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# Determination of Recreation Areas in Acarlar Longoz *

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**Abstract**
*The protection of nature and the environment, the preservation of the diversity of ecosystems without jeopardizing their integrity, and their sustainable development are important for sustainability. The Acarlar Floodplain is an extraordinary tourism and recreation area in terms of its ecological and landscape features. In the Acarlar Floodplain, which has recently become an important tourist destination, it is important to determine the attractions for daily recreation without neglecting the conservation value. The aim of this study is to identify suitable areas for hiking and birdwatching in the region using the weighted overlay method. The results show that most of the region is restricted areas for targeted activities, especially birdwatching, due to the different conservation status of Acar Longoz. The 1st degree suitable areas for hiking activities cover 226 ha and 4169 ha fall under the 2nd degree suitable category. The 1st degree suitable areas for birdwatching cover 16 ha, while the 2nd degree suitable areas cover 487 ha. The results provide essential inputs and an exemplary scientific methodology for the development of the current ecotourism project and wetland management plans.*

**Keywords:** *Acarlar Longoz, Birdwatching, Hiking, Protected Area, Recreational Planning*

*This study is not included in the study group that requires TR Index Ethics Committee Approval.

## 1. Introduction

The area protection practice aims to conserve the geographic context for various purposes such as scientific research, nature education, and protection of natural and cultural values. The idea of protecting nature in a recreational sense has been discussed since the middle of the 20th century (Zasada, 2011). In terms of their natural characteristics and recreational potential, protected areas provide a unique environment where people can do sports, relax, spend their spare time, and renew physically and spiritually (Caner, 2007; Eagles & McCool, 2002). Accordingly, natural environments have become highly preferred recreation and tourism destinations (Andkjær & Arvidsen, 2015; Ghorbanzadeh et al., 2019).

Spatial restrictions can cause problems when planning recreational activities in protected areas, as protected areas generally aim to protect the natural environment. Therefore, recreational activities are not allowed or are restricted in certain areas (Hammer, 2016). These restrictions can limit the use of certain areas and make planning more difficult. If the protection of the natural environment is not adequately considered when planning recreational areas, shortcomings such as neglecting the protection of the natural environment (Sun & Wang, 2024), assessing environmental impacts, failing to manage visitor density, and failing to promote sustainable use (Farrell & Marion, 2002) can lead to problems such as habitat degradation, overexploitation of natural resources, and loss of biodiversity (Mora & Sale, 2011; Ayyad, 2003; McNeely, 1994). At the same time, failure to effectively manage visitor density in protected areas can lead to problems such as pollution, damage to wildlife, and overexploitation of natural resources, particularly in popular areas (Farrell & Marion, 2002).

Water bodies and forests make the protected areas even more attractive, providing psychological relief to the visitors (López-Mosquera & Sánchez, 2011). Recreational activities in and around water in the last 30 years are among the most preferred activities in many countries (Jenkins & Pigram, 2005; Mimbs et al., 2020). The research of Komossa et al. (2018) in the Netherlands and Switzerland, conducted by analysing photos, shows that people highly prefer water-related features. Howley (2011) study of landscape preferences in Ireland indicates that the public prefers areas around water. Another study in Sweden reveals that areas with water are the most preferred places by the public for recreational purposes, followed by forests (Ezebilo et al., 2015). Consequently, regarding the diverse and attractive resources they host, protected areas, especially ones with water bodies, are unique destinations for recreational activities (Gülez, 1990; Koçan, 2012) and have become popular tourism destinations.

Being significant ecosystems and providing shelter for migrating birds, mammals, reptiles, etc. (Abraham, 2015; Karia, 2012; Keddy, 2010), wetlands make precious water bodies with diverse potential for recreation. Wetlands also have essential functions, such as supporting fish production, feeding the groundwater level, providing water supply for agriculture, and flood control (Hartig et al., 1997; Maltby, 2009). For this reason, they have become an indispensable value for the people living in the environment as well as the wildlife (Aber et al., 2012). The protection of wetlands has been a topic of interest in recent years with the increasing interest in wetlands ecotourism. Ecotourism is considered an instrument to protect natural resources and provide economic support for local communities (Xu et al., 2020). There have been concerns about the degradation of wetlands due to public unawareness and the lack of strategic planning and management to protect them (Turner, 1991; Turner et al., 2000; Wang et al., 2008). Wetlands also serve as transition zones between aquatic and terrestrial ecosystems (Hammer & Bastian, 2020). Therefore, any changes in one of the two would affect the quality of the landscape. Wetlands within developed landscapes indicate higher environmental knowledge, improved public health, wildlife habitats and recreational activities, and connection between humans and nature (McInnes, 2013; (McInnes, 2013; Tafahomi & Nadi, 2021).

The intensity and type of recreational activities in protected areas can have a negative impact on the balance and functions of the ecosystem (Chun et al., 2020; Kim et al., 2019; DeFries et al., 2007). For example, disturbance of wildlife and habitat destruction can disrupt the balance of ecosystems. When human needs take precedence, the sustainability of protected areas can be jeopardized and problems such as excessive tourism, resource consumption, and waste production can occur, which can jeopardize the ecological and socio-cultural values of the area in the long term (Taiminen, 2018; Zeng et al., 2005). As protected areas are designated to protect natural and cultural values, conservation objectives may be overshadowed when human needs take precedence and protected areas may become vulnerable to undesirable changes. For these reasons, not only human needs but also the protection of natural and cultural values should be taken into account when planning suitable recreational areas in protected areas. A balanced approach should be taken and the sustainability and integrity of protected areas should be considered.

Some of the protected areas are planned and managed for recreational and touristic purposes worldwide in accordance with the legislation, scientific requirements, and protection priorities (Becken & Job, 2014; Bishop et al., 1995; Morea, 2019). Thus, it becomes possible for individuals to sustainably benefit from these resources via different recreational activities such as camping, picnicking, photography, hunting, wildlife watching, climbing, hiking and jogging, bird watching, and cycling. Since millions visit protected areas daily for tourism and recreation, motorized and consumptive activities might threaten vulnerable ecosystems (Liu et al., 2001; Wilkins et al., 2019). It is significant to consider the positive and negative ecological effects of these activities and create a sustainable balance between protection and use (Altunöz et al., 2014; Polat & Polat, 2016; Tosun, 2001). Reed & Merenlender (2008) note that appreciative activities, such as hiking, wildlife viewing, and photography, do not have many destructive impacts on the areas. Moreover, these recreational activities are mostly adopted to increase public support for the topics regarding the conservation of the areas, habitat protection, and restoration. Also, recreationists engaged in nonmotorized activities are more concerned about the degradation and loss of ecosystem services (Pickering & Rossi, 2016; Wilkins et al., 2019).

From this perspective, holistic, rational, and appropriate physical and management plans should be developed to transfer existing resource values to future generations (Bilge Ozturk et al., 2022; Ciegis et al., 2009; Kılıç, 2018). There are various approaches to addressing recreational use interaction and planning for different types of protected areas (Bentsen et al., 2010; Breiby et al., 2022; Liburd et al., 2023; Moseley et al., 2013; Yuan et al., 2023). According to the IUCN protected area system, at least ¾ of the area should be allocated for the primary protection purpose, and the other land use targets should be determined harmoniously (Kuvan, 2012). While tourism and recreation can be considered the main purpose in national parks, natural monuments, and landscape protection areas, they are not permitted in nature reserve areas. Limited recreational uses are allowed in managed ecosystems and resource protection zones (McLachlan et al., 2013; Yıldız, 2019). Regardless of the protection status, the mentioned decision-making and planning practice requires the analysis of the diverse inventory consisting of natural and cultural data to determine, supply, organize, and make the necessary spatial use and conservation decisions.

The process of planning suitable recreational areas in protected areas worldwide and in Türkiye is based on similar basic principles, but there are also some differences. Globally, it is a comprehensive process that follows the guidelines of organizations such as the United Nations Environment Program (UNEP) and the International Union for Conservation of Nature (IUCN) and often includes a detailed spatial and suitability analysis supported by various scientific and technical tools (Job et al., 2020; Charabi & Gastli, 2011). These analyses take into account topography (Qi et al., 2022), ecological factors (Rocha et al., 2021), socio-economic factors (Wilkerson et al., 2018), visitor demand (Gül et al., 2006), and other important factors. Around the world, the assessment of suitable recreation opportunities often takes a long-term perspective and aims to preserve the natural and cultural values of the area, meet the needs of visitors, and promote sustainable tourism practices. Different recreation types and activities are examined and a balanced approach is taken to the different options.

In Türkiye, on the other hand, the planning of suitable recreational areas in protected areas is generally based on legal regulations established at a national and local level. Institutions such as the Ministry of Forestry and Water Affairs and the Ministry of Environment and Urbanization are responsible for the management of protected areas (Kuvan et al., 2018; Çiçek & Taş, 2018). Planning is carried out with a centralized management approach (Cakar, 2018) and the participation of local communities is sometimes insufficient (Hatipoğlu et al., 2016). Spatial and suitability analyses are important for the planning process, but the level of detail and scope of these analyses are sometimes rather limited compared to international standards. It can sometimes be difficult to adequately consider the alternatives in line with the protection of ecological and cultural values, especially in the face of increasing pressure and conflicts of use in tourist areas in coastal regions (Atik, 2010).

Considering its diverse natural and cultural characteristics, Türkiye hosts many protected areas (Bozkurt et al., 2023). Amongst these are world heritage areas, wetlands, Ramsar sites, biosphere reserves, special environmental protection areas, and Natura 2000 sites (Albayrak, 2010; Güneş, 2011). There are 4985 protected areas in the country, of which 3279 are natural sites (Korunan Alanlar, 2023). These areas are highly demanded recreational and touristic destinations, revealing the necessity of determining the characteristics and potential of the region for target purposes, following protection priorities, and producing specific plans. Planning processes for protected areas are carried out by different institutions depending on the scale, function, and administrative purposes. The general framework of the approaches followed so far has been on how and to what extent existing natural resources can meet human needs (Mebratu, 1998; Yenilmez-Arpa, 2011). However, international planning perspectives have recently been integrated into the national legislation, which has had a positive impact on preparation of long-term development and management plans for the protected areas. According to the Ramsar Convention, wetland management plans are also developed for Ramsar sites in the country (Elvan & Birben, 2021; Tırıl & Baylan, 2009). Although the Ramsar Convention emphasizes the importance of conservation and promotes the sustainable use of wetlands, the process of planning suitable recreational areas in protected areas is often based on national legislation, local authority policies, and international best practices. In this process, the protection of ecological and cultural values, the sustainability of natural life, and the enhancement of the visitor experience must be reconciled. Therefore, the fact that the Ramsar Convention is protective does not mean that the process of planning suitable spaces for recreation in protected areas is also protective.

One of the most significant protected areas and wetland zones in Türkiye is Acarlar Floodplain Forest (Acarlar Longoz). Acarlar is amongst the most valuable protected areas in Türkiye in terms of both national and international importance, and it is the biggest floodplain forest area in the country. Due to its unique characteristics, delicate ecosystems, and rich biodiversity, Acarlar has been managed under different protection statutes. Acarlar has a very high potential and is extremely attractive for a wide range of recreational activities besides absolute conservation requirements. Therefore, a wetland management plan has been prepared for the Acarlar Longoz regularly since 2009 against problems such as the destruction of the floodplain forest, the decrease in biological diversity, and the deterioration of the socio-economic structure in the region (Çevre ve Orman Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü, 2009). This management plan plays a significant role in the spatial and strategic decision-making process for the future of the region and constitutes an essential basis for sustainable recreational uses. It is necessary to comprehensively evaluate the area in line with the legislation, protection purposes and priorities, existing characteristics, and needs and demands of the individuals to determine the potential recreational zones properly.

During the mentioned processes, geographical information systems (GIS) is widely used to determine the recreational potential of sites. Many studies focus on determining the recreational potential of lands using GIS. Senevirathna & Gunathilake (2015) highlight the necessity of GIS implementation in tourism while benefiting from different GIS analyses to identify the recreational opportunities and the quickest paths connecting different destinations in Udawalawe National Park, Sri Lanka. In the research of Kuşçu Şimşek et al. (2018), a variety of GIS-based analyses is performed with different data sets, such as protected areas, wind direction, digital elevation model, land use, highways, aspect etc., to determine the suitable lands for paragliding in the rural of Sivas province, Türkiye. Diktaş Bulut (2018) aims to select the potential recreation areas in the Maçka-Altındere valleys, Trabzon, Türkiye, and made a suitability overlay mapping with GIS capabilities. The author establishes a 5-level terrain suitability scale to address the recreational potential in accordance with scenic beauty, accessibility, surface landscape, tree type, and stand condition.

Researchers around the world have adopted various methods to assess the suitability of recreational activities and their impact on protected areas by using multi-criteria evaluation (Charabi & Gastli, 2011), measuring visitor needs (Gül et al., 2006) or observing visitors (Muhar et al., 2002), conducting analysis and using categorization (Popović et al., 2018), comparing current and potential preferences and visitor use (Beeco et al., 2014). However, there is a lack of high-quality research on the suitability of recreation planning in protected areas, especially in Türkiye, to enable more thorough and holistic planning that balances people and nature, rather than prioritizing people and their needs over nature. Within this context, we aim to determine the most suitable areas for two prominent recreation types, namely hiking and bird watching, based on a GIS-aided multi-criteria decision-making analysis and put forward a sample approach and methodology for the stakeholders, planners, decision-makers, and authorized organizations involved in the development of the spatial and management plans including recreational uses in the protected areas. To this end, we used the weighted overlay method to spatially assess the cultural and national characteristics of Acarlar Longoz and produce 3-level suitability maps for hiking and bird watching. No similar spatial analysis and/or research was made within the study area, although there has been an ongoing ecotourism project and the Wetland Management Plan development process since 2009.

## 2. Literature Review

Douglass (2013) defines the term recreation in his book as a healthy activity practiced for fun and pleasure that includes any action that refreshes the individual's mental attitude and sees recreation as a form of play. This fact is also reflected in the declaration of leisure as a human right (Jennings, 2007). When the concept of recreation is examined with a systematic approach, it is found to encompass activities such as health, exercise, and sport. Recreational activities that involve physical and experiential interactions with the natural environment are among the most appropriate ecosystem services, especially those provided by green infrastructure. Nature-based recreation includes many physically intensive outdoor activities. At the same time, this type of recreation has a restorative and healing effect on human health and well-being (Cortinovis et al., 2018). For this reason, conducting recreational activities and monitoring vegetation and wildlife have become very popular, especially in nature reserves (Fisichelli et al., 2015). However, if not managed effectively, these activities can have a negative impact on natural ecosystems and visitor experiences (Chun et al., 2020; Kim et al., 2019; Monz et al., 2010; Watson et al., 2016). These negative impacts include disturbance of wildlife (Kays et al., 2017), loss of vegetation (Barros et al., 2013), degradation of landscapes and habitats (Leung et al., 2011; Zuckerberg & Porter, 2010) soil compaction, and loss of drainage properties and pore volume (Navas Romero et al., 2019), etc. This can happen in different ways. Jones et al. (2018) find that 33% of protected areas are under high pressure from anthropogenic factors. Hausmann et al. (2019), emphasize that 17% of IBAs (the world's Important Bird and Biodiversity Areas) are highly threatened. For this reason, it is of great importance to manage recreational activities wisely, especially in protected areas.

The management of national parks has been described as “a complex situation” (McCool & Moisey, 2008). This is because uncertainties and conflicting objectives can arise in management processes. Given the complexity of sustainable development in protected areas, this situation is increasingly being studied by academic circles (Allendorf, 2022; Farrell & Twining-Ward, 2004; Miller et al., 2005). The concept of sustainability can be examined under three main headings: the activity-based approach, the resource-based approach, and the community-based approach (Saarinen, 2015) The activity-based approach stands for tourism-centered approaches and allows for “soft” management techniques such as training programs, consultations, information boards, etc. The resource-based approach often requires the use of strict management strategies such as bans, visitor quotas, and fees (Mason, 2005). The community-based approach, on the other hand, identifies information on visitors' preferences, motivations, attitudes, and opinions on regulatory measures as a management strategy (Gunderson et al., 2002). When converting protected areas into recreational areas with a sustainable approach, the focus should be on protecting the natural environment, respecting wildlife, and minimizing potential negative impacts.

The practice of managing protected areas began with the establishment of Yellowstone National Park in the United States in 1872 (Shafer, 2015). In 2023, according to the World Database of Protected Areas (WDPA), the number of protected areas amounted to 295574 (Protected Planet, 2023). However, all these protected areas, which are scattered around the world, still face problems such as insufficient resources for management, inadequate measures, human intrusion, and poaching (Hockings, 2003).

In 1997, the Management Effectiveness Task Force was founded by the CNPPA (National Parks and Protected Areas) to draw attention to the problem of the management effectiveness of protected areas and to investigate evaluation options (Hockings et al., 2006) In 2000, the World Wide Fund for Nature (WWF, formerly World Wildlife Fund) initiated a study on the current threats to protected areas. As a result of this study, a correlation was found between poorly managed and threatened protected areas (Carey et al., 2000). The World Commission on Protected Areas (WCPA) has developed science-based policy, advice, and guidance on many issues related to protected areas (IUCN, 2023). In addition to the WCPA, other organizations such as World Wildlife World (WWF), The Nature Conservancy, and the World Bank have also addressed the issue of management effectiveness. Approaches such as the index of conflict tendency of tourism development and ecological protection have been proposed to address the conflict between tourism development and ecological protection (Yuxi & Linsheng, 2020). Various organizations around the world have developed different frameworks to evaluate the effectiveness of protected area management. However, there are still various administrative and legal issues related to protected areas in the world (Xu et al., 2019). The rapid increase in the number of protected areas has put the problems of protecting and managing these areas on the agenda (Cao et al., 2015).

In Türkiye, the General Directorate for the Protection of Natural Properties has determined the procedures and principles on this issue, published laws, regulations, and instructions, and developed the Protected Areas Management System (SAYS) (CBSGM, 2023; Tabiat Varlıklarını Koruma Genel Müdürlüğü, 2023). Intangible cultural heritage inventory studies are carried out by the Ministry of Culture and Tourism (KTB, 2023). These created portals are only accessible to a limited extent. In Türkiye, there are still problems in the management of protected areas (Yavuz & Vatandaşlar, 2018). There is no suitable and effective method that covers all protected areas (Birben, 2019).

The potential for ecological tourism in Türkiye is quite large. In 2021, the ratio of total protected areas (land and sea) under the responsibility of the Ministry of Agriculture and Forestry and the General Directorate of Natural Assets Protection of the Ministry of Environment, Urbanization, and Climate Change to the area of the country is 12.92%. In 2021, there are 59 (869697 ha) protected areas under the title of "Wetlands of National Importance in the Country" and Acarlar Floodplain is one of these areas (Korunan Alanlar, 2023). Areas with high scenic attractiveness tend to attract more tourists, leading to greater ecological impacts (Gundersen et al., 2019; Nahuelhual et al., 2013; Weyland & Laterra, 2014). Therefore, there is a great need for plans based on ecological information in these areas (Blaschke, 2011). In this context, the serious need for studies that take into account the ecosystem, wildlife, management measures, tourist behavior and characteristics, and the scale and intensity of tourism activities in protected areas forms the starting point of this study.

## 3. Materials and Methods

This section provides information about the study area, data and methods.

### 3.1. Study Area

Acarlar Longoz (Acarlar Floodplain Forest) and its buffer area cover a surface area of 175 km² in the Marmara Region, Türkiye. Acarlar Longoz is the biggest floodplain forest in the country (Şahin, 2020). The area is situated northeast of Sakarya province between the Karasu and Kaynarca districts and lies parallel to the Black Sea. Due to the characteristics of the region, the topography of the study area is mostly flat or slightly sloped, and the elevation varies between 0 and 164 meters. The hinterland of the study area is covered with forests. The lagoon is 23 km², approximately 2 km from the sea, and stretches 12 km in the east-west direction. Its distance in the north-south direction varies between 250 m and 1.5 km. (T.C. Orman ve Su İşleri Bakanlığı, 2016). Fig. 1 illustrates the study area.

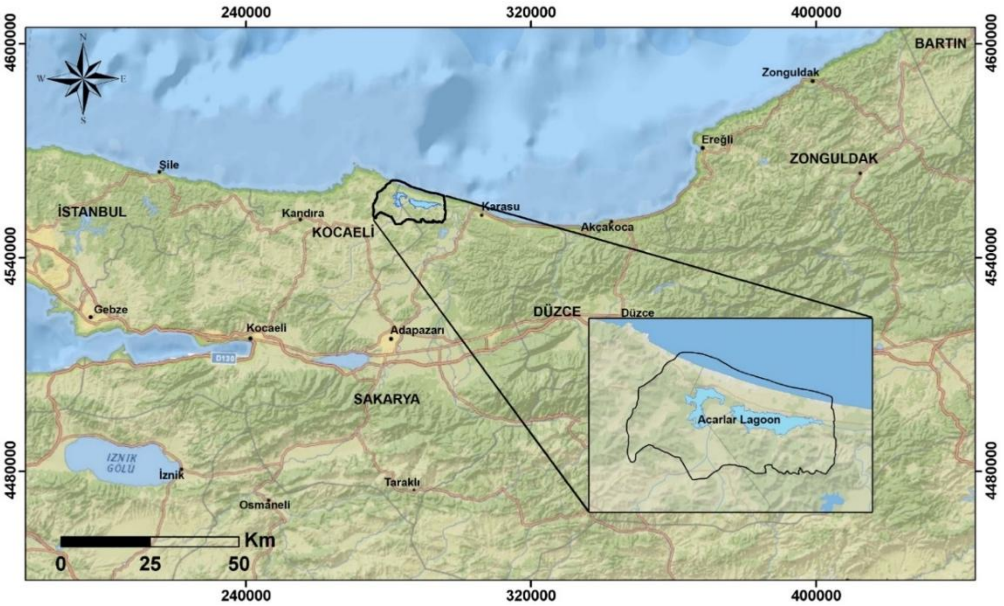



**Figure 1.** Study Area

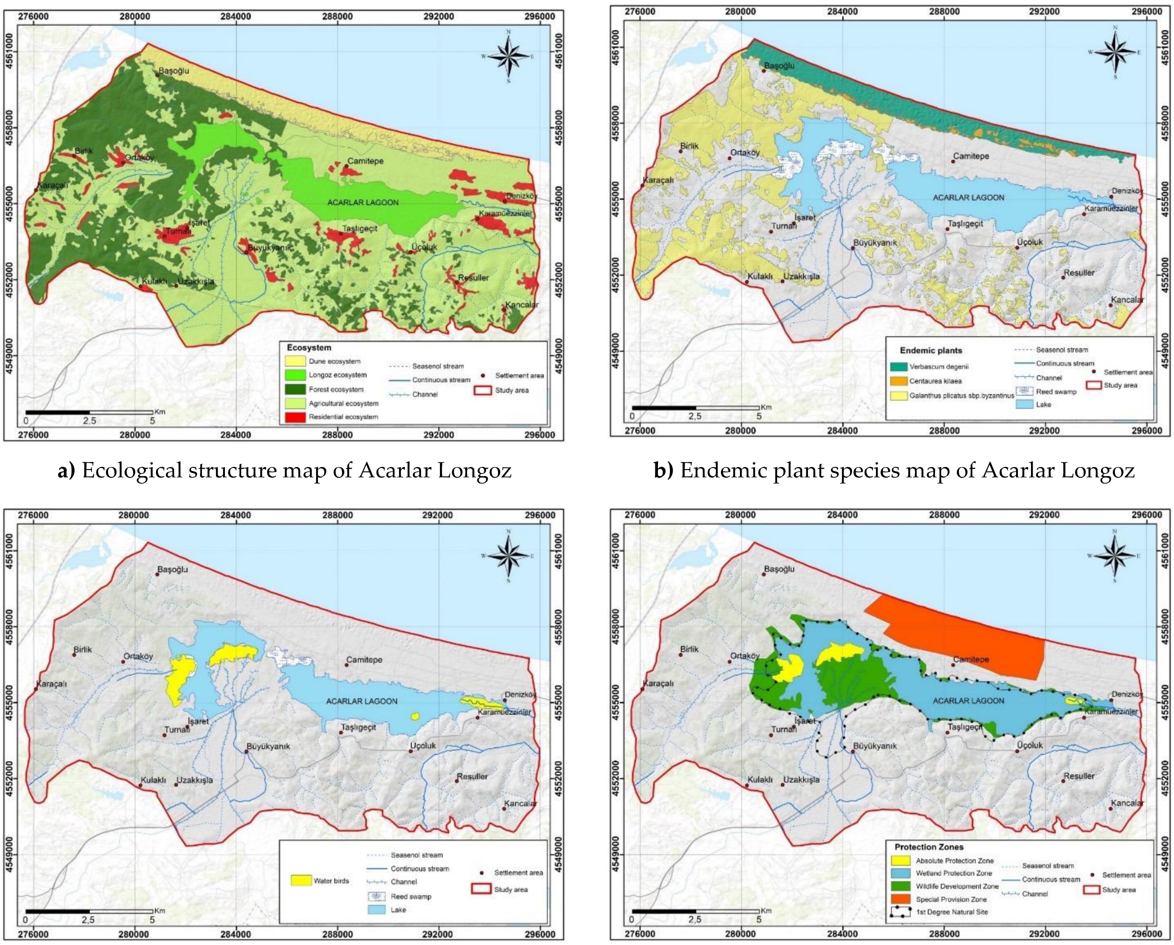
Tunca et al. (2014) explain that the area is a wetland system, which originally existed as a stream and transformed into a lagoon. Streams, over time, blocked the coastal plain and accumulated sand dunes from the lake, which has the character of a lagoon. In the early days, the water of the lagoon was poured into the Black Sea by a drain from Denizköy, but when the front of the drain was filled with sand dunes, it formed a new drain towards the Sakarya River and took its current form (Gönençgil, 2008). The lagoon is fed by seasonal streams flowing from the south and pouring into the Sakarya River via Okçu Creek and then into the Black Sea. In summer, the lake's depth is 1 m, while it rises to 5 m in winter. In the northern part of Acarlar Longoz, on the Black Sea coast, some dunes sometimes move in harmony with the prevailing wind and allow the formation of different ecosystems.

Acarlar Longoz is unique and differs from other wetlands in Türkiye in terms of its dense forest texture covering the lagoon floor, which is inconvenient to walk through. A diverse range of vegetation types has been observed by researchers within the floodplain forest, open areas, forest lakes, swamps, scrub communities, and marine dunes (Ursavaş & Işin, 2019).

In all these respects, Acarlar Longoz is rich in biodiversity and comprises unique ecosystems (Fig 2-a). Amongst the endemic plant species in the region are Verbascum degenii, Centaurea kilaea, and Galanthus plicatus subsp. byzantinus (Fig. 2-b). Lily (Lilium sp.), Spanish broom (Spartium junceum), cornflower (Centaurea sp.) and marram grass (Ammophila arenaria) species grow on the dunes in the coastal parts. Besides, the area is the home of many frogs, reptile, mammal, bird, and fish species. Catfish, carp, eel, rudd, pike, and mullet are the most common fish species in the longoz. From this perspective, 1576 ha of the area was declared as a Wildlife Conservation Zone by the General Directorate of National Parks and Wildlife, the Ministry of Forestry, and then in 2006, a land of 2751 ha was officially redefined as Wildlife Development Zone. The most critical factor in gaining this status is the existence of 218 different bird species in the area, some of which are endangered species according to IUCN categories (T.C. Orman ve Su İşleri Bakanlığı, 2016; Yılmaz et al., 2011). Fig 2-c shows the water birds map of the study area. Uzun et al. (2008) report that the existing tree species such as ash (Fraxinus ornus), alder (Alnus sp.), cranberry (Cornus sp.), hornbeam (Carpinus betulus-Carpinus orientalis), hazelnut (Corylus sp.), maple (Acer platanoides-Acer campestre), rowan and beech (Fagus orientalis) species provide favorable sanctuary for the birds.

Acarlar Longoz was also declared 1st-degree Natural Site in 1998 by the Bursa Cultural and Natural Heritage Preservation Board, Ministry of Culture. The area was additionally included in the Ramsar List in 2009 and the List of Wetlands with National Importance in 2019. Consequently, since 2009, the National Wetlands Commission has prepared a wetland management plan in line with the Wetlands Protection Regulation and the Ramsar Management Planning Guide. Besides the territories reserved for various conservation goals, the region also comprises a Special Provision Zone reserved for the compulsory development of the settlements located within the protection zones, in line with the relevant legislation.

To sum up, the study area hosts a variety of regions reserved for special protection and development purposes, namely 1st-degree Natural Site (2760 ha), Wetland Protection Zone (1917 ha), Absolute Protection Zone (195 ha), Wildlife Development Zone (2751 ha), and Special Provision Zone (1091 ha) that are in close contact with each other. Fig. 2-d shows the location of protection zones.




**a)** Ecological structure map of Acarlar Longoz

**b)** Endemic plant species map of Acarlar Longoz

**c)** Water birds map of Acarlar Longoz

**d)** Protection zones map of Acarlar Longoz

**Figure 2.** Protected Biota Structure

### 3.2. Data

The primary material of this study is the graphical data of Acarlar Longoz, including topography, land use, forest management plan, wetland protection zones, ecological structure, hydrology, transportation, flora, and fauna. Relevant legislation, guides, reports/plans, and the literature were examined to determine the necessary data and their suitability classification approaches to detect the most suitable areas for hiking and bird watching activities within the study area. ArcGIS 10.3 software was used to prepare the data, perform spatial analyses and produce the maps. The study used data in vector and raster format, which were used for the analysis. The data on flora and fauna, wildlife development zone boundaries, wetland protection zone boundaries and forest management were provided by the Ministry of Agriculture and Forestry. The data on national protection and hydrology, boundaries of natural areas and land use (CORINE-2018) were provided by Sakarya Municipality in vector format. The base maps in 1/25000 format were provided by Sakarya Municipality and the Ministry of Agriculture and Forestry in raster format. Finally, the ASTERDEM data (2013) was obtained from the USGS (United States Geological Survey) in raster format.

### 3.3. Methods

The primary method of this study is the weighted overlay analysis, a commonly utilized multi-criteria decision-making method allowing for the spatial evaluation of diverse factors/characteristics in the target geographical context in parallel with their suitability priorities and influence weights (Ağaçsapan & Cabuk, 2020). There are a variety of studies and fields in which the weighted overlay method has been adopted for site selection, including the determination of suitable lands for recreational and tourism activities/areas (Abrehe et al., 2021; Jūrmalis & Lībiete, 2019; Komossa et al., 2020; Sahabo & Mohammed, 2016).

Weighted overlay analysis is a method that allows each layer to overlap its weight scores based on the attribute data, and only raster data with particular values can be used. The most suitable class in the selected working scale is usually given the highest score (Özenen-Kavlak et al., 2021). In weighted overlay analysis, multiple data sets are compared according to criteria specified for site selection, suitability, or preference decisions by experts. The analysis reclassifies all varying criteria values into a common evaluation scale, weights the importance of criteria and adds them together on a composite map with the desirable areas for the prespecified purposes (Atak et al., 2019; Özenen-Kavlak & Çabuk, 2021). Several studies have been conducted to determine the suitability of locations for agriculture and plantations (Bodaghabadi et al., 2019), windfarms (Baseer et al., 2017), regional development planning (Qiu et al., 2017), and tours (Ayhan et al., 2020). The study by Azem & Terzi (2018) carried out with weighted overlay analysis suggests the most suitable areas for new developments in the city of Kırklareli, Türkiye. Slope, aspect, land use, soil classes, and six more criteria that could affect sustainable urban development are adopted in the study as comparison criteria.

Besides weighted overlay analysis, other spatial analysis methods were also applied to produce sub-data layers. For example, roads, streams, and channels were digitized from 1/25000-scale maps. ASTER DEM data was used to perform the topographic analyses to produce the study area's slope, aspect, and elevation maps. Buffer analysis was made to determine different proximity zones around roads, streams, protection zones, etc. Efforts were made to organize the data in different scales and formats.

In the weighted overlay process, the natural and cultural characteristics (main and sub-data layers), which influence the suitability of the geographic context for the target activity, were determined, and a weighted overlay model was developed in the first place (Fig. 3). Accordingly, 3 suitability classes were determined. Suitable 1st-degree areas are rated as 3 points and are defined as the most suitable areas where no measures are required within the framework of legal regulations and technical standards. Suitable 2nd-degree areas are rated as 2 points and are defined as moderately suitable areas where certain restrictions may occur and therefore various precautionary measures should be taken. Finally, 3rd-degree areas are scored with 1 point and are the least suitable areas that should only be preferred if necessary. If these areas are preferred, serious measures should be taken. As can be seen here, 1st-degree suitable areas have been assigned the highest suitability score, while 3rd-degree suitable areas have been assigned the lowest suitability score. Unsuitable lands for the target recreation activity were defined as restricted areas and extracted from the study area. Amongst the restricted areas are Absolute Protection Zones, Wildlife Development Zone, endemic plant species zones, lake/lagoon area, etc. For each overlaying map, attributes were reclassified according to suitability classes.

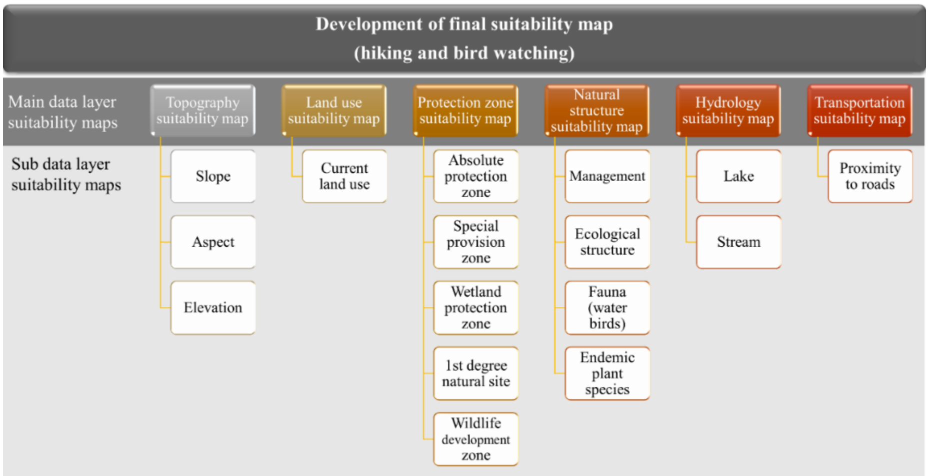
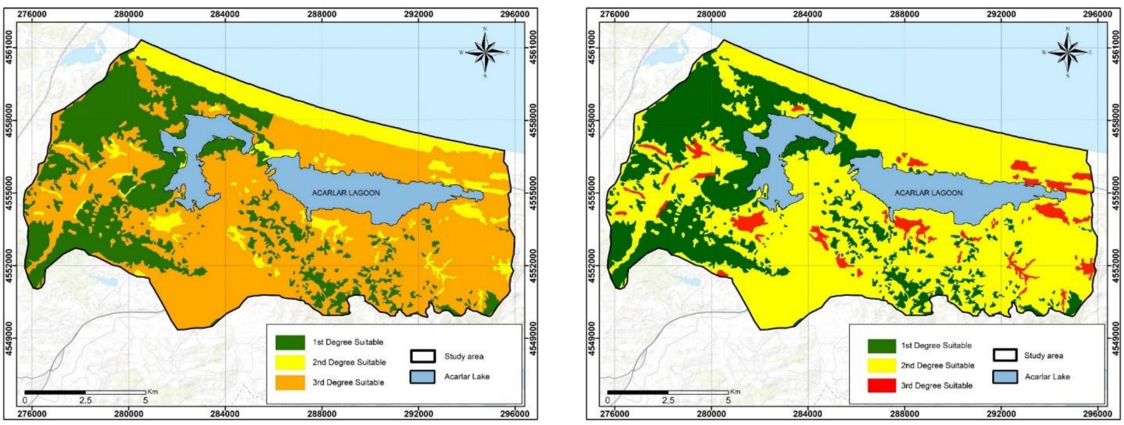



**Figure 3.** Weighted Overlay Model

Before the weighted overlay, the data were transformed into integer raster and reclassified according to the suitability classes. Besides assigning suitability classes and scores for different attributes in each dataset, influence weights were also determined for both main and sub-overlay data groups. Regarding this process (determination of the suitability classes and the influence weights), draft weighted overlay forms were prepared and shared with experts (3 landscape architects, a tourism and recreation expert, and a bird-watching expert), followed by an expert discussion panel conducted online with the participation of 5 experts from mentioned expertise areas. The suitability classes/scores for each attribute and influence weights of the main and sub-data layers were determined by complete consensus. In addition to the knowledge of experts, the legal framework and the information in the literature were considered during this panel. Appendix 1 and Appendix 2 give information related to layers, influence weights, suitability classes, suitability scores, and attributes under each sub-data layer for hiking and bird-watching activities within the study area.

## 4. Results

16 sub-data layer suitability maps, 6 main data layer suitability maps, and 1 final suitability map were developed for each activity type (Fig. 3). Fig. 4 and Fig. 5 show sub-data and main data layer suitability map samples, respectively for hiking and bird watching activities in Acarlar Longoz. The information about the suitability attributes, classes, scores, and areas for the sample maps are provided in Table 1 and Table 2. Fig. 6 illustrate the final suitability maps produced via the weighted overlay of the main data layer suitability maps.




**a)** Acarlar Longoz ecological structure suitability classification for hiking

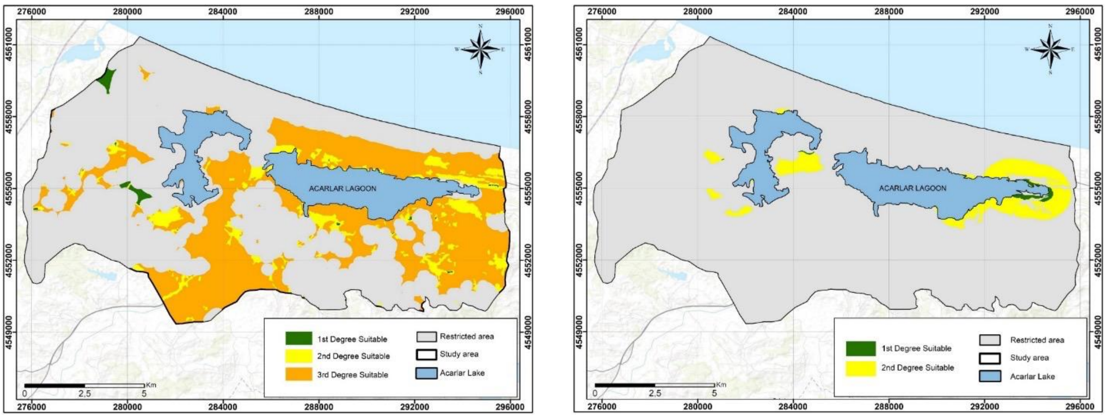
**b)** Acarlar Longoz ecological structure suitability classification for bird watching

**Figure 4.** Sub-data Suitability Map Samples for Hiking and Bird Watching Activities in Acarlar Longoz – Ecological Structure Suitability Maps

**Table 1.** Ecological Structure Suitability Classification Information for Hiking and Bird Watching in Acarlar Longoz

| Activity Type | Attributes | Suitability Score | Suitability Class | Area (ha) | Area (%) |
|---|---|---|---|---|---|
| Hiking | Dune ecosystem | 2 | 2nd-degree suitable | 1131 | 8 |
| | Longoz ecosystem | 2 | 2nd-degree suitable | 428 | 3 |
| | Forest ecosystem | 3 | 1st-degree suitable | 3658 | 25 |
| | Agricultural ecosystem | 1 | 3rd-degree suitable | 8590 | 59 |
| | Residential ecosystem | 2 | 2nd-degree suitable | 668 | 5 |
| Bird watching | Dune ecosystem | 2 | 2nd-degree suitable | 1131 | 8 |
| | Longoz ecosystem | 3 | 1st-degree suitable | 428 | 3 |
| | Forest ecosystem | 3 | 1st-degree suitable | 3658 | 25 |
| | Agricultural ecosystem | 2 | 2nd-degree suitable | 8590 | 59 |
| | Residential ecosystem | - | Restricted | 668 | 5 |

The amount of suitable areas in each suitability class differs in accordance with the type of recreational activity. For instance, according to the ecological structure suitability map, more than 59% of the study area covers agricultural ecosystems and has 3rd-degree suitable lands for hiking activities, while 25% of the longoz area hosts forest ecosystem and has 1st-degree suitability that is mainly located on the southwest and northwest parts, and partially scattered towards the south-eastern territories. Regarding bird watching, the number of 1st-degree suitable areas is around 4086 ha, corresponding to 28% of the total study area.




**a)** Acarlar Longoz natural structure suitability for hiking

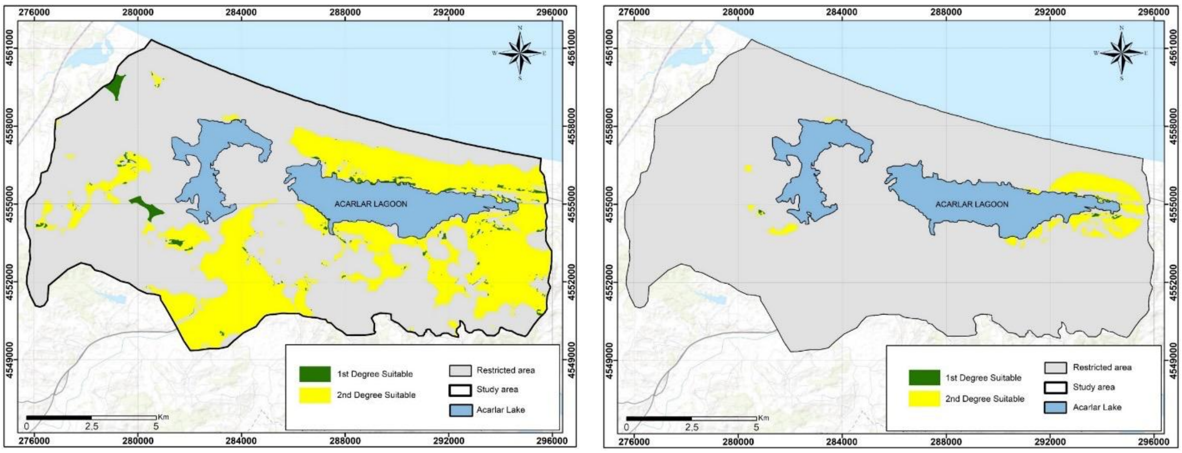
**b)** Acarlar Longoz natural structure suitability map for bird-watching

**Figure 5.** Main Data Suitability Map Samples for Hiking and Bird-Watching Activities in Acarlar Longoz – Natural Structure Suitability Maps

**Table 2.** Natural Structure Suitability Classification Information for Hiking and Bird Watching in Acarlar Longoz

| Main Data Suitability Map | Activity Type | Suitability Class | Area (ha) | Area (%) |
|---|---|---|---|---|
| Natural Structure Suitability Map | Hiking | Restricted | 4471 | 30 |
| | | 1st-degree Suitable | 268 | 2 |
| | | 2nd-degree Suitable | 2852 | 20 |
| | | 3rd-degree Suitable | 6884 | 48 |
| | Bird watching | Restricted | 13302 | 91.9 |
| | | 1st-degree Suitable | 80 | 0.6 |
| | | 2nd-degree Suitable | 1093 | 7.5 |

Natural structure suitability maps are produced via the weighted overlay of management, ecological structure, fauna (water birds), and endemic plant species suitability maps. In terms of natural characteristics, Acarlar Longoz has around 4471 ha of restricted areas for hiking activities, corresponding to 30% of the total study area, while this amount goes up to 91.9% for bird watching. The high percentage of restricted lands in this main data layer is due to the existence of protection zones strictly protected by law.




**a)** Hiking suitability map in Acarlar Longoz **b)** Bird watching suitability map in Acarlar Longoz

**Figure 6.** The Final Suitability Maps Produced Via The Weighted Overlay of The Main Data Layer Suitability Maps

**Table 3.** Final Suitability Classification Information for Hiking and Bird Watching in Acarlar Longoz

| Final Suitability Map | Suitability Class | Area (ha) | Area (%) |
|---|---|---|---|
| Hiking Suitability Map | Restricted | 10080 | 70 |
| | 1st-degree suitable | 226 | 2 |
| | 2nd-degree suitable | 4169 | 28 |
| Bird Watching Suitability Map | Restricted | 13971 | 96.5 |
| | 1st-degree suitable | 16 | 0.1 |
| | 2nd-degree suitable | 487 | 3.4 |

When the final suitability maps (Fig. 6) and Table 3 are examined, it is observed that 226 ha of the study area was defined as 1st-degree suitable, 4169 ha as 2nd-degree suitable, and 10080 ha as restricted area for hiking purposes. 1st-degree suitable areas are spatially scattered throughout the study area, and 2nd-degree suitable areas are located in the south, east, north, and northeast regions. The remaining lands are classified as restricted areas.

In terms of bird-watching activity, 16 ha of the area was determined as 1st-degree suitable areas. 2nd-degree suitable areas cover a surface of 487 ha (3.4%) and are mostly distributed in the northeastern part of the study area. As there are many protected areas within the study area, the amount of restricted areas also for bird watching is quite high (96.5%). The suitable lands are generally distributed in the northeastern part of the study area.

Fig. 7 shows the estimated location of the existing recreation area. The exact geographical boundaries of the project area have not been made accessible by the relevant authority and therefore were digitized from Google Earth to compare and estimate the suitability of the selected project area. In terms of the hybrid overlaid map showing suitable areas for hiking and bird-watching activities, the project area comprises restricted lands that mostly fall into Wildlife Development Zone territories.

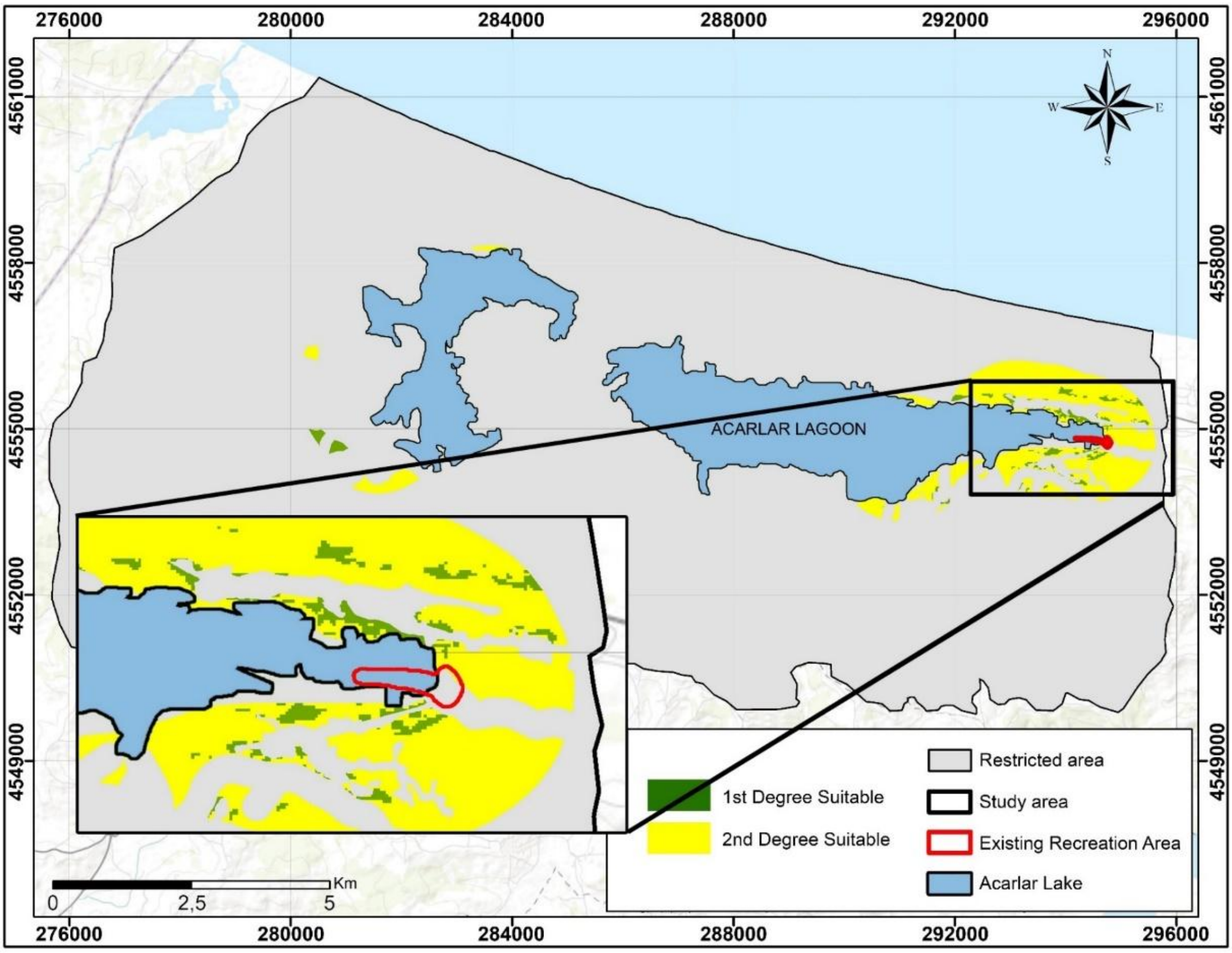



**Figure 7.** Comparison of the hiking and bird-watching suitability map with the existing recreational area

## 5. Discussion

Acarlar Longoz is amongst the most significant wetlands in the world and is protected with different legal national, and international protection statuses. The rich natural resources and precious landscape characteristics of the area offer extremely attractive opportunities for tourism and recreation activities. The region hosts pleasing and attractive destinations for hiking, especially when its unique natural characteristics are considered. Although it is challenging to pass/walk through the longoz forest due to the abundance of forest texture, it is possible to walk around the area. The length of the existing walking path is supposed to be increased within the scope of the ongoing ecotourism project. However, no walking path planning has been done for the area yet. In addition, there are no predetermined standards for bird-watching activity in the region.

First, it is important to prevent human contact with birds' habitats. Disturbing visual contact risks should be prevented by creating an artificial or living barrier (reeds, etc.) around the open areas where water birds mainly exist. The ground structure is important for bird watching, which can be done with different equipment. Especially when sensitive instruments such as telescopes will be used, units that may cause disturbing ground vibrations should be avoided. There is currently no designated area for bird watching in Acarlar Longoz. Observation towers are stated to be structured within the scope of the new ecotourism project. However, the scientific basis of the spatial decisions within the mentioned project is unclear and lacks transparency. Therefore, it is extremely critical to consider the protection priorities in the potential recreational areas and implement a holistic planning and design approach, which should be integrated with the national planning, management, and design processes already performed within the study area territories. Thus, the most suitable lands for different recreation activities can be properly determined with a perspective allowing for the use and protection balance.

A diversity of natural and cultural data are processed within the scope of suitable site selection implementations. When the conservation statuses, the different land uses, and the delicate flora and fauna in the study area are considered, the determination of suitable lands for recreational activities becomes a challenging process and inevitably requires the adoption of advanced technologies such as GIS and multi-criteria decision-making methodologies.

Weighted overlay methods, which is also the main method of this study, are widely used for a variety of site determination processes and are considered the major tool for planning activities since the 1960s (Özenen-Kavlak & Çabuk, 2022). Although the weighted overlay method is not a new approach, the necessary data sets, attribute classifications, suitability scales/levels, weights, and influence factors, weighted overlay model details vary depending on a good number of factors such as the natural and cultural characteristics of the geographical context, planning/protection strategies, and priorities, legislation, policies, data availability, etc. (Atak et al., 2019). Similarly, different methods (AHP, ANP, Delphi, expert panels, etc.) can be utilized to determine influence factors and weights. Therefore, the difference of the method and the results of this study results from the unique characteristics of the study area, the selection of the data sets, the determination of the overlay model, the assignment of the weights, and influence factors. In other words, the results of this study are unique to the study area. Besides, no similar study was conducted before in Acarlar Longoz for the determination of the suitable lands for different recreation types, which have great importance for the development of the wetland management plans, as well as other physical planning and design processes in the area.

Inappropriate management of visitor density in protected areas can also lead to problems such as pollution, damage to wildlife, and overexploitation of natural resources (Farrell & Marion, 2002). Insufficient involvement of local communities in the planning process or insufficient consideration of their needs and views can be problematic (Bello et al., 2017). To overcome these obstacles, a participatory strategy that involves local communities and experts uses relevant data, and efficiently analyzes and resolves conflicts of interest must be implemented. Long-term sustainability and a balance between the demands of different user groups should also be considered, as this can influence the acceptance and long-term sustainability of the planned recreational activities (Korir et al., 2013). To overcome these challenges, a participatory approach that involves experts and local communities uses appropriate data and analyzes and effectively manages conflicts of interest must be followed (McKinley et al., 2017).

## 6. Conclusion

In this study, 16 sub-data groups (slope, aspect, elevation, management, ecological structure, water birds, endemic plant species, lake, stream, land use types, protection areas, transportation, etc.) were processed to produce 6 main suitability maps for each type of selected recreation activity. Finally, suitability maps for hiking and bird-watching activities were developed. The majority of Acarlar Longoz has been reserved as restricted areas due to the fact that the protection areas of different statuses cover considerably large space in the area. The results of the study are significant as they are supposed to present precious scientific and objective input data for both current and future landscape and recreational planning and design processes, the evaluation of the touristic and recreational potential of Acarlar Longoz, and the development of Wetland Management Plan under the legal conservation practices and strategies.

Unfortunately, previous planning practices in protected lands in Türkiye lacked holistic approaches and advanced spatial analysis implementations. It is vital for the sustainability of both resources and recreational/touristic activities to be based on scientific data and methods for both ongoing and future plans. Considering that the current ecotourism project boundaries overlap with some of the restricted areas of this study and the scientific approach and methodology of the project development and implementation phases are unclear, it is of great significance to improve the planning and design implementations by making necessary spatial analyses.

Wetlands provide many ecological benefits for communities and the natural environment and economic benefits to surrounding areas through tourism and recreation. Acarlar Longoz is the biggest floodplain forest in Türkiye, and it is under national and international protection area statuses. There is a high potential for recreational activities in the area, and thus, it is important to negotiate the balance between protection requirements and recreation opportunities. GIS techniques are beneficial for the site selection process to determine the most suitable areas for recreation purposes, specifically bird watching and hiking in Acarlar Longoz. The total area of the Longoz, including the buffer zones, is 175 km². Only 3.5% (1st and 2nd-degree suitable total) of the area is suitable, and 13971 ha area is restricted for bird watching while 30% (1st and 2nd-degree suitable total) of the area is suitable, and 10080 ha area is restricted for hiking activities.

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**References**

Aber, J. S., Pavri, F., & Aber, S. W. (2012). Wetland environments: a global perspective. John Wiley & Sons.

Abraham, S. (2015). The relevance of wetland conservation in Kerala. International Journal of Fauna and Biological Studies, 2(3), 1–05.

Abrehe, S., Girma, A., & Nigusse, A. G. (2021). Potential ecotourism site suitability evaluation for sustainable natural resource management in Kafta Sheraro National Park (KSNP), north-western Tigray, Ethiopia. Journal of Ecotourism, 1–30.

Ağaçsapan, B., & Cabuk, S. N. (2020). Determination of suitable waste transfer station areas for sustainable territories: Eskisehir case. Sustainable Cities and Society, 52, 101829.

Albayrak, F. F. (2010). Korunan alanların ekoturizm gelişimine etkileri: Camili biyosfer rezervi örneği. In Fen Bilimleri Enstitüsü: Vol. Master Thesis. Artvin Çoruh Üniversitesi.

Allendorf, T. D. (2022). A global summary of local residents' perceptions of benefits and problems of protected areas. In Biodiversity and Conservation (Vol. 31, Issue 2). https://doi.org/10.1007/s10531-022-02359-z

Altunöz, Ö., Tırıl, A., & Arslan, Ö. E. (2014). Hamsilos Tabiat Parkı'nın rekreasyon potansiyelini belirlemeye yönelik bir araştırma. Journal of Recreation and Tourism Research, 1(1), 20–38.

Andkjær, S., & Arvidsen, J. (2015). Places for active outdoor recreation–a scoping review. Journal of Outdoor Recreation and Tourism, 12, 25–46.

Atak, A., Çabuk, S. N., Bakış, R., & Çabuk, A. (2019). Determination of suitable sites for solar power plants by using weighted overlay analysis: Sivrihisar Case. International Journal of Renewable Energy Research (IJRER), 9(3), 1203–1213.

Atik, M. (2010). Environmental protection in coastal recreation sites in Antalya, Turkey. Coastal Management, 38(6), 598-616.

Ayhan, Ç. K., Taşlı, T. C., Özkök, F., & Tatlı, H. (2020). Land use suitability analysis of rural tourism activities: Yenice, Türkiye. Tourism Management, 76, 103949.

Ayyad, M. A. (2003). Case studies in the conservation of biodiversity: degradation and threats. Journal of Arid Environments, 54(1), 165-182.

Azem, K., & Terzi, F. (2018). Determination of new development area in Kırklareli by GIS based Weighted Overlay Analysis. International Journal of Environment and Geoinformatics, 5(3), 244–259.

Barros, A., Gonnet, J., & Pickering, C. (2013). Impacts of informal trails on vegetation and soils in the highest protected area in the Southern Hemisphere. Journal of Environmental Management, 127. https://doi.org/10.1016/j.jenvman.2013.04.030

Baseer, M. A., Rehman, S., Meyer, J. P., & Alam, M. M. (2017). GIS-based site suitability analysis for wind farm development in Saudi Arabia. Energy, 141, 1166–1176.

Becken, S., & Job, H. (2014). Protected areas in an era of global–local change. *Journal of Sustainable Tourism, 22*(4), 507-527.

Beeco, J. A., Hallo, J. C., & Brownlee, M. T. (2014). GPS visitor tracking and recreation suitability mapping: Tools for understanding and managing visitor use. Landscape and Urban Planning, 127, 136-145.

Bello, F. G., Lovelock, B., & Carr, N. (2017). Constraints of community participation in protected area-based tourism planning: The case of Malawi. Journal of Ecotourism, 16(2), 131-151.

Bentsen, P., Lindholst, A. C., & Konijnendijk, C. C. (2010). Reviewing eight years of Urban Forestry & Urban Greening: Taking stock, looking ahead. In Urban Forestry and Urban Greening (Vol. 9, Issue 4). https://doi.org/10.1016/j.ufug.2010.06.003

Bilge Ozturk, G., Ozenen Kavlak, M., Cabuk, S. N., Cabuk, A., & Cetin, M. (2022). Estimation of the water footprint of kiwifruit: in the areas transferred from hazelnut to kiwi. Environmental Science and Pollution Research, 29(48), 73171–73180. https://doi.org/10.1007/S11356-022-21050-Y/FIGURES/5

Birben, Ü. (2019). The effectiveness of protected areas in biodiversity conservation: The case of Turkey. Cerne, 25(4). https://doi.org/10.1590/01047760201925042644

Bishop, K., Phillips, A., & Warren, L. (1995). Protected for ever?: Factors shaping the future of protected areas policy. Land Use Policy, 12(4), 291–305. https://doi.org/10.1016/0264-8377(95)00030-H

Blaschke, T. (2011). Environmental Monitoring and Management of Protected Areas through Integrated Ecological Information Systems - An EU Perspective. In Environmental Information Systems in Industry and Public Administration. https://doi.org/10.4018/978-1-930708-02-0.ch005

Bodaghabadi, M. B., Faskhodi, A. A., Salehi, M. H., Hosseinifard, S. J., & Heydari, M. (2019). Soil suitability analysis and evaluation of pistachio orchard farming, using canonical multivariate analysis. Scientia Horticulturae, 246, 528–534.

Bozkurt, S. G., Kuşak, L., & Akkemik, Ü. (2023). Investigation of land cover (LC)/land use (LU) change affecting forest and seminatural ecosystems in Istanbul (Turkey) metropolitan area between 1990 and 2018. In Environmental Monitoring and Assessment (Vol. 195, Issue 1). https://doi.org/10.1007/s10661-022-10785-3

Breiby, M. A., Selvaag, S. K., Øian, H., Duedahl, E., & Lerfald, M. (2022). Managing sustainable development in recreational and protected areas. The Dovre case, Norway. Journal of Outdoor Recreation and Tourism, 37. https://doi.org/10.1016/j.jort.2021.100461

Caner, G. (2007). Ulusal ve uluslararası doğa koruma kriterleri ve Natura 2000. In Fen Bilimleri Enstitüsü: Vol. Master Thesis. Yıldız Teknik Üniversitesi.

Cakar, K. (2018). Critical success factors for tourist destination governance in times of crisis: a case study of Antalya, Türkiye. Journal of Travel & Tourism Marketing, 35(6), 786-802.

Cao, M., Peng, L., & Liu, S. (2015). Analysis of the network of protected areas in China based on a geographic perspective: Current status, issues and integration. Sustainability (Switzerland), 7(11). https://doi.org/10.3390/su71115617

Carey, C., Dudley, N., & Stolton, S. (2000). Squandering paradise? The importance and vulnerability of the world's protected areas. WWF-World Wide Fund For Nature.

CBSGM. (2023). Sit alanları yönetim sistemi. Tabiat Varlıklarını Koruma Genel Müdürlüğü. https://says.csb.gov.tr/

Çevre ve Orman Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü, S. ve Ç. A. D. (Ed.). (2009). Acarlar Gölü Longoz Ormanı Sulak Alan Yönetim Planı. Su ve Çevre Araştırmaları Derneği.

Charabi, Y., & Gastli, A. (2011). PV site suitability analysis using GIS-based spatial fuzzy multi-criteria evaluation. Renewable Energy, 36(9), 2554-2561.

Chun, J., Kim, C. K., Kim, G. S., Jeong, J. Y., & Lee, W. K. (2020). Social big data informs spatially explicit management options for national parks with high tourism pressures. Tourism Management, 81. https://doi.org/10.1016/j.tourman.2020.104136

Çiçek, M., & Taş, N. (2018). Planning Process and Projects in National Parks of Turkey. Uluslararası Peyzaj Mimarlığı Araştırmaları Dergisi (IJLAR) E-ISSN: 2602-4322, 2(2), 24-31.

Ciegis, R., Ramanauskiene, J., & Martinkus, B. (2009). The concept of sustainable development and its use for sustainability scenarios. Engineering Economics, 62(2).

Cortinovis, C., Zulian, G., & Geneletti, D. (2018). Assessing nature-based recreation to support urban green infrastructure planning in Trento (Italy). Land, 7(4). https://doi.org/10.3390/land7040112

DeFries, R., Hansen, A., Turner, B. L., Reid, R., & Liu, J. (2007). Land use change around protected areas: management to balance human needs and ecological function. Ecological applications, 17(4), 1031-1038.

Diktaş Bulut, N. (2018). An approach to determining forest areas with recreational potential: The case of forest areas around main transportation roads in the Maçka Region of Trabzon, Türkiye. Journal of Sustainable Forestry, 37(3), 286–301.

Douglass, R. W. (2013). Forest recreation. Pergamon Press.

Eagles, P. F. J., & McCool, S. F. (2002). Tourism in national parks and protected areas: Planning and management. Cabi.

Elvan, O. D., & Birben, Ü. (2021). Analysis of the Ramsar Convention's effectiveness on the Turkish legislation and judicial decisions. Wetlands, 41(3), 1–11.

Ezebilo, E. E., Boman, M., Mattsson, L., Lindhagen, A., & Mbongo, W. (2015). Preferences and willingness to pay for close to home nature for outdoor recreation in Sweden. Journal of Environmental Planning and Management, 58(2), 283–296.

Farrell, T. A., & Marion, J. L. (2002). The protected area visitor impact management (PAVIM) framework: A simplified process for making management decisions. Journal of sustainable tourism, 10(1), 31-51.

Farrell, B. H., & Twining-Ward, L. (2004). Reconceptualizing tourism. Annals of Tourism Research, 31(2). https://doi.org/10.1016/j.annals.2003.12.002

Fisichelli, N. A., Schuurman, G. W., Monahan, W. B., & Ziesler, P. S. (2015). Protected area tourism in a changing climate: Will visitation at US National Parks warm up or overheat? PLoS ONE, 10(6). https://doi.org/10.1371/journal.pone.0128226

Ghorbanzadeh, O., Pourmoradian, S., Blaschke, T., & Feizizadeh, B. (2019). Mapping potential nature-based tourism areas by applying GIS-decision making systems in East Azerbaijan Province, Iran. Journal of Ecotourism, 18(3), 261–283.

Gönençgil, B. (2008). Tehdit Altındaki Kıyı Alanlarına Bir Örnek: Acarlar Longozu-Karasu, Sakarya. In V. Ulusal Coğrafya Sempozyumu. Türkiye Coğrafyası Araştırma ve Uygulama Merkezi (TÜCAM), Ankara Üniversitesi.

Gül, A., Örücü, M. K., & Karaca, Ö. (2006). An approach for recreation suitability analysis to recreation planning in Gölcük Nature Park. Environmental management, 37, 606-625.

Gülez, S. (1990). Ormaniçi rekreasyon potansiyelinin saptanması için geliştirilen bir değerlendirme yöntemi. Journal of the Faculty of Forestry Istanbul University, 40(2).

Gundersen, V., Vistad, O. I., Panzacchi, M., Strand, O., & van Moorter, B. (2019). Large-scale segregation of tourists and wild reindeer in three Norwegian national parks: Management implications. Tourism Management, 75. https://doi.org/10.1016/j.tourman.2019.04.017

Gunderson, L. H., Holling, C. S., Pritchard Lowell, Jr., & Peterson, G. D. (2002). Resilience of large-scale resource systems. Resilience and the Behavior of Large-Scale Systems, 60.

Güneş, G. (2011). Korunan alanların yönetiminde yeni bir yaklaşım: katılımcı yönetim planları. Ekonomi Bilimleri Dergisi, 3(1), 47–57.

Hammer, T. (2016). Protected areas and regional development: Conflicts and opportunities. In Protected areas and regional development in Europe (pp. 21-36). Routledge.

Hammer, D. A., & Bastian, R. K. (2020). Wetlands ecosystems: natural water purifiers?. In *Constructed wetlands for wastewater treatment* (pp. 5-19). CRC Press.

Hartig, E. K., Grozev, O. & Rosenzweig, C. (1997). Climate change, agriculture and wetlands in Eastern Europe: vulnerability, adaptation and policy. *Climatic Change, 36*(1), 107-121. https://doi.org/10.1023/A:1005304816660

Hatipoglu, B., Alvarez, M. D., & Ertuna, B. (2016). Barriers to stakeholder involvement in the planning of sustainable tourism: The case of the Thrace region in Turkey. Journal of cleaner production, 111, 306-317.

Hausmann, A., Toivonen, T., Fink, C., Heikinheimo, V., Tenkanen, H., Butchart, S. H. M., Brooks, T. M., & Di Minin, E. (2019). Assessing global popularity and threats to Important Bird and Biodiversity Areas using social media data. Science of the Total Environment, 683. https://doi.org/10.1016/j.scitotenv.2019.05.268

Hockings, M. (2003). Systems for assessing the effectiveness of management in protected areas. In BioScience (Vol. 53, Issue 9). https://doi.org/10.1641/0006-3568(2003)053[0823:SFATEO]2.0.CO;2

Hockings, M., Stolton, S., & Leverington, F. (2006). Evaluating effectiveness : a framework for assessing management effectiveness of protected areas, 2nd edition. In Evaluating effectiveness : a framework for assessing management effectiveness of protected areas, 2nd edition. https://doi.org/10.2305/iucn.ch.2006.pag.14.en

Howley, P. (2011). Landscape aesthetics: Assessing the general publics' preferences towards rural landscapes. Ecological Economics, 72, 161–169.

IUCN. (2023). World Commission on Protected Areas. International Union for Conservation of Nature and Natural Resources. https://www.iucn.org/our-union/commissions/world-commission-protected-areas

Jenkins, J., & Pigram, J. (2005). Outdoor recreation management. Routledge.

Jennings, G. (2007). Water-Based Tourism, Sport, Leisure, and Recreation Experiences. In Water-Based Tourism, Sport, Leisure, and Recreation Experiences. https://doi.org/10.4324/9780080468310-1

Job, H., Becken, S., & Lane, B. (2020). Protected Areas in a neoliberal world and the role of tourism in supporting conservation and sustainable development: an assessment of strategic planning, zoning, impact monitoring, and tourism management at natural World Heritage Sites. In Protected areas, sustainable tourism and neo-liberal governance policies (pp. 1-22). Routledge.

Jones, K. R., Venter, O., Fuller, R. A., Allan, J. R., Maxwell, S. L., Negret, P. J., & Watson, J. E. M. (2018). One-third of global protected land is under intense human pressure. Science, 360(6390). https://doi.org/10.1126/science.aap9565

Jūrmalis, E., & Lībiete, Z. (2019). Developing a framework for characterizing recreational potential of forest areas using Weighted Criteria Analysis. Research For Rural Development, 1.

Karia, J. P. (2012). Floral and Avifaunal Diversity of Thol Lake Wildlife (Bird) Sanctuary of Gujarat State, India. Biodiversity Enrichment in a Diverse World. IntechOpen Ltd., London, UK. https://dx. doi. org/10.5772/50073, 1-34.

Kays, R., Parsons, A. W., Baker, M. C., Kalies, E. L., Forrester, T., Costello, R., Rota, C. T., Millspaugh, J. J., & McShea, W. J. (2017). Does hunting or hiking affect wildlife communities in protected areas? Journal of Applied Ecology, 54(1). https://doi.org/10.1111/1365-2664.12700

Keddy, P. (2010). Wetland ecology: principles and conservation. https://books.google.com/books?hl=tr&lr=&id=eVeaSqFy2VgC&oi=fnd&pg=PR5&dq=eddy,+P.+A.+

(2010).+Wetland+ecology:+principles+and+conservation.+Cambridge+university+press&ots=MgW6gc6JNe&sig=3pwHH1lDxdLCF88x6-fduKzHqvc

Kim, Y., Kim, C. ki, Lee, D. K., Lee, H. woo, & Andrada, R. I. T. (2019). Quantifying nature-based tourism in protected areas in developing countries by using social big data. Tourism Management, 72. https://doi.org/10.1016/j.tourman.2018.12.005

Kılıç, M. (2018). Türkiye'de Milli Parkların Gelişimi: Yozgat Çamlığı Milli Parkı Örneği. Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Coğrafya Anabilim Dalı, Yayımlanmamış Yüksek Lisans Tezi, Isparta.

Koçan, N. (2012). Kızılcahamam-Çamlıdere jeoparkında kırsal peyzaj ve rekreasyon planlama. Erciyes Üniversitesi Fen Bilimleri Enstitüsü Fen Bilimleri Dergisi, 28(1), 38–46.

Komossa, F., van der Zanden, E. H., Schulp, C. J. E., & Verburg, P. H. (2018). Mapping landscape potential for outdoor recreation using different archetypical recreation user groups in the European Union. Ecological Indicators, 85, 105–116.

Komossa, F., Wartmann, F. M., Kienast, F., & Verburg, P. H. (2020). Comparing outdoor recreation preferences in peri-urban landscapes using different data gathering methods. Landscape and Urban Planning, 199, 103796.

Korir, J., Muchiri, J., & Kamwea, J. (2013). Wildlife-based tourism, ecology and sustainability of protected areas in Kenya.

Korunan alanlar. (2023). Türkiye Cumhuriyeti Çevre, Şehircilik ve İklim Değişikliği Bakanlığı. https://cevreselgostergeler.csb.gov.tr/korunan-alanlar-i-85778

KTB. (2023). Somut Olmayan Kültürel Miras Envanter Çalışmaları. Türkiye Cumhuriyeti Kültür ve Turizm Bakanlığı. https://aregem.ktb.gov.tr/TR-50839/somut-olmayan-kulturel-miras-envanter-calismalari.html

Kuşçu Şimşek, Ç., Türk, T., Ödül, H., & Çelik, M. N. (2018). Detection of paragliding fields by GIS. International Journal of Engineering and Geosciences, 3(3), 119–125.

Kuvan, Y. (2012). Doğa koruma ve korunan alanlar. İstanbul Üniversitesi Yayınları, 5066.

Kuvan, Y., Erol, S. Y., & Şahin, G. (2018). Management of forest areas used for ecotourism and recreation in Turkey. Forestist, 68(2), 114-121.

Leung, Y. F., Newburger, T., Jones, M., Kuhn, B., & Woiderski, B. (2011). Developing a monitoring protocol for visitor-created informal trails in Yosemite National Park, USA. Environmental Management, 47(1). https://doi.org/10.1007/s00267-010-9581-4

Liburd, J., Menke, B., & Tomej, K. (2023). Activating socio-cultural values for sustainable tourism development in natural protected areas. Journal of Sustainable Tourism. https://doi.org/10.1080/09669582.2023.2211245

Liu, J., Linderman, M., Ouyang, Z., An, L., Yang, J., & Zhang, H. (2001). Ecological degradation in protected areas: the case of Wolong Nature Reserve for giant pandas. Science, 292(5514), 98–101.

López-Mosquera, N., & Sánchez, M. (2011). Emotional and satisfaction benefits to visitors as explanatory factors in the monetary valuation of environmental goods. An application to periurban green spaces. Land Use Policy, 28(1), 151–166. https://doi.org/10.1016/J.LANDUSEPOL.2010.05.008

Maltby, E. (2009). Functional assessment of wetlands: towards evaluation of ecosystem services. https://books.google.com/books?hl=tr&lr=&id=W--iAgAAQBAJ&oi=fnd&pg=PP1&dq=Maltby,+E.+(2009).+Functional+assessment+of+wetlands:+towards+evaluation+of+ecosystem+services.+Elsevie&ots=687oXV_iq7&sig=yQFY_aupgOjTmHEYIDDw46dI0YU

Mason, P. (2005). Visitor management in protected areas: From "hard" to "soft" approaches? Current Issues in Tourism, 8(2–3). https://doi.org/10.1080/13683500508668213

McCool, S. F., & Moisey, R. N. (2008). Tourism, recreation, and sustainability: Linking culture and the environment: Second edition. In Tourism, Recreation and Sustainability: Linking Culture and the Environment: Second Edition.

McInnes, R. J. (2013). Recognizing ecosystem services from wetlands of international importance: An example from Sussex, UK. Wetlands, 33(6), 1001–1017. https://doi.org/10.1007/S13157-013-0458-1

McKinley, D. C., Miller-Rushing, A. J., Ballard, H. L., Bonney, R., Brown, H., Cook-Patton, S. C., ... & Soukup, M. A. (2017). Citizen science can improve conservation science, natural resource management, and environmental protection. Biological Conservation, 208, 15-28.

McLachlan, A., Defeo, O., Jaramillo, E., & Short, A. D. (2013). Sandy beach conservation and recreation: Guidelines for optimising management strategies for multi-purpose use. Ocean & Coastal Management, 71, 256–268.

McNeely, J. A. (1994). Protected areas for the 21st century: working to provide benefits to society. Biodiversity & Conservation, 3, 390-405.

Mebratu, D. (1998). Sustainability and sustainable development: historical and conceptual review. Environmental Impact Assessment Review, 18(6), 493–520.

Miller, G., Twining-Ward, L., Bakker, M., Carbone, G., Duka, T., Farrell, B., Font, X., Jack, E., & Tapper, R. (2005). Monitoring for a sustainable tourism transition: The challenge of developing and using indicators. In Monitoring for a Sustainable Tourism Transition: The Challenge of Developing and Using Indicators. https://doi.org/10.1057/palgrave.thr.6050034

Mimbs, B. P., Boley, B. B., Bowker, J. M., Woosnam, K. M., & Green, G. T. (2020). Importance-performance analysis of residents' and tourists' preferences for water-based recreation in the Southeastern United States. Journal of Outdoor Recreation and Tourism, 31, 100324.

Monz, C. A., Cole, D. N., Leung, Y. F., & Marion, J. L. (2010). Sustaining visitor use in protected areas: Future opportunities in recreation ecology research based on the USA experience. In Environmental Management (Vol. 45, Issue 3). https://doi.org/10.1007/s00267-009-9406-5

Mora, C., & Sale, P. F. (2011). Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea. Marine ecology progress series, 434, 251-266.

Morea, J. P. (2019). A framework for improving the management of protected areas from a social perspective: The case of Bahía de San Antonio Protected Natural Area, Argentina. Land Use Policy, 87, 104044. https://doi.org/10.1016/J.LANDUSEPOL.2019.104044

Moseley, D., Marzano, M., Chetcuti, J., & Watts, K. (2013). Green networks for people: Application of a functional approach to support the planning and management of greenspace. Landscape and Urban Planning, 116. https://doi.org/10.1016/j.landurbplan.2013.04.004

Muhar, A., Arnberger, A., & Brandenburg, C. (2002). Methods for visitor monitoring in recreational and protected areas: An overview. Monitoring and Management of Visitor Flows in Recreational and Protected Areas. Institut for Landscape Architecture & Landscape Management Bodenkultur University Vienna, 2001, 1-6.

Nahuelhual, L., Carmona, A., Lozada, P., Jaramillo, A., & Aguayo, M. (2013). Mapping recreation and ecotourism as a cultural ecosystem service: An application at the local level in Southern Chile. Applied Geography, 40. https://doi.org/10.1016/j.apgeog.2012.12.004

Navas Romero, A. L., Herrera Moratta, M. A., Dalmasso, A. D., & Barros, A. (2019). Quad bike impacts on vegetation and soil physicochemical properties in an arid ecosystem. Acta Oecologica, 97. https://doi.org/10.1016/j.actao.2019.04.007

Özenen-Kavlak, M., & Çabuk, S. N. (2022). Geospatial suitability and cost analysis modeling for energy crop cultivation: Switchgrass case for Eskisehir. Renewable Energy.

Özenen-Kavlak, M., & Çabuk, S. N. (2021). Enerji bitkisi yetiştiriciliğinde coğrafi bilgi sistemlerinin kullanımı: Fil otu için uygun alanların belirlenmesi. GSI Journals Serie C: Advancements in Information Sciences and Technologies, 4(2), 1–27.

Özenen-Kavlak, M., Cabuk, S. N., & Cetin, M. (2021). Development of forest fire risk map using geographical information systems and remote sensing capabilities: Ören case. Environmental Science and Pollution Research, 1–27.

Pickering, C. M., & Rossi, S. (2016). Mountain biking in peri-urban parks: Social factors influencing perceptions of conflicts in three popular National Parks in Australia. Journal of Outdoor Recreation and Tourism, 15, 71–81.

Polat, S., & Polat, S. A. (2016). Rekreasyonel tabiat parklarının korunan alanlar kapsamında incelenmesi: Mersin ili örneği. Social Sciences, 11(2), 85–115.

Popović, D., Doljak, D., Kuzmanović, D., & Pecelj, M. (2018). Geoecological evaluation of protected area for recreation and tourism planning-the evidence from the Bosnia and Herzegovina national park. Journal of the Geographical Institute" Jovan Cvijic", SASA, 68(1), 119-131.

Protected Planet. (2023). December 2023 update of the WDPA and WD-OECM. UN Enviroment Programme WCMC. https://www.protectedplanet.net/en/resources/december-2023-update-of-the-wdpa-and-wd-oecm

Qi, J., Lu, Y., Han, F., Ma, X., & Yang, Z. (2022). Spatial distribution characteristics of the rural tourism villages in the Qinghai-Tibetan Plateau and its influencing factors. International Journal of Environmental Research and Public Health, 19(15), 9330.

Qiu, L., Zhu, J., Pan, Y., Hu, W., & Amable, G. S. (2017). Multi-criteria land use suitability analysis for livestock development planning in Hangzhou metropolitan area, China. Journal of Cleaner Production, 161, 1011–1019.

Reed, S. E., & Merenlender, A. M. (2008). Quiet, nonconsumptive recreation reduces protected area effectiveness. Conservation Letters, 1(3), 146–154.

Rocha, C. H. B., Fontoura, L. M., Vale, W. B. D., Castro, L. F. D. P., da Silva, A. L. F., Prado, T. D. O., & da Silveira, F. J. (2021). Carrying capacity and impact indicators: analysis and suggestions for sustainable tourism in protected areas–Brazil. World Leisure Journal, 63(1), 73-97.

Saarinen, J. (2015). Conflicting limits to growth in sustainable tourism. In Current Issues in Tourism (Vol. 18, Issue 10). https://doi.org/10.1080/13683500.2014.972344

Sahabo, A. A., & Mohammed, A. B. (2016). A Gis Based Multi-Criteria Analysis For Siting Recreational Parks In Yola-North Local Government. Int J Appl Sci Eng Res, 5(1), 20–29.

Sun, Y., & Wang, W. (2024). Research On China's Tourism Competitiveness and its Coordination Degree Based on the Three-Dimensional Perspective Of Market, Resources and Environment. In 2023 5th International Conference on Economic Management and Cultural Industry (ICEMCI 2023) (pp. 819-837). Atlantis Press.

Şahin, C. (2020). Sakarya Nehri Deltası'nda uzun süreli rüzgar ve dalga iklimi değişimleri. Dokuz Eylül Üniversitesi Mühendislik Fakültesi Fen ve Mühendislik Dergisi, 22(65), 353–368.

Senevirathna, E., & Gunathilake, J. (2015). Demand Based Geographic Information System for Analyzing Recreational Opportunity in Protected Areas in Sri Lanka: Special Reference to Udawalawe National Park.

Shafer, C. L. (2015). Cautionary thoughts on IUCN protected area management categories V-VI. In Global Ecology and Conservation (Vol. 3). https://doi.org/10.1016/j.gecco.2014.12.007

Tabiat Varlıklarını Koruma Genel Müdürlüğü. (2023). Türkiye Cumhuriyeti Çevre, Şehircilik ve İklim Değişikliği Bakanlığı. https://tvk.csb.gov.tr/

Tafahomi, R., & Nadi, R. (2021). Protection of natural wetlands through landscape design in Kigali City. Rwanda Journal of Engineering, Science, Technology and Environment, 4(1).

Taiminen, S. (2018). The negative impacts of overtourism on tourism destination from environmental and socio-cultural perspectives.

T.C. Orman ve Su İşleri Bakanlığı, D. K. ve M. P. G. M. (Ed.). (2016). Acarlar Gölü Longoz Ormanı Sulak Alan Yönetim Planı [2016 - 2020]. Ekoplan Mühendislik Danışmanlık Ltd. Şti.

Tırıl, A., & Baylan, E. (2009). Wetland management in Turkey: Problems, achievements and perspectives. African Journal of Agricultural Research, 4(11), 1106–1119.

Tosun, C. (2001). Challenges of sustainable tourism development in the developing world: the case of Turkey. Tourism Management, 22(3), 289–303.

Tunca, H., Sevindik, T. O., Bal, D. N., & Arabaci, S. (2014). Community structure of epiphytic algae on three different macrophytes at Acarlar floodplain forest (northern Turkey). Chinese Journal of Oceanology and Limnology, 32(4), 845–857.

Turner, K. (1991). Economics and wetland management. Ambio. https://www.jstor.org/stable/4313777

Turner, R. K., Van Den Bergh, J. C., Söderqvist, T., Barendregt, A., Van Der Straaten, J., Maltby, E., & Van Ierland, E. C. (2000). Ecological-economic analysis of wetlands: scientific integration for management and policy. Ecological economics, 35(1), 7-23.

Ursavaş, S., & Işin, Z. (2019). New records of Bryum gemmiferum and Atrichum crispum for Turkey. Plant Biosystems-An International Journal Dealing with All Aspects of Plant Biology, 153(5), 686–690.

Uzun, A., Tabur, M. A., & Ayvaz, Y. (2008). Birds of Lake Acarlar and environmental problems. Ekoloji Dergisi, 17(66).

Wang, Y., Yao, Y., & Ju, M. (2008). Wise use of wetlands: Current state of protection and utilization of chinese wetlands and recommendations for improvement. Environmental Management, 41(6), 793–808. https://doi.org/10.1007/S00267-008-9072-Z

Watson, J. E. M., Darling, E. S., Venter, O., Maron, M., Walston, J., Possingham, H. P., Dudley, N., Hockings, M., Barnes, M., & Brooks, T. M. (2016). Bolder science needed now for protected areas. Conservation Biology, 30(2). https://doi.org/10.1111/cobi.12645

Weyland, F., & Laterra, P. (2014). Recreation potential assessment at large spatial scales: A method based in the ecosystem services approach and landscape metrics. Ecological Indicators, 39. https://doi.org/10.1016/j.ecolind.2013.11.023

Wilkerson, M. L., Mitchell, M. G., Shanahan, D., Wilson, K. A., Ives, C. D., Lovelock, C. E., & Rhodes, J. R. (2018). The role of socio-economic factors in planning and managing urban ecosystem services. Ecosystem Services, 31, 102-110.

Wilkins, E. J., Sinclair, W., Miller, H. M., & Schuster, R. M. (2019). Does proximity to wetlands matter? A landscape-level analysis of the influence of local wetlands on the public's concern for ecosystem services and conservation involvement. Wetlands, 39(6), 1271–1280.

Xu, L., Ao, C., Mao, B., Cheng, Y., Sun, B., Wang, J., Liu, B., & Ma, J. (2020). Which is more Important, Ecological Conservation or Recreational Service? Evidence from a Choice Experiment in Wetland Nature Reserve Management. Wetlands, 40(6), 2381–2396. https://doi.org/10.1007/S13157-020-01348-8

Xu, T., Weng, B., Yan, D., Wang, K., Li, X., Bi, W., Li, M., Cheng, X., & Liu, Y. (2019). Wetlands of international importance: Status, threats, and future protection. International Journal of Environmental Research and Public Health, 16(10). https://doi.org/10.3390/ijerph16101818

Yavuz, M., & Vatandaşlar, C. (2018). Monitoring temporal and ecological changes in protected areas with fragmentation analysis: a case study from Karagöl-Sahara National Park. Turkish Journal of Forestry Research.

Yenilmez-Arpa, N. (2011). Türkiye'de korunan alanların belirlenmesi, planlanması ve yönetimi sürecinde katılımcılığın değerlendirilmesi: Sultan Sazlığı Milli Parkı. In Fen Bilimleri Enstitüsü, Peyzaj Mimarlığı Anabilim Dalı: Vol. Master Thesis. Ankara Üniversitesi .

Yıldız, D. (2019). Korunan alanlarda çatışma yönetimi: Küre Dağları Milli Parkı örneği.

Yılmaz, R., Uygun, Ö., & Ajansı, T. C. D. M. K. (2011). Karasu'nun Genel Durum Değerlendirmesi ve Swot Analizi Raporu. T.C. Doğu Marmara Kalkınma Ajansı.

Yuan, J., Yang, D., Liu, N., & Gao, C. (2023). A local-scale participatory zoning approach to conflict resolution in protected areas. Landscape and Urban Planning, 232. https://doi.org/10.1016/j.landurbplan.2022.104677

Yuxi, Z., & Linsheng, Z. (2020). Identifying conflicts tendency between nature-based tourism development and ecological protection in China. Ecological Indicators, 109. https://doi.org/10.1016/j.ecolind.2019.105791

Zasada, I. (2011). Multifunctional peri-urban agriculture—A review of societal demands and the provision of goods and services by farming. Land Use Policy, 28(4), 639–648. https://doi.org/10.1016/J.LANDUSEPOL.2011.01.008

Zeng, H., Sui, D. Z., & Wu, X. B. (2005). Human disturbances on landscapes in protected areas: a case study of the Wolong Nature Reserve. Ecological Research, 20, 487-496.

Zuckerberg, B., & Porter, W. F. (2010). Thresholds in the long-term responses of breeding birds to forest cover and fragmentation. Biological Conservation, 143(4). https://doi.org/10.1016/j.biocon.2010.01.004

## Appendix

**Appendix 1.** Weighted Overlay Data Layers and Suitability Classes for Hiking Activities

| Primary Suitability Map | Influence Weight for Main Data Layer (%) | Main Data Layer | Sub Data Layer | Influence Weight for Sub Data Layer (%) | Attributes | Suitability Scores | Suitability Classes |
|---|---|---|---|---|---|---|---|
| Topography Suitability Map | 15 | Topography | Slope | 60 | 0-2% | 3 | 1st-degree |
| | | | | | 2-6% | 3 | 1st-degree |
| | | | | | 6-12% | 2 | 2nd-degree |
| | | | | | 12-20% | 2 | 2nd-degree |
| | | | | | >20% | 1 | 3rd-degree |
| | | | Aspect | 30 | South, Southeast, Southwest | 3 | 1st-degree |
| | | | | | East | 3 | 1st-degree |
| | | | | | North, Northeast, Northwest | 2 | 2nd-degree |
| | | | | | West | 2 | 2nd-degree |
| | | | | | Flat | 3 | 1st-degree |
| | | | Elevation | 10 | 0-20 m | 3 | 1st-degree |
| | | | | | 20-40 m | 3 | 1st-degree |
| | | | | | 40-60 m | 3 | 1st-degree |
| | | | | | 60m + | 3 | 1st-degree |
| Land Use Suitability Map | 10 | Current Land Use | CORINE | 100 | Open spaces with little or no vegetation | 3 | 1st-degree |
| | | | | | Arable land | 1 | 3rd-degree |
| | | | | | Inland wetlands | - | Restricted |
| | | | | | Heterogeneous agricultural areas | 1 | 3rd-degree |
| | | | | | Mine, dump, construction sites | - | Restricted |
| | | | | | Scrub and/or herbaceous vegetation associations | 3 | 1st-degree |
| | | | | | Forests | 3 | 1st-degree |
| | | | | | Permanent crops | 1 | 3rd-degree |
| | | | | | Urban fabric | 2 | 2nd-degree |
| Protection Zone Suitability Map | 15 | Protection Zone | Absolute Protection Zone | 20 | Absolute Protection Zone | - | Restricted |
| | | | | | 0-200 m | 1 | 3rd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | Special Provision Zone | 20 | Special Provision Zone | 2 | 2nd-degree |
| | | | | | 0-200 m | 2 | 2nd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | Wetland Protection Zone | 20 | Wetland Protection Zone | 2 | 2nd-degree |
| | | | | | 0-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | 1st Degree Natural Site | 20 | 1st Degree Natural Site | 3 | 1st-degree |
| | | | | | 0-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | Wildlife Development Zone | 20 | Wildlife Development Zone | - | Restricted |
| | | | | | 0-200 m | 1 | 3rd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |

**Appendix 2 continued**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Natural Structure Suitability Map | 25 | Natural and Ecological Structure | Management | 30 | Deciduous forest | 3 | 1st-degree |
| | | | | | Coniferous forest | 3 | 1st-degree |
| | | | | | Agricultural land | 1 | 3rd-degree |
| | | | | | Swamp, reed | - | Restricted |
| | | | | | Energy, natural gas etc. infrastructure | 2 | 2nd-degree |
| | | | | | Treeless Forest Land | 3 | 1st-degree |
| | | | | | Settlement area | 2 | 2nd-degree |
| | | | Ecological structure | 30 | Dune ecosystem | 2 | 2nd-degree |
| | | | | | Longoz ecosystem | 2 | 2nd-degree |
| | | | | | Forest ecosystem | 3 | 1st-degree |
| | | | | | Agricultural ecosystem | 1 | 3rd-degree |
| | | | | | Residential ecosystem | 2 | 2nd-degree |
| | | Natural and Ecological Structure | Fauna (water birds) | 20 | 0-200 m | - | Restricted |
| | | | | | 200 m+ | 2 | 2nd-degree |
| | | | Endemic plant species | 20 | 0-200m | - | Restricted |
| | | | | | 200 m+ | 2 | 2nd-degree |
| Hydrology Suitability Map | 25 | Hydrology | Lake | 50 | Lake | - | Restricted |
| | | | | | 0-100 m | 3 | 1st-degree |
| | | | | | 100-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 2 | 2nd-degree |
| | | | Stream | 50 | 0-100 m | 3 | 1st-degree |
| | | | | | 100-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 2 | 2nd-degree |
| Transportation Suitability Map | 10 | Transportation | Proximity to roads | 100 | 0-500 m | 3 | 1st-degree |
| | | | | | 500-1000 m | 3 | 1st-degree |
| | | | | | 1000-1500 m | 2 | 2nd-degree |
| | | | | | 1500 m+ | 2 | 2nd-degree |

**Appendix 2.** Weighted Overlay Data Layers and Suitability Classes for Hiking Activities

| Primary Suitability Map | Influence Weight for Main Data Layer (%) | Main Data Layer | Sub Data Layer | Influence Weight for Sub Data Layer (%) | Attributes | Suitability Scores | Suitability Classes |
|---|---|---|---|---|---|---|---|
| Topography Suitability Map | 15 | Topography | Slope | 50 | 0-2% | 3 | 1st-degree |
| | | | | | 2-6% | 2 | 2nd-degree |
| | | | | | 6-12% | 1 | 3rd-degree |
| | | | | | 12-20% | 1 | 3rd-degree |
| | | | | | >20% | 1 | 3rd-degree |
| | | | Aspect | 5 | South, Southeast, Southwest | 3 | 1st-degree |
| | | | | | East | 3 | 1st-degree |
| | | | | | North, Northeast, Northwest | 3 | 1st-degree |
| | | | | | West | 3 | 1st-degree |
| | | | | | Flat | 3 | 1st-degree |
| | | | Elevation | 45 | 0-20 m | 2 | 2nd-degree |
| | | | | | 20-40 m | 3 | 1st-degree |
| | | | | | 40-60 m | 3 | 1st-degree |
| | | | | | 60m + | 3 | 1st-degree |
| Land Use Suitability Map | 5 | Current Land Use | CORINE | 100 | Open spaces with little or no vegetation | 3 | 1st-degree |
| | | | | | Arable land | 2 | 2nd-degree |
| | | | | | Inland wetlands | - | Restricted |
| | | | | | Heterogeneous agricultural areas | 1 | 3rd-degree |
| | | | | | Mine, dump and construction sites | - | Restricted |
| | | | | | Scrub and/or herbaceous vegetation associations | 3 | 1st-degree |
| | | | | | Forests | 3 | 1st-degree |
| | | | | | Permanent crops | 1 | 3rd-degree |
| | | | | | Urban fabric | - | Restricted |
| Protection Zone Suitability Map | 10 | Protection Zone | Absolute Protection Zone | 20 | Absolute Protection Zone | - | Restricted |
| | | | | | 0-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | Special Provision Zone | 20 | Special Provision Zone | 2 | 2nd-degree |
| | | | | | 0-200 m | 2 | 2nd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | Wetland Protection Zone | 20 | Wetland Protection Zone | 3 | 1st-degree |
| | | | | | 0-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | 1st Degree Natural Site | 20 | 1st Degree Natural Site | 3 | 1st-degree |
| | | | | | 0-200 m | 3 | 1st-degree |
| | | | | | 200 m+ | 3 | 1st-degree |

**Appendix 2 continued**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Protection Zone Suitability Map | 10 | Protection Zone | Wildlife Development Zone | 20 | Wildlife Development Zone | - | Restricted |
| | | | | | 0-200 m | 1 | 3rd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| Natural Structure Suitability Map | 45 | Natural and Ecological Structure | Management | 15 | Deciduous forest | 3 | 1st-degree |
| | | | | | Coniferous forest | 3 | 1st-degree |
| | | | | | Agricultural land | 2 | 2nd-degree |
| | | | | | Swamp, reed | - | Restricted |
| | | | | | Energy, natural gas etc. infrastructure | 2 | 2nd-degree |
| | | | | | Treeless Forest Land | 3 | 1st-degree |
| | | | | | Settlement area | - | Restricted |
| | | | Ecological structure | 25 | Dune ecosystem | 2 | 2nd-degree |
| | | | | | Longoz ecosystem | 3 | 1st-degree |
| | | | | | Forest ecosystem | 3 | 1st-degree |
| | | | | | Agricultural ecosystem | 2 | 2nd-degree |
| | | | | | Residential ecosystem | - | Restricted |
| | | | Fauna (water birds) | 40 | 0-50 m | - | Restricted |
| | | | | | 50-250 m | 3 | 1st-degree |
| | | | | | 250-500 m | 2 | 2nd-degree |
| | | | | | 500-1000 m | 1 | 3rd-degree |
| | | | | | 1000 m+ | - | Restricted |
| | | | Endemic plant species | 20 | 0-200 m | - | Restricted |
| | | | | | 200 m+ | 3 | 2nd-degree |
| Hydrology Suitability Map | 20 | Hydrology | Lake | 65 | 0-100 m | - | Restricted |
| