EVALUATION OF COASTAL SCENIC ASSESMENT PARAMETERS; PILOT STUDY FOR SELECTED COASTAL AREA "ANTALYA/KONYAALTI BEACH"

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Approval of the Graduate School of Natural and Applied Sciences

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ABSTRACT

EVALUATION OF COASTAL SCENIC ASSESMENT PARAMETERS;
PILOT STUDY FOR SELECTED AREA
"ANTALYA/KONYAALTI BEACH"

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The present scenic assessment study has a checklist that itemizes 26 parameters (comprising physical and human parameters), as a first step in quantifying scenery. Each parameter was rated on a five-point score, essentially covering presence/absence or poor quality (1), to excellence/outstanding (5). The ratings were subjected to fuzzy logic matrices and weights to reflect importance of the various parameters, which produced histograms of weighted averages for the various attributes. Based on this methodology coastal scenery evaluation was carried out and coastal areas were grouped into 5 five classes from Class 1 = Top Natural Sites to Class 5 = Very Unattractive Urban.

The present work focuses on human parameters from the perspective of people with mobility handicaps. Public surveys were carried out for the necessary arrangements in coastal areas for accessibility of these people. Selected site (Antalya/Konyaaltı Beach) is reviewed to bring some recommendations from the point of view of people with mobility handicaps.

Keywords: Buffer Zone, People With Mobility Handicaps, Coastal Scenic Assessment

ÖZ

KIYI ALANLARI ÖLÇME
PARAMETRELERİNİN DEĞERLENDİRİLMESİ;
SEÇİLMİŞ YÖRE
(ANTALYA/KONYAALTI PLAJI) İÇİN PİLOT ÇALIŞMA

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Mevcut görünüm değerlendirme çalışması, görünüm değerlendirme adına ilk adım olarak insan ve fiziksel olmak üzere 26 parametreden oluşan bir değerlendirme listesinden faydalanmaktadır. Her bir parametre olmak ya da olmamak veya düşük kaliteden (1) yüksek kaliteye (5) olmak üzere 5 puanlık bir aralıkta değerlendirilmiştir. Puanlamalar değişik parametrelerin önemini göstermek üzere bulanık mantık matrislerine ve ağırlıklarına girilmiştir, buradan da farklı nitelikler için ağırlıklı ortalamalar histogramına geçilmiştir. Bu metodolojiye dayanarak kıyı görünümleri değerlendirilmesi yapılmış ve kıyı alanları "1. Sınıf = Son Derece Doğal Yöre" den "5.Sınıf = Son Derece İtici Şehir" olmak üzere 5 sınıfa ayrılmıştır.

Bu çalışma bedensel engelli insanların bakış açısından insan parametreleri üzerine odaklanmıştır. Bu insanların kıyı alanlarına ulaşabilmesi için gerekli düzenlemelerin ortaya çıkarılması amacıyla anket çalışmaları yürütülmüştür.

Seçilmiş yöre (Antalya/Konyaaltı Plajı) bu açıdan bazı öneriler getirmek amacıyla gözden geçirilmiştir.

Anahtar Kelimeler: Kıyı Geçiş Bölgesi, Bedensel Engelli İnsanlar, Kıyı Alanlarının Değerlendirilmesi

To
Meaning of My Life

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CHAPTER 1

INTRODUCTION

Coastal scenery evaluation which is strongly rooted in the man-environment tradition is not a subject that has been studied on mathematical and scientific basis. However it should be investigated for providing baseline information for management plans. To be able to evaluate coastal areas some parameters are needed. These parameters are separated to two main categories one of which is physical and the other is human parameters. Physical parameters are usually related to natural features of the site such as cliff height, width of beach face etc and human parameters are usually consequences of human activities such as noise disturbance, sewage discharge.

The aim of this study is to show how human activities can affect desirability of a coastal site. The affect can be positive, as it can be negative on the other hand. In this study especially positive affects of the arrangements such as buffer zones coastal areas with special consideration to people with mobility handicaps will be discussed. For this aim Antalya Konyaaltı beach is selected as pilot site for a sample work including features for people with mobility handicaps. Therefore Antalya/Konyaaltı Beach Buffer Zone Project is reviewed with special features for mobility handicapped people. Such design elements will not reflect on the physical parameters of a site. However, that will reflect as an increase in attribute values on the human parameters mainly on the buffer zone consideration. Such a planning concept will be a plus from the humanitarian point of view and also, where feasible, will make such coastal areas with special considerations for people with mobility handicaps desirable for them and their families.

Even though a wide literature exists related to scenic assessment it is not possible to say the same for coastal scenery. However, in recent years there exists a decrease on the studies about the subject. Linton (1968), Leopold (1969), Zube (1973), Shuttleworth S. (1980), Williams (1986) and Countryside Commission's (1987) studies can be evaluated as pioneering works on the field but there is still no assessment methodology for coastal areas.

Investigating people's opinions and perceptions about coastal scenery has some subjectivities and difficulties. Therefore fuzzy logic approach is used for this aim. Fuzzy logic approach can be briefly defined as a superset of conventional logic that has been extended to handle the concept of partial truth – truth values between completely true and completely false. To be able to make an evaluation, weight of parameters were needed. In the field studies people's priorities were determined by questionnaire. Then the results of the questionnaire were subjected to fuzzy logic matrices to reflect the importance of each parameter. Using these data membership degree attributes graphs were drawn and membership degree figures gave the overall result of scenic assessment over attributes. In addition one more field study performed with people with mobility handicaps on the pilot site to reflect their point of views on necessary arrangements for their daily activities on coastal areas.

In Chapter 2 fuzzy logic methodology is described and its application for Konyaaltı beach is given. Chapter 3 includes the interviews and questionnaire made with people with mobility handicaps. And finally discussions and conclusion are summarised in Chapter 4 .

CHAPTER 2

METHODOLOGY

2.1. Parameter Selection

As part of a three-year study, a literature search, together with questionnaires given to coastal users in Turkey and the UK, and consultation with coastal landscape experts, an assessment was made as to what were the main parameters essential in coastal scenery perception (Ergin et al, 2003). Landscape values 'can be assessed and described or illustrated in objective and subjective terms by landscape professionals, consulting with a wide range of interest groups and people and analysing all relevant information.' (LIIEA; 1995, p19). Results obtained through this work, enabled key elements to be condensed down to 26 'coastal scenic assessment parameters' and these are given in Table 1 and Table 2, together with the 'attributes' represented by numbers ranging from low to a high rating 1,2,3,4 and 5 (Ergin et al, 2003).

Table 1.Coastal Scenic Evaluation System Physical Parameters

No:	Physical Parameters		RATING 1	2	3	4	5
1	CLIFF	Height	Absent	>5 -<30m	30 - <60m	61 - 90m	>90m
2		Slope	45° - 55°	55° - 65°	65° - 75°	75° - 85°	Circa Vertical
3		Special Features*	Absent	1	2	3	Many >3
4	BEACH FACE	Type	Absent	Mud	Cobble / Boulder	Pebble / Gravel (±Sand)	Sand
5		Width	Absent	<5m - >100m	5m - <25m	25m - <50m	50m-100m
6		Colour	Absent	Dark	Dark Tan	Light Tan / Bleached	White/Gold
7	ROCKY SHORE	Slope	Absent	<5°	5°-10°	10°-20°	20°-45°
8		Extent	Absent	<5m	5m-10m	10m-20m	>20m
9		Roughness	Absent	Distinctly Jagged	Deeply Pitted and/or Irregular (uneven)	Shallow Pitted	Smooth
10	DUNES		Absent	Remnants	Fore-dune	Secondary Ridge	Several
11	VALLEY		Absent	Dry Valley	(<1m) Stream	(1m-4m) Stream	River / Limestone gorge
12	SKYLINE LANDFORM		Not Visible	Flat	Undulating	Highly Undulating	Mountainous
13	TIDES		Macro (>4m)		Meso (2m-4m)		Micro (<2m)
14	COASTAL LANDSCAPE FEATURES **		None	1	2	3	>3
15	VISTAS		Open on one side	Open on two sides		Open on three sides	Open on four sides
16	WATER COLOUR & CLARITY		Muddy Brown / Grey	Milky Blue / Green; Opaque	Green / Grey Blue	Clear Blue / Dark blue	Very Clear Turquoise
17	NATURAL VEGETATION COVER		Bare (< 10% vegetation only)	Scrub / Garigue (marram/gorse, bramble, etc))	Wetlands / Meadow	Coppices, Maquis (±Mature Trees)	Variety of Mature Trees / Mature Natural Cover
18	VEGETATION DEBRIS		Continuous >50cm high	Full Strand Line	Single Accumulation	Few Scattered Items	None

* Cliff Special Features: Indentation, banding, folding, screes, irregular profile

** Coastal Landscape Features: Peninsulas, rock ridges, irregular headlands, arches, windows, caves, waterfalls, deltas, lagoons, islands, stacks, estuaries, reefs, fauna, embayment, tombola, etc.

Table 2.Coastal Scenic Evaluation System Human Parameters

No:	Human Parameters	RATING				
		1	2	3	4	5
19	NOISE DISTURBANCE	Intolerable	Tolerable		Little	None
20	LITTER	Continuous Accumulations	Full Strand Line	Single Accumulation	Few Scattered Items	Virtually Absent
21	SEWAGE DISCHARGE EVIDENCE	Sewage Evidence		Some Evidence (1-3 items)		No Evidence of Sewage
22	NON-BUILT ENVIRONMENT	None		Hedgerow / Terracing / Monoculture		Field Mixed Cultivation ± Trees / Natural
23	BUILT ENVIRONMENT*	Heavy Industry	Heavy Tourism and/or Urban	Light Tourism and/or Urban and/or Sensitive Industry	Sensitive Tourism and/or Urban	Historic and/or None
24	ACCESS TYPE	No Buffer Zone / Heavy Traffic	No Buffer Zone / Light Traffic		Parking Lot Visible From Coastal Area	Parking Lot Not Visible From Coastal Area
25	SKYLINE	Very Unattractive	Unattractive	Sensitively Designed High / Low	Very Sensitively Designed	Natural / Historic Features
26	UTILITIES **	>3	3	2	1	None

*Built Environment: Caravans will come under Tourism, Grading 2: Large intensive caravan site, Grading 3: Light, but still intensive caravan sites, Grading 4: Sensitively designed caravan sites.

** Utilities: Power lines, pipelines, street lamps, groins, seawalls, revetments

2.2. Perception Studies

It is clearly understood that perception depends upon imagination and experience (Lowenthal, 1961), i.e. each brain is nontrivially unique' (Tuan, 2003, p879). Therefore it has both internal and external elements, or as Lippmann (1961, p56) put it, 'the world outside and the pictures within our head.' In most coastal scenic assessment studies, assessment parameter gradings have tended to be obtained from subjective observations. These depend on a number of factors such as the national and cultural background, age, gender, education and training. Eletheriadis et al (1990) found that European nationality groups agreed as to the least/preferred landscape types, but that cultural traits could give differences. Zube and Pitt (1981) also argued that not all cultures shared similar perceptions of landscapes. However, shape and form are still the prime considerations for any epistemological approach.

To re-evaluate the validity of this assumption and bring out viewers' preferences and priority to the different assessment parameters, a questionnaire perception survey was inaugurated in Turkey, Malta and the UK. Coastal questionnaire surveys have generally tended to be of two types: postal e.g. Myatt et al (2002), who studied attitudes, opinion, perceptions, or via interviewing actual users, e.g. Pereira da Silva (in press). Based on results from surveys, a 'Coastal Scenic Assessment Inquiry Form' was finalised (Table 3). This consisted of some 26 parameters and respondents were asked to grade parameters on a five-point scale (1 being not important, 5 being extremely important). In Table 3, the y-axis bold-faced parameter numbers correspond to the physical and human parameters listed in Table 1 and Table 2, and were used in evaluation of the weighting parameters. The column reserved for the 'top five' preferences in Table 3, are for a quick preview of the priority given by the public to the parameters.

Table 3. Overall Questionnaire Result for Turkish Beaches

Çıralı + Crotia+Malta+Southerdown + previous study									
Number Of People Contributed To The Inquiry is 485									
Parameters				**Importance**					**Top Five**
				1	2	3	4	5	
1	Cliff	Height		63	71	160	114	77	22
2		Slope		77	102	159	82	65	10
3		Special Features (Indentation, Bending, Folding)		58	72	119	99	137	23
4	Beach Face	Type	Sand	44	39	72	101	229	136
5			Pebble / Gravel	104	99	141	91	50	28
6			Rocky	160	80	120	73	52	17
7		Width		40	46	110	143	146	39
8		Colour		56	69	130	119	111	13
9	Rocky Shore Platform	Slope		80	120	154	86	45	4
10		Extent		69	115	155	89	57	10
11		Roughness		66	88	121	102	108	27
12	Sand Dunes			111	103	119	86	66	11
13	Valley and River Mouth			65	54	92	146	128	31
14	Landform	Flat		110	99	120	97	59	25
15		Undulating		72	81	168	122	42	10
16		Mountainous		59	59	89	106	172	52
17	Tides			121	96	140	64	64	18
18	Coastal Landscape Features (Caves, Waterfalls, Islands, Rocks…)			10	14	53	120	288	162
19	Vistas of Far Places			22	33	117	142	171	41
20	Historical Features (Castles, Towers, Historical Remains...)			17	33	74	123	238	127
21	Water Colour and Clarity			6	4	15	73	387	333
22	Seaweed Banquets			68	62	104	86	165	48
23	Biotype Diversity (Fauna)			32	27	87	116	223	102
24	Natural Vegetation Cover (Flora)			20	37	53	136	239	142
25	Absence of Noise			8	13	33	116	315	238
26	Absence of Sewage and Litter			7	4	17	38	419	371
27	Land use (Monoculture, Many Crops...)			67	65	141	108	104	40
28	Absence of Buildings and Utilities (Powerlines…), Natural View of the Skyline			5	14	42	109	315	213
29	Ease of Access			39	53	82	106	205	105

2.3. Definitions of Parameters

Definitions and explanations of the parameters are given below. In addition visual definitions of the parameters are given as Appendix D, the photographs which are used for definitions are taken from Davis R.A. (1994), White A. (1998), Lealhman S.P. (1998).

