

Assessment of Geomorphosites in the Celil Gorge

Prof. Dr. Deniz Ekinçi

Cihanbeyli Plateau, Turkey
Istanbul University
ekincide@istanbul.edu.tr

Prof. Dr. Suna Doğaner

Cihanbeyli Plateau, Turkey
Istanbul University
sudogan@istanbul.edu.tr

Abstract: *Geomorphosite is a segment of tourism that has developed worldwide and emerging as a new global phenomenon in recent years. It is a form of special interest tourism and focuses on morphological features and the types of landscapes. In addition, Geomorphosite is sustainable tourism with a primary focus on experiencing the landform types in a way that fosters geomorphological and cultural understanding, appreciation and preservation, and is locally advantageous. As it state geomorphosite is landforms to which the society confers a certain value for scientific, but also cultural, ecological, aesthetic or economic reasons. Many natural landscapes are preserved throughout Turkey due to their cultural and historical values as well as for their environmental importance. As it is state, tourism is the largest economic sector in terms of earnings and in number of people employed among Turkey. This paper aims at assessment of geomorphosites on the Celil Gorge where located central Anatolia. There are semi-arid morphoclimatic region. Celil Gorge is a large range of geomorphosites, which were formed by the action of the seasonal creeks and winds. In this gorge, there are many different types of geomorphosites however rock pillarsare the best example. This site offers a landscape that affects and excites people. The occurrence of rock pillarsimplies immense variations in the rates of degradational activity on the land surface. In rock pillar landscapes, the active erosional processes are confined to valley sides and valley floors. These geomorphosites are at different stages of development some are established tourism destinations and some are working towards this goal. As a result, this area has important resources concerning geomorphologic heritage so it has a big geomorphotourism potential and has a unique position in the world.*

Keywords: *Geomorphosite, Assessment, Celil gorge, Turkey, rock pillar*

1. INTRODUCTION

In the Lake Salt District of Konya Part of Middle Anatolia Region, on the local of CelilGorge which is 2 km away from the Kuşça Town situated in the northwest of Cihanbeyli, there are geographical formations high in the value of geomorphosit with the appearance of statue having been formed through natural erosion (Figure 1). Those formations are situated on the Cihanbeyli plateau whose average altitude is 1000-1200 m. The biggest mountain on the surrounding is Kale Mountain on the northwest (1320m).

There are considerable amount of rock pillar. These formation wind and water erode the soft material from around harder cap rock, leaving isolated pillars protected by cap rocks. These are all rocks and they are all tourism attractions. The Earth's geomorphological wonders have always fascinated people and many form the basis for protected areas and World Heritage Sites. So, rock pillars as heritage. Yet it was determined that this important geomorphotourism zone has experienced human ruination in the recent past. The rock formations have been used as building rock upon being exploded with dynamite, moreover in the year 2012 the motorcycle feast for the introduction of rock monuments has been held on this heritage zone, which supposed to be protected. Those geographical formations are keeping their erosion under the effect of wind erosion and seasonal rivers on which depends their formation. On the other hand it is not under the protection status. Those rock formations haven't been examined yet in details in terms of

geomorphological. In this research the aim is initially to reveal the formation of this zone in terms of geomorphologie and to determine its scientific value. Secondly, to present its potential within the context of geomorphotourism.

