cities in the region and 124 shopping centers, in different numbers in every city, apart from one of them. Istanbul is the leading city in the region, in which the highest number of shopping centers of the region and Turkey are located. The cities with proper sites for shopping centers in the region with an area of 73.100 km² where about 22 million people (1/4 of Turkey population) live are respectively Istanbul, Bursa, Kocaeli, Balıkesir and Sakarya (Table 1, Figure 1-2).

Table 1 Geographical (spatial) and socio economic (semantic) data of Marmara Region

Plaka kodu	Ad	Alan (km ²)	İl nüfusu (kişi)	Nüfus yoğunluğu (/km ²)	Merkez nüfusu (kişi)	En Yakın İl	KM	Zenginlik (mevduat/kişi)	A/VM Sayısı	Kırsal A.m ²	Ekonomi	Eğitim	Sağlık	Güvenlik	Kent Hayatı	Kültür-Sanat	Yaşam Kalitesi	Merkez nüfus %	x	y	Yüzde Değerler	
10	Balıkesir	14442	1152323	81	215436	Manisa	137	4841	4	40	87	85	75	31	78	48	68	18,70	27,88	39,65	3,61	
11	Bilecik	4181	225381	52	34105	Eskişehir	80	2380	0	0	76	79	26	43	79	57	49	15,13	29,98	40,14	0,68	
16	Bursa	11087	2605495	250	2287981	Bilecik	95	5325	10	200	74	55	70	36	63	92	60	87,81	29,07	40,18	20,56	
17	Çanakkale	10201	508769	54	110000	Tekirdağ	188	3987	2	20	89	95	68	25	93	54	80	21,62	26,42	40,15	1,74	
22	Edirne	6241	390428	64	119298	Kırklareli	62	5174	2	20	77	92	89	30	65	50	88	30,56	26,55	41,68	1,61	
34	İstanbul	5170	13255685	2551	11008790	Tekirdağ	132	19252	97	2910	98	80	50	85	98	95	94	83,05	28,99	41,04	100,00	
39	Kırklareli	6056	332791	53	53221	Edirne	62	5342	0	0	81	75	56	90	74	81	79	15,99	27,23	41,73	1,05	
41	Kocaeli	3635	1560138	432	294875	Sakarya	37	5238	8	80	97	65	60	40	71	82	77	18,90	29,90	40,76	4,87	
54	Sakarya	4895	872872	180	283752	Kocaeli	37	2441	5	50	47	43	36	81	75	90	51	32,51	30,40	40,77	3,55	
59	Tekirdağ	6345	798109	126	107191	Kırklareli	121	4459	5	50	86	49	22	68	43	41	42	13,43	27,51	40,98	2,22	
77	Yalova	847	203741	241	70118	Kocaeli	65	4494	2	20	80	91	30	34	96	91	62	34,42	29,24	40,65	0,92	
Toplam		73100	21905732																			

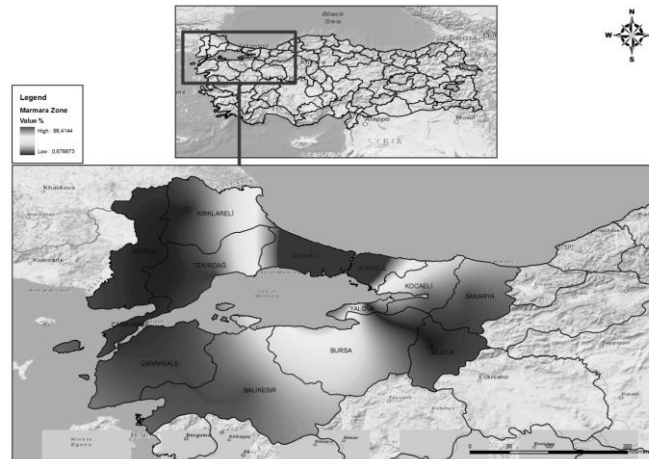


Fig. 1 The location of the Marmara Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)

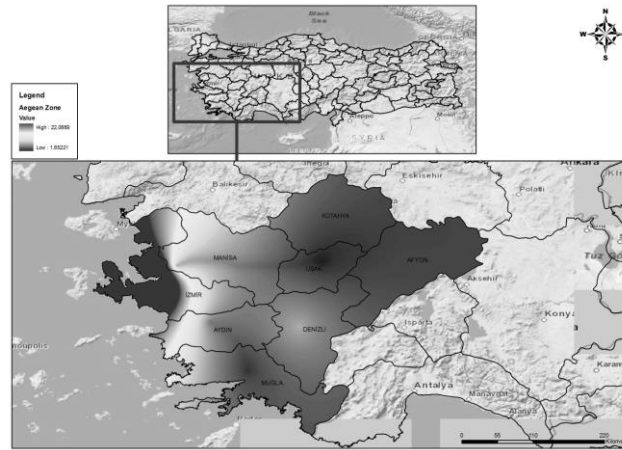


Fig. 3 The location of the Aegean Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)