2.3.1. Cliff

A high (>5m) area usually composed of rock with a > 45˚ slope.

- Banding: The cliff can be composed of various layers of rock e.g. alternate shale and limestone.
- Colour : Various colours can differentiate the bands.
- Faulting: Where earth movements have displaced the rock bands so that a line can be seen (fault line) which has shifted the layers on either side.
- Folding: Where the rocks have been under pressure and have folded to accommodate the pressure. Folding can be gentle of severe.
- Gullying: Rain can form gullies/rills along which cliff materials can be washed away.
- Indentation: The shape of the cliff edge. It could be straight or curved the more curved, the more highly indented the cliff face.
- Scree: Accumulation of rock material at the foot of, or mantling cliff slopes.
- Tufa: Deposits of calcareous material on a limestone cliff face due to water seepage.
- Unconformity: Represents the junction between two sets of rocks formed under different geological ages.

2.3.2. Beach Face

The area between the water's edge and the back of beach. The latter could be a wall, dune, building etc.

2.3.3. Rocky Shore Platform

An area of rock with a smaller than 45 degree slope. Formed by shore processes, especially wave action.

2.3.4. Dunes

- Foredune: The main dune adjacent to the beach. Frequently termed yellow dunes.
- Secondary dune ridges: Located behind the foredune and representing old foredunes that have been colonised by plants. There may be many ridges and they are loosely called grey dunes.

2.3.5. Valley and River Mouth

A valley is a V shaped landscape feature formed by flowing water. If no water is present, it is termed as a dry valley.

2.3.6. Skyline Landform

Landform represents the distant land form type or in the side view of the coast.

2.3.7. Tide

Tide is the alternating rise and fall in sea level with respect to the land, produced by the gravitational attraction of the sun and more importantly, the moon.

2.3.8. Coastal Landscape Features

- Peninsula/headland is an area of land taht juts out into water which covers three sides.
- Bay is the reverse of the above an area of water bordering land on three sides.

- Cave is a hollow in a cliff face that can be caused by wave action, rock slippage, weathering, faulting etc. Where the cave breaks through a cliff headland it is called an arch.
- Lagoon is a stretch of comparatively shallow salt/fresh water separated from the sea by a shallow or exposed sandbank, coral reef, shingle beach or similar structure.
- Sandbank is a mound of and located offshore which is exposed to the air. If completely submerged it is a sand bar.
- Stack is steep, often vertical, sided column of rock in the sea formed as a result of collapse of an arch (see cave above).
- Tombolo is a deposition landform (usually sand or shingle) which connects an island to the shore.
- Delta is a land usually a triangular in shape, formed by deposition of riverine sediment where a river enters the sea.
- Estuary is an area of water bounded on one side by marine water and the other side by riverine input. It is the junction zone between salt/fresh water.
- Reef is a degraded stack located beneath sea level.
- Window occurs if cave(s) carve through a headland above the water line resulting a hole through the cliff.

2.3.9. Vistas

Vistas is related to far off views. For example a site could be enclosed on 4 sides, so no far off views can be seen. Alternatively it could be open on 1 or more. A far vista is where the foreground hill has another secondary background feature visible; e.g. a higher hill/mountain.

2.3.10. Water Colour & Clarity

The colour of the sea is determined by the interactions of incident light with substances or particles present in the water. The most significant constituents are free floating photosynthetic organisms (phytoplankton) and inorganic particulates. Clarity is related to whether sea bed can be seen or not. Nutrient free waters tend to have the best clarity.

2.3.11. Natural Vegetation Cover

Natural vegetation cover represents the flora of the coastal area vicinity, close enough to affect the beach and beach users visually and etc.

2.3.12. Vegetation Debris

Seaweed refers to the large marine algae that grow almost exclusively in the shallow waters at the edge of the world's oceans. Excessive seaweed accumulation in the coast represents unattractive views to beach users most of the time.

2.3.13. Disturbance Factor

Disturbance factor relates to the noise factor on the beach, e.g. playing of radios, jet skies, heavy traffic, etc.

2.3.14. Litter

This is anthropogenic generated discards and includes building rubble. Examples are beer cans, sweet wrappers, plastic bags etc. Accumulations represent piles of these materials, measurement surveys are usually carried out over a 100 m stretch of beach site.

2.3.15. Non Built Environment

Rural areas, few buildings.

2.3.16. Skyline

The silhouette of buildings on the skyline. They are in harmony with the environment if building lines are of the same height as the tree cover etc. Discord exists if they stand out from the surroundings.

2.3.17. Sewage

Human or animal waste products.

2.3.18. Utilities

These include items such as power lines, telegraph lines/ poles, roads, etc

2.3.19. Access Type

- Buffer Zone: An area that divides two separate entities. For example, a grass/tree lined street that separates a beach from a coastal road.

2.3.20. Built Environment

The urban environment. It could include heavy industries (steel works, plants, etc); light industries.

2.4. Fuzzy Logic Approach

In coastal assessment studies as in many other fields, judgements made by an expert or a group of experts have a great influence on the results and sometimes can be stated in vague language format. Although some characteristics or parameters used to assess a certain region can be measurable (cliff height, shore width, etc), many others are experts' view of the coastal scenery and are given using terms "good" or "bad"; " clean" or "not clean", etc.

Experts are also sometimes guilty of using vague concepts based upon experience, intuition, human nature, environmental conditions, national cultural and social policies and economic conditions. Further, when several factors are to be considered in an analysis and/or assessment, it is difficult to describe a mathematical expression based on deterministic methods (Ergin et al, 2003). Fuzzy Logic Approach (FLA) is a tool to assess the possibility (magnitude) and the degree of each factor considered to affect the evaluation results. Zadeh (1965) proposed making the membership function (or the values True and False), operate over the range of real numbers in the interval [0.0, 1.0] instead of on 0 and 1 of classic Boolean logic. This implies that fuzzy logic may allow more than one conclusion per rule. Since Zadeh (1965), the theory has developed and found uses in several wide–ranging areas where subjective pronouncements are inherent in most scientific fields as from communication to financial systems (Ambala, 2001).

This study aims to comprehensively assess the dominance of physical and human factors, with their attendant subsections, in coastal scenery evaluation. Therefore it is an appropriate study in which to use fuzzy logic mathematics. For the sake of simplicity in mathematical and numerical processing, a condensed version of fuzzy analysis was adapted for the decision- making phase of the coastal scenery investigated (Ergin et al, 2003).

The scenic assessment factor set F is defined as composed of physical (P) and human (H) factors and symbolically, F is expressed as:

F = (Physical, Human) = (P, H)

Where subsets of P and H are formed from the following listed file characteristics as:

P = (cliff, beach, rocky shore, dunes, valley, land form, tides, coastal landscape features, vistas, water colour and clarity, natural vegetation cover, vegetation debris)

H = (noise, litter, sewage, non built environment, built environment, access type, skyline, utilities)

In P, cliff, beach and rock shore characteristics are further formed from sub-characteristics or elements and for simplicity of notation, P is expressed as:

$P = (P_1, P_2, P_3, P_{other})$

Where:

P_1 = (height, slope, special features) refers to the cliff

P_2 = (type, width, colour) refers to the beach

P_3 = (Slope, extent, roughness) refers to the rocky shore

P_{other} = refers to the remaining nine physical parameters in P that are not listed in P_1, P_2 and P_3, i.e. from dunes to vegetation debris and will be denoted as P_4 to P_{12}.

P and H were established with 18 and 8 assessment parameters, respectively (Ergin et al, 2003).

2.5. Weights of Assessment Parameters

Membership grades of the factors P and H to the assessment class were expressed by assigning weight numbers w_P and w_H, respectively. These numbers reflect the importance of the factors in the overall evaluation, and will be represented as a row matrix (or vector) for the purpose of computational simplicity:

$\mathbf{W}_F = (w_P \quad w_H)$

The weight numbers or the elements of $\mathbf{W}_F$ are to be non-negative (positive numbers together with zero) and generally so chosen that their sum was equal to one (the normality condition). These numbers are subjective; they rely on the experience and preference of experts. Therefore, $\mathbf{W}_F$ is a fuzzy matrix and the assessment result will be different, for different choices of entries or weights.

Initial choice for the weights in this study, were that both P and H have the same significance, that is:

$\mathbf{W}_F = (0.5 \quad 0.5)$

Re-evaluation of $\mathbf{W}_F$ is possible with further surveys and more expert opinions.

The weights for the parameters (or subsets) of P and H were estimated from public perception survey data (Table 3). The first column of the table with bold-faced numbers, correspond to the parameters used in the weight evaluation of the assessment parameters. The grading parameters are categorized from 1 to 5, i.e. from not important to very important. Weight numbers of the corresponding parameters were based on the weighted averages of the ticked boxes 4 and 5, with the weights of these grades as 4 and 5, respectively to promote higher preferences. For 485 observations these weighted averages are shown in Tables 4 and 5, respectively for the physical and human parameters.

As listed above cliff, beach and rocky shore parameters all appear with three sub features, whereas remaining parameters have only one basic feature. In order to give equal weight gradings to every factor of P from P_1 to P_{12}, the sub features were considered to have a weight of 1/36 and the others with 1/12 for the physical parameters. Similarly, for the human parameters the equal weights were as 1/8. Normalized weights for all parameters are listed in the last columns of Tables 4 and 5 and also summarized in Table 6 (column 3) for further evaluation (Ergin et al, 2003).

2.6. Matrices

The dominance of physical and human factors with various sub-factors, becomes very important in obtaining weight matrices, as given in the previous section. In return, weight matrices affect the final assessment results via weighted averages of the parameters. A Fuzzy Logic Assessment Matrix is given as an example, in Table 6 for Konyaaltı Beach, Turkey. The weight matrices WP and WH for factors P and H, are 1 x 18 and 1 x 8 row matrices, respectively with their entries as listed in column 3 of Table 6.

For every graded assessment parameter j, a possible square membership-grading matrix $\mathbf{M}_j$ was established with estimated membership grades. This matrix was based on the idea that an error may be introduced in the chosen grades, as one is obliged to make a unique decision among several other possible grades, over an attribute based on vague characteristics. For the present study, attributes were formed from a set of five ordered grades (from 1 to 5). As an example for parameter seven, i.e. the rocky shore slope (the angle between the rocky shore and the horizontal), the membership grading matrix M_7 and related attributes were as follows:

$$M_7 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} \begin{array}{c} \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0.5 & 0 & 0 \\ 0 & 0.5 & 1 & 0.5 & 0 \\ 0 & 0 & 0.5 & 1 & 0.5 \\ 0 & 0 & 0 & 0.2 & 1 \end{bmatrix} \end{array}$$

- 1- Absent
- 2- Smaller than 5°
- 3- Smaller than 10° greater than 5°
- 4- Smaller than 20° greater than 10°
- 5- Smaller than 45° greater than 20°

Table 4. Weight Evaluation for Physical Parameters

Physical Parameters		Number of Ticks (From Table 3)		Overall Weighted Average $\frac{4N_4+5N_5}{485}$ w_i	Significance Grades for Parameters gi	w_i x g_i	Normalized Final Weights of Parameters, w_P
No	**Name**	**Box 4** N_4	**Box 5** N_5				
1	Cliff Height	114	77	1,734	1/36	0,0482	0,019
2	Cliff Slope	82	65	1,346	1/36	0,0374	0,014
3	Special features	99	137	2,229	1/36	0,0619	0,024
4	Beach Type	101	229	3,194	1/36	0,0887	0,034
5	Beach Width	143	146	2,685	1/36	0,0746	0,029
6	Beach Colour	119	111	2,126	1/36	0,0590	0,023
7	Rocky Shore Slope	86	45	1,173	1/36	0,0326	0,013
8	Rocky Shore Extent	89	57	1,322	1/36	0,0367	0,014
9	Rocky Shore Roughness	102	108	1,955	1/36	0,0543	0,021
10	Dunes	86	66	1,390	1/12	0,1158	0,045
11	Valley	146	128	2,524	1/12	0,2103	0,081
12	Landform	106	172	2,647	1/12	0,2206	0,085
13	Tides	64	64	1,188	1/12	0,0990	0,038
14	Landscape Features	120	288	3,959	1/12	0,3299	0,127
15	Vistas	142	171	2,934	1/12	0,2445	0,094
16	Water Colour	73	387	4,592	1/12	0,3826	0,147
17	Vegetation Cover	136	239	3,586	1/12	0,2988	0,115
18	Seaweed	86	165	2,410	1/12	0,2009	0,077
				Total	**1**	**2,5958**	**1.000**

Table 5. Weight Evaluation for Human Parameters

Human Parameters		Number of Ticks (From Table 3)		Overall Weighted Average $\frac{4N_4 + 5N_5}{485}$	Significance Grades for Parameters g_i	$w_i \times g_i$	Normalized Final Weights of Parameters w_H
No	**Name**	**Box 4** N_4	**Box 5** N_5	w_i			
19	Disturbance Factor	116	315	4,204	1/8	0,5255	0,136
20	Litter	38	419	4,633	1/8	0,5791	0,150
21	Sewage	38	419	4,633	1/8	0,5791	0,150
22	Non-built Environ.	108	104	1,963	1/8	0,2454	0,064
23	Built Environment	109	315	4,146	1/8	0,5183	0,134
24	Access Type	106	205	2,988	1/8	0,3735	0,097
25	Skyline	109	315	4,146	1/8	0,5183	0,134
26	Utilities	109	315	4,146	1/8	0,5183	0,134
				Total	**1**	**3,8575**	**1.000**