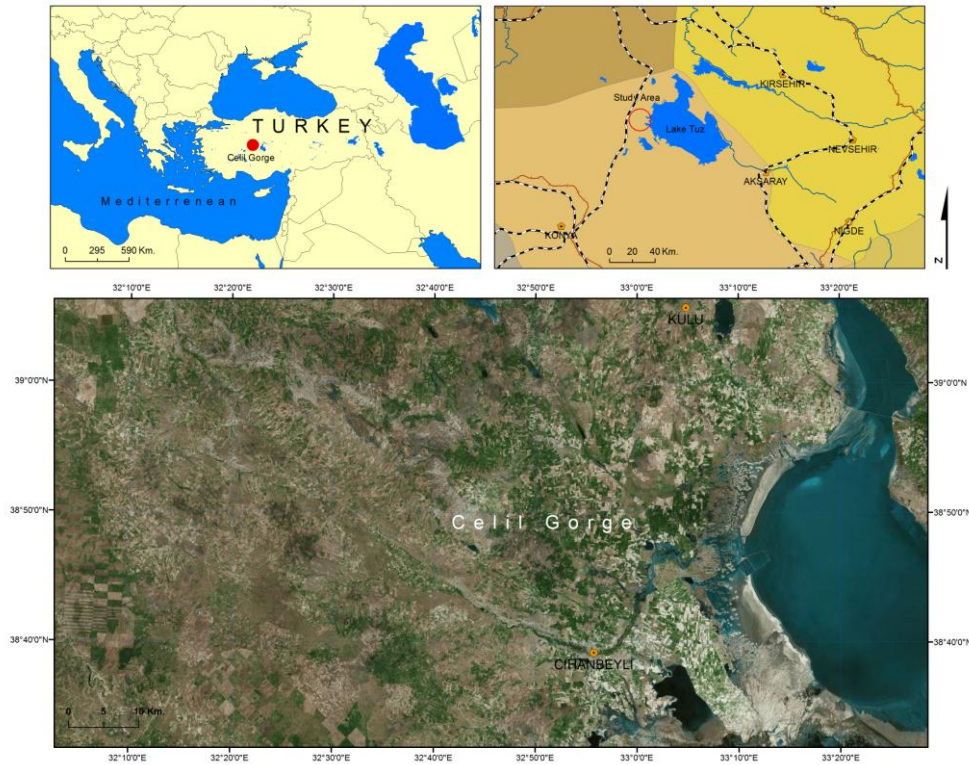


Figure1. Geographical Location of the Study Area

2. THE FACTORS WHICH ARE EFFECTIVE IN THE FORMATION OF ROCK PILLARS

The Kuşca member (Pliosen) which belongs to the Cihanbeyli formation Neogene old is being surfaced (Appropriate, 1981; Uluvd., 1994, Dirik and Erol, 2003; Tunoğluvd., 1995; Beker, 2002). The Kuşcamember of Pliosenis in the colours of tawny, red, green, grey and white multicoloured, and formed by middle-thick layered, middle asserted, sandstone, pebble stone, mudstone, volcanic ashes, tuff, argillaceous limestone and conglomerates (Figure 2).