Fig. 4 Aegean Region graphical representation (three-dimensional)

2.4. Black Sea Region

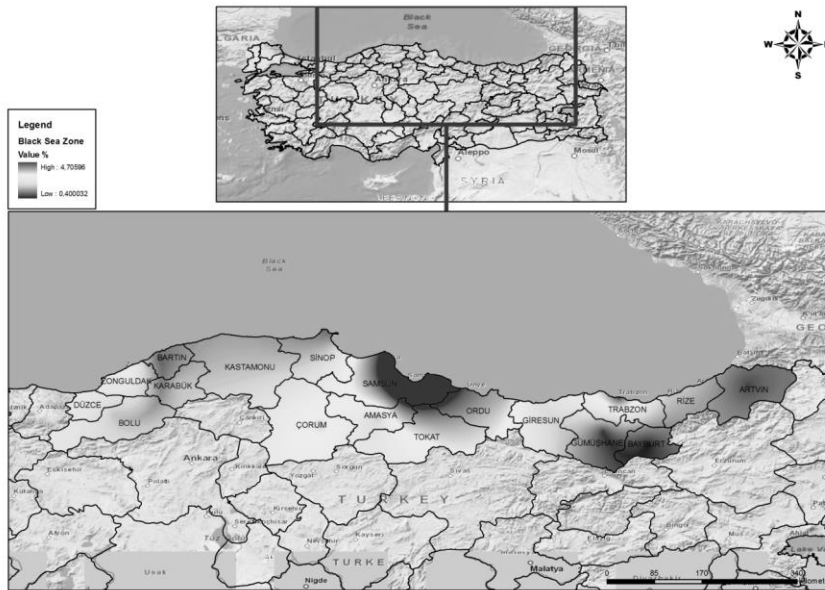
Covers 18% of the country with an area of 143.537 km² and it is the 3rd largest geographical region of the country. Population is about 8.4 million and population density is 59 people/km². (Turkey average is 83 people/km²). It is the second region with the lowest population density. Population growth rate is 0.4% (Turkey population growth is 0.1834%). 51% of the population lives in the rural area (Turkey average is 35%).

There are no shopping centers in 10 cities in the region and 13 shopping centers in the other 5 cities.

The priority order of the cities in the region according to the site selection results for new shopping centers in the region is Samsun, Trabzon, Ordu and Çorum (Table 3, Figure 5-6).

Table 3 Geographical (spatial) and socio economic (semantic) data of Black Sea Region