Table 6. Fuzzy Assessment Matrice For Konyaaltı Beach, Turkey

No C1	Assessment Parameters — Physical (C2)	Weights of Parameters, W_P (C3)	Graded Attributes (C4)	Input Matrices D_J (C5 to C9)					A Matrices	Fuzzy Assessment Matrix — Attributes C10 to C14: 1	2	3	4	5
1	Cliff Height (1-1)	0,019	2	0	1	0	0	0	A_P	0,0	1,0	0,3	0,0	0,0
2	Cliff Slope (1-2)	0,014	3	0	0	1	0	0		0,0	0,5	1,0	0,5	0,0
3	Special Features (1-3)	0,024	2	0	1	0	0	0		0,0	1,0	0,3	0,0	0,0
4	Beach Type (2-1)	0,034	4	0	0	0	1	0		0,0	0,0	0,0	1,0	0,0
5	Beach Width (2-2)	0,029	4	0	0	0	1	0		0,0	0,0	0,2	1,0	0,6
6	Beach Colour (2-3)	0,023	4	0	0	0	1	0		0,0	0,0	0,6	1,0	0,0
7	Rock. Shore Slope (3-1)	0,013	1	1	0	0	0	0		1,0	0,0	0,0	0,0	0,0
8	Rock. Shore Extent (3-2)	0,014	1	1	0	0	0	0		1,0	0,0	0,0	0,0	0,0
9	Rock. Shore Rough. (3-3)	0,021	1	1	0	0	0	0		1,0	0,0	0,0	0,0	0,0
10	Dunes (4)	0,045	1	1	0	0	0	0		1,0	0,0	0,0	0,0	0,0
11	Valley (5)	0,081	1	1	0	0	0	0		1,0	0,0	0,0	0,0	0,0
12	Landform (6)	0,085	5	0	0	0	0	1		0,0	0,0	0,0	0,2	1,0
13	Tides (7)	0,038	5	0	0	0	0	1		0,0	0,0	0,0	0,0	1,0
14	Landscape Features (8)	0,127	2	0	1	0	0	0		0,0	1,0	0,2	0,0	0,0
15	Vistas (9)	0,094	4	0	0	0	1	0		0,0	0,0	0,0	1,0	0,3
16	Water Colour (10)	0,147	4	0	0	0	1	0		0,0	0,0	0,5	1,0	0,2
17	Vegetation Cover (11)	0,115	1	1	0	0	0	0		1,0	0,2	0,0	0,0	0,0
18	Seaweed (12)	0,077	5	0	0	0	0	1		0,0	0,0	0,0	0,2	1,0
FUZZY WEIGHTED AVERAGE MATRIX ELEMENTS FOR SUBSET PHYSICAL ($K_P = W_P A_P$)										0,288	0,200	0,146	0,367	0,275
	Human	W_H												
19	Disturbance Factor (1)	0,136	1	1	0	0	0	0	A_H	1,0	0,0	0,0	0,0	0,0
20	Litter (2)	0,150	3	0	0	1	0	0		0,0	0,2	1,0	0,2	0,0
21	Sewage (3)	0,150	5	0	0	0	0	1		0,0	0,0	0,2	0,0	1,0
22	Non—built Env. (4)	0,064	1	1	0	0	0	0		1,0	0,0	0,2	0,0	0,0
23	Built Env. (5)	0,134	4	0	0	0	1	0		0,0	0,0	0,3	1,0	0,0
24	Access Type (6)	0,097	2	0	1	0	0	0		0,2	1,0	0,0	0,2	0,0
25	Skyline (7)	0,134	2	0	1	0	0	0		0,4	1,0	0,2	0,0	0,0
26	Utilities (8)	0,134	1	1	0	0	0	0		0,0	0,0	0,2	1,0	0,0
FUZZY WEIGHTED AVERAGE MATRIX ELEMENTS FOR SUBSET HUMAN ($K_H = W_H A_H$)										0,273	0,261	0,287	0,318	0,150

Final Assessment Matrix (Membership Degree), R

$$R = W_F\,K = \begin{pmatrix} 0.5 & 0.5 \end{pmatrix} \begin{bmatrix} 0.288 & 0.200 & 0.146 & 0.367 & 0.275 \\ 0.273 & 0.261 & 0.287 & 0.318 & 1.500 \end{bmatrix} = (0.281\ \ 0.230\ \ 0.216\ \ 0.343\ \ 0.213)$$

Evaluation Index (D) = 0.10

In matrix M_7, every row corresponds to each of the attributes listed above, with the order 1 to 5. The first row's elements is reserved for the grading of 'no rocky shore' (absent state), the second row for the angle of the rocky shore being less than 5°, etc. The estimated membership grades for each attribute, i.e. every element of the matrix, was formed from possibilities ranging from 0 to 1, where 0 implies no possibility and 1 implies the highest possibility on the given grades. Values for the possibilities in the present study were based on expert opinions and usually based on the possible error that a person could make in deciding the grades. If the parameter was absent or not relevant, then the first element of the first row is 1, while all other entries of this row are zero, denoting the absoluteness of the grade "absent". If the rocky shore slope was present but had an angle of less than 5°, then 1 is inserted into the second entry of the second row. Due to the possibility of an error in assessing the angle as less than 5° when it might be larger than 5°, the third entry of the second row (implying the third attribute) is given as 0.5. As it is extremely unlikely that the error 'jumps' an assessment grade, the remainder of the row is given a zero probability. Similarly, if a score of 4 was recorded, the error could now be on either side of the true grade, so 0.5 was given on either side. The remaining rows of the matrix were built up via similar logic. Membership grading matrices M_i were established in a similar way for all other 25 coastal scenic assessment parameters (Ergin et al, 2003).

Since experts may give different grades to the same parameter for the same beach, fuzzy assessment matrices $\mathbf{A}_P$ and $\mathbf{A}_H$ were developed based on the degree of possibility among the grades obtained from $\mathbf{M_j}$. $\mathbf{A}_P$ and $\mathbf{A}_H$ are 18 x 5 and 8 x 5 rectangular matrices where any j'th row of both matrices refers to the membership grades decided by the experts, evaluated from its input matrix and membership grade matrix as:

$$\mathbf{A}_{P,j} = \mathbf{D}_j \quad \mathbf{M_j} \ (j = 1 \text{ to } 18) \text{ and, } \ \mathbf{A}_{H,j} = \mathbf{D}_j \quad \mathbf{M_j} \ (j = 19 \text{ to } 26)$$

Where: $\mathbf{A}_{P,j}$ and $\mathbf{A}_{H,j}$ are the j'th rows of the fuzzy assessment matrices for the physical and human factors, respectively. Their elements are listed in columns 10 to 14 of Table 6 reflecting the corresponding attributes from 1 to 5, respectively. In Table 6, $\mathbf{D}_j$ is the 1 x 5 input matrix with the entry as 1 on the ticked attribute, all other entries being zero (as shown row-wise in Table 6, under the heading of 'input matrices' from columns 5 to 9, for every parameter).

If the ticked grade box (graded attribute given in column 4 of Table 6) for the rocky shore slope (parameter 7) is 4, the input matrix is:

$$\mathbf{D}_7 = (0 \quad 0 \quad 0 \quad 1 \quad 0)$$

The assessment matrix for this parameter is obtained by matrix multiplication of $\mathbf{D}_7$ with $\mathbf{M}_7$,

$$\mathbf{A}_{P,7} = \mathbf{D}_7 \, \mathbf{M}_7 = (0.00 \quad 0.00 \quad 0.50 \quad 1.00 \quad 0.50)$$

and is given in row seven of the assessment matrix columns 10 to 14 in Table 6.

Among the several mathematical models used in fuzzy logic applications, the weighted mean model was preferred for this study due to its simplicity and capability of holding useful information concerning all assessment evaluation parameters.

The process of assessment was carried out by direct multiplication of the fuzzy weight and assessment matrices, resulting in two weighted assessment matrices $\mathbf{K}_P$ and $\mathbf{K}_H$ for the factors P and H as:

$$\mathbf{K}_P = \mathbf{W}_P \, \mathbf{A}_P \qquad \text{and} \qquad \mathbf{K}_H = \mathbf{W}_H \, \mathbf{A}_H$$

respectively.

The final assessment matrix **R** (1 x 5) is obtained from the following matrix multiplication;

$$\mathbf{R} = \mathbf{W}_F \, \mathbf{K}$$

where the matrix **K** is formed from the matrices $\mathbf{K}_P$ and $\mathbf{K}_H$ as its rows. The absolute values of the entries (membership grades) of the final assessment matrix **R** are not significant, but the entry with the maximum membership grade and its relative differences with the other entries will be the decisive factor for the assessment.

For Konyaaltı Beach, Turkey, (Table 6), the final assessment matrix is given by the following steps.

As a first step the fuzzy weighted average matrix $\mathbf{K}_P$ for the physical parameters is:

$$\mathbf{K}_P = \mathbf{W}_P \; \mathbf{A}_P = (0.288 \quad 0.200 \quad 0.146 \quad \overset{\downarrow}{0.367} \quad 0.275)$$

As stated previously, the absolute values of the elements of the fuzzy matrix has only a meaning relative to each another. In the above matrix, the maximum entry is on the fourth column implying that the beach assessed may be graded by the attribute 4 with respect to its physical characteristics. Similarly, the fuzzy weighted average matrix $\mathbf{K}_H$ for the human parameters is:

$$\mathbf{K}_H = \mathbf{W}_H \; \mathbf{A}_H = (0.275 \quad 0.261 \quad 0.287 \quad \overset{\downarrow}{0.318} \quad 0.150)$$

where the maximum entry is in the fourth column implying that when the human parameters are considered this beach may be graded as 4.

As a second step and synthesizing all factors of the first step, one arrives at the final assessment matrix **R:**

$$\mathbf{R} = \mathbf{W}_F\ \mathbf{K} = (\,0.5 \quad 0.5)\begin{bmatrix} 0.288 & 0.200 & 0.146 & 0.367 & 0.275 \\ 0.275 & 0.261 & 0.287 & 0.318 & 0.150 \end{bmatrix}$$

$$\downarrow$$

$$= (0.281 \quad 0.230 \quad 0.216 \quad 0.343 \quad 0.213)$$

As in the previous assessment matrices, the i'th element of assessment matrix **R** is the membership grade of the i'th attribute. In this example the beach is grade "4" according to the principle of maximum membership grade (Ergin et al, 2003).

2.7. Data Presentation

Coastal scenic assessments of the sites and scenic evaluation carried out by the fuzzy methodology were presented by three tools as explained below.

2.7.1. Scenic Evaluation Score Histograms

The histogram was produced by plotting the scores taken from the "Coastal Scenic Evaluation System" (Table 1 and Table 2) on the y axis versus scenic evaluation parameters on the x-axis. The x-axis was further grouped into physical and human sub-sections. A scenic evaluation score histogram for Konyaaltı Beach, Turkey is given as an example in Figure 1.

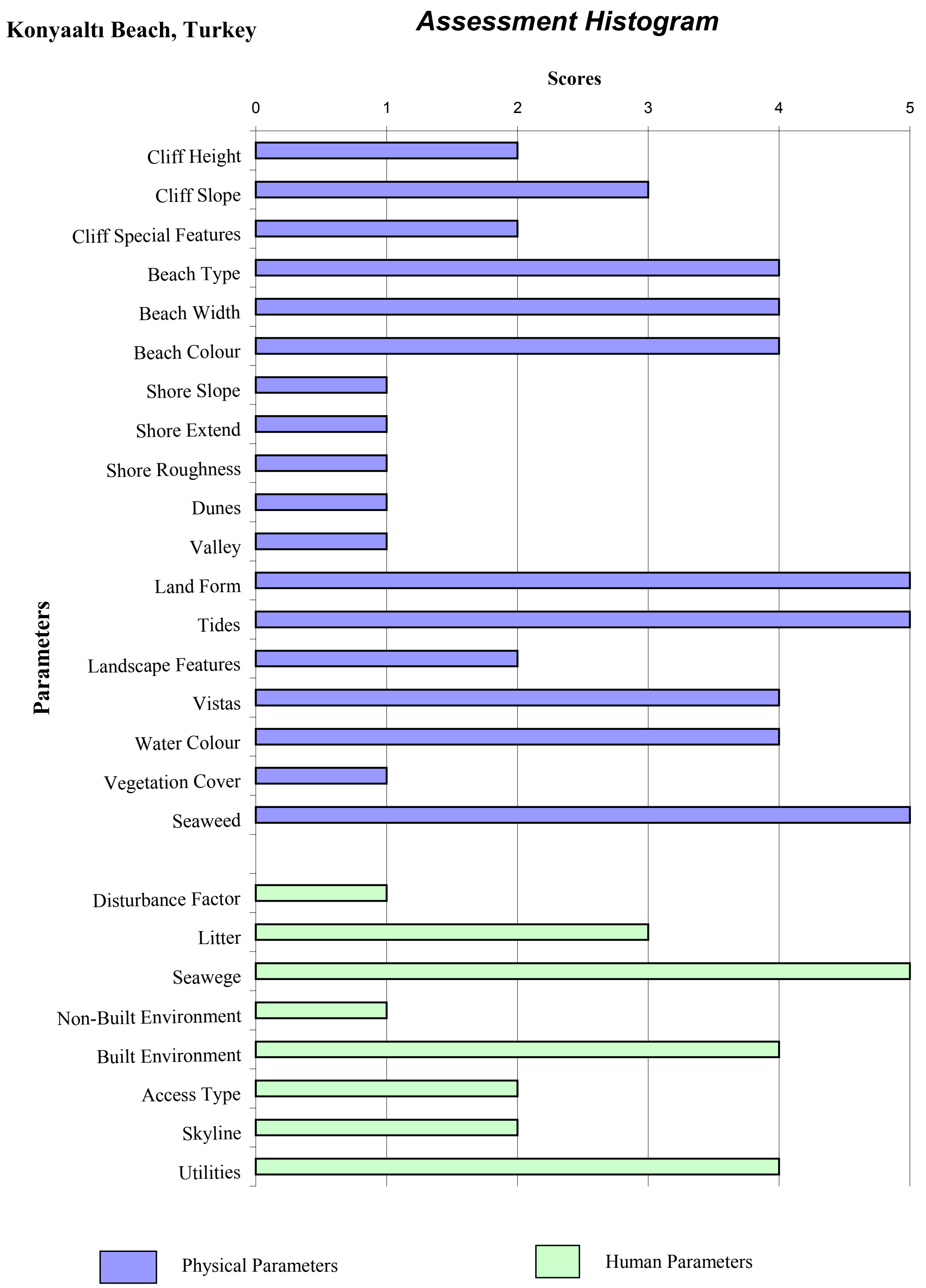

Figure 1. Scenic Evaluation Score Histogram for Konyaaltı Beach, Turkey

2.7.2. Fuzzy Weighted Average Matrices of Physical and Human Factors

Weighted averages are given in Tables 4, 5 and 6 for Konyaaltı Beach, Turkey as an example.