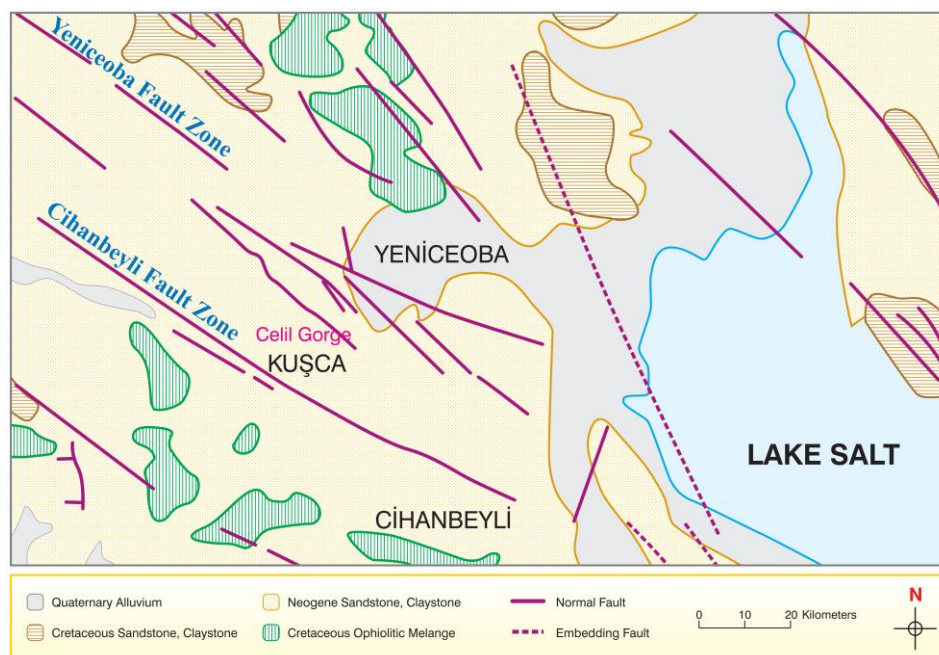


Figure 2. Geological Map of the Celil Gorge and its Surroundings

Assessment of Geomorphosites in the Celil Gorge

In the ground, generally it starts with red coloured alluviums, through the top it continues with sediments formed by carbonates with lacustrine chippings. Particularly in the location where the rock columns are seen, there are greyish-black coloured pebblestone at the lowermost, volcanic angled pebblestones at the top. There are fine-grained sandstone levels showing graduated transition as thin grades, present among the pebblestones. The sandstone and pebblestone are generally carbonate cemented; the pebblestone and sands inside it are based on all the older units and particularly on Eocene flyschs and radiolaritinedophiolitic sand gabbro blocks. There are gray - cream coloured tubercular mudstone levels present on the higher level. And on that, thick layered, gray-cream colored tuff levels are present (Figure 3).

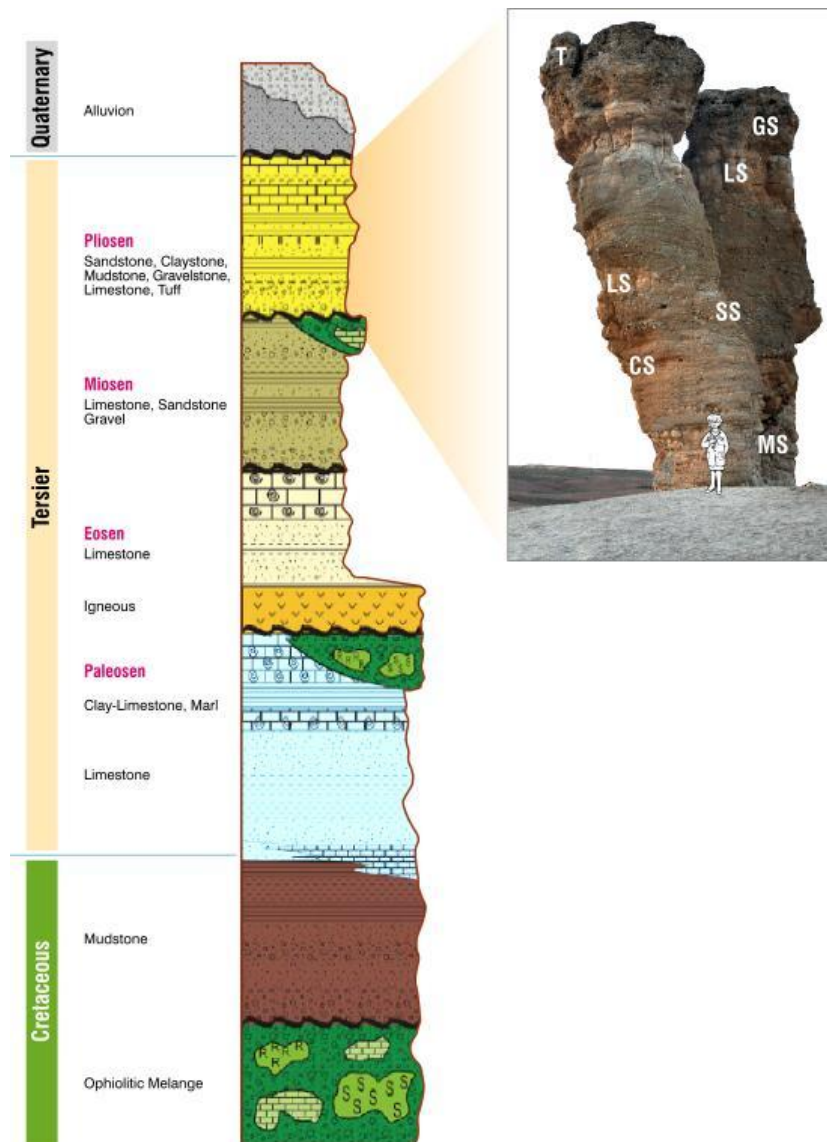


Figure 3. Simplified stratigraphy of the Celil Gorge and its Surroundings

On the field, faulting systems have developed deriving from the tectonic activity. Those are generally striking slip faults produced by a transtentional tectonic regimen (Dirik and Erol, 2003).

The total annual rain is 350 mm and annual average heat is 12 °C, it has a semi-arid climate. The annual wind speed is 2,5 m/sc (Kızıltuğ, 2002). According to Wilson diagram, the examination area is being posed by the effect of intermediate wind. Being described with " D,B'1,d,b'2" letters according to Thorntwaite Climatic Classification, the semi-arid is standing amongst the climate type of mesothermal, not posing extra water, under the effect of continent. Again the Lake Salt closed basin to which the MelendizRiver is flowing, is the biggest basin on that area. Having the orographic factors, The Salt lake closed basin is the climatic andoreism area, having dominantly semi-arid climate conditions in general, and with big rates of heat and evaporation values in the summer season.

The Brown steppe soils which are the characteristically soil of areas with around 8-12 °C of average annual heat, and with less than 400 mm of yearly average rain amount, are common in the area. Those areas are generally corresponding for steppe areas. The aspiration level of Brown steppe soils on which the dry agriculture is being carried out and herbaceous plants are cultured are between 50-100 cm in the field which are flat and nearly flat. The most important feature of the soil is that it has intense lime knobs in the under soil level. With that feature it has, the soil level is much lighter colored in comparison to the horizon A.

That the annual average rain on the area is under 400 mm, the summers pass hot and arid, and the relative humidity on the air is low are the reasons which prevent the trees to grow. Depending on the fact that the rain is low, inside the low soil level there are soils on which the lime accumulation are dominant in the part. Those soils are appropriate as well for the culture of grained plants having the herbaceous features which require highly the lime. As a result chamaephyte (short bushes and grasses) hemicryptophite (welwitschias) and geophytes (bulbous plants) are growing on the low plateaus, basins and plains of Middle Anatolia. Those plants pullulated during the spring period of one - two months which the vegetation period starts, then blossom and get grains, later on they start to dry out and since the starting of the summer their period of vegetation is accomplished by means of broadcasting. In the Middle Anatolia the plants forming the steppe vegetation are as following: veronica, thyme, stipa, *wild almond*, *blackthorn*, *caper*, gum tragacanth plant are some of them. The most characteristically plant of the area is *Artemisia fragrans* (veronica). Yet that the region has been included highly in the culture of cereals and moreover as a result of the extremely grazing, the steppe vegetation has become degenerated. *The Artemisias* are nibbled by sheep and gots until their root collars. As a result of excessive grassing of animals the thorny and bitter species which are not eaten by those animals have become widespread. There is a weak plant cover in the character of halophyte (arid, and salt plant) are present around the Salt Lake on the arid soils. In the field, it is seen the steppe vegetation that can be assumed as characteristic on the regions of steppes which have the altitude of 1100-1200 m outside the arid (salty-alkaline) soils zones and on the anthropogenic steppe areas which have formed by the ruination of forest as well (Atalay, 2012).

3. THE FORMATION OF ROCK COLUMNS

During the period which corresponds for the ending Miocene the climate has entered into a cooling era in general, and became much humid during the Upper Pliocene. Through the cooling period at the endings of Pliocene, it has entered to the Pleistocene. Yet because of the glacial effects no glaciation impacts have been seen on the examination area. But the humidious conditions have been effective. Therefore a lake has formed in the Konya basin. The terraces of that lake still keep their freshness. Likewise it is confirmed by the river valleys which have been formed in fluvial conditions. After the Pleistocene, it is generally a warming that is present in the climate. The continuing process has revealed the current landscape. On the examination field, the presence of formations reflecting the fluvial and arid regional topography is important in terms of demonstrating that those processes have affected here.

The area is corresponding for a big lake ground which has been present during the Miocene period. The abovementioned Lake has become smaller at the end of the Pliocene as a result of drying around 2 million years ago. The Lakes Salt and Bolluk are the remaining of that great lake. In the environment of lake facies the elements transferred and subsiding from the surroundings on the level of clay, silt, sand and pebblestone have caused the formation of sedimentary rocks. In this way, the rocks which are made by mudstone, argillaceous limestone and pebblestones have been formed. During this period of sedimentation the ophiolitedpebblestones and tuffs have merged to sediments. As a result, they have joined to rocks and resistant volcanic pebblestones inside the irresistant sedimentary deposits. Thus, an admixture and stacking which has a different resistance structure has been formed.

On the field, after the water has gone, the erosion processes have replaced the accumulation. Previously the rain water has started to corrode and pull into pieces the places where they leak through the cracks. During the corrosion, the regions which have steady rocks at the upmost have got the lower parts protected as they resisted against the corrosion. Thus, when the soft and resistless parts dramatically lose hight the tougher ones have rested on above. No doubt that the fault lines had role on the efficiency and the level of corrosion processes as well. The parts

squashed as a result of faulting have been eroded much easily, the other parts standing away from the crushed and scratched zones have effected to the formation of those natural monuments by means of resisting the corrosion. The resistant rocks such as the pebblestone and blocks which haven't been cemented duly have been effected less from the corrosion, thus stayed abover in comparison to their surrounding.

In terms of criterons such as climate, geographical formations, soil, plant cover, orographic structure, it is observed that the field is staying in a semi-arid morphogeneticalregion. From this point of view the activity of wind is on the nail as weel. The rock columns have been formed and developed as a result of factors such as floods, landslides, rivers and wind, and processes like mechanical dismemberment, resolution and mass movements. As a result of annihilation of steppe plant cover in the field which belongs to the ancient Konya Lake the wind erosion has started and the sand and silt particles have come loose and increased the effect of deflation, thus the actual relief has developed in the field.

The wind has shown its effect through transporting the particles pulled off their places by means of mechanical resolution and rain-wash. By means of wind corrosion the surface of rocks has been scratched, polished and even the lowermost parts of the slopes have been caved. The efficiency of the wind alternates according to the factors such as the speed of the wind, the formation and dimension of the transported elements, the plant cover and humidity condition of the ground, soil conditions, texture condition, zone usage. The much fast the wind, the much strong the deflation is. In this case in the manner the amount of factors transported has increased the distance of transportation increases as well. Another case what needs to be inclined here is the dimension of the factor and its relation with the wind speed. As long as the factor dimension gets bigger it needs that the wind speed increased. When a wind which is blowing in the speeds between 0,1-0,5 meter/second transports the factors in dimensions of dust, a wind which is blowing in the speeds between 10-12 meters/second can transport huge sands. Consequently the wind needs to have a level of speed to transport. Yet in order for the wind to become totally efficient, the areas are needed which is clear and lacking plant cover. As is known, that the ground is humid has an effect preventing the deflation. From this point of view, the forming activity of the wind makes itself much obvious in the fields that have very weak plant cover, very low level of humidity in the ground. The thin elemented materials on the ground such as clay, silt and thin sand have been transported by winds and thus the irresistable cover has been graded excessively. On the other hand the resistable levels have formed the formation of current rock columns as a result of avoiding the corrosion.

4. THE GEOMORPHOSITES VALUATION OF ROCK COLUMNS IN CELIL GORGE

The research area in this study has been examined in terms of its scientific, esthetic, cultural and economical value.

4.1. The Scientific Value

The scientific value of a geomorphosite increases by means of the rarity of its formation. This field is an important point for the paleogeography. It provides information about its environment from millions of years before. It certificates that this field has stayed within the field of a lake under a different climate, there have been volcanos around it, the lake has been filled with the materials transported by a different river system and by means of the ash, lava and rocks derived from the eruption of volcanos as intermediate layers and has dried out as a result of the climate change. The forrest remains which covers a less area, certificates the presence of forrest until a very close past as well. In this way this place is a sequence of Anatolia and earth history. It involves the corrosional formations in the fields which belong to the lakes of Pleistocene in the Closed Basin of Tuz Lake and Konya alongside with the lakes around Konya plain and Salt lake (Tersakan lake, Bolluk Lake). By the altering climate conditions the lake levels in the Basins of Konya and Salt lake, dried out to a great extent and those formations have occured as a result of the wind effect.