Plaka Kodu	Ad	Alan (km ²)	İl nüfusu (kişi)	Nüfus Yoğunluğu (/km ²)	Merkez nüfusu (kişi)	En Yakın İl	KM	Zenginlik(mevduat/kşi)	AVM Sayısı	Kira. A.m ²	Ekonomi	Eğitim	Sağlık	Güvenlik	Kent Hayatı	Kültür-Sanat	Yaşam Kalitesi	Merkez nüfus %	x	y	Yüzde Değerler
5	Amasya	5731	334786	59	74393	Corum	92	2578	0	0	71	70	41	39	64	43	48	22,22	35,85	40,67	1,16
8	Artvin	7493	164759	22	23157	Rize	159	3130	1	10	95	82	63	91	89	86	91	14,06	41,82	41,19	0,52
14	Bolu	10716	271208	33	84565	Düzce	45	3337	1	10	57	90	96	49	86	94	93	31,18	31,60	40,74	1,14
19	Çorum	12833	535405	42	161321	Amasya	92	2775	1	10	88	48	61	99	58	77	89	30,13	34,93	40,55	2,13
28	Giresun	7151	419256	61	83636	Ordu	44	3357	2	20	92	64	76	42	60	67	72	19,95	38,41	40,91	1,38
29	Gümüşhane	6125	129618	20	30270	Bayburt	78	1832	0	0	49	83	80	59	55	44	61	23,35	39,48	40,46	0,48
37	Kastamonu	13473	361222	27	64606	Karabük	122	2893	2	20	84	57	62	37	95	74	67	17,89	33,78	41,39	1,15
52	Ordu	5894	719183	121	141000	Giresun	44	2109	1	10	60	41	64	46	51	64	46	19,61	37,89	40,98	2,28
53	Rize	3792	319637	81	78144	Trabzon	74	2773	0	0	75	71	78	92	67	73	85	24,45	40,51	41,03	1,16
55	Samsun	9474	1252693	138	363180	Amasya	131	3262	3	30	64	60	86	57	62	83	83	28,99	36,34	41,31	4,78
57	Sinop	5858	202740	35	30502	Samsun	165	3523	0	0	73	76	69	83	90	98	90	15,04	35,14	42,03	0,64
60	Tokat	9912	617802	62	113100	Sivas	108	1733	1	10	55	56	57	54	61	45	50	18,31	36,56	40,33	1,91
61	Trabzon	4495	763714	164	214949	Rize	75	4049	3	30	79	84	94	96	68	87	96	28,15	39,74	41,00	2,90
67	Zonguldak	3470	619703	188	104276	Bartın	89	6068	2	20	82	59	87	51	81	72	87	16,83	31,79	41,45	1,92
69	Bayburt	4043	74412	20	32285	Gümüşhane	78	2124	0	0	65	74	51	89	53	61	63	43,39	40,22	40,26	0,40
74	Bartın	1960	187758	90	35992	Karabük	88	4608	0	0	53	58	49	24	80	71	47	19,17	32,33	41,63	0,66
78	Karabük	2420	227610	55	100749	Bartın	88	3444	2	20	68	87	71	44	92	58	69	44,26	32,63	41,20	1,16
81	Düzce	3641	338188	132	129118	Bolu	45	2257	1	10	45	66	79	28	57	39	44	38,18	31,16	40,84	1,53
	Toplam	118481	7539694																		

**Fig. 5** The location of the Black Sea Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)

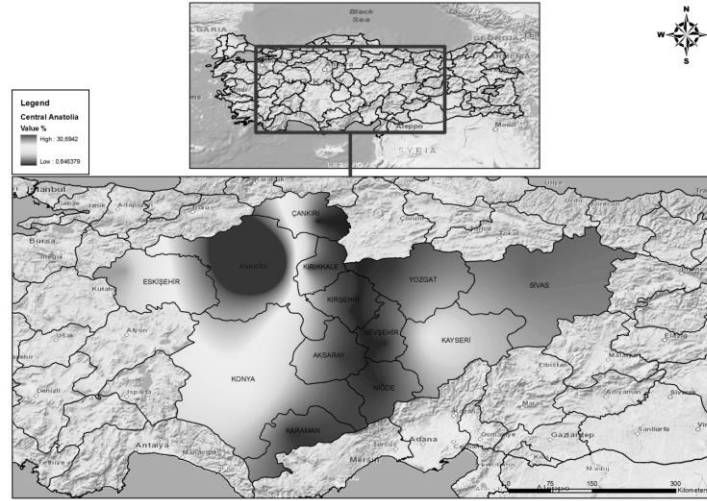


Fig. 7 The location of the Central Anatolia Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)

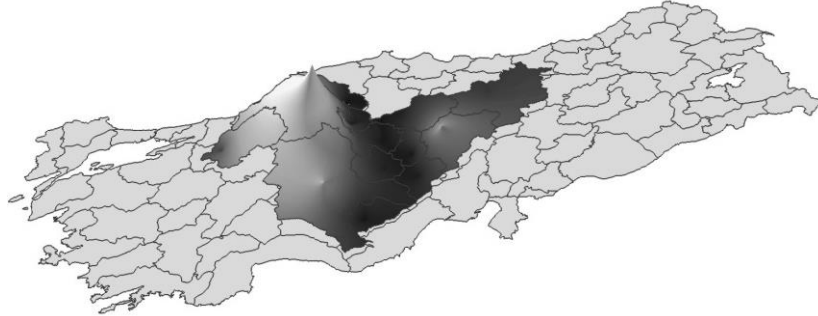


Fig. 8 Central Anatolia Region graphical representation (three-dimensional)

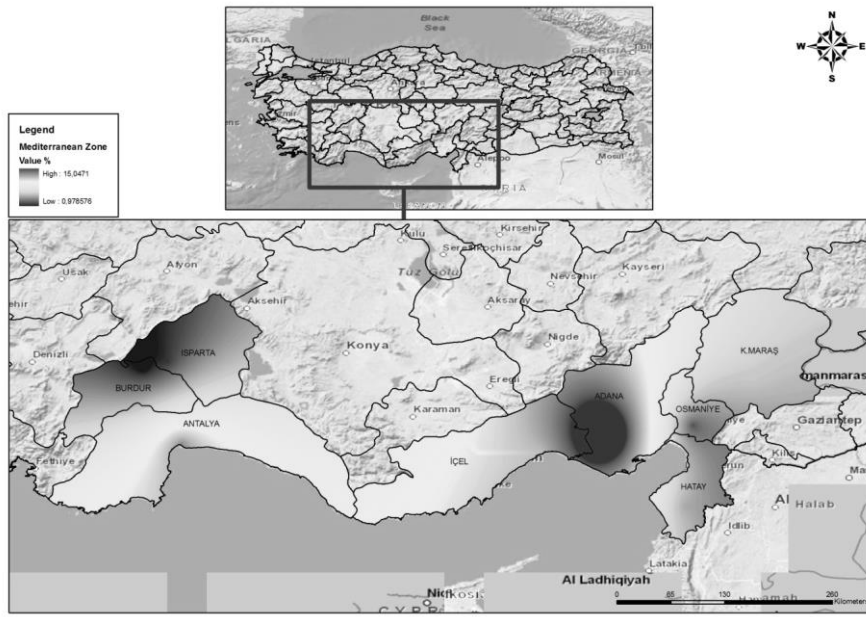
2.6. Mediterranean Region

Covers 15% of the country with an area of 122.927 km². Ranks 4 by size. Population is about 9 million and population density is 71 people/km². 60% of populations live in cities. Population growth rate is 0.22%.

There are 8 cities in the region and a total of 25 shopping centers apart from two cities. Antalya ranks first with 13 shopping centers. As a result of the research and evaluation, the most suitable cities for shopping centers are respectively Adana, Antalya, Mersin and Kahramanmaraş (Table 5, Figure 9-10).

Table 5 Geographical (spatial) and socio economic (semantic) data of Mediterranean Region

Plaka kodu	Ad	Alan (km ²)	İl nüfusu (kişi)	Nüfus yoğunluğu (/km ²)	Merkez nüfusu (kişi)	En Yakın İl	KİM	Zenginlik (mevduat/kişi)	AVM Sayısı	Kira. A. m ²	Ekonomi	Eğitim	Sağlık	Güvenlik	Kent Hayatı	Kültür-Sanat	Yaşam Kalitesi	Merkez nüfus %	x	y	Yüzde Değerler
1	Adana	14256	2085225	150	1630710	Mersin	69	4596	4	40	48	42	53	70	50	66	45	78,20	35,31	37,00	15,08
7	Antalya	20815	1978333	95	955596	Burdur	122	6878	17	170	94	89	90	76	99	93	98	48,30	30,70	36,89	10,25
15	Burdur	7238	258868	38	63363	İsparta	51	3750	0	0	91	93	58	45	85	78	76	24,48	30,29	37,71	0,97
31	Hatay	5403	1480571	254	202216	Osmaniye	128	3247	1	10	38	31	23	50	73	31	32	13,66	36,16	36,22	4,05
32	İsparta	8733	448298	54	148496	Burdur	51	4045	1	10	61	97	97	61	91	84	95	33,12	30,57	37,78	1,83
33	Mersin	15737	1647899	106	875842	Adana	69	4057	6	60	54	50	48	60	76	70	54	53,15	34,62	36,80	9,06
46	K.Maraş	14327	1044816	73	403828	Gaziantep	80	1721	1	10	32	35	42	77	49	25	39	38,65	36,92	37,57	4,68
80	Osmaniye	3767	479221	153	198836	Adana	86	1320	0	0	40	38	43	22	66	27	37	41,49	36,26	37,09	2,25
Toplam		90276	9423231																		

**Fig. 9** The location of the Mediterranean Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)

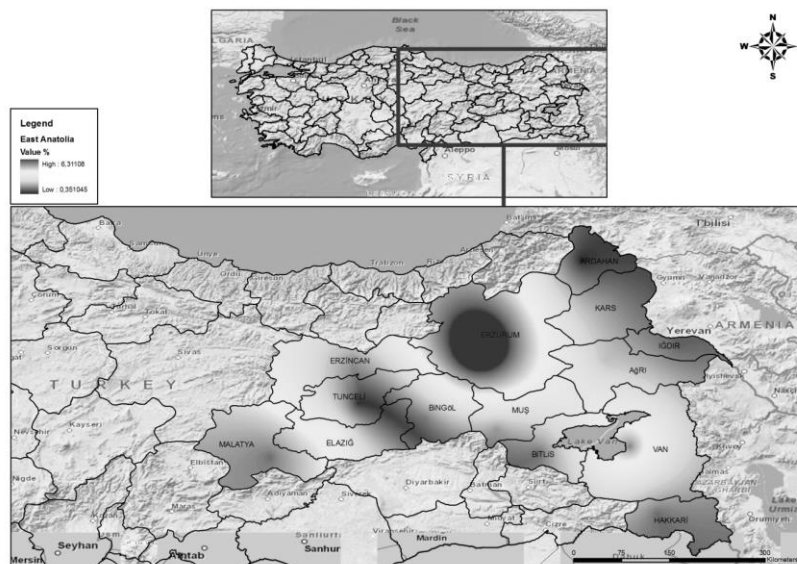


Fig. 11 The location of the Eastern Anatolia Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)

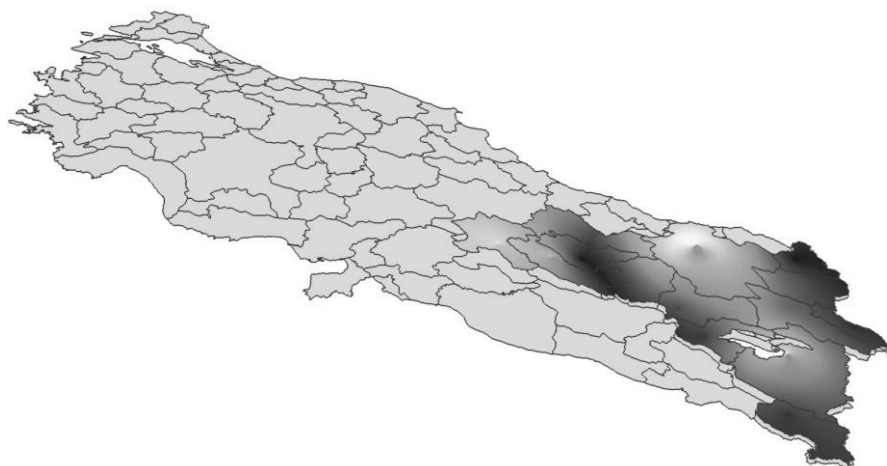


Fig. 12 Eastern Anatolia Region graphical representation (three-dimensional)

2.8. Southeastern Anatolia Region

It is the smallest geographical region of the country with an area of 59.176 km² and the population density is 113 people/km². Population growth rate is 0.25%.

62% of the populations live in cities. 1/7 of the country petroleum is collected from this region.

There are 8 cities in the region. There no shopping centers in 5 of the cities. There are 8 shopping centers in total in other 3 cities. The city with this highest number of shopping centers is Gaziantep with 5 shopping centers. According to the research and evaluation results, the most suitable cities for shopping centers are respectively Gaziantep, Diyarbakır, Şanlıurfa, Batman and Adıyaman. (Table 7, Figure 13-14).

Table 7 Geographical (spatial) and socio economic (semantic) data of Southeastern Anatolia Region

Plaka kodu	Ad	Alan (km ²)	İl nüfusu (kişi)	Nüfus yoğunluğu (/km ²)	Merkez nüfusu (kişi)	En Yakın İl	KM	Zenginlik(mevduat/kişi)	AVM Sayısı	Kıra. A.m ²	Ekonomi	Eğitim	Sağlık	Güvenlik	Kent Hayatı	Kültür-Sanat	Yaşam Kalitesi	Merkez nüfus %	x	y	Yüzde Değerler
2	Adıyaman	7572	590935	84	178538	K.Maraş	164	1143	0	0	39	32	29	67	42	34	33	30,21	38,28	37,76	2,30
21	Diyarbakır	15162	1528958	102	545983	Mardin	95	1266	5	50	27	25	72	71	30	32	34	35,71	40,21	37,93	6,51
27	Gaziantep	7194	1700763	249	1253513	K.Maraş	80	2314	12	240	36	29	59	64	54	37	40	73,70	37,35	37,09	11,73
47	Mardin	9097	744606	85	65072	Diyarbakır	95	903	0	0	28	24	19	97	24	29	27	8,74	40,74	37,32	1,78
56	Siirt	5465	300695	55	98281	Batman	87	845	0	0	25	26	37	88	33	36	29	32,68	41,94	37,93	1,23
63	Şanlıurfa	19091	1663371	89	385588	Adıyaman	109	759	2	20	26	19	24	93	29	20	22	23,18	38,79	37,17	5,62
72	Batman	4671	510200	110	246678	Siirt	87	999	1	10	31	27	47	55	25	52	28	48,35	41,13	37,90	2,63
73	Sırmak	7296	430109	60	52743	Siirt	97	810	0	0	24	22	20	94	31	23	24	12,26	42,45	37,53	1,14
	Toplam	75548	7469637																		

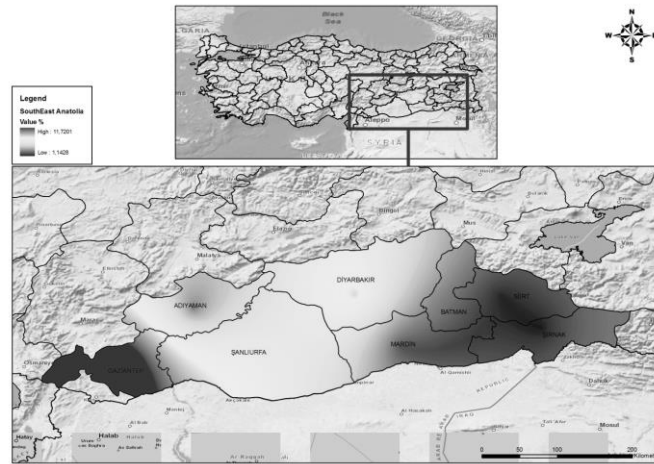


Fig. 13 The location of the Southeastern Anatolia Region in Turkey (above) and graphic representation of the area (two-dimensional) (bottom)

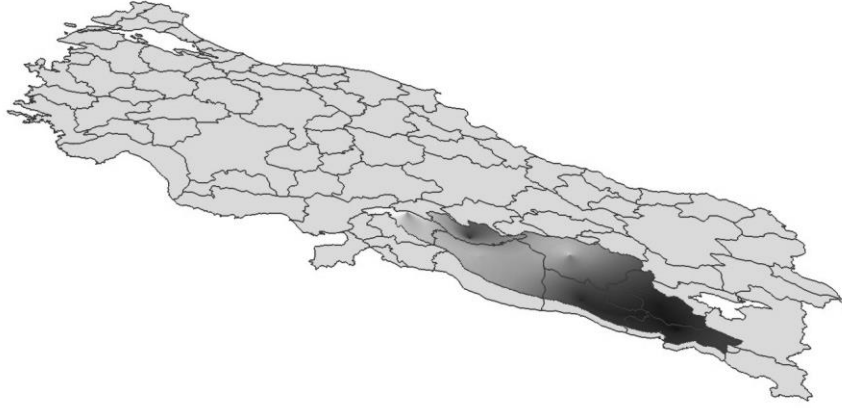


Fig. 14 Southeastern Anatolia Region graphical representation (three-dimensional)

3. CONCLUSION

In this study carried out with the purpose of selecting optimal shopping center locations on regional basis, an analysis was performed in GIS environment upon loading semantic data on geographical (spatial) data. Analysis results indicated the potential areas of shopping centers in an easily understandable format by every decision maker. When results are reviewed numerically or graphically, it is observed that potential areas of shopping centers coincide with life quality in general, however the results are negative and contrary to what is expected in some cities. It is observed that parameters such as urban life, culture-art as well as economic data play an important role in selection of optimal shopping center locations. It is observed that there is a high potential for shopping center sector on regional basis. In conclusion, it is a fundamental condition for decision makers to evaluate geographical (spatial) and semantic data together with reasonable care for rational investments.

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BIOGRAPHICAL NOTES

Ceren Erdin Gundogdu was born in Istanbul-Turkey in 1973. In 1997 she was graduated from Marmara University (Turkey) Faculty of Economic and Administrative Sciences and in 2001 she completed here master thesis about Economic Policy at Istanbul University (Turkey). She wrote her doctoral thesis about “Fuzzy Goal Programming” and gained a Ph.D. degree in 2007 from Istanbul University. Since 2002 she is an academic staff of Department of Business Administration of Yildiz Technical University (Turkey). She has a lot of articles and presentations both in Turkish and in English. She is also reviewer and editor of some international journals. Her academic fields are especially “decision making”, “fuzzy goal programming”, “geographical information systems (GIS)” and “simulation”.