

# Evaluation of Tortum Waterfall According to the Criteria Used in the Selection of Protected Areas in Turkey

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## **Abstract**

For more than a century, several countries all over the world have taken certain areas under protection in order to protect their natural beauty and biological diversity. Today, protected areas, as well as their function of protecting nature, are considered as areas contributing to human welfare, reduction of poverty, and sustainable development.

In this study, it is established that with its landscape and natural landscape beauty, the Tortum Waterfall is visited by lots of tourists, especially in summer. The waterfall is the highest in Turkey and Europe and the third highest in the world at 48 m. The objective of our study is to refer to the current condition and importance of the area needing protection and, therefore, continually promote and contributing to regional and national tourism. With a hydrophical valley and area of 205.5 ha, the research area has been studied in accordance with the natural protection criteria and necessity of protection has been suggested. Moreover, it has been stated that the Tortum Waterfall should be taken under protection as a "Natural Park" and emphasized that the improvement plans of the area need to be prepared quickly.

**Keywords:** Tortum waterfall, natural parks, protected area, landscape planning, recreation

## **Introduction**

Today the protection, care, and rearrangement of nature is considered among subjects of increasing importance along with developments that appear in disfavour of nature in human-nature relations [1]. Protected areas have long been considered as a way of preventing the reduction of biological diversity in the world. Today, protected areas, as well as their function of protecting nature, are considered among the areas that contribute to human welfare, reduction of poverty, and sustainable development [2, 3]. By taking international standards into consideration, every

country has been forming its own systems of area protection in the direction of national area protection strategies [4-6].

The USA first applied acts of protection by setting up Yellowstone National Park in 1872. The natural area protection categories differ according to the country, depending on changing conditions and approaches. Therefore, the IUCN (International Union for Conservation of Nature) was set up in order to establish a general cooperation for the conservation of nature. Turkey joined the union in 1 January 1993 and the union has still been carrying out its studies on this subject. The protection areas are divided into 10 main categories by the union [1, 7]. According to the studies of the IUCN, the number of protected areas all over the world is approximately 100,000 and they cover approx-

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Table 1. The waterfalls in Turkey conservation status.

Name of the conservation area	Location (Province)	Yükseklği (m)	Waterfall Type	Area (m <sup>2</sup> )	Conservation status
Samandere Waterfall	Düzce	15	Single-drop Waterfall	109.955	Natural Monuments
Güney Waterfall	Denizli	20	Single-drop Waterfall	5.000	Natural Monuments
Mut Yerköprü Waterfall	Mersin	30	Single-drop Waterfall	1.115.717	Natural Monuments
Kurşunlu Waterfall	Antalya	18	Single-drop Waterfall	5.590.000	Natural Park
Güzeldere Waterfall	Düzce	130	Multiple-drop Waterfall	200.000	Natural Park
Tomara Waterfall	Gümüşhane	15	Single-drop Waterfall	70.000	Natural Park
Derebağ Waterfall	Kayseri	15	Single-drop Waterfall	100.000	Natural Park

imately 12 percent of the world's total land surface (1.8 million ha) [8]. Areas protected in various ways are being established in order to take next generations to visit the natural and cultural possessions in Turkey, which are both of national and international significance and the areas that represent important battles of Turks just as how they are. To do this, the use and protection of these areas should be balanced.

Areas protected by the law of National Parks, which was introduced in 1983, are divided into 4 categories; national parks, nature protection areas, natural parks, and natural monuments. As of 2013 there are 42 national parks, 189 natural parks, 31 nature protection areas, and 109 natural monuments in Turkey [9]. Some of these protected areas are rivers and waterfalls. Rivers and waterfalls are among the important natural resources that have touristic potential. Rivers attract attention as interesting natural wonders with their geological and geomorphological formations [10, 11]. In this context, the conservation status of the

protected waterfalls and their areas in Turkey are shown in Table 1.

Varied topographical structure of Turkey enhances her natural richness and beauty. In this sense, the structure increases the number of protected, and to be protected areas in Turkey as well. On the other hand, there are a lot of areas except those mentioned above that bear the features of being protected, but instead of being in this status these areas have been left to face their own destiny for various reasons. Tortum Waterfall is one of these areas. As a result of the rehabilitation works, the waterfall, which is visited by a great number of people, has been under great pressure. In this study, the current condition and protection value of Tortum Waterfall will be set forth. In addition, it is hoped that the area will be promoted and then presented to regional and national tourism in a sustainable concept. The data obtained at the end of the study will be submitted to the relevant institutions and organizations and so they will be informed about the area.

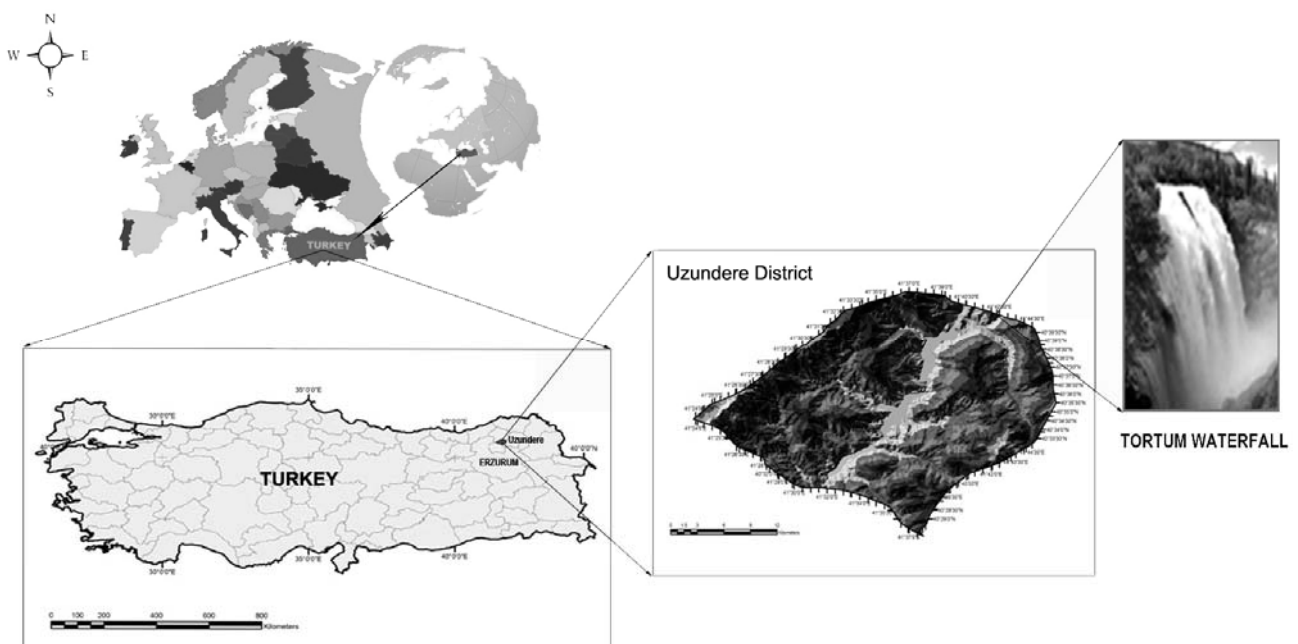


Fig. 1. The research area.

**Materials and Methods**

Tortum Waterfall, the research area, is geographically situated in the Eastern Black Sea Region and for being in the borders of Uzundere Province; it is governed by Erzurum City Province. Being a passageway between these two regions the area has a microclimatic structure. In terms of transportation, the area is 110 km from Erzurum City Province, 58 km from Tortum Province and 32 km from Uzundere Province (Fig. 1).

Tortum Waterfall is the longest waterfall of not only Turkey but also Europe and No. 3 in the world. Thousands of people visit the waterfall, which falls from 48 m. Determining the research area borders, the spring values of the waterfall lying in the borders of Uzundere Province and the natural limits surrounding it have been taken into consideration [12-14]. These areas are determined by taking

the ecosystem features and the topographic structure of the area (criteria of river, dry creek, hill, hillside, etc.) into consideration based on natural borders. The research area is situated in 41°39'34.99," 40°39'29.703" west, 41°41'21.518," 40°39'48.311" east, 41°40'19.202," 40°40'18.204" north, and 41°40'19.291," 40°39'23.482" south latitudes and longitudes. The research area is surrounded by Tortum Lake in the west, Cevizli creek in the east, and D-950 Erzurum-Artvin highway and Santral hillside and Çağlayan Village road to the south.

In this study determination of natural protection areas and rating of protection features as a result of association of the data about research area which have various formats and ingredients to each other are targeted. The method, which can be considered as a sample to studies on this issue, was first set forth by Forester (1973) and later on has been used by many researchers by being developed according to the features of the research area [15-20]. In the study NetCAD 5.0 mapping programs and the ArcGIS 9.3 software of the operation firm have been used by making use of the CBS techniques. Besides, it has been enabled that the whole spatial data shall be in accordance with UTM projection system and European, Goodetic Datum.

The first stage of the study consists of the selection of the area and determination of the objectives. In the selection of this area, it was taken into account that the research area has significantly protected its natural and natural-like landscape characteristics, and that the region, including the Tortum waterfall, is among the most important waterfalls for natural landscape beauty, and houses different plant species from the region as the area is in a microclimatic region.

In the second stage; the data of studies concerning the area has been gathered, visiting the area at certain times of the year, during the observation year, examination and the data gathering processes have been conducted about their status quo and these observations have been photographed. In the second stage, gathering the data about the research area, these have been evaluated.



Fig. 2. Digital terrain model of the research area.

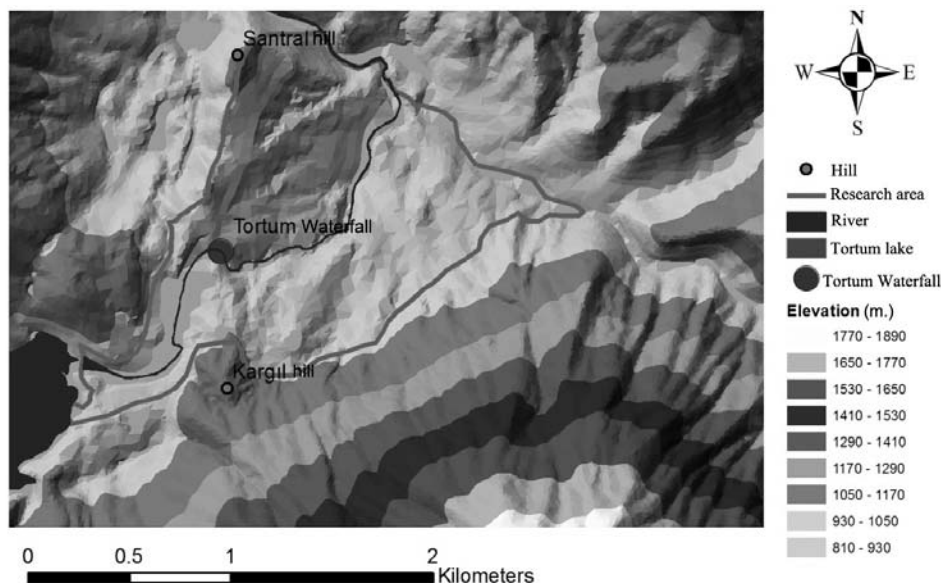


Fig. 3. Topographical structure of the research area.

At the third stage, evaluating the gathered data, social, cultural, and physical analyses of the area have been carried out. At the fourth stage, digitizing process of maps in different scales has been carried out and collected in a database, it has been transferred to geographic information system (GIS).

Fifthly, in the light of research findings and analysis of the research area it has been tried to determine whether it is worth preserving and landing values that have been examined in terms of natural protection criteria. These criteria are put in order as follow: size, position/location, transportation, naturalness, imperilment, non-renewableness, fertility, abundance, variety, rarity, integrity, and representation.

In the sixth stage, the examination of the field has been carried out within the scope of national park law, the protected area definition that has been presented, and a "Protected Area Map" that has been formed. In the seventh and last stage: a general evaluation of study has been performed and when the study is completed, in accordance with the aim of the study, it will be delivered to the Ministry of Forest and Water Affairs, Nature Conservation and Natural Parks Head Office, and a database will be created for subsequent studies of the area.

## Results

### Socio-Economic Structure of the Research Area

The research area, being on the historical ways linking East Anatolia to the Black Sea region and its being a microclimate region, raised its strategic importance. Consequently it has been inhabited throughout history and has had a substantial population. Caglayan village, which is included in the research area, and Tortum lake and waterfall are administratively connected to Uzundere. According to 2007 population census results, the population of Uzundere county town is 3,716 and that of its villages 5,622, thus total population is 9,338. When the population of Caglayan village is examined in regard to years, in 1997, 2000, 2007 the population has been found to be 473,467 and 525 [21].

Economic activity that dominates the Tortum watercourse basin is also seen in the study area. The economy of Caglayan village in the study area is based on agriculture and stock farming. Covered greenhousing has been one of the important means of existence since 1997, as well. The most important factor determining the form of agricultural activities in the research area is the natural environment.

Especially topographical factors and elevation yield crop and fruit growing activity with the valley plain to roll up the hillside, which has a low slope. Fertile land, irrigated farming, and convenient climate conditions in the valley in low contour line bring on the development of fruit growing and gardening [22].

There are not any industrial activities in the research area. By means of projects designed in recent years for the research area which cause pollution with resources of sight-seeing, demonstration for abroad has been given, brochures have been prepared, training and seminars for local people

have been conducted. Operating home pensioning which started in 2008 has been offering accommodations for tourists and thus enabling them to discover nature. By this way the number of tourists visiting this area has substantially increased [23]. According to the data collected from the managing office of the waterfall, more than 100,000 domestic and foreign tourists have been visiting annually.

### Nature of the Research Area

Topographical structure, geological structure, hydrological structure, soil structure, climate, natural vegetation, and wildlife form the characteristic of nature of the research area. The research area which features a water basin in terms of hydrographical features has approximately 2 km<sup>2</sup> area. The area which is a catchment basin with its overall picture is formed by landforms, geological structure, and fluvial erosion. There are great altitude differences between the valley plain and the highest parts of the mountains. The area has gained a hill-like appearance where straight and continuous hillsides dominate as a result of natural wear (Fig. 2).

There are great altitude differences between the valley plain and the highest parts of the mountains. For example, while Porsburun Hill, the highest part of the valley where the Tortum Waterfall (1000 m) falls has 2264m altitude, the lowest altitude of the valley is 800 m. The relativistic altitude difference between the highest and the lowest parts is 1,460 m (Fig. 3).

Geomorphological features of the Tortum watercourse is also seen in the research area, and these are a deep and narrow valley plain and hilly fields. Geological structure of the region, tectonic movements, and external factors have an effect on the landform in question. The landform of the area is formed by geological structure and fluvial erosion. It is deeply cracked by Mesozoic formations. It is formed approximately in the middle of the 1700s. The Tortum watercourse which passes over Tortum Lake forms the biggest landslide rampart of Turkey, from the landslide rampart [24].

Tortum Waterfall is the most important scenic beauty of the region. Tortum Lake is formed by banking up a mass that became disjointed from Kamerli Mountain, rising from western part of the region, to the front of Tortum watercourse. After that event Tortum watercourse, not backtracking its old seam, opened a new seam and formed Tortum Waterfall in the 1.2 km northeast of the seam of the present lake (Fig. 4). The waterfall, its watermass falling from 48 m, babbles sonorously only between May and July with the help of melted snow water [23].

Leaning conditions are the dominant factor among the formation process of the soil in the research area. Thus, in the research area in which leaning values are quite high, as a result of material coming to physical and chemical dissolution, being transferred by precip waters becoming a runoff throughout lampings, the soil profile has not developed [25]. It is possible to see the general climate features of the region. Altitude over sea level of the study area is approximately 800 m and yearly mean temperature is 11.2°C.



Approximate yearly precipitation of the area is 304 mm. When the temperature's direction is examined, it is remarkable to see that the warmest month is July 19.6°C, the coldest month is January, at -3.4°C. Dominant wind direction of the research area is south and secondarily is north [26].

The research area has substantial potential in terms of wildlife existence. In addition to the Çoruh Valley's importance in terms of floating raptor immigration, with the population of breeding *Gypaetus barbatus*, *Gyps fulvus*, *Aegypiusmonachus*, *Tetrao mlokosiewiczzi*, and *Tetraogallus caspius*, it gains the status of an important bird area. The research area has the characteristics of an important mammal area with the populations of *Ursus arctos*, *Rupicapra rupicapra*, *Capra aegagrus*, *Canis lupus*, and *Lynx lynx* [27]. In addition, the area is in a highly important location owing to Tortum Lake which has the status of an international wetland. Right along with the bird immigration, the area has high potential in terms of birdwatching tourism.

A general characteristic of vegetation cover of the research area is that it has the position of a transition zone under the influence of terrestrius and semi-terrestrius climate conditions because of its being in the Iran-Turan Phytogeographical Region. Vegetation rises in April and May. Main bush and tree kinds widely appearing along the Tortum watercourse are as follows: *Hippophae rhamnoides*, *Populus nigra*, *Populus tremula*, *Salix tridentata*, *Salix babylonica*, *Tamarix symrensis*, and *Myricaria germaniaca*. We can put the downstream welwitschias in order as: *Ranunculus repens*, *Ranunculus brachylobus*, *Mentha spicata*, *Caltha polypetala*, *Veronica anagallis-aquatica*, *Veronica beggabunga*, *Typha latifolia*, and *Gentianella ciliate* [28].

### Examination of the Research Area in Terms of Nature Protection Criteria

Tortum Waterfall has an important place among the most important waterfalls in the world. The research area was declared as a first-degree protection area by Erzurum Cultural and Natural Properties Protection Council on 5 May 2000. However, it is seen that such important areas are protected as national parks, natural parks, natural monuments, and nature reserve areas carrying more values, when the status of protection in Turkey and in the world is examined. It is seen that some waterfalls in Turkey are protected as nature monument and more of these are protected at the status of nature parks such as Victoria in Uganda, Niagara in the United States of America, and Imatra in Finland. Samandere Waterfall in Düzce city is protected as a nature monument, Kurşunlu Waterfall, a tourist attraction in Antalya, is protected as a natural park.

One of the most important problems of our country is protected areas being under the control of different ministries and their being protected under different protection status. [29,30]. Sometimes a place is protected under several protection status. Because the definition of natural protection areas and scientific criterion, authentic data and international protection technics found in the present law, regulations, and decisions are not used as base, dominance of incapability in terms of protection and subjective value judgement is experienced in the matter of definition, theory, and application of natural protection areas. Considering this fact, it is being discussed how to provide opportunity for structuring and what kind of structuring or how to prevent the structuring more than the aim of protection of habi-

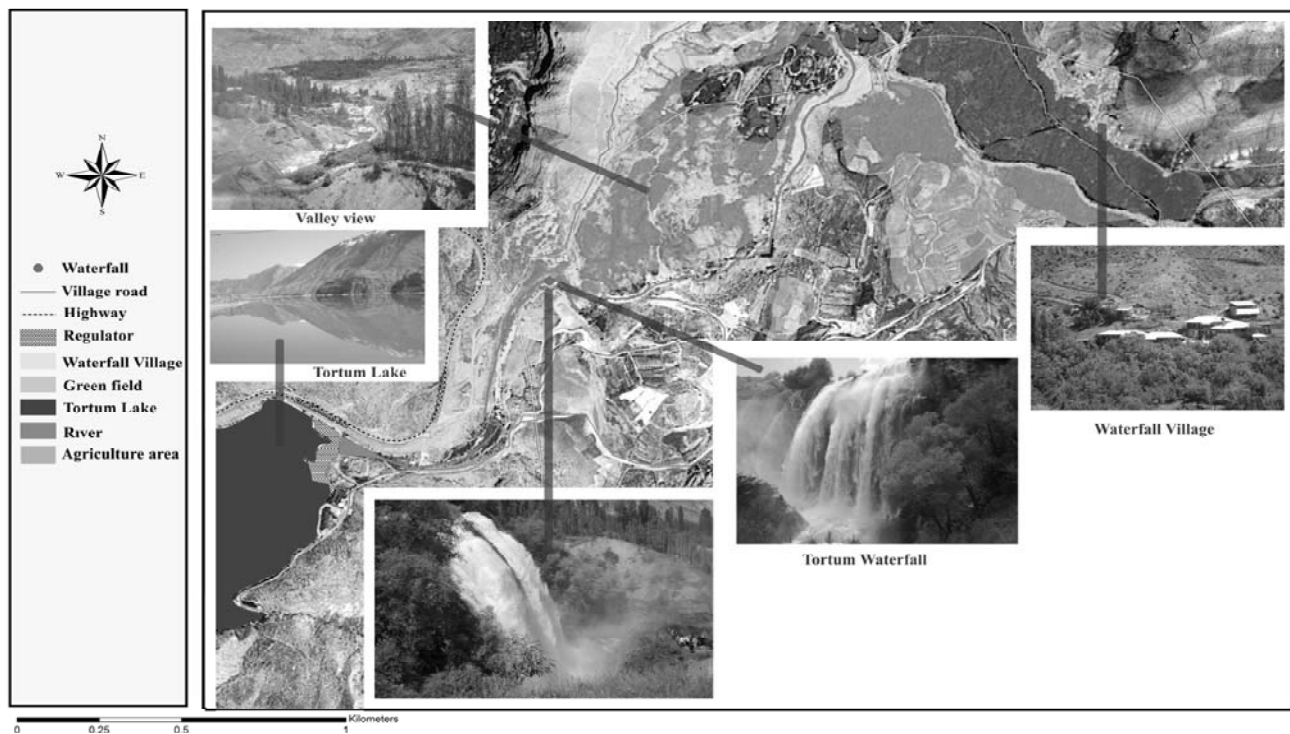


Fig. 4. Views from the research area.

tat, natural assets, and protection area. In such an approach it will come to the fore as the most important reason in forming the missing plan decisions for a protection area [31]. With all these reasons we see that the places that have been parted as protected areas parted to other protection status. It is seen that when it is examined in terms of size, position/location, transportation, nature, imperilment, unrenewableness, fertility, abundance, variety, rarity, integrity, and representation which are nature protection criteria, the waterfall, the highest in Turkey and Europe, the third highest waterfall in the world, provides unrenewableness criteria.

Accordingly, the area has the quality of being a national park, a natural monument, and a natural park. Yet the area is less than 1,000 hectares; thousands of tourists' visiting the area and in accordance with the examples given above bring the necessity of being protected as a natural park of the area into the forefront. Natural park criteria in our country consists of 5 provisions as follows:

Natural park criteria in our country consists of 5 principals as follows:

1. They must have superior natural physiogeographical structure (at national and regional level), vegetation and wildlife features, and recreation potential with beautiful scenery.
2. They must be large enough to provide unity between resources and scenery.
3. They must have a different and rich potential in respect to especially outdoor recreation.
4. They must include interesting examples of local customs and traditions, traditional landuse planning, and cultural scenery.
5. They must be under state ownership.

When these items are studied, it is obvious that the area has a very different rich vegetation and wildlife because it is in a microclimatic region. A region's own characteristics enable different ecosystem types to develop, and thus enrich biodiversity.

Tortum Lake, which makes up the valley and its surroundings houses many bird species that are only native to the eastern Black Sea region. Besides, its variable topographic structure and its feature of being a valley present good scenes in respect to scenery and enable proper facilities for recreation. The facility that is readily available in the area has various units for recreation. This 205.5 hectare area specified in the study is large enough to provide unity between resources and scenery. The area also has such recreational opportunities as trekking, photography, and picnicing. Visitors coming from urban areas are especially welcomed by country life examples in the region. But there are state and private ownerships within the specified borders of the area. The places posing trouble on that issue must be publicized and the ones posing no trouble must be left as they are. Digital cadastral data indicating the borders and the areas of real estate in the research area are given in Fig. 5 [32].

Private properties within the research area (their cadastral parcels) cover a total of 77.4 hectares. It turns out that the research area studied in view of natural park criteria above mentioned provides these criteria easily. Also, the fact that the area is used as a natural park by local residents reveals its suitability for having this protected status. After determining the protected status in the study, the situation of an area's protected districts was determined. In the research area Tortum Lake, which is the starting point of the study, and Tortum Brook, tied to it, was planned as "Corine Areas."

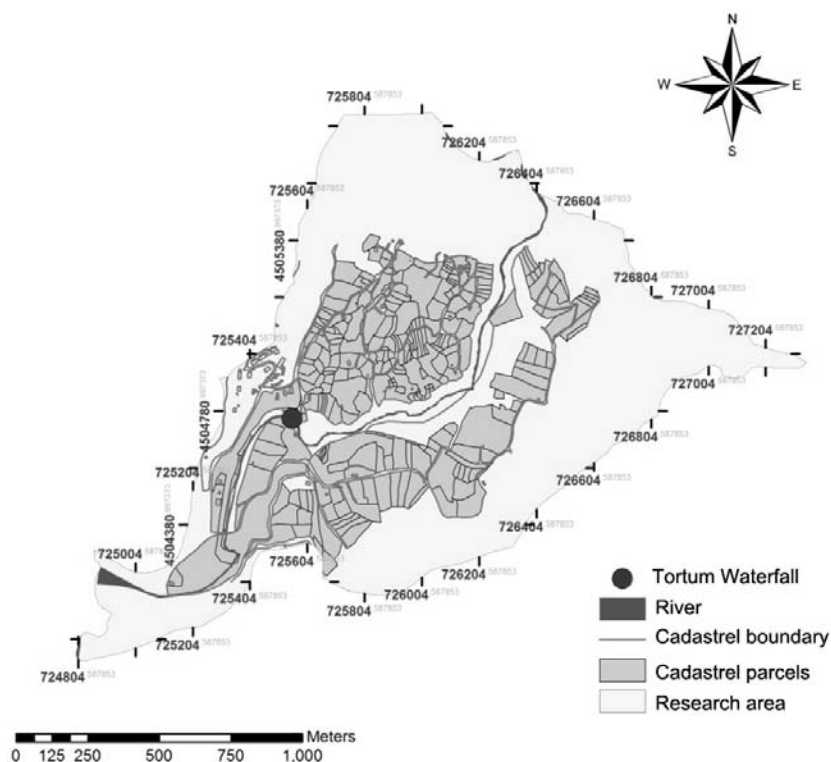


Fig. 5. Digital map showing cadastral parcels in the research area.

The distance from the water level of Corine areas; publicising works were paid attention to be the least for waterfall regarding the area's unity and property status. Corine areas for the waterfall were determined to be 0.008 ha. Private properties in the Corine areas zone make up approximately 0.0056 ha.

Corine areas for the river were determined according to the present usage conditions and the topographical structure of the land as 20 m on the ground formed by natural habitats such as reedy, scrub, stony, and dune from the point that water in the rivers touch the land toward the land, and it has been considered as a River Protection Strip. Corine areas for the river are determined as 0.016 ha. A buffer zone in the research area has been determined as the boundaries of the valley, which are the boundaries of the research area at the same time. The zone covers approximately 205.476 ha<sup>2</sup> (Fig. 6).

According to Benett (1991), Bishaff and Jongman (1893), Nass (1996), J. Abstal (1991), and the Council of Europe et al. (1896), core areas are places that include important ecosystems and provide the habitat needs of these species. Due to the fact that nature protection policies vary according to countries, there are neither standards in determining criteria nor size determination of the core areas. The size of core areas varies in ecological features, legal-supervisory status, location, scale (national, regional, local etc.), and objectives [33]. In our country there is not a particular standard value for the protection area borders in selecting the areas targeted to be taken into protection As a matter of fact, an approach that is restrictive and in which standards are proposed in distance may not always result

positively. Because during a land survey, width of the protection area is mostly determined as the ecosystem, topography determined as the ecosystem with topography of the land and natural borders.

### Discussion

The Tortum Waterfall, subject of the study, is situated in the Tortum Creek Basin and has a distinctive place in Turkey with its attractive topographical structure, biological diversity, and exclusively beautiful natural landscape.

It has been established that the research area should in general have the status of protection as a natural park according to the National Park Regulations. However, determining an area as a protected area is not enough for protection. The most active and important factor for the protection areas is inhabitants of the area.

No achievements can be expected if the inhabitants are ignored. They should be asked about their requests and the positive and negative aspects of tourism should elaborately be told to them. Therefore possible advantages and disadvantages stemming from the status of a protection area should elaborately be told to them, and they should be relieved and their support should be acquired [18] (several studies on this subject have put importance on this issue [34]). With its touristic potential, ecology, cultural and historical features, Margoon Waterfall located in the Fars province in Iran has attracted attention to the danger stemming from the increasing imbalance between the capacity of the area and the number of tourists [35]. Waterfalls have

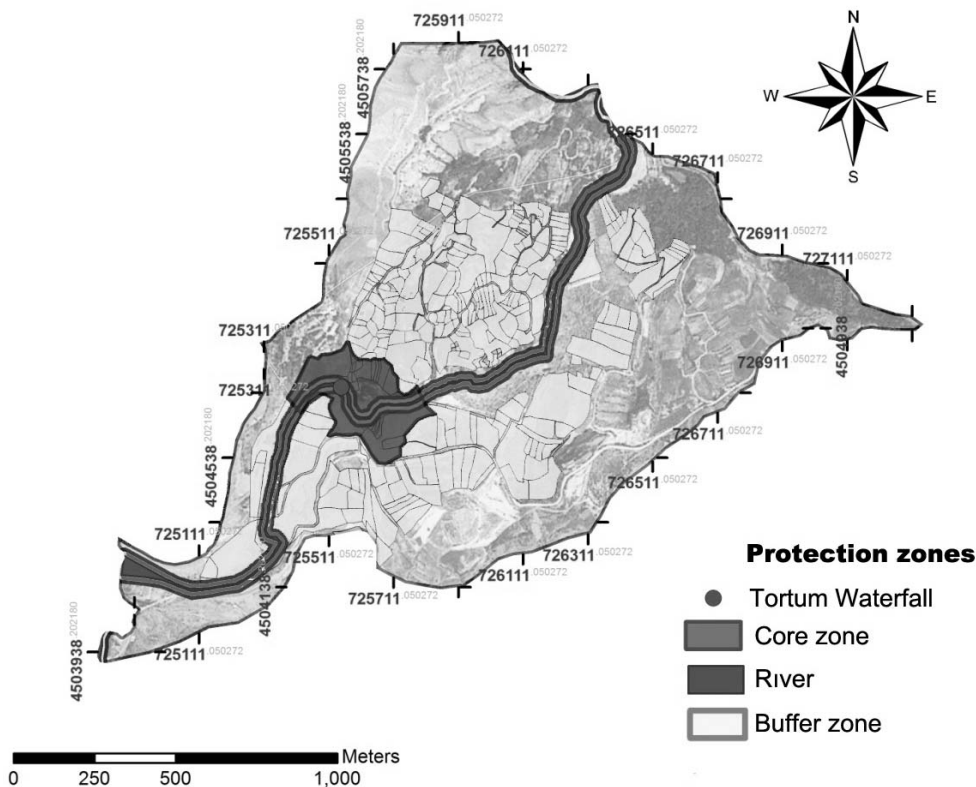


Fig. 6. Protection areas in the research area.



been examined by economists and geographers in the theoretic frames, to do so their places in recreation and tourism have been examined with examples from various places in the world (United States America, Canada, England, and Jamaica)

In conclusion, Tortum Waterfall, the research area, has a status in which it attracts the attention of both Turkey, and Europe and even the world as well. In this study the need for this waterfall to be announced as a natural park has been revealed. However this cannot be enough, either. Because in Turkey it is usual for many protection areas that there have not been many visible differences except the change in status only. For this reason upon the announcement of the protection status, developmental plans must be prepared and necessary practices must be performed. It is crucially urgent to prepare a developmental plan in the balance of protection and usage. Because this area attracts a great number of visitors mostly in May and June. As a result, the area is exposed to see intense anthropogenic pressure. In addition, the more that local inhabitants contribute to protection practices, the more success will be achieved, which helps the waterfall to be preserved for future generations.

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