4.2. The Aesthetic Value

Those formations make an important difference in the uniform (monoton) landscaping of Cihanbeyli plateau (Photo 1, Photo 2).The environment is like a giant statue exhibition. By

different reflections of the sun beams during the day they change formation and colour every hour. The shapes present eternal formations such as human, camel, child, camel caravans according to the imagination of the people. The formations which are present on the sand hills can be seen easily as they stay at the higher position. The monuments are in closer positions to each other. They are obvious on the light yellow coloured sand hills through darker tones of yellow. Those colours adorn themselves out by the light and dark tones of red during the sunset from the west and become dark when the sun downs. In the morning it is enlightened by yellow and red beams of the sun from east then gets yellow again when the sun rises. Those formations become camel caravans and marche, become human and explain his life by the beams. The any time of the day altering appearance of the formation and colour has also differencies according to the seasons. In summer, one can feel himself in the dessert by means of hot climate. In winter it tells other tales under the snow cover through the continental climate of Middle Anatolia. Kuşça is a plateau to which the nomads from Mediterranean Region came in order to grass and feed their herds until the beginning of 19. century. In spring those herds passed through Celil Mountain Pass and paused in the source situated there. They returned from the same route in autumn. In this way this pass has a story for all the visitors during all the seasons.



Photo 1. *Rock Pillar from Celil Gorge*



Photo 2. *Celil Gorge*

4.3. The Cultural Value

As this area is formed by soft rocks it hasn't been caved too much artefactually. The parts formed by sandstone of those formations which have been made by means of the corrosion of the residues accumulated in an ancient lake field, are appropriate to corrosion by erosion. The cultures don't leave thraces in the parts where soft rocks are present. Yet what make those formations to occur are volcanic rocks among the lavas and ashes deriving from volcanos. Those rocks have protected the tuffs and soft rocks such as marn from corrosion. In the places where the solid rocks are present, there are places used by people as shelter or domicile. One of them has 3 chambers and used as religious purposes.

Within the cultural value of that area, is the fact that it has been on the migration route of the nomads through the Celil Mountain Pass during the times in the past when the nomadic life was present. A story of mother-doughter which belonged to that nomadic life has come until today by means of fossiling on the rocks. The surrounding of a water source called mother-doughter has become the sacrifice place for the local community.

When we take a look at this site from the Anatolian habitation history point of view this site is plateau field. Because this place is the foothill of the highest mountain around; the Kale Mountain. At the end of 19. century, new villages have been established in Anatolia for nomadic tribes (nomads) or they have been inserted in the current villages. Meanwhile the nomadic tribes have settled from Southeastern Anatolia to the neighborhood of Yeniceoba and Kelhasan. When the place where Kuşça is, had been used as a plateau which belonged to Kelhasan village, in Yeniceoba in order to finish the arguments between the chiefs of nomad group this hill station has been opened to permanent settle and Kuşça has lost its state of hill station and become a permanent settlement. Kuşça has gained the village status in 1928. After it was accepted as a village its names has been respectively Yenyapan, Hacılar and at the end Kuşça. It procured the town status during the local elections of 1989

As a village having become a permanent settlement, the people of Kuşça have been living by agriculture and stockbreeding, at the end of 1960s nearly 300 people have immigrated to Denmark from the village as worker. Today, Denmark taking the first place, Kuşça people settled in Germany, Switzerland, Sweden, Norway, Holland and Canada have contributed to the afforestation project carried out by local administration as well. As they pass their annual leave in Kuşça and established new houses, has led Kuşça Town to become a modern hill station.

4.4. The Economic Value

A decrease is seen in the population of Kuşça for the last 10 years. In the year 2000 its population of 2321 has decreased to 2011 in the year 2012. The bringing that zone into the tourism could enliven the economy. Cihanbeyli local administration and established Cihanbeyli Platform is arranging photo-safari tours for bringing this zone into the tourism. Cihanbeyli is conscious of the fact that this zone has an important place for the tourism. This place is close to three big cities such as Ankara and Konya, Eskişehir. It can attract domestic tourists from those cities in weekends. Cihanbeyli will gain a new income source from the accomodation, transportation and shopping. Tourism will avoid the migration from Kuşça as a new economical source.

5. THE CURRENT USAGE OF ROCK COLUMNS FIELD

Initially the local administration has realized the importance of that area. Those statue shaped rocks have been used for the construction of house as stone by means of explosion. The protection decision of the local administration has prohibited this. Another destruction is that the forests have been consumed as firewood. That depredation of the past is being compensated by the afforestation project of the local administration. The local administration has planted 80 000 of trees around Celil Mountain Pass and Kuşça, most of which are fruiters. The Kuşça people working in Denmark have also supported this project. Thus the initial protection precautions have been taken by the local administration.

The current usage of the field is as picnic area where the water source is present by the neighbor community. This usage is being carried out traditionally. The water source there has become a sacrifice place based on a legend. Thus it has importance in terms of belief. As a result of the people coming there for sacrifice who made pick-nick here, this place has become a recreational

area. People who participated at that activity, are using those shapes for walks, photographing etc activities.

Alongside with that usage of the local people which continued for centuries in last years it has initially attracted the photograph lovers to there as a result of the exhibiton of those shapes' photos in travel journals. As those photographs have been shared in the internet, led it to be recognized in short period. That place has started to attract attention to itself particularly in terms of photography. That the local administration has let the motor cross races to be held here for the presentation of here, has led the misuseage of this area. In that field where the erosion is way too strong, the activities which would increase the erosion mustn't be held. Within the present usage, the local administration is arranging photo-safari tours to this place with the neighborhood. The local administration has arranged a photo-safari tour in 2011 26-27 November to Lake Tuz, İnsuyu valley, Lake Bolluktravertines and Celil Mountain Pass, to which 20 photographers have participated.

6. THE POTENTIAL OF ROCK COLUMNS FIELD IN TERMS OF GEOMORPHOTOURISM

When examined within the content of the resources provided by the formation the field has a high competition power in terms of its geographical formations' scientific value. It is an important seminary field for geologist and geographer scientifics, masters and bachelor's degree students. The increase in the documentaries has led to an increase in the formation of the surface. For that reason it has a power to attract the people to there who are interested in the formation of those shapes.

When examined within the context of the opportunities provided by its position, the region is close to 3 large cities such as Ankara, Konya and Eskişehir. When we consider the population of those cities and the student population it has a great domestic tourist potential. At the nearest, the aerial access to that area is providing the easy access opportunity from both Turkey and the tourists coming from other parts of the world. The field is 133 km away from Konya, 170 km away from Ankara. The field is 33 km away from Cihanbeyli.

With its neighborhood, when it is examined in terms of the tourism opportunities, there are lakes in the Konya and Salt Lake closed basin as wetlands. Those lakes are Salt lake in the east, Lake Tersakan and Lake Bolluk in southeast. The lakes of Tersakan and Bolluk are protected areas and have been protected as Lake Salt Special Environment Protection Region. These lakes are the residuals of Pleistocene lakes in terms of their formation. From this point of view each is a separate geosite and documents to the earth history of Konya Closed Basin. Lake Salt, Lake Tersakan and Lake Bolluk are also important for the people in terms of learning the formation of the salt they eat every day. As they are on the international migration route of the birds those little lakes are the stopover destination for migratory birds. Their neighborhood has also got biological diversity. It is very appropriate for the bird watching.

Another geosite field is the travertine cones in the north of Lake Bolluk. In the north of the lake 63 cones have been spotted which have been formed as a result of water sources. (Erol, O., 1967).

Alongside with the lakes, one of the main rills flowing to Lake Salt is here. İnsuyu stream flows to Salt lake from there. İnsuyu rill borns from the Pınarbaşı village gets streamed by natural source waters passes through İnsuyu village and flows to Lake Salt. İnsuyu valley is recognised by its sources, caves and picnic areas.

7. RESULT

The Celil Mountain Pass Rock Columns are geographical formations with tourism potential, which have been developed under the control of too many different factors. Here the rainwash is strong. The effect of the rainwash, causes the slopes to be covered with countless ravines, let it to nearly have an appearance of badlands. In all the region, the brown soils are common which are one of the typical soils of the steppe. The vegetation comes into life only in the spring. The summer heats, following it leads to have a typical steppe appearance to become visible. The mechanical disintegration is strong. The wind has been determined in the intermediate levels. The effects of rivers on the formation have decreased because the flows have decreased. Under these circumstances the field keeps formation.

The rock columns' is one of the appropriate destinations to be opened to tourism in terms of its esthetical value and scientific importance. There are 3 big cities in the close neighborhood with sufficient population potential for the tourism. The convenience of the Cihanbeyli plateau geographical formations for the access, doesn't lead to a difficulty in its transportation. Salt lakes and Bolluk lake travertine cones are other geosite regions in the close neighborhood. Those lakes are also appropriate for another recreational activity as bird watching. Cihanbeyli local administration and local people approach positively to tourism.

Apart from its current usage of photo-safari and picnic, this field hasn't been opened to geomorphotourism. Initially this field must be taken under a protection status as it hasn't got any protective status whose scientific value has been certificated with this research. In this subject, it must be declared as protected area before all. During the mapping and photography of the area, each rock monument must be marked and numerated in a detailed map. The shapes must be photographed in three dimensions. This scientific study will be a source for both the tourism map and the brochure of the area as well. The informative boards must be prepared to the field, which are explaining its geomorphosite importance. It is an easy field, which anyone can tour. Wooden racecourses can be made to the relevant places to avoid corrosion. An administrative plan must be prepared.

Cihanbeyli rock monuments are extremely appropriate for photo safaris. As photo safari tours are arranged for little groups, it protects the environment as well. Photo safari is an activity, which can be carried out for all year long. When considered with the environment the little lakes, which are wetlands, are appropriate for bird watching (Ornithology). It is indispensable to protect the natural conditions in terms of sustainable environment administration during the performance of those activities.

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Prof. Dr. Deniz Ekinci, In 1999 Dr. Ekinci completed his Master's Degree, and in 2004 his PhD. In October 2007, he took the title of Assistant Professor, and at the same year in December Associate Professor. In 2013, he promoted as Professor in Geography Department of Letter Faculty. Field areas are Geomorphology, Hydrography, Disasters Management, Geographic Information Systems, Remote Sensing, Geo-politics, Hydro-politics and Distance Education. In addition to his academic works, he has been working as vice dean of the Open and Distance Education Faculty and head of Geography department same faculty at Istanbul University. He has many administrative tasks as the Board Member of Istanbul University Environment and Earth Sciences Application and Research Centre, the Board Member of Istanbul University Continuing Education and Research Centre. He is the member of Turkish Geographical Society, Turkish American Scientists and Scholars Association (TASSA), and Turkey Earthquake Association. Moreover, he is the founder as well as the chairman of the board of the Association of Ahiskan Students, Graduates, and Companions.



Dr. Dođaner is a member of Istanbul University Faculty of Letters Department of Geography. There is research on the tourism geography, regional geography, historical and political geography. Among the articles in the field of tourism geography are Effects of Geography on Tourism in Egypt, A Geographical Heritage of Anatolia: Pamukkale, Tourism in Coastal Utilization of Turkey, War and Tourism: Battlefields of Trojan and Gallipoli, Importance of Fairy Chimneys (Earth Pillars) in Tourism. Her books are Tourism Geography of Turkey and Cultural Tourism of Turkey. Dr. Dođaner offers courses related to tourism geography in Istanbul University Letter Faculty, Open and Distance Faculty and Social Sciences Institute.