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Proposal for a Methodological Approach to Cultural Geomorphology Studies [1]

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ABSTRACT

In addition to determining, using and developing the advantages provided to human life by the formation of landforms and effective processes, addressing and solving the problems they cause is rapidly progressing. The way to examine the spatial distribution and changes of landforms with social problems and to find solutions should also be evaluated within this scope. Especially during the last two centuries, people have made an increasingly important impact on material transfer and changing landforms on earth, primarily through agricultural activities, mining and quarrying, and the construction of cities and roads.

With the study, the research methodology to be used in cultural geomorphology studies was established and a study technique addressed in four sections was determined. Within the scope of the suggestions, a mixed research method was used in the study. The geographical features of the research area were obtained using the quantitative research method. The data were subjected to meta-analysis and the definition of the area was carried out. Land observation and evaluation were made with the progressive and regressive research method study, and the existence of cultural areas and needs were revealed. With the help of the qualitative research technique, the theory of the concept of cultural geomorphology was developed, hypotheses were created, interpretations and generalizations were made.

Kültürel Jeomorfoloji Çalışmalarına Metodolojik Bir Yaklaşım Önerisi

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ÖZ

Arazi şekillerinin oluşumu ve etkili süreçlerin insan yaşamına sağladığı avantajların belirlenmesi, kullanılması ve geliştirilmesinin yanı sıra, bunların neden olduğu sorunların ele alınması ve çözülmesi de hızla ilerlemektedir. Arazi şekillerinin mekansal dağılımını ve değişimlerini toplumsal sorunlarla birlikte inceleme ve çözüm bulma yolu da bu kapsamda değerlendirilmelidir. Özellikle son iki yüzyıldır insanlar, öncelikle tarımsal faaliyetler, madencilik ve taş ocakçılığı ile şehir ve yolların inşası yoluyla, yeryüzündeki malzeme transferi ve değişen arazi şekilleri üzerinde giderek daha önemli bir etki yaratmışlardır.

Çalışma ile kültürel jeomorfoloji çalışmalarında kullanılacak araştırma metodolojisi oluşturulmuş ve dört bölümde ele alınan bir çalışma tekniği belirlenmiştir. Öneriler kapsamında çalışmada karma araştırma yöntemi kullanılmıştır. Araştırma alanının coğrafi özellikleri nicel araştırma yöntemi kullanılarak elde edilmiştir. Veriler meta-analize tabi tutulmuş ve alanın tanımı yapılmıştır. İlerici ve gerici araştırma yöntemi çalışması ile arazi gözlemi ve değerlendirmesi yapılmış, kültürel alanların varlığı ve ihtiyaçları ortaya konulmuştur. Nitel araştırma tekniğinden yararlanılarak kültürel jeomorfoloji kavramının teorisi geliştirilmiş, hipotezler oluşturulmuş, yorum ve genellemeler yapılmıştır.

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Entrance

The subject of cultural geomorphology is the landforms created by humans, whose origins and purposes are extremely different and constantly expanding. In a broader sense, it is the observation of the effects of landforms formed by natural processes or artificially on the physical environment.

On the transformations carried out by humans on the natural environment; Vitousek et al. (1986) presented a study on the fact that we have converted 40% of the forests in the world's habitable land mass into agricultural areas for agricultural activities in more than 20 years. Similarly, Ibisch et al. (2016) presented research on the land forms fragmented by the complex road network connecting cities or the ever-increasing population, for resource search and use. In addition, Winemiller et al. (2016) conducted important studies on the examination of changes caused by cultural activities with studies revealing the effects of the change processes in river basins and drainage systems due to the construction of dams that are underway or ongoing.

Szabo et al. (1993) emphasizes that human intervention, which is diversified directly and indirectly, on natural systems has intensified, and therefore almost every part of the physical environment is exposed to human impact. This intervention on the existing geomorphic system needs to be analyzed with a comprehensive approach and defined with a logical research goal. Today, human impact on the formation or development of landforms has become equal to other factors. Sherlock (1922) stated that a 7 cm deep layer was removed from a 30.5 km³ wide area of approximately 13.3 cm deep and the material was transferred to the territory of Great Britain, and Holdgate (1982) stated that 3x〖10〗^12 t of soil and rock mass was transported annually on Earth. This value is more than twice the annual total discharge of rivers, which is 2.4x〖10〗^10 t, according to Judson (1968). However, although all human activities change the appearance of the environment, not all of them can be considered as a subject of geomorphology. For example, high-rise buildings in residential areas affect the appearance of the environment. Because they create a contrast in terms of their size and features, but they do not fall within the scope of geomorphology. However, mounds and hills formed in ancient settlement areas are geomorphological elements.

1.The Concept of Cultural Geomorphology

There is still no definitive classification in scientific database and practical applications in geomorphology research. For this reason, a general definition accepted by everyone regarding the term geomorphology has not been established. The academic definition summarized as the changes in the solid outer shell of the earth as the main subject can be shortened as the scientific explanation of landforms and the processes that affect them. This explanation is the database development paradigm that is tried to be created for geomorphology in geography science (Mostafaei and Moshiri 2013, p.148). In recent times, determining settlement/application locations for civil, military and industrial projects or scenarios and practical application steps of settlements have increased the importance of geomorphology. Even ensuring its representation in three spatial areas (marine, coastal and soil geomorphology)

has led to the development of the rights and authorities of geomorphology (Drieu, 2006, p.1). In order to help develop these rights and authorities, it is necessary to evaluate all the concepts stated so far and to define and examine the relationship between geomorphology and humans in new approaches by going beyond this. This is the development of the concept of "cultural geomorphology" as a new idea in the development of a new field in geography based on the analysis of the elements that interact with each other. Geomorphology and human interaction at the environmental scale are best studied in environments with strong geomorphological traces of environmental changes and where human activity has been present for a long time (Knight and Harrison, 2013). On the other hand, cultural geomorphology is a discipline that studies the geomorphological components of a site that embody both a cultural presence of the natural environment and its interactions with the geological heritage. Geomorphology and the anthropogenic relationships that act as influences present a mutually integrated perspective (Sahariah et al., 2013). This perspective;

a. Geomorphology is a component of the geomorphological heritage (Geomorphosite) of a region.

b. It is the geomorphological context that changes with the components of some cultural activities of a region.

These perspectives address the cultural definition of the physical environment and conceptualize the natural environment that is being changed by human activities as a "cultural geomorphology area". In addition to the degradation of the natural environment by human interaction, these perspectives are much more suitable for understanding and adapting to human landscape interpretations. Considering these perspectives, the concept tries to discover the current situation of the areas that have developed with the adaptation of humans to geomorphology in terms of the protection of the cultural natural environment.

The characteristics offered by the natural environment take on a cultural dimension with the observation phase as the first step and offer a study object with strong educational effects to establish a new relationship between humans and nature (Panizza and Piacente, 2009). Therefore, it creates more awareness and sensitivity towards the concept of natural environment and culture and responsible and active participation in sustainable development (Wimbledon et al., 1996). The environment should be considered, understood, protected and evaluated as a cultural asset that can be evaluated in all its aspects. It is important to understand the environmental components and the evolution of the environment in depth and to choose the right protection and management initiatives.

1.1.Cultural Geomorphology Research

Humans have started to create their own cultural environment on the natural environment by adopting a settled life. As their knowledge accumulation increased, their needs have also increased and diversified and they have transformed into a structure that will put more pressure on nature, and the increasing pressure with the Industrial Revolution has gained momentum today. Humans have started to show their effect on the process directly or indirectly by increasing their effect on nature in proportion to the width of their cultural environment. They have benefited from the cultural area in the most way, this benefit has accelerated the formation on morphometry or has affected the formation by creating new morphological conditions foreign to the natural environment and has initiated new process formations.

For example; geomorphological unit is interrupted as a result of the land being split during highway construction. In the face of the new formation, the deformation process is triggered on the surface where the slope is created and the formation of new morphological units begins to make itself felt with the effect of the geological structure. Another example is the abandonment

of settlement areas. The settled units now completely become a pile and form an elevation (artificial hill). These mounds create new habitats or erosion surfaces specific to that area. In other words, even if interrupted, the process has started and continues.

The study of cities in the historical process has shown us that in the formation of landforms with geomorphological processes in these urban environments, human-induced areas often develop in natural processes.

High areas, unique climate and geographical conditions, rocks used as building materials and quarries have revealed settlements both in the open and underground. Changes in hydrographic networks such as excavation of elevations, filling of pits, terracing of slopes, construction of dams on streams, diversion of stream mouths or changing of their beds in these natural areas are examples of interventions that have continued until today in the areas where these ancient settlements began. In addition, advances made for defense or trade on the coasts, artificial lands collected, ruins formed, collapses or reconstruction in shallow cavities guide us in understanding the impact of humans on natural processes. Brandolini et al. (2019) defined this intervention as "human-driven processes over centuries" and emphasized that these processes represent the current outcome of each landform from multiple activities with "contrasting geomorphological" effects.

Coke (1976), Cooper et al. (2018) and Crutzen (2002) refer to the time when human impact on Earth and its geological record dominates natural processes as the "Anthropocene". Therefore, cultural geomorphology studies that require current understanding and evaluations in the theory and practice of this subject can address the definition of "Anthropocene".

Geomorphological research in the created cultural environment requires careful observation of the topography in this area. Information obtained from sources such as historical and geographical information and archaeological and geochronological (drilling records) is necessary to determine, map and express the chronology, including landforms that emerged or changed as a result of human activity. Therefore, the aim of geomorphological research in the cultural environment can be listed as follows:

a. To reveal geomorphological features that have an effect on the beginning of settlement and development in the following process.

b. To detect artificial landforms formed by human influence.

c. To evaluate the effects of human intervention on the geomorphological process.

d. To define current geomorphological assessment scenarios in different study cases.

Brandolini et al. (2019) determined that Anthropocene landscapes shaped by human-induced processes have been exhibited in Mediterranean coastal cities since approximately 3000 BC and especially in recent years, and that these human-induced geomorphological units constitute four main geomorphological change categories as drainage network changes, changes in the coastline, excavation and filling in slopes/valleys and streams/coastal plains, and artificial underground caves. Brown et al. (2017) mentioned that these process change categories should be evaluated as spatial and temporal changes "Anthropocene geomorphology", and Zalasiewicz et al. (2019) as "Anthropocene".

With cultural development, life, which was initially limited by the presence of waterways and topographic barriers, has turned to suitable areas with increasing demand with development, and has brought about various processes affected by humans, including reclamation works, flattening or erasing the topography, and filling of depressions. As a result, local sedimentation processes have become suppressed by anthropogenic proliferation and accumulation, which have higher growth rates, and have become activities that reveal mobility

with opposing geomorphological effects. The geomechanical properties of the soil are compromised by the diffusion of layers, reduce the resistance of the natural structure, and create underground voids, paving the way for the risk of collapse. Therefore, it has become necessary to determine the relationship between the functional use of the land for natural dynamics with an interdisciplinary study, and to identify and map the interaction of natural and human-induced processes with risk reduction measures for sustainable development.

As a result of all these evaluations; "What is the scope of cultural geomorphology, is it the study of man-made landforms?" questions should be asked. Of course, it is not only man-made landforms but also the estimation of the results of the disturbed natural balance, the interpretation of their beneficial or harmful effects and their explanation with an interdisciplinary approach, unlike environmental determinism. Protection of the environment is the promotion of the implementation of socio-economic tasks and the rendering of human-natural environment interaction meaningful. The cultural environment created by humans is in an area where natural processes are active and therefore will logically try to defend itself against these forces. However, this effort is aimed at preventing, reducing or destroying geomorphological processes. This situation is also an intervention in geomorphological evolution. It will either weaken or increase the process or cause it to change shape (Planation). Geomorphological development, defined as the lowering-flattening appearance resulting from the effect of erosion, is evaluated with the concept of planation. Sometimes, the structural activity it presents provides perfect harmony with nature and contributes to the functionality of natural components. Then the issue of protection will emerge. The complexity of human activity also causes thematic complexity of cultural geomorphology. Therefore, the discipline needs a clear systematization. In this context, Goudie (2007) explains planation with the example of filling a valley with debris and flattening a sand dune. He emphasizes that human intervention can be effective in both erosion and accumulation processes, and that this process, which occurs within the definition of planation, must be addressed.

Hale (1961), in his approach to systematize human activity based on its direct or indirect effects, includes direct effects (excavation, etc.) that lead to clearly identifiable results, and less identifiable indirect effects (acceleration of sedimentation) within the systematic scope of cultural geomorphology. Here, the following question immediately comes to mind: "Is the landform formed as a result of direct effects the clear purpose of human action or an inevitable effect?" In short, is it a primary or secondary landform? Szabo (1993) looks at this question in terms of its benefits to humans and gives the following example:

"Agricultural terracing on slopes is a primary landform, since the change in the slope character is beneficial to production. However, the accumulation of useless material in mining activities is a secondary landform." (Szabo, 1993)

1.1.1.Research Stages in Cultural Geomorphology Studies

The physical geography elements of a region and interventions made by humans on natural elements are the first source of information about geomorphology. The five stages mentioned by Panizza and Piacente (2008) in revealing the relationship between geomorphology and culture are recompiled for the study area and presented as research stages.

Stage 1: It can be expressed as the definition stage. It consists of the analysis of the structure of the study area and the expression of geomorphological evolution.

Stage 2: It can also be defined as the observation stage. It is the determination of interventions made by humans on geomorphology through cultural activities. It is based on field work.

Stage 3: It can be explained as the evaluation stage. Analysis of the cultural geomorphological area affected by geomorphological hazards and exposed to risk due to this in the study area. It is based on the evaluation of the data obtained through field work.

Stage 4: It is the modeling stage. It is the application of field risk analysis with progressive and regressive methods. This stage is the modeling of the effect of the use of cultural geomorphological assets on the natural environment and environmental impact. Stage 5: It can be summarized as the planning stage. It is the encouragement of correct action with positive returns in terms of both protection and improvement in terms of socio-economic aspects, where the correct management of the cultural geomorphological area cannot be separated from the knowledge of integration with the environment. It is the cataloging of "cultural geomorphosites" within the concept of geomorphological heritage.

2.Methodology in Cultural Geomorphology

Some studies conducted to evaluate the effects of human activities on geomorphological features show us that sediment is transported by “cultural denudation” at a higher rate than geological erosion on morphometry. A comparison should be made with denudation and sediment data in cultural lands, which is referred to as the “Geomorphological Footprint of Man” (Candrero et al., 2006). The perception of danger originating from the geomorphic footprint seems to be related to a growth (GDP) at local, national or global levels. Because increasing population, need, and use of technology cause geomorphic change affecting the sensitivity of the natural environment, acceleration of landscape evolution rates, and increase in geomorphological hazards. It is necessary to present a proposal to stop this geomorphic change and to regress the tendency to increase geomorphic disaster formation. Applied geomorphology, which is an extension of process geomorphology, addresses the effect of the geomorphological process on humans and humans on the process. Process geomorphology, which presents various models in the evaluation of this situation, contributes to the examination of the alarming problems accompanying human impact on the land. Therefore, the presentation of process geomorphology data and the conceptualization of human activity in the cultural geomorphological environment as cultural geomorphology should be the main theme. Cultural Environment: Concrete environments that are shaped according to the needs that form the basis of human lifestyle and social relations, and that display the production activities and consumption patterns in a simple manner. These environments become interesting with the rational interpretation of the qualities of geography and climate. They reveal their own characteristic features.Some studies conducted to evaluate the effects of human activities on geomorphological features show us that sediment is transported by “cultural denudation” at a higher rate than geological erosion on morphometry. A comparison should be made with denudation and sediment data in cultural lands, which is referred to as the “Geomorphological Footprint of Man” (Candrero et al., 2006). The perception of danger originating from the geomorphic footprint seems to be related to a growth (GDP) at local, national or global levels. Because increasing population, need, and use of technology cause geomorphic change affecting the sensitivity of the natural environment, acceleration of landscape evolution rates, and increase in geomorphological hazards. It is necessary to present a proposal to stop this geomorphic change and to regress the tendency to increase geomorphic disaster formation. Applied geomorphology, which is an extension of process geomorphology, addresses the effect of the geomorphological process on humans and humans on the process. Process geomorphology, which presents various models in the evaluation of this situation, contributes to the examination of the alarming problems accompanying human impact on the land. Therefore, the presentation of process geomorphology data and the conceptualization of human activity in the cultural geomorphological environment as cultural geomorphology should be the main theme. Cultural Environment: Concrete environments that are shaped according to the

needs that form the basis of human lifestyle and social relations, and that display the production activities and consumption patterns in a simple manner. These environments become interesting with the rational interpretation of the qualities of geography and climate. They reveal their own characteristic features.

Human beings carry out activities to sustain their lives by adapting to geomorphological elements that shape the natural environment. Thus, they create their own “environmental impact area”. New developments occur with human adaptation to the factors on the development of geomorphology and the elements that occur as a result of these events. As a result, all these interactions/changes create the natural environment. The results that emerge and their causes have positive or negative effects. Therefore, revealing the clear reflection indicators of human activities that affect geomorphological features in topography constitutes the main subject of cultural geomorphology. Analyses aimed at presenting concrete data are important in explaining the formation and development processes of geomorphological features.

Today, it can be evaluated that the impact of humans on nature and the impact of other geomorphological factors have the same importance. However, it is almost insignificant to compare the force exerted by humans with the forces of tectonic movements, volcanic activities and earthquakes, which are considered as the internal forces of the Earth. It would be a mistake to measure the human effect only based on the effect of external forces such as winds, glaciers, rivers, waves and currents. Because sometimes, topography can show more and faster activity and leave behind the forces that affect this process. The rapid increase in population eventually brings greater demands. In order to meet these demands, man begins to cultivate the earth much more. In fact, the population growth rate, which will continue a little faster in the future, emerges as a process.

For this purpose, changes in the control of the geomorphic system or the forces applied to this system depend on the balance between the affecting and affected forces in the "natural environment sensitivity concept" (This concept was proposed by Brunsden and Thomas in 1979). This balance refers to the direct effect on geomorphic processes, not on the characteristics of the environment (Thomas and Allison, 1993). As Brunsden (2001) stated, geomorphological evolution and material are formed by time and space changes resulting from the relationships between humans and the natural environment. Processes such as transportation, quarries, mining, ponds, settlement activities, agricultural activities, etc. provide direct or indirect effects on this evolution. Cultural geomorphology, on the other hand, presents an approach analysis to these relationships. This analysis is related to the dynamic factors affecting the natural environment evolution. The main subject of cultural geomorphology is to reveal the representation of the clear reflections of human activities affecting geomorphology in topography.

In order to understand cultural geomorphology, a methodology needs to be constructed regarding how the data will be produced and where the parameters will be placed in the morphological equation. In this context, the main basis of the cultural geomorphology methodology is to provide a clearer and more understandable expression with calculable models and mathematical formulas that will enable process analysis in terms of the functioning of the cultural process in the sample area and the development of geomorphological features.

In this context, as a first study:

1/25,000 scale topography and geology maps and 10 m resolution DEM data, satellite images and orthophotos should be analyzed in ArcGıs pro software to produce detailed data of the field (digital elevation model, geology, slope, river network, etc.). Satellite and orthophoto images should be used in mapping spatial change, and geomorphology and cultural geomorphology maps should be produced by supporting them with field observations.

As a second study:

In order to interpret the effect of human activities on the processes affecting geomorphological features and the units formed in the research field and its surroundings, the mathematical algorithm should be created using the "Potential Anthropogenic Geomorphology Index (PAJİ)" development and perception degree parameters created by Nir (1983). While the development degree reveals the human impact, the perception degree expresses the threats originating from human-geomorphological processes.

In order to reveal the relationship between geomorphological features and human activities, the PAJI formula given below can be used:

$$I=Up+DI/2x1/100x(Kc+Kr)$$

I: Potential anthropogenic geomorphology index

Up: Population rate

DI: Illiteracy rate

Kc: Climate type (Köppen)

Kr: Relief value

In order to evaluate the results of the formula above, Nir (1983) graded the parameter values between 0-1. If the result is less than 0.30, the effect size contains a low risk in terms of anthropogenic activities. If it is between 0.30-0.50, it indicates that the efforts to prevent problems can be evaluated, if a value greater than 0.50 occurs, it indicates that the anthropogenic geomorphology condition effect creates a problem to a large extent and that measures should be taken quickly to prevent problems. If the value is greater than 0.75, it can be concluded that the problems and risks of anthropogenic origin in the field are very high (Erkal, A. 2018, p.54).

PAJI parameters are considered to be a controversial source due to their inadequacy in fully explaining anthropogenic geomorphology conditions (Uzun, 2020, p.322). The fact that the relationship between anthropogenic conditions in the field and the illiterate population or the city/neighborhood population is very low and the levels of benefiting from technology, human desires and economic desires are at different levels cause an increase in anthropogenic pressures. The PAJI formula is preferred only in expressing the anthropogenic situation due to the presence of other factors that cause geomorphology to be re-evaluated in certain situations.

In the evaluation of geomorphological systems as shape and process structures, process-shape systems that interact with humans are considered as control systems. Rivers that are taken under control, protective structures against sea effects, coasts and organized caves can be given as examples of these systems. From this point on, except for the structure, humans affect topography or events within the scope of their developing knowledge and technology on process and time phenomena. Now, humans are an important factor of the Davis formula.

The geomorphological evolution of the natural environment is determined by the changes in landforms caused by erosion. Denudation-sedimentation is a strong determinant in the shape difference. This steady state causes the evolution to proceed at more or less constant rates. The rate of geological material transfer is accelerated by human activities directly and intentionally through excavation-deposition activities. Lu (2005) states that excavation and deposition activities indirectly cause material transfer, sediment supply and land evolution by developing natural processes. The activity becomes interpretable by modeling the evolution systematics of the field geochronologically. For modeling, it is necessary to access data with 3D laser imaging or sedimentation analyses of deformation and to create the model.

Since the time when humans started to engage in agricultural activities, they have exhibited some negative behaviors on the environment: consuming, destroying and polluting… This transformation and ongoing change has accelerated even more with the Industrial Revolution. The increase in the number of population continues, industrial activities are changing, developing and increasing with the developing technology. All these developments increase the pressure and threat on the natural environment. The activities that humans have put forward in the face of nature in order to adapt to the characteristics of nature or to continue living together have provided the formation of a cultural environment. People create a significant source of wealth with an effective feeling and a strong element towards these areas, explaining and introducing the living spaces they have created. People have conceptualized culture in order to convey their experiences and to ensure that the acquisitions they have gained are used to shed light on the future. Culture is important not only for the values possessed but also for providing opportunities for the learning and development of future generations. People leave cultural elements as a legacy for reasons such as protecting the natural environment they live in by keeping the beautiful feelings they experience alive. For this reason, it is important that the concept of cultural heritage is defined as "all material elements and intangible values created by previous generations and believed to have national and universal importance".

The culture of civilization is the sum of the products that occur by human activities disrupting or processing nature. Each element that embodies the cultural environmental characteristics of a region and the results of the interactions it presents is a cultural heritage. Based on this statement, the destruction in the natural environment has accelerated with the rapid increase in the population today. Great importance has been given to developing behavior at the international level against these threats. Ultimately, it has led to the emergence of the idea of environmental protection and natural heritage. In the face of the destruction and destruction of nature, the protection of the natural environment has become mandatory, the awareness of “cultural and natural heritage” has been created, and it has been agreed that the protection of values is a common problem of all societies/nations/states.

The research question “Can a geomorphological process caused by human activities in the natural environment be evaluated?” constitutes the main basis of cultural geomorphology studies. Within the framework of this basic question, is it possible for “change” to be defined and accepted by the geomorphology discipline, what is a “cultural geomorphological area”, what should be taken into consideration when evaluating, is there a counterpart to the concept of “culture” in the natural environment? Answers are sought to sub-questions such as.

The sub-hypotheses of cultural geomorphology research include the ability to apply cultural change to geomorphology in a historical perspective, to contribute to the equation between humans and the environment from a geomorphology discipline perspective, and to evaluate “Why should we build a geopark?” within the scope of the concept of “protection” for existing risks and dangers in the cultural geomorphological field (Baylak and Erkal, 2020).

3.Conclusion and Recommendation

It is necessary to define the geomorphological features that occur in the natural environment as a result of the culture created by humans, to establish the research methodology, to determine the subjects of interest, to reveal the research principles and evaluation methods, to explain the interdisciplinary approach and to determine its place as an applied geomorphology sub-discipline. The third stage is to evaluate the components of geomorphology in a geographical area as a cultural element and to examine their interactions. Cultural geomorphology elements, namely cultural geomorphosites, should be selected and evaluated, the cultural dimensions of landforms should be addressed and scientifically verified. In this context, the main methods of Cultural Geomorphology can be briefly stated as follows:

a) Geomorphological analysis: Obtaining quantitative and qualitative data to evaluate the hypsometric and lateral organization of the land surface and the morphological characteristics of geomorphosites. Here, structural and formal features and slope angles, etc. can be expressed. To evaluate the relationship between different environmental components and geological and geomorphological features.

b) Stratigraphic approach: To reveal geochronological data in order to reveal deformations occurring in the environment.

c) Paleogeographic analysis: To understand the origin and geological history of the components of geomorphosites.

d) Cultural geomorphosite definition: To interpret the effect of cultural environment activities on the development of structural features of geomorphosites.

e) Perceptual approach of cultural geomorphosites: To analyze educational and aesthetic perceptions.

The main research materials required for the use of the methods listed above are; remote sensing data (satellite images, multispectral data, SRTM etc.), 1/25,000 scale topography and digitized maps according to their subjects, geochronological evolution sections and morphometry analyses and field research data.

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