2.7.3. Membership Degrees of Physical and Human Factors

Membership degrees are the final assessment matrix R of attributes (from 1-5), as given in (Table 6) for Konyaaltı Beach. Weighted Averages and Membership Degrees were presented in graphical forms as:

- The histogram of weighted average of attributes grouped into physical and human parameters versus attributes for each site. An example is given in Figure 2.

- The graph of membership degrees of attributes (R) for each site. An example is given in Figure 3.

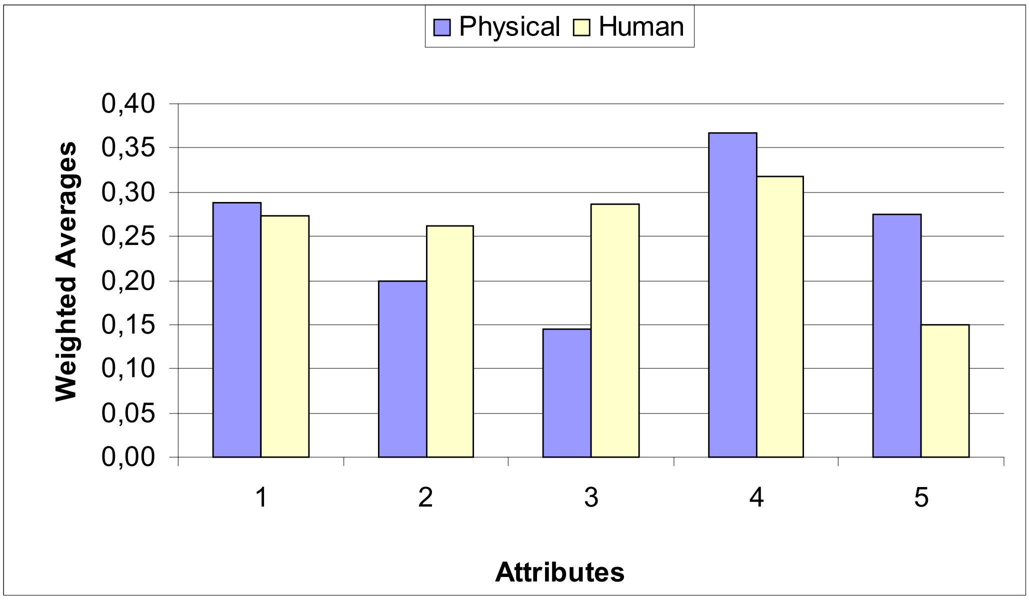

Figure 2. Weighted Averages Histogram, Konyaaltı Beach, Turkey

As it can be seen from the Figure, Konyaaltı Beach does not have high values from the point of both human and physical parameters. There is nothing to do for physical parameters but human parameters could be made better by arrangements especially on buffer zone.

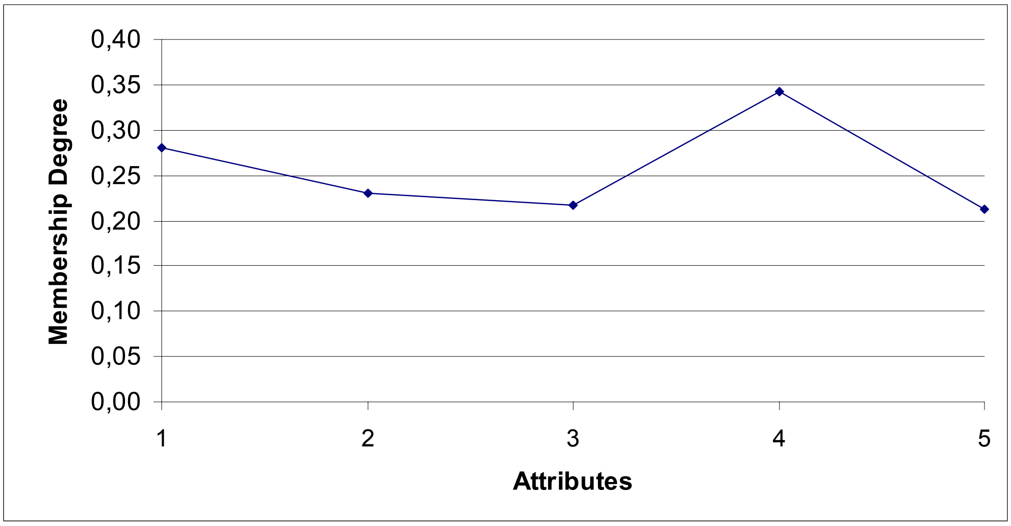

Figure 3. Scenic Evaluation Score Histogram for Konyaaltı Beach, Turkey

2.8. Data Interpretation

With respect to the weighted averages vs. attributes histograms, high weighted averages at lower attribute values such as 1 and 2 reflect the adverse impact of the physical or human parameter. The reverse holds true for high attribute values, such as 4 and 5, which reflect the positive influencing impact of the physical/human parameter as given in Figure 2 for Konyaaltı Beach, Turkey. With respect to coastal management issues, high human parameters at low attribute values may be interpreted, for example as having too much litter present, etc. Most sites have physical parameters for which managers can do little to alleviate their scenic impact, so perhaps emphasis should be given to assessing ways of upgrading the human parameter scores.

For comparison between sites, a decision parameter (D) was defined –see below. Decision parameter computations were performed by using the Membership Degree versus Attributes curves (Figure 3) and included:

D = $\frac{(-2\times A_{12})+(-1\times A_{23})+(1\times A_{34})+(2\times A_{45})}{A_T}$. The higher the D value as above

Where the area under the curve between the attributes i and j is named A_{ij} with:
i =1, 2, 3, 4 and j = 2, 3, 4, 5. The total area under the curve is A_T.

It can be seen that;

For D

$A_{12}+A_{23}+A_{34}+A_{45} = A_T \Rightarrow 2 \geq \frac{(-2\times A_{12})+(-1\times A_{23})+(1\times A_{34})+(2\times A_{45})}{A_T} \geq -2$

For 57 different coastal area calculations were carried out to evaluate sites by using D decision parameter. Among the proposed decision parameters D, criteria, D was chosen as a decision tool since it reflected all attributed values in terms of weighted areas; with negative and positive weights referring respectively to the sequence of attributes from 1 to 5. These were applied in order to distinguish the attributes' impact on the evaluation of the coastal scenery. The D parameter was termed the Evaluation Index (D). Sequence figures/curve for D, are given in tabular form in Table 7 together with a graphical form in Figure 4, for 57 sites.

Table 7. Site Sequence with Respect to D criteria

k	Sites (UK, Turkey, Malta)	D	k	Sites (UK, Turkey, Malta)	D
1	Çıralı Mid-section (TR)	1.31	30	Tenby N (UK)	0.26
2	Çıralı Karaburun (TR)	1.26	31	Antalya Old Harbour (TR)	0.19
3	Phasalis Small Bay (TR)	1.08	32	Tekirova North (TR)	0.19
4	Little Haven (UK)	1.00	33	Tekirova South (TR)	0.18
5	Dingli Cliffs (MT)	0.97	34	Kercem Cliffs (MT)	0.16
6	Phaselis Large Bay (TR)	0.91	35	Saundersfoot (UK)	0.15
7	Poppit (UK)	0.91	36	**Konyaaltı West (TR)**	**0.10**
8	Tisan Back Bay Mersin (TR)	0.83	37	White Towers (MT)	0.10
9	Fungus Rock (MT)	0.77	38	Konyaaltı East (TR)	0.09
10	Nash (UK)	0.74	39	Xwieni Point (MT)	0.08
11	St Govans (UK)	0.69	40	Xlendi Bay (MT)	0.07
12	Tisan Tample, Mersin (TR)	0.68	41	Alata East, Mersin (TR)	0.07
13	Whitesands (UK)	0.68	42	Llantwit (UK)	0.04
14	Karaburun Akyar Mersin (TR)	0.67	43	Konyaaltı Middle (TR)	0.04
15	Newgale (UK)	0.66	44	Ogmore (UK)	0.03
16	Göksu Hurma, Mersin (TR)	0.61	45	Porthcawl (UK)	0.02
17	Tenby S (UK)	0.57	46	Antalya Waterfalls (TR)	-0.01
18	Ghajn Tuffieha (MT)	0.56	47	Mygarr Ix-xini	-0.02
19	Manikata (MT)	0.56	48	Ramla Bay (MT)	-0.06
20	Southerndown (UK)	0.54	49	Amroth (UK)	-0.08
21	Calypso Cave (MT)	0.48	50	Ghallis Rocks coastline (MT)	-0.12
22	FreshWater West (UK)	0.46	51	Antalya Lara Barınak (TR)	-0.16
23	Blue Lagoon (UK)	0.45	52	Antalya Dedeman Hotel (TR)	-0.21
24	Mellieha (MT)	0.37	53	Lara Beach (TR)	-0.28
25	Wisemans Bridge (UK)	0.34	54	Marsalforn (MT)	-0.37
26	Broadhaven (UK)	0.34	55	Bahar Ic-caghaq (MT)	-0.41
27	Angle (UK)	0.33	56	Kız Kalesi Mersin (TR)	-0.58
28	Alata West, Mersin (TR)	0.31	57	St. George's Bay (MT)	-0.64
29	Alata Mid, Mersin (TR)	0.29			

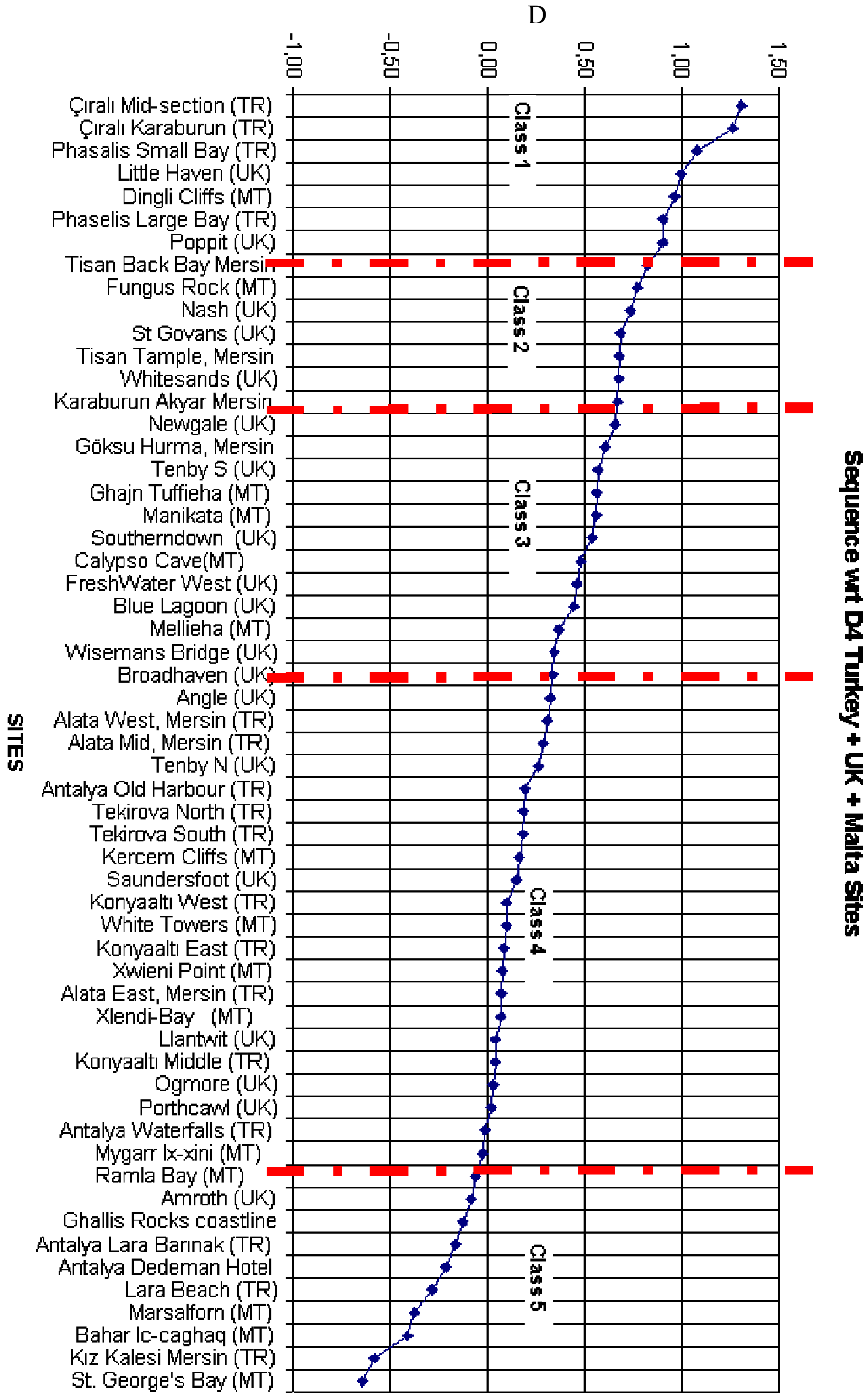

Figure 4. Evaluation Index Curve for 57 Sites.

CHAPTER 3

PEOPLE WITH MOBILITY HANDICAPS AND DESCRIPTION OF THE PILOT SITE

Coastal areas are such places that people go to just rest or have fun. Most of people wish to have their holidays in coastal areas. But people with mobility handicaps cannot have these opportunities because of physical obstacles. However, it is not a problem that does not have a solution. Coastal areas can be accessible for people with mobility handicaps by some arrangements on buffer zones in coastal areas with an economical optimization.

Mobility handicap is a broad church. It includes people who by reason of accident, disease or a congenital condition find it difficult to move around, or to see or hear or understand. It includes people who have a temporary impairment which can encompass anything from a leg broken in a skiing accident to having a small child and/or several baskets of shopping. In fact at one time or another virtually everyone has a degree of mobility impairment, so good design of transport – in the broadest sense – has a universality of relevance. (ECMT, 2000)

In a recent publication by the following estimates of numbers of people with various types of impairment are given. They relate to geographic Europe, which has a total population of about 800 million. (Gill, J, 1997)

Table 8. Numbers Of People With Various Types Of Impairment In Geographic Europe (In Million).

Wheelchair Users Cannot Walk Without Aid	**3** **45**
Cannot Use Fingers	**1**
Cannot Use One Arm	**1**
Reduced Strength	**22**
Reduced Co-Ordination	**11**
Speech İmpaired	**2**
Language İmpaired	**5**
Dyslexia	**25**
Intellectually Impaired	**30**
Deaf	**1**
Hard Of Hearing	**80**
Blind	**1**
Low Vision	**11**

3.1. People With Mobility Handicaps and Special Design Considerations for Them

As it is mentioned in Chapter 1 a beach unit for people with mobility handicaps could be suggested to be applied for a coastal area like Konyaaltı Beach Park, Antalya. It is an economical problem to partially use the coastal area for disabled people. A questionnaire study was performed in 2003 to investigate the potential of such a beach unit that can be used by disabled people. As the number of questionnaire works (applicated on people with mobility handicaps) is limited it is hard to make a strict decision but some basic necessities are expressed by almost all of the respondents. The results obtained are as follows;

- It is difficult to drive wheel-chair on sand so they cannot approach the shoreline,
- To be able to drive wheel-chair on sand a suitable ramp is needed,

- Beach units (undressing cabins, toilets etc.) should be modified according to the dimensions required for people with mobility handicaps.

The questionnaire also includes people's preferences about weather and climatic conditions. Previous field studies did not include weather and climatic conditions so the results of this questionnaire work will be evaluated in further studies. The results of the questionnaire work which is applicated in general concept summarised in Table 9.

Table 9. People's Preferences About Weather And Climatic Conditions

<table>
<tr><td rowspan="2">SUN CONDITION</td><td colspan="7">Very Cloudy</td><td colspan="7">Partially Cloudy</td><td colspan="6">Sunny</td></tr>
<tr><td colspan="7">4</td><td colspan="7">26</td><td colspan="6">220</td></tr>
<tr><td rowspan="2">TEMPERATURE</td><td colspan="4"><15°</td><td colspan="4">15°-20°</td><td colspan="4">20°-25°</td><td colspan="4">25°-30°</td><td colspan="4">>30°</td></tr>
<tr><td colspan="4">5</td><td colspan="4">14</td><td colspan="4">57</td><td colspan="4">118</td><td colspan="4">56</td></tr>
<tr><td rowspan="2">WIND</td><td colspan="7">Calm</td><td colspan="7">Light Wind</td><td colspan="6">Hard Wind</td></tr>
<tr><td colspan="7">114</td><td colspan="7">134</td><td colspan="6">2</td></tr>
<tr><td rowspan="2">HUMIDITY</td><td colspan="7">Dry</td><td colspan="7">Humid</td><td colspan="6">Very Humid</td></tr>
<tr><td colspan="7">122</td><td colspan="7">126</td><td colspan="6">2</td></tr>
<tr><td rowspan="2">TEMPERATURE OF SEA WATER</td><td colspan="4"><10°</td><td colspan="4">10°-15°</td><td colspan="4">15°-20°</td><td colspan="4">20°-25°</td><td colspan="4">>25°</td></tr>
<tr><td colspan="4">9</td><td colspan="4">23</td><td colspan="4">65</td><td colspan="4">112</td><td colspan="4">41</td></tr>
<tr><td rowspan="2">WAVE HEIGHT</td><td colspan="7">Calm</td><td colspan="7">Intermediate</td><td colspan="6">High</td></tr>
<tr><td colspan="7">157</td><td colspan="7">64</td><td colspan="6">29</td></tr>
<tr><td rowspan="2">PURPOSE OF GOING TO COASTAL AREA</td><td colspan="5">To Swim</td><td colspan="5">To Have Sun</td><td colspan="5">To Walk</td><td colspan="5">To Have Picnic</td></tr>
<tr><td colspan="5">201</td><td colspan="5">111</td><td colspan="5">70</td><td colspan="5">49</td></tr>
</table>

The questionnaire work was carried out with 250 people but for the last parameter to tick boxes more than one was allowed so the total number exceeds 250.

In Turkey there are not many beach unites those are specially designed to be able to be used by people with mobility handicaps. An architect (Ayhan Mert), who is a disabled person, has some studies on this subject. A sample beach unit that can be used by people with mobility handicaps is given in Appendix A. The sample beach unit is thought to be applied in the zone signed with the circle in Appendix B. There already exists a beach unit including an undressing cabin, bath and resting facilities. This unit could be modified according to the dimensions given in the sample project. A car park is also needed to fulfill the requirements of people with mobility handicaps. A park area to be separated for disabled people for six or seven cars seems to be enough.

Constructing or separating such a beach unit for people with mobility handicaps does not directly affect on coastal scenic assessment parameters but from the humanitarian point of view the importance of these facilities for these people and their families is obvious. Such a design concept should definitely be in an economical and feasible consideration. That would not be feasible if a large part of beach capacity were designed for people with mobility handicaps of course but at least one of beach units were used for this aim that would be both enough and feasible.

Even though there is no legislation for coastal areas, it is not the same for building type structures. A panel "Mobility handicapped people" was organised in 1999 by prime ministry the directorate of government of mobility handicapped people. And the legislations are summarised as below in this panel.

"By the rules determined by United Union it is said that in the scope of giving equal opportunities to all parts of society, governments should accept the great importance of transportation and for all types of mobility handicaps

a) should prepare and present activity programmes which will make physical environment conditions easier from the point of view of transportation,

b) should take precautions to provide information and communication possibilities.

In our country there are many architectural obstacles making life harder for people with mobility handicaps at regulations on inside and outside buildings, transportation in the city, game areas, parks, hospitals and fun places. To cope with these obstacles a wide study was performed between the years 1992-1995 by Ministry of Labour National Coordination Committee of Keeping People With Mobility Handicaps.

Study of "Constituting Standards" for taking some architectural precautions and constructing straight ramps to make entrance and exit to public buildings easier is completed and published. Similar studies are performed for foot-paths, elevators and public places to be used comfortably. Some special voice signalisation systems are installed by local governments for sightless people at cross-roads with heavy traffic. Required regulations are being performed at overpasses for orthopaedic disabled people. By a study performed at Hacettepe University Physical Treatment and Rehabilitation Academy, determining of environmental architectural obstacles was aimed at ten different places of Ankara. In these places the factors that force people with wheelchair to dependence are determined. When we think the difficulties of changing adopted behaviours, the importance of taking into account of properties of disabled people for urban planning is clear. Therefore legal regulations are required. Some laws are revised in this respect. The article of "it is compulsory to obey to the related standards of Turkish Standards Institute to make physical environment accessible for disabled people at development plans, municipal, social technical infrastructure fields and buildings" is added to related rules.

On the other hand EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT (ECMT) has published a guide "Improving Transport For People With Mobility Handicaps (2000)" including advices to make transportation easier and more comfortable for disabled people. Following paragraphs are taken from this guide.

The underlying purpose of a pavement is to provide safe, easy access for everyone walking or using a wheelchair. To achieve this the following guidelines should be followed wherever possible:

– a minimum obstacle free footway at least 1 800 mm wide – preferably 2 000-2 500 mm;

– widths should be greater at bus stops (minimum 3 000 mm) and in front of shops (3 500 mm or more);

– if possible gradients should be not more than 5 per cent (1 in 20) to cater for self-propelled wheelchairs: this should be used as a design limit in new development (The Swedish Association of Local Authorities2 noted that a gradient of 2.5 per cent (1 in 40) can be managed by the majority of people, but gradients steeper than this begin to cause difficulties for some manual wheelchair users.);

– where gradients are unavoidably steeper than this, level areas (preferably 1 800 mm long) should be incorporated at intervals of 10 metres;

– crossfalls, which are needed to make sure rain water drains away quickly should not be more than 2.5 per cent (1 in 40). Anything steeper than this makes it difficult for a wheelchair user to steer in a straight line;

– where there is a drop or steep slope at the rear side of a footway (or both sides of a footpath) a 100 mm edging upstand should be provided as a safeguard for wheelchair users and as a tapping rail for long cane users;

– surfaces should be non-slip, well maintained and any joints between paving slabs should be closed and flush to avoid catching the small wheels of a wheelchair;

– covers and gratings should be non-slip and flush with the pavement surface;

– nothing should overhang the footway (signs, tree branches, etc.) to a height of less than 2 100 mm (preferably 2 500 mm);

– where it is not possible to avoid having obstacles in the pavement, such as lamp-posts, traffic signs, etc. they should have a contrasting band of colour 140 mm to

160 mm wide with the lower edge 1.5 to 1.7 metres above ground level. Trees in the footway should have a distinctive surface around them (for example grating or pebbled) to warn blind people;
– seating should be provided at regular intervals of around 100 metres.

Areas, particularly in town centres, that are traffic free for some or all of the time can provide a pleasant and safe environment for all pedestrians, but they an also contain hazards.

The gradients mentioned earlier (in 2.1) also apply to pedestrianized area sand, where there are unavoidable changes in level, ramps should be provided as well as steps. Two level (or more) shopping precincts must have lift access to all floors.
The walking surface, like that of footways, should be non-slip and well lit; good maintenance is also essential.

There is very likely to be some encroachment onto the pedestrian areas of shop displays and goods as well as street furniture – lamp posts, bollards, wastebins and the like. Such encroachment should be carefully controlled otherwise it can be dangerous for visually-impaired people. The aim should always be to maintain all the principal directions of movement as "pedestrian clearways". Large open pedestrian areas are difficult for visually-handicapped people to navigate, so tactile guidance surfaces should be incorporated in such areas (see 2.5) as well as appropriate warning for any flights of steps. In the future navigation systems may help blind people to find their way through these types of area.

For people who are blind or who have little residual vision, tactile surfaces are essential for the safe progress through the street environment.

Many European countries have developed tactile surfaces of various kinds. There is a strong case for Europe-wide agreement on which surface should be used in what circumstance, but this does not exist at moment and indeed there is some inconsistency even within one country, let alone between countries.

However, there are some general guidelines of good practice that can be adduced:
– Tactile surfaces have to be sufficiently "rough" or "rigorous" for blind people to feel them through their shoes, bearing in mind that some medical conditions which lead to vision impairment also cause loss of feeling in the lower limbs (e.g. diabetic retinopathy);

– The surface should not be so rigorous that it causes problems to other pedestrians, particularly ambulant disabled people and wheelchair users;
– because most visually-impaired people still have some vision, tactile surfaces should be readily distinguishable by colour and tone from the general pedestrian area;
– there are two categories of tactile surfaces; those that warn of a potential hazard and those that impart information;
warning surfaces should be used in the following circumstances and should be readily distinguishable one from another:
• at pedestrian crossings (where colour may be used to differentiate between controlled and uncontrolled crossings),
• at the edges of rail, tram and raised bus platforms,
• to warn of other hazards: steps, level crossings, the approach to on-street light rapid transit platforms;
– information surfaces can be used to:
• provide a guidance route through large open spaces or through complex pedestrian environments
• indicate the presence of facilities such as bus stops, telephone kiosks, tactile or talking information services, toilets and so on.

Research has shown that a height of approximately 5 mm for the raised profile part of a surface is sufficient for almost all blind people to detect the surface and at this height it does not cause too much of a problem to other pedestrians. An alternative to a surface with a raised profile is one that feels different underfoot. A surface made of neoprene rubber or similar elastomeric compound feels noticeably softer than normal paving – and sounds different when walked on. This type of surface is recommended in the UK as an information surface. Sound itself can be a guide. Hamburger Hochbahn AG has equipped some of its underground stations with ceramic tiles with raised bumps 30 mm in diameter but only 1.5 mm high4. The detection of these tiles depends on sound rather than feel, and thus the environment is of major importance. The Dutch town of Gouda has introduced an extensive system of tactile surfaces including route guidance and warning of a junction, the latter based on a concrete tile coated with a layer of hard rubber.

It is usual in European countries for special car parking arrangements to be made for disabled car users.

Parking bays should be wide enough to give space for a wheelchair user to transfer from chair into the car, that is about 3.6 metres wide compared with a standard bay width of 2.5 metres. Where there are several bays together some space can be saved by having one shared extra space (1.2 metres) to two bays.

Where parking bays are on-street kerb-side they should be 6.6 m long to allow for access to the rear of the vehicle, where wheelchairs are often stored. An adjacent flush dropped kerb should be provided to give access to the pavement.

Whether on or off-street, enforcement is essential to ensure that parking bays (marked with the wheelchair symbol) are not used by other motorists. The recommended numbers of parking spaces for disabled motorists vary according to the type and capacity of car parks. The following examples are taken from the British Institution of Highways and Transportation Guidelines:

A GUIDE TO GOOD PRACTICE

(i) for car parks associated with employment premises and providing for employees and visitors:

Up to 200 spaces : 5% of capacity (minimum two spaces)

Over 200 spaces : 2% of capacity plus six spaces.

(ii) for car parks associated with shopping areas, leisure or recreational facilities and places open to the public:

Up to 200 spaces : 6% of capacity (minimum three spaces)

Over 200 spaces : 4% of capacity plus four spaces.

Other countries have different recommendations – for example the French regulation (1994) envisages one space per 50 parking spaces and a minimum of ten spaces for car parks with over 500 spaces. When deciding on the number of spaces to be allocated, it should be remembered that the number of disabled car users as a proportion of all car users is likely to increase in the future.

The reserved spaces in whatever type of car park should be placed at the closest point possible to the place they are intended to service. This is particularly important in pedestrianized town centres where, because of the distances involved, it may well be appropriate to make provision just for disabled motorists within the pedestrian area rather than on its periphery. Increasingly, variable message signs (VMS) are being used to tell people whether there are spaces available in public car parks. It would be helpful if these signs could also show whether there are any spaces for disabled motorists available as well.

3.2. Description of The Pilot Site

Konyaaltı Beach (Beach Park, Antalya) is the selected site for the study. Beach Park is a coastal area that is found on 500.000 m^2 land and having blue-flag beaches of 3 kilometres. The site includes a waterpark which serves for 200.000 guests per year and the first member of “World Waterpark Association” in Turkey, a five star hotel and 77 units (Restaurants, Pubs and Shopping Units).

With all these features and its jungle area of 300.000 m^2 the site is unique. A general view of Antalya Zone is given as Appendix C.

Being much closed to the city makes the site favourable for most of the people living in Antalya. In coastal scenic evaluation all these factors taken into account by meanings of human and physical parameters and the site has a D value of 0,10. With some regulations on buffer zone the site can take an upper place in evaluation of coastal areas all over the worlds. The site gets four points for the parameter "access type". In Appendix B layout of "Buffer zone Planning for Antalya/Konyaaltı Beach" is given. As it can be seen on the project a large part of the total area is used as parking area and visible from the coastal area. Therefore the site cannot get five points for the "access type" parameter. More effective use of public transportation can be considered as a solution for this problem.

3.3. Recommandaitons On Antalya/Konyaaltı Beach to Improve The Present Situation

To make a rough estimation about the carrying capacity of Antalya/Konyaaltı Beach and required car parking area some calculations are performed. There are three assumptions on the base of the calculations;

- One person uses an area of $6m^2$,
- One car is used for three people.
- One car needs an area of 2mx5m for parking.

Total Effective Area	= 14m x 600m	= $8.400m^2$
The Area Used By People	= 8.400 m^2 x 0.40	= $3.360m^2$
Number of People	= 3.360/4	= 840 People
Number Of Cars	= 840/3	= 280 Cars
Area Used For Car Park	= 280 x 2m x 5m	= 2.800 m^2

- The present situation;

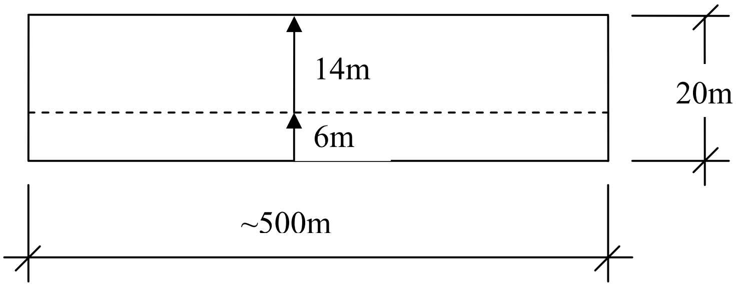

Figure 5. Definition Sketch Of The Present Situation Of Konyaaltı Beach

The left-hand side of the Beach Park there is no buffer zone between beach face and car park. Therefore approximately 100m long of the beach becomes undesirable and this causes extra load on the other parts of the beach. If these areas are not used as car parks and modified as buffer zone the effective beach length will increase approximately 100m and it will increase the comfort of the people using the beach.

- The situation after recommended arrangements;

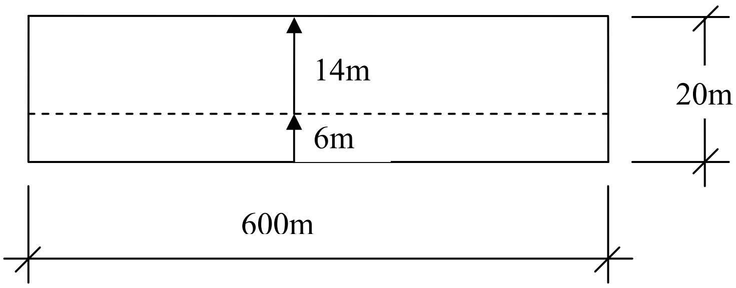

Figure 6. Definition Sketch Of Situation After Recommended Arrangements On Buffer Zone Of Konyaaltı Beach

CHAPTER 4

DISCUSSIONS AND CONCLUSION

Scientific evaluation of such concepts that like scenic, beauty, landscape is a recent progress. “Coastal Scenic Assessment by Fuzzy Logic Approach” is an innovative methodology to achieve this evaluation. The methodology is based on 26 parameters. 18 of these 26 parameters are physical parameters (cliff, beach face, rocky shore platform etc.) and human parameters (noise disturbance, litter, sewage discharge evidence etc.) constitute 8 of the parameters. These parameters are explained separately in words and pictures in the scope of this study. Also a public survey on people’s preferences on weather and climatic conditions was carried out. Present assessment methodology does not include weather and climatic parameters. Results of this questionnaire work are to be evaluated by further studies.

When we look at the results of applications of the methodology on various sites it is possible to see that physical parameters does not dominate the value of D criteria which is the most important criteria of classifying sites. The reason is that almost all sites have some features special to itself. Here human parameters go into consideration. Anyway according to questionnaire results top five parameters consist of human parameters. The sites which are included in Class 5 sites have a common feature which is having low ratings on human parameters. If managers realise this fact and orientate the future plans in this consideration the study will achieve its goal.

In this thesis the methodology is applicated on Antalya/Konyaaltı Beach. The site has a D3 value of 0.10 which means that Konyaaltı beach is a Class 4 coastal site. In fact there are not so many alternatives to improve the present situation by physical parameters. It is only possible to do some actions which will be taken into consideration with human parameters. For example large car park areas cause a low rating for access type parameter. The situation could be improved by arrangements on buffer zone as it is mentioned in Chapter 3.

Another main issue of the study is evaluating the coastal areas from the point of people with mobility handicaps. Buffer zone planning for the pilot site is reviewed in this respect. As usual there is no special consideration for these people. In fact for building type structures and other accessibility conditions there are important progresses even lawful arrangements.

Over the last ten years or so there has been considerable progress in making transport more accessible for people with mobility handicaps. Low-floor wheelchair accessible buses are coming into service in ever increasing numbers; new light rail systems are now built to be fully accessible and many existing metro and heavy rail systems are gradually being refurbished and made more accessible. Air and maritime transport now provide much improved access for mobility handicapped passengers. (ECMT, 2000)

Transport infrastructure has also improved, and for example much more use is now made of tactile warning and guidance surfaces; ramps and lifts are provided where formerly there were only steps. New technology is also playing an important role in making travel easier for many disabled people, particularly in providing better, more immediate and useable information both before and during journeys. (ECMT, 2000)

However, it is not possible to say the same for coastal areas. A sample project work of Ayhan Mert, who is a disabled architect, is given as Appendix A. The sample project includes beach unit elements (undressing cabins, toilets, resting facilities) designed according to necessity of people with mobility handicaps. Also a ramp which gives opportunity to reach the shoreline is considered in harmony with the results of the survey performed with people with mobility handicaps. The planners could consider this project work in future planning.

Having a beach unit designed for people with mobility handicaps does not reflect directly on coastal scenic assessment methodology. On the other hand it is obvious that this subject is such important for these people and their families. Planners are not supposed to separate wide areas for people with mobility handicaps. That should definitely be considered in a way of economical optimization.

Finally if the concepts which are mentioned in this thesis are taken into consideration while planning, the study will achieve its aim. It seems possible as special consideration for mobility handicapped people is a growing concept.

REFERENCES

Lowenthal, D., 1961. Geography, experience and imagination. AAAG. 5,241-260.

Tuan, Yi –Fu, 2003. Perceptual and Cultural Geography: A commentary. AAAG, 93(4), 878-881

Lippmann, W., 1961. Public Opinion, New York, Macmillan.

Eletheriadis, N., Tsalikidis, I and B. Manos, 1990. Coastal landscape preference evaluation. A comparison among tourists in Greece. Environmental Management, 14(4), 475-487.

Zube, E.H. and D.G. Pitt, 1981. Cross cultural perceptions of scenic and heritage landscapes, Landscape Planning, 8, 69-87.

Myatt, L.B., Scrimshaw, M.D. and J.N. Lester, 2002. Public perceptions and attitudes towards an established managed realignment scheme: Orplands, Essex, UK. Jn, Environmental Management, 68, 173-181

Zadeh, L., 1965. "Fuzzy Sets", Information & Control, 8: 338-353.

Ambala, V. P., 2001. Analytical Structures and Analysis of Fuzzy PD controllers with Multifuzzy Sets Having Variable Cross-Point Level, Fuzzy Sets and Systems, 129, 311- 334.

ECMT, European Conference Of Ministry Of Transport, 2000. Improving Transport For People With Mobility Handicaps, 3, 7, 19-27.

Gill, J., 1997. "Access Prohibited? Information for Designers of Public Access Terminals"

Ergin A., Williams A. and Micallef A., 2003 “Coastal Scenic Assessment At Selected Areas Turkey, UK, Malta

Davis R.A, 1994. The Evolving Coast

White A., 1998. Discovering Turkey

Lealhman S.P., 1998. America’s Best Beaches

APPENDIX A: SAMPLE BEACH UNIT PROJECT DESIGNED FOR PEOPLE WITH MOBILITY HANDICAPS

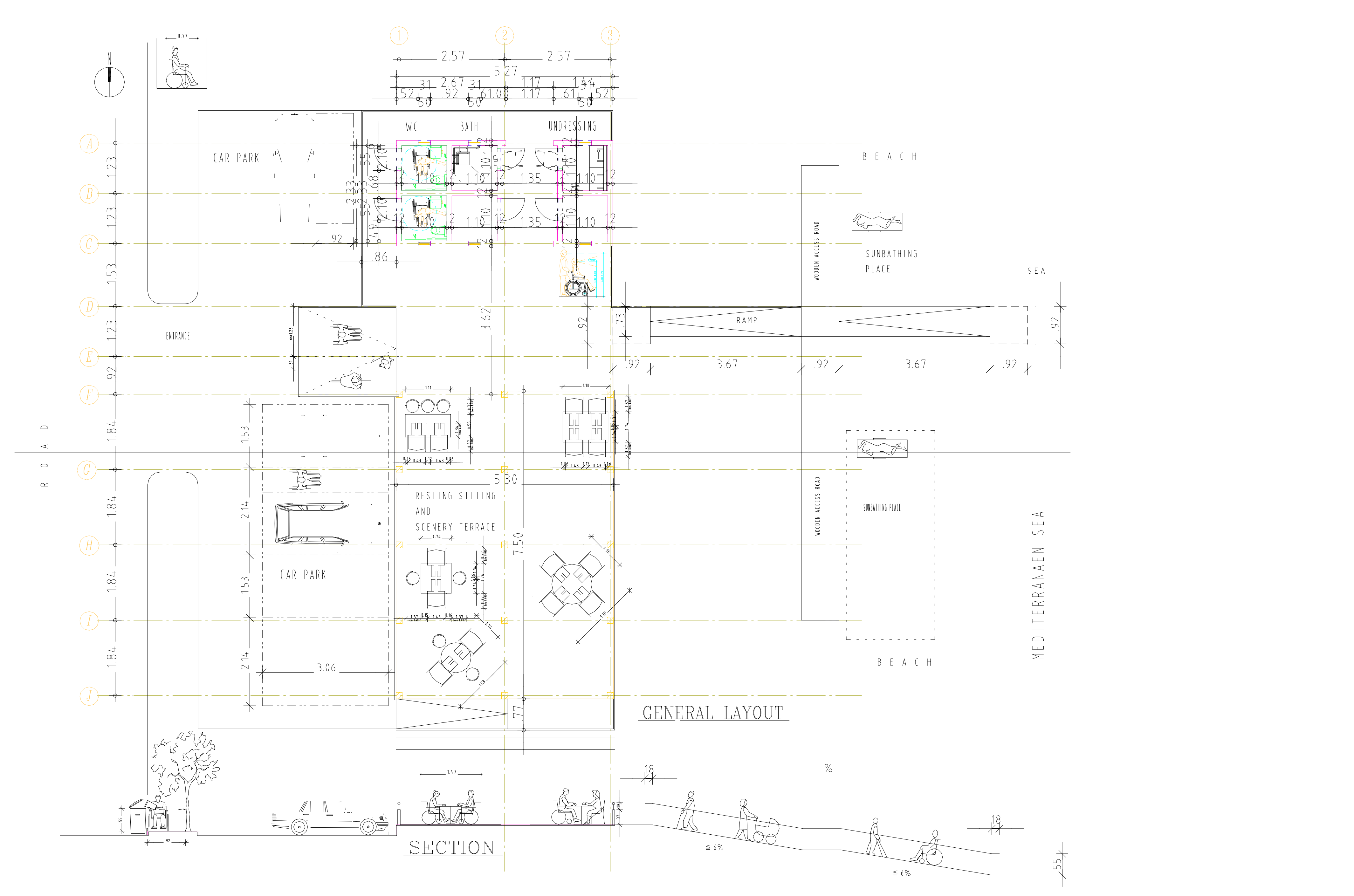

Figure 7. Specially Designed Beach Unit For People With Mobility Handicaps

APPENDIX B: BUFFER ZONE PLANNING PROJECT FOR ANTALYA/KONYAALTI BEACH

Figure 8. Buffer Zone Planning Project For Antalya/Konyaaltı Beach

APPENDIX C: GENERAL VIEW OF ANTALYA ZONE

Figure 9. General View of Antalya Zone

APPENDIX D: DEFINITONS OF COASTAL SCENIC PARAMETERS BY FIGURES

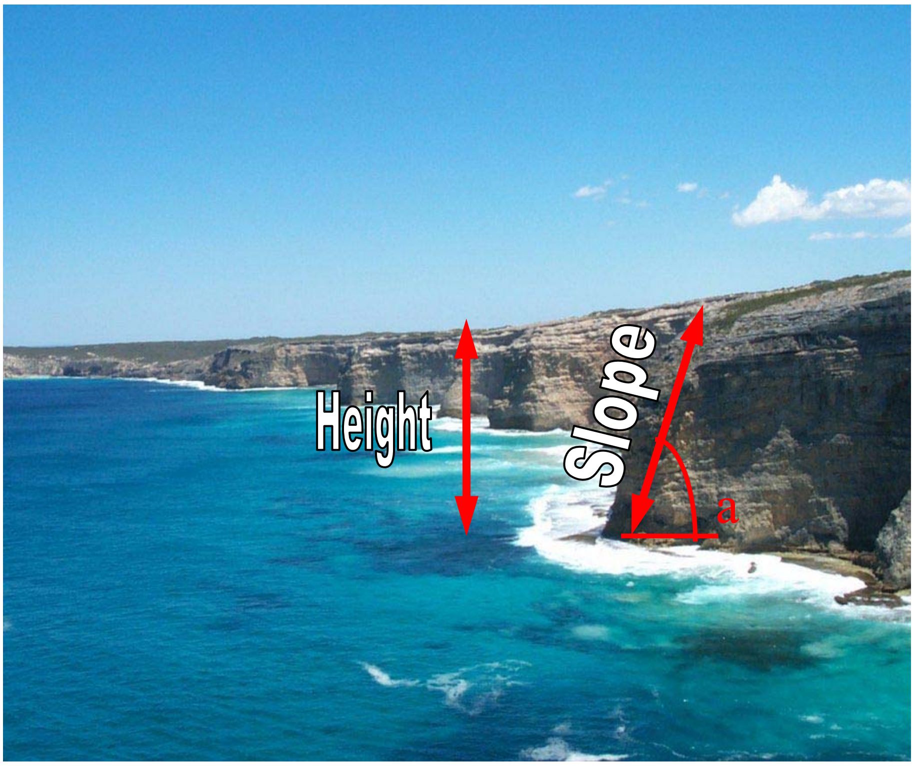

Figure 10. Cliff Parameters; Height and Slope

Figure 11. Cliff Parameters; Special Features

Figure 12. Beach Face Parameters; Type, Width, Color

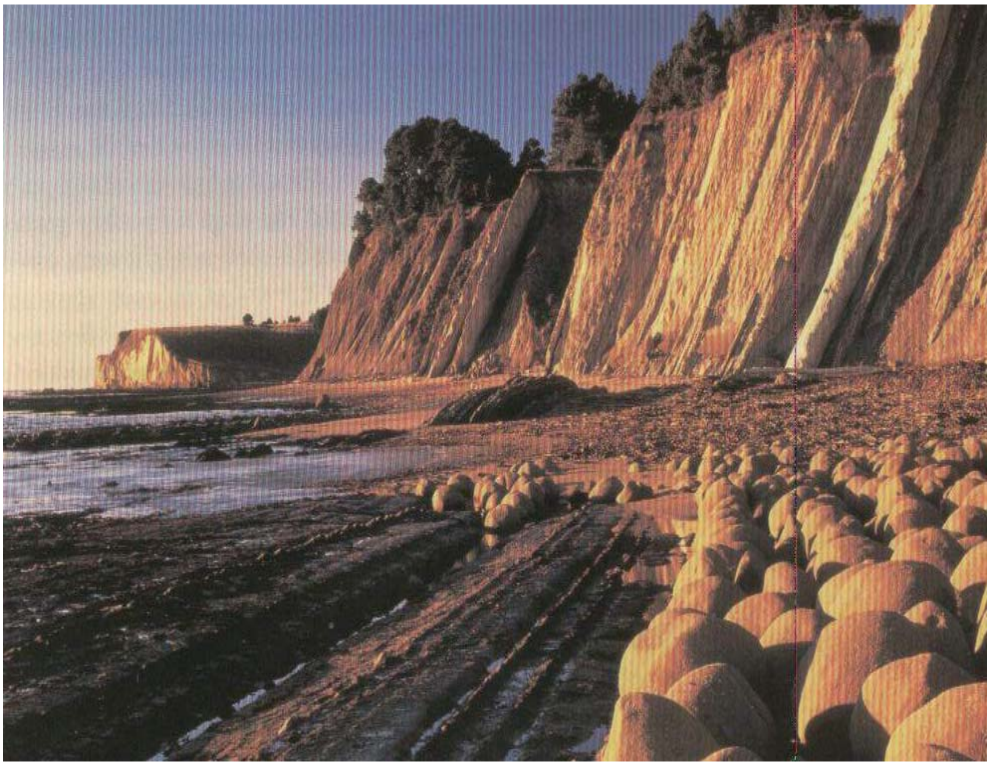

Figure 13. Beach Face Parameters; Beach Type Cobble/Border

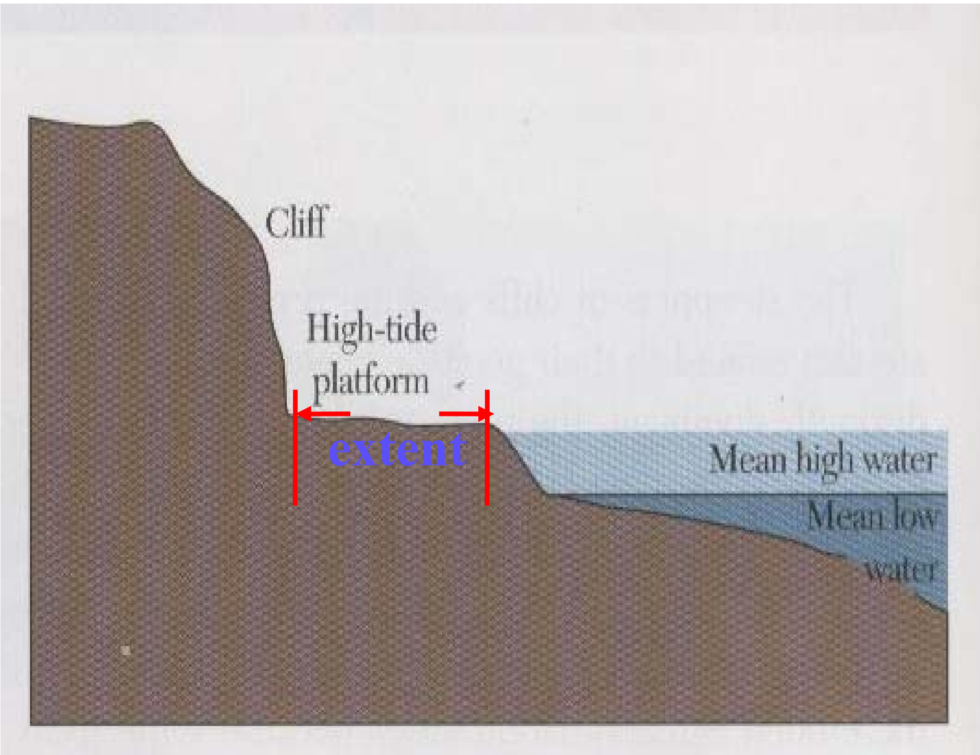

Figure 14. Rocky Shore Platform Parameters; Extent

Figure 15. Rocky Shore Platform Parameters; Smooth

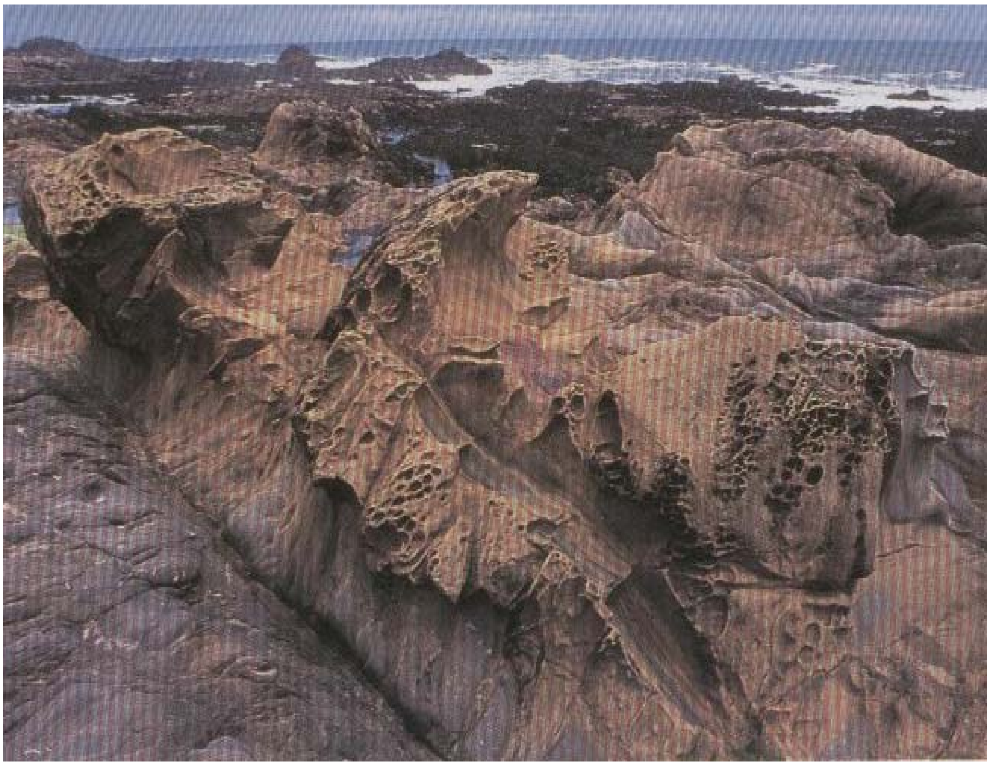

Figure 16. Rocky Shore Platform Parameters; Distinctly Jagged

Figure 17. Dune Parameters; Several Dune Ridges

Figure 18. Dune Parameters; Foredune

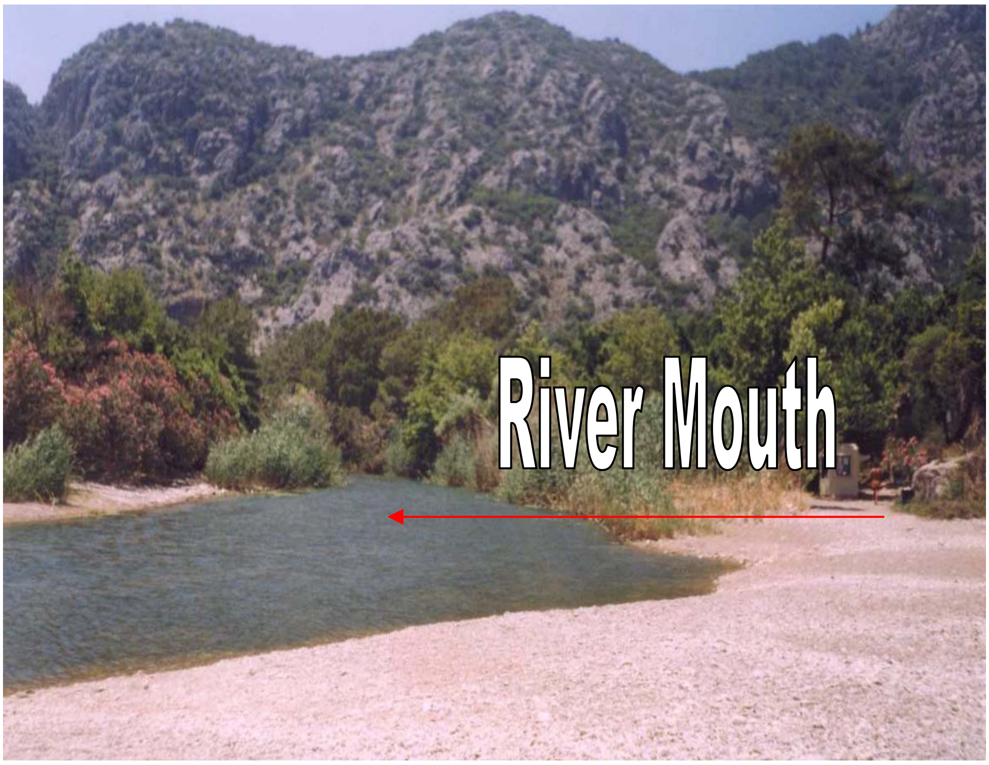

Figure 19. River Mouth

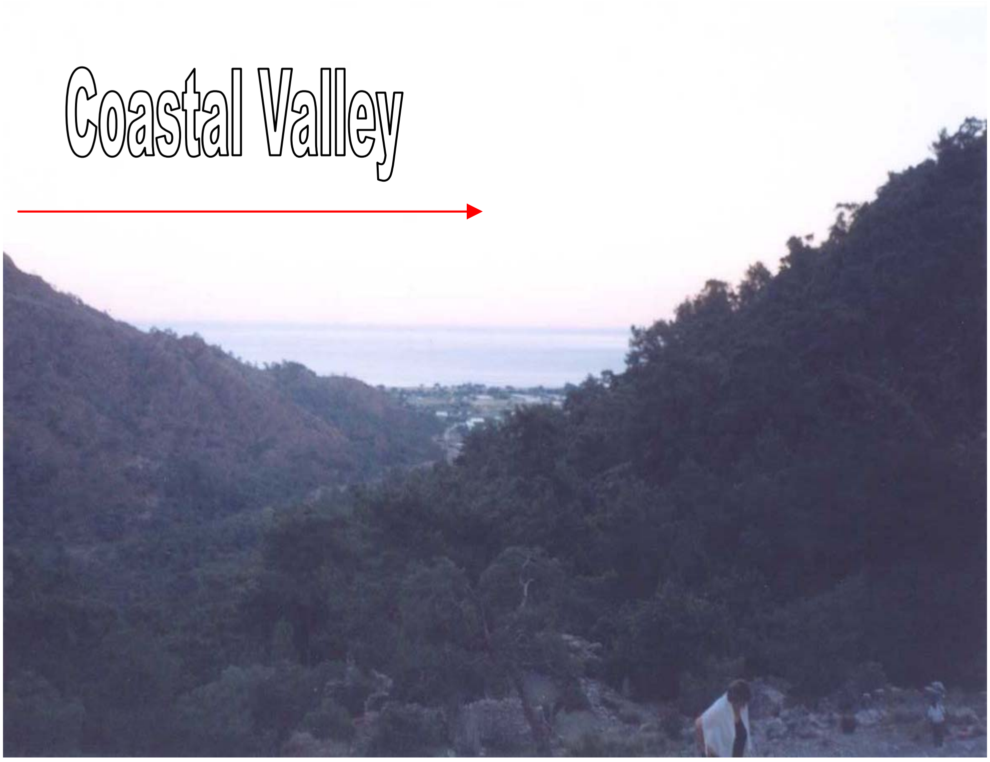

Figure 20. Coastal Valley

Figure 21. Landform Parameters; Undulating

Figure 22. Landform Parameters; Mountainous

Figure 23. Tide Parameters; Views of the Same Place At High Tide

Figure 24. Tide Parameters; Views of the Same Place At Low Tide

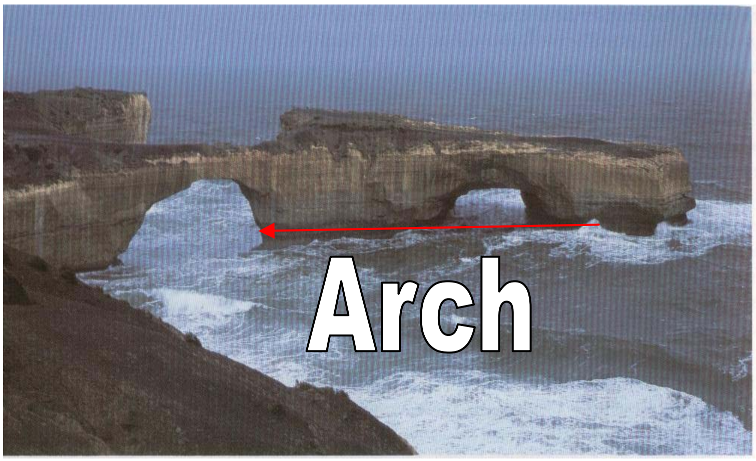

Figure 25. Coastal Landscape Features; Arch

Figure 26. Coastal Landscape Features; Special Feature

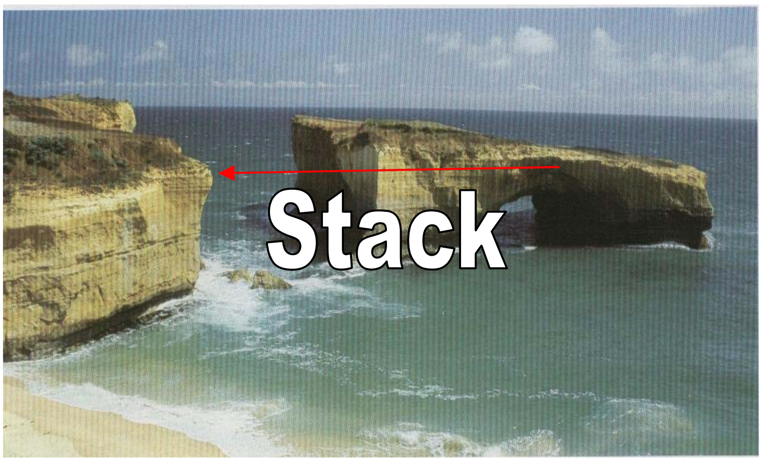

Figure 27. Coastal Landscape Features; Stack

Figure 28. Coastal Landscape Features; Island

Figure 29. Coastal Landscape Features; Cave

Figure 30. Vistas Of Far Places; Open In One Side

Figure 31. Vegetation Cover Parameters; Bare

Figure 32. Vegetation Cover Parameters; Scrub

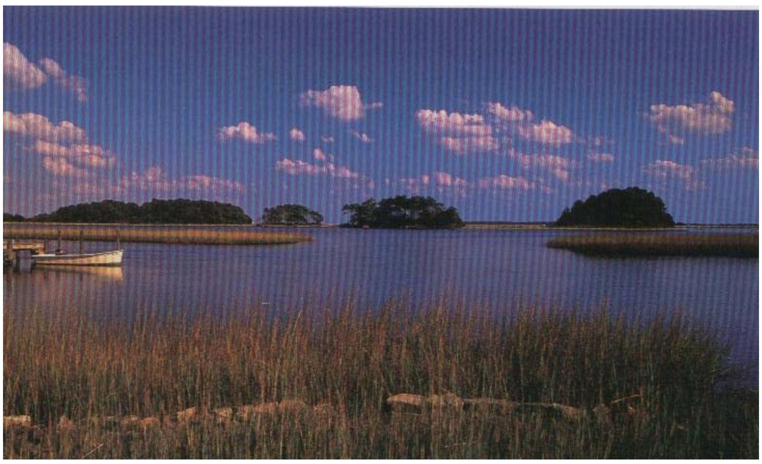

Figure 33. Vegetation Cover Parameters; Wetland

Figure 34. Vegetation Cover Parameters; Maquis

Figure 35. Vegetation Cover Parameters; Forest

Figure 36. Vegetation Debris Parameters; Seaweed Banquet

Figure 37. Water Color And Clarity; Muddy Grey

Figure 38. Water Color And Clarity; Turquoise

Figure 39. Evidence Of Sewage

Figure 40. Built Environment; Heavy Industry

Figure 41. Built Environment; Heavy Tourism and/or Urban

Figure 42. Built Environment; Light Tourism and/or Urban

Figure 43. Built Environment; Sensitive Tourism and/or Urban

Figure 44. Built Environment; Historic and/or None

Figure 45. Skyline

Figure 46. Litter

Figure 47. None-Built Environment

Figure 48. Noise Disturbance

Figure 49. Access Type; Parking Lot Visible From Coastal Area

Figure 50. Utilities; Pier, Seawall, Railway Bridge

APPENDIX E: FUZZY ASSESMENT MATRICES OF

26 PARAMETERS OF COASTAL SCENIC ASSESSMENT

1 M_1 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,3	0,0	0,0
3	0,0	0,3	1,0	0,3	0,0
4	0,0	0,0	0,5	1,0	0,5
5	0,0	0,0	0,0	0,5	1,0

2 M_2 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,5	0,0	0,0
3	0,0	0,5	1,0	0,5	0,0
4	0,0	0,0	0,5	1,0	0,5
5	0,0	0,0	0,0	0,5	1,0

3 M_3 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,3	0,0	0,0
3	0,0	0,0	1,0	0,3	0,0
4	0,0	0,0	0,0	1,0	0,3
5	0,0	0,0	0,0	0,0	1,0

4 M_4 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,0	0,0
4	0,0	0,0	0,0	1,0	0,0
5	0,0	0,0	0,0	0,0	1,0

5 M_5 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,2	1,0	0,2	0,0
4	0,0	0,0	0,2	1,0	0,6
5	0,0	0,0	0,0	0,6	1,0

6 M_6 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,6	0,0
4	0,0	0,0	0,6	1,0	0,0
5	0,0	0,0	0,0	0,0	1,0

7 M_7 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,5	0,0	0,0
3	0,0	0,5	1,0	0,5	0,0
4	0,0	0,0	0,5	1,0	0,5
5	0,0	0,0	0,0	0,2	1,0

8 M_8 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,2	0,0	0,0
3	0,0	0,2	1,0	0,5	0,0
4	0,0	0,0	0,5	1,0	0,4
5	0,0	0,0	0,0	0,4	1,0

9 M_9 =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,1	0,0	0,0
3	0,0	0,1	1,0	0,6	0,0
4	0,0	0,0	0,6	1,0	0,5
5	0,0	0,0	0,0	0,5	1,0

10 M_{10} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,0	0,0
4	0,0	0,0	0,0	1,0	0,0
5	0,0	0,0	0,0	0,0	1,0

11 M_{11} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,0	0,0
4	0,0	0,0	0,0	1,0	0,1
5	0,0	0,0	0,0	0,1	1,0

12 M_{12} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,0	1,0	0,3	0,0	0,0
3	0,0	0,6	1,0	0,6	0,0
4	0,0	0,0	0,6	1,0	0,2
5	0,0	0,0	0,0	0,2	1,0

13 M_{13} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,0	0,0
4	0,0	0,0	0,0	1,0	0,0
5	0,0	0,0	0,0	0,0	1,0

14 M_{14} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,0	1,0	0,2	0,0	0,0
3	0,0	0,0	1,0	0,2	0,0
4	0,0	0,0	0,0	1,0	0,2
5	0,0	0,0	0,0	0,0	1,0

15 M_{15} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,0	0,0
4	0,0	0,0	0,0	1,0	0,3
5	0,0	0,0	0,0	0,3	1,0

16 M_{16} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,2	1,0	0,2	0,0	0,0
3	0,0	0,5	1,0	0,5	0,0
4	0,0	0,0	0,5	1,0	0,2
5	0,0	0,0	0,0	0,2	1,0

17 M_{17} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,2	1,0	0,2	0,1	0,0
3	0,0	0,2	1,0	0,2	0,0
4	0,0	0,0	0,2	1,0	0,2
5	0,0	0,0	0,0	0,2	1,0

18 M_{18} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,2	1,0	0,0	0,0	0,0
3	0,0	0,0	1,0	0,2	0,0
4	0,0	0,0	0,2	1,0	0,0
5	0,0	0,0	0,0	0,2	1,0

19 M_{19} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,2	1,0	0,0	0,2	0,0
3	0,0	0,0	0,0	0,0	0,0
4	0,0	0,2	0,0	1,0	0,2
5	0,0	0,0	0,0	0,2	1,0

20 M_{20} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,2	1,0	0,2	0,0	0,0
3	0,0	0,2	1,0	0,2	0,0
4	0,0	0,0	0,2	1,0	0,2
5	0,0	0,0	0,0	0,2	1,0

21 M_{21} =

	1	2	3	4	5
1	1,0	0,0	0,2	0,0	0,0
2	0,0	0,0	0,0	0,0	0,0
3	0,3	0,0	1,0	0,0	0,1
4	0,0	0,0	0,0	0,0	0,0
5	0,0	0,0	0,2	0,0	1,0

22 M_{22} =

	1	2	3	4	5
1	1,0	0,0	0,2	0,0	0,0
2	0,0	0,0	0,0	0,0	0,0
3	0,2	0,0	1,0	0,0	0,2
4	0,0	0,0	0,0	0,0	0,0
5	0,0	0,0	0,2	0,0	1,0

23 M_{23} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,0	1,0	0,2	0,0	0,0
3	0,0	0,2	1,0	0,2	0,0
4	0,0	0,0	0,3	1,0	0,0
5	0,0	0,0	0,0	0,0	1,0

24 M_{24} =

	1	2	3	4	5
1	1,0	0,2	0,0	0,0	0,0
2	0,2	1,0	0,0	0,2	0,0
3	0,0	0,0	0,0	0,0	0,0
4	0,0	0,2	0,0	1,0	0,2
5	0,0	0,0	0,0	0,2	1,0

25 M_{25} =

	1	2	3	4	5
1	1,0	0,4	0,0	0,0	0,0
2	0,4	1,0	0,2	0,0	0,0
3	0,0	0,4	1,0	0,2	0,0
4	0,0	0,0	0,4	1,0	0,0
5	0,0	0,0	0,0	0,0	1,0

26 M_{26} =

	1	2	3	4	5
1	1,0	0,0	0,0	0,0	0,0
2	0,2	1,0	0,0	0,0	0,0
3	0,0	0,2	1,0	0,0	0,0
4	0,0	0,0	0,2	1,0	0,0
5	0,0	0,0	0,0	0,2	1,0

APPENDIX F: INQUIRY FORM OF THE FIELD STUDY PERFORMED IN 2003

Kıyı Alanlarının Yapı ve Doğal Kullanımı" konulu çalışmamız için kıyı bölgelerinde mevsimsel ve iklimsel tercihleri belirlemek üzere aşağıdaki anket sorularını cevaplamanız bizleri aydınlatacaktır. Teşekkürlerimizle…

Güneşlilik Durumu

Kapalı	Parçalı Bulutlu	Açık
☐	☐	☐

Hava Sıcaklığı

15 °C den Düşük	15-20	20-25	25-30	30 °C den Yüksek
☐	☐	☐	☐	☐

Rüzgar

Durgun	Esinti	Sert Rüzgar
☐	☐	☐

Nemlilik

Kuru	Nemli	Çok Nemli
☐	☐	☐

Deniz Suyu Sıcaklığı

10 °C den Düşük	10-15 °C	15-20 °C	20-25 °C	25 °C den Yüksek
☐	☐	☐	☐	☐

Dalga Yüksekliği

Durgun	Dalgalı	Çok Dalgalı
☐	☐	☐

Deniz Kenarına Gitme Amacı

Denize Girmek	Güneşlenmek	Yürüyüş	Piknik Yapmak
☐	☐	☐	☐

SIRALAMA (1-6)

Güneşlilik Durumu	
Sıcaklık	
Rüzgar	
Nemlilik	
Deniz Suyu Sıcaklığı	
Dalga Yüksekliği	

Yaş:

Cinsiyet:

Eğitim Durumu:

Şehir: