

A Negative Example Area In Human-Natural Environment Relationship: Erciyes Mountain (Turkiye)

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Abstract: Mountain areas, which are one of the most prominent geographical units, have increased their usage due to the economic and ecological resource value they bear. In today's world, these usages, which are usually carried out without considering conservation-usage balance, result in degradational ecosystem changes. Erciyes Mountain is one of those places where negative changes due to the activities of humans are seen. Although making use of the land is inevitable for man, forests have disappeared and conditions have been affected due to the upset in the ecological balance of the area as the methods used in the area are destructive. Erosion which has begun in the places where trees have been destroyed has not only devastated soil but also constricted potential underground water areas. Moreover, erosion has led to disasters such as flood-overflowing and reduced input related to vegetal and animal products. However, if the potential Erciyes Mountain still has and its environment is better known, better conserved and better arranged, it will be able to meet the constantly increasing, changing and complicated needs of man living on this geographical area which has basically remained the same. Thus, the local people should be made conscious on how to make better use of the mountain and give it the least damage. If the fact that this issue will be taken as an example in the region is taken into consideration, it has great prominence as to evaluating the potential of mountain areas with the principle of sustainable development and enabling future generations to make use of this opportunity and resource.

Key words: Erciyes mountain . human-nature interaction . degradational ecosystem change

INTRODUCTION

Mountains are the leading natural areas with a prominent place in the lives of humans with their economic and ecological potential and this prominence is constantly increasing. Activities which will be carried out in these areas bearing in mind conservation-usage balance also have physical, human and economic prominence for neighbouring areas. On the other hand, areas not used parallel to sustainable development principles are greatly damaged and lose their potential immensely.

Erciyes Mountain is one of the mountain areas faced with great damage as conservation and usage balances are not paid attention to, despite its great physical, human, economic and ecological potential.

Erciyes Mountain (3917 m) is situated in Central Anatolia Region (Fig. 1)

Erciyes means "Akdag" (White Mountain) and it was called so in historic periods too. The name of the mountain is written as "Harkasos" on Hittite hieroglyph inscription and means "White Mountain"

Erciyes Mountain is of volcanic origin. Volcanic activities that began in the mountain in the Neogen (Miyoson-Sub Pliyoson) era continued until about 2000 years ago. The mountain has been inactive since then. Erciyes Mountain has an area of 1000 km squares. This area reaches 1500 km squares with atmospheric cones. Within the area, there are 68 volcanic cones whose diameters range between 600-3000 meters.

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The type of climate in the area where the mountain is situated is continental climate. However, the physical geography factors formed by the altitude of the mountain, its exposure characteristics and continental condition results in changes within this type of climate. On Erciyes Mountain, different climatic zones have formed from the foot of the mountain to its peak-semi arid, semi arid-semi humid, semi humid, humid-cool and humid-cold. These different zones have each formed different living conditions in a vertical direction and have offered different living opportunities to people by forming orobiyom.

The types of climatic soil which have formed in the area as a result of climatic conditions and which have spread to a large area are brown soil without lime and brown soil. Apart from these types of soil, kolüvyol soil and litosols are also found on the foot of the mountain in the north, south and west. In contrast, litosols are found on the higher regions of the mountain.

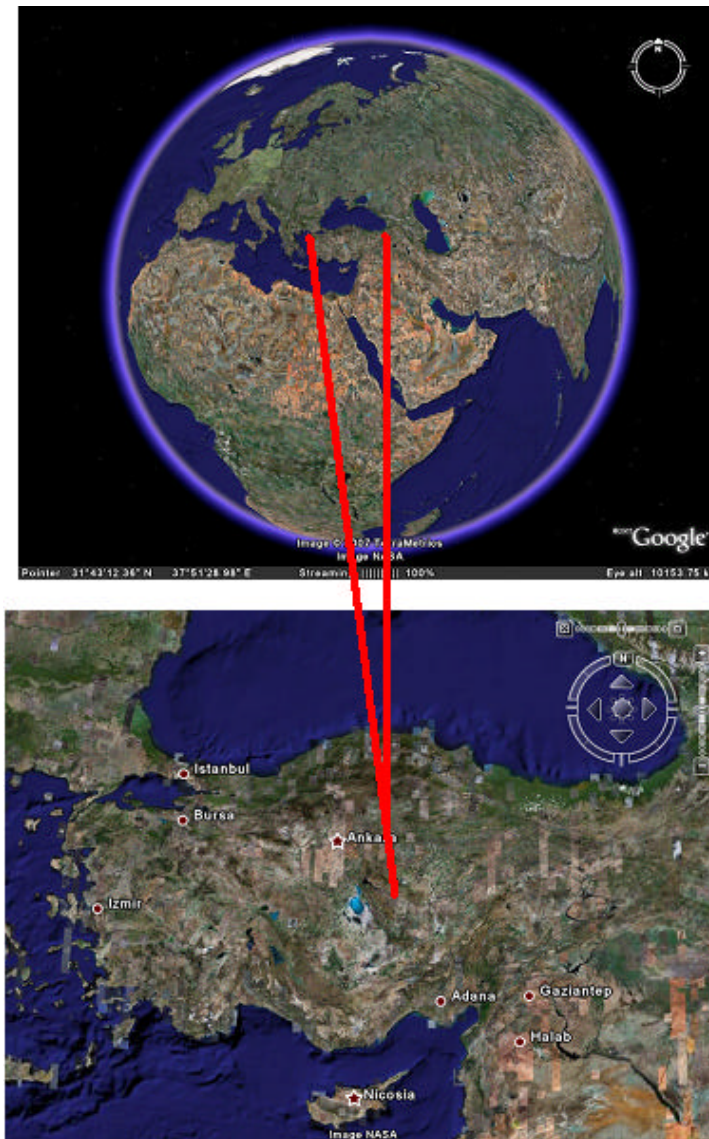


Fig. 1: The location of the area of study (Google Earth)

In terms of hydrographics, the sides of Erciyes Mountain, except for the eastern part, are meager in constant streams. The most important factor causing this is without doubt the litological structure. The streams in the area have mixed regime consisting of snow and rain. Catchment on snow is more common than rain on the regime. The area lays in Iran-Turan Fitogeography Region. Plant formations in the area determined by growth conditions consisting of climate, soil and relief are divided into two groups as tree formation and grass formation. If taken as a whole without going into detail, Erciyes Mountain consists of:

- The steppe region characterized by steppe plants at about 1000-1100 meters.
- Arid forest represented by *Populus tremula*, *Juniperus* and mainly *Quercus* and antropogene steppe region where these have been damaged at 1100-2500 m.
- Mountain pasture until snow border above 2500 metres.

The region where the mountain whose main characteristics are given is situated in one of the oldest settlement areas on Earth and has stood in the intersection of main military and trade routes. As a result of its locational advantage, it has always attracted the attention of humans. Likewise, the area dates back to 15th century BC. Thus, in the area of study the human-nature relationship has existed for about 3500 years. However, as it is known, man is the creature that affects the environment it is in most. Although man has positive effects on the environment, this effect is mainly negative. Only man-among other living beings-has erased vegetation on vast areas and built shelter for himself. He doesn't allocate enough land for agricultural purposes and consumes natural resources without hesitation.

On Erciyes Mountain, which is an area where the negative effects of human-nature relationship are seen, man has taken the responsibility of the spoiling of the natural balance and the rapid changing of the living-nonliving environment throughout the years.

MATERIALS AND METHODS

The study has been carried out in two stages. In the first stage, the area was studied in the summer months of 1992-1993 and 2007 in order to determine its physical characteristics and to study the results arising from nature-human relationship.

In the second stage, the study was completed by field observation and evaluating existing literature.

RESULTS AND DISCUSSION

Erciyes Mountain is the highest mountain in the area and the sixth highest in Turkiye (Photo 1).

The fact that the mountain is in the highlands has affected climatic conditions and as a result, types of soil, vegetation and formation processes. This has led to the existence of layers of different characteristics in a perpendicular direction and this has offered an advantage to the mass. This has enabled the area to have a different nature and a high potential compared to neighboring relief units. This, as a result, has affected life around the mountain in terms of climate, hydrographic conditions, types of settlement, tourism and agricultural facilities and the mountain has become a potential resource area that people make use of.

The area where the mountain stands has always attracted the attention of man because of its positional advantage. As a result, the mountain has also been used as shelter against potential dangers. However, despite the advantages the mountain has offered to mankind, man hasn't shown the same sensitivity towards nature. As man has exaggerated his use of natural resources used in the area are beyond those shaped by needs, every element of natural balance has begun to disappear one by one. The main elements are vegetation, soil and water.

Vegetation is the first of these disappearing elements and probably the most prominent because following the disappearance of this element, soil and water resources have also come under threat.

In reality, the mountain was within an area of forest growth with its altitude and climatic conditions at 1100-2500 m and was covered in thick forest in the past. The fact that Strabon stated that Erciyes Mountain was covered in forests and that the people of the Cappodacia region met their need of fuel and timber from Erciyes



Photo 1: A general view of Erciyes Mountain (www.kayseriliyim.com) [1]



Photo 2: Puny oak trees that have replaced forests as a result of destruction (Photo Ülkü ESER ÜNALDI)

Mountain during that period (B.C 404), that animals and strangers trespassing on the mountain fell into furnaces and burned [2] and that the reason Kayseri was founded there was the thick forests on Erciyes Mountain [3] gives us important clues on how thick the vegetation was then.

However, as stated previously, the area which is one of the oldest settlement and cultural areas in the world has been densely populated for 3500 years. As man has damaged the area for purposes of fuel and timber, extreme grazing and cutting down trees for agricultural areas has led to present antropogene steppe areas. In the historical process, forests have become groups of forests due to the interference on oak forests. As a result of the continuation of damage, forests have become wooded steppes and then finally antropogene steppes. Consequently, man seems to have the main responsibility for this striking change and he has taken the first and probably the most negative step towards changing the ecosystem on the mountain.

The rapid damaging process continues today too because oak wood is considered as one of the most precious wood type as fuel and other purposes. Oak wood is quite hard and durable and thus has been popular since old times. Moreover, nearly all cattle and sheep love the leaves of the oak. Because of this, places where oaks grow have been accepted as the most suitable places for grazing since ancient times. Apart from these, people have widely used acorn since prehistoric times. Around Kayseri, acorn is collected by the public, later sold in street markets and eaten like chestnut after being kept in cool places in sand or in pots [4]. All these reasons have led to the fact that the oak is one of the most damaged trees. Due to this reason, oak forests in the area have become puny and squat oak groups or antropogene steppes (Photo 2).

In addition, the fact that permanent settlement areas on the mountain have gone up as high as 1900 m and that high plateau have reached an altitude of 2500 m has increased the pressure on the mountain. Extreme grazing related to this settlement is a great threat to vegetation. Animals that constantly graze in the same place cause the extinction of plant species and these places are invaded by plant species that even the animals don't eat.

In the area, not only trees but also other plants have been affected by the destruction. The plant that is most destroyed is tragacanth. The tragacanth that is a widespread plant of both the antropogene steppe regions and the subalpine zone has a thorny trunk. By applying certain procedures on the thorny bark of the tragacanth, a glue of great economical value called 'kitre' is obtained. Because of its roots that can go as deep as 3-5 meters and its wide branches, the tragacanth is like a guard protecting sloping mountain sides against erosion. The tragacanth can protect an area twice to four times its size against erosion (www.ekolojimagazin.com) [5].

However, the tragacanth is very popular in the region as winter fuel and fodder. Moreover, the thorns on its trunk are burned and the remaining barks are softened in water and also used as fodder. The destruction of the natural protector which is an important erosion controller affects an area three times its size and makes the area vulnerable to floods, avalanches, landslides and erosion. The destruction of the tragacanth also threatens the natural balance of the area and affects the spoiling of biological variety composition of species. This process of uprooting (Photo 3) which still continues at present faces us as a negative activity of nature-human relationship.

The fact that the share of forests on vegetation shaped by antropogene effects in human-nature relationship constantly decreases has naturally affected soil ecosystem.

Consequently in areas where deforestation occurs erosion has begun, productive soil has been carried away, litosols have become widespread and floods have formed gullies on the topography (Photo 4).



Photo 3: Tragacanth that have been destroyed due to various reasons (Photo. Ülkü ESER ÜNALDI)



Photo 4: Gullies that have formed as a result of massive destruction (Photo. Ülkü ESER ÜNALDI)



Photo 5: Miniature bad-land topography which can be seen in eroded areas (Photo. Ülkü ESER ÜNALDI)



Photo 6: Activities to protect vegetation in limited areas (Photo. Ülkü ESER ÜNALDI)

The plant-water balance of the soil in these areas have been spoilt and soil creatures, especially microorganisms have greatly disappeared. Besides, water flowing on the surface has led to the formation of a topography which has a miniature bad-land appearance (Photo 5).

The soil on the mountain is also impoverished in terms of humus due to the destruction of the vegetation. This condition creates an effect that facilitates erosion because as it is known, humus acts as a sponge in soil and aids in protecting erosion by absorbing water nine times its mass. Another factor that triggers erosion in the area is extreme grazing because animals constantly trampling the soil while grazing damage the structure, decrease absorption and as a result of the speeding up of runoff, erosion increases. The negative effect of grazing on soil is not merely this. The fact that the leaves of the oak are used as fodder, results in the decrease of plant nutrients that pass onto the soil after the decomposition of leaves, especially potassium. This condition, as well as hindering the growth of plants, especially the oak, decreases nutrient substances on the upper layer of soil.

The area offers a wide range of agricultural opportunities. This is seen especially in the orchards on the northern side of the mountain. However, clearing away orchards for settlement purposes and settling on the present ones is another reason for land loss and brings along with it economic losses. Although interaction in nature-human relationship is generally to the disadvantage of nature, this interaction has some advantages, but little. These areas are Gögdag, Lifos Hill and Hisarcik Wood (Photo 6).

These areas, in which people protect vegetation and carry out afforestation activities, are comparatively faraway from the threat of erosion due to the direct or indirect prevention vegetation provides. In these areas, the roots of trees spread over the soil and prevent natural forces from carrying it away, tree trunks decrease the power of runoff in the direction of the mountain slope and increase the amount of water absorbed by the soil and act as a shield against the harm raindrops will have on the soil. Forests enrich the soil in terms of humus as stated above with the dead layer it provides. This condition enables the humus to absorb rainwater like a sponge and prevents erosion by preventing rainwater from hitting the soil directly.

Water, which is an indispensable element of life, is an element that is necessary for not only biological needs but also economic activities. Considered from this point of view, it is possible that Erciyes Mountain acts as a water tank for neighbouring dry steppes. During the summer, snow and ice that melt as a result of rising

temperatures merge and form streams and in some places create rich springs. However, these streams that form high up infiltrate due to the disadvantage the geological structure has created and except for the west side surface as springs in places with slope cracks and plains. These underground waters create artesian springs in the places they surface along the cracks as they are under pressure. In places where they can't surface naturally, artificial artesian wells are made by digging wells. From each of these wells whose depth vary between 15 and 70 m 5-10 liter of water is pumped in the irrigation period [6]. Apart from these, nearly all villages and cottages on the mountain have shallow wells whose depths vary between 2 and 10 meters and which have been built manually.

Water that is obtained from these springs is delicious and suitable for drinking water as the level of lime is low since it infiltrates through volcanic rocks [7].

This situation has great prominence for settlement and agricultural activities. Consequently, the existence of certain settlement on the foot of the mountain and neighbouring area is related to these springs. Moreover, the mountain is important due to the underground water the neighbouring plains have besides its own springs. Streams that flow as far as the plains disappear under the alluvium when they reach the floor and feed underground water [6]. In addition, these waters have prominent effect on the natural life of Sultan Sazligi (reedbed) which is situated on the southwest region of the mass and is included in the list of wetlands in accordance with the second and third item of RAMSAR contract dated 1994.

However, the rise in daily water consumption per person due to rapid population growth and the socio-economic changes that accompany it, seriously increases the need for drinking and usage water. Due to the rapid settlement activities around the mountain, underground water has lost its characteristics of drinking water due to intense environmental pollution. Moreover, there has been a fall in potential underground water levels due to extreme use. For instance, water that was obtained from a depth of 90-100 m around Yesilhisar in 1996 has fallen to 140-150 m in 2007. In addition, due to the extreme destruction of vegetation on the mountain, forests have been destroyed too and this has led to a restriction in potential water reserves. In other words, water is another value that has been lost through the negative results of man-nature relationship. If water resources are not used properly and man continues to damage vegetation, lack of water around Erciyes Mountain will be a big problem in the future.

CONCLUSIONS

It is seen that several problems exist in human-nature relationship on Erciyes Mountain regarding the use of nature and that most of these problems have not been solved. Problems about vegetation, soil and water on the mountain resulting from the negative interaction of man and nature increase day by day. However, despite all these negative aspects, it is still not too late. It is certain that the mountain can meet the forever increasing, changing and complex needs of men living in this region which has remained basically the same if the nature around Erciyes Mountain is better known, better protected and better organized.

It is obligatory to urgently prepare a plan of action bearing in mind conservation-usage balance on Erciyes Mountain paying attention to this fact.

In this context,

- The local people should be given guidance on how to use these areas on this sloping and high region and what kind of benefits it will offer. If this is not done, the present destructive management economy will continue.
- Places where the forests have been destroyed should be afforested. However in order to achieve success, the first step is to grow intense grass cover to recover natural balance before afforestation with oak trees. Thus, the mountain should regain its original vegetation with long-term action.
- In afforestation activities in areas where natural balance has not been destroyed, the ecologic conditions of the plants must be taken into consideration and afforestation must not be done with unfamiliar species. Afforestation which has been done on the north side of the mountain with *Cedrus libani* for which it is impossible to reach climax within the area's climatic conditions, is a wrong practice and such afforestation should not be carried out on the other sides of the mountain.

- Extreme grazing results in the invasion of species that even the animals don't eat. To solve this problem, measures such as controlled grazing should be taken and suitable projects aiming at pasture improvement should be developed.
- The tragacanth honey is the most favoured resource of beekeepers due to its rich smell and taste. This honey is of the same quality as the world-famous Anzer honey. In addition, 'kitre' glue found in the roots of tragacanth is used in the fields of pharmacy, dye, weaving and paper production and thus there is great demand for kitre in exportation. Due to these reasons, it is necessary to explain the uses of tragacanth to local people and make use of it as an economic income and thus decrease its destruction and provide conscious conservation of tragacanth.
- As it is known, soil is a vital decomposed layer that covers the earth. As the population of the world increases, the dependence on land increases consequently and forests are destroyed to create new agricultural areas, stony areas are cleaned and sloping sides are improved. Gaining soil in this way is without doubt an expensive and long-lasting method. On the other hand, knowing how to benefit from soil by realizing its characteristics is an easier way. For this reason, people working on the land in the region should be educated and taught about soil conservation methods.
- To make more use of water around Erciyes Mountain that gains prominence but decreases day by day, ducts should be made to prevent the water from infiltrating at the points they surface so that the water can reach the north and south foot of the mountain.
- Policies should be created to protect and use existing water resources in the short-term and long-term. Mountainous and upper basins where water resources are produced and problems related to these should be dealt with seriously in a process of planning.
- To make existing usages sustainable, alternative ways of making a living, such as eco tourism should be created.

However, it should immediately be stated that in a country like Türkiye, two thirds of which is mountainous, these issues have great prominence not only for Erciyes Mountain but also for the evaluation of the potential of all mountainous regions in a principle of sustainable development and enabling future generations to make use of these opportunities.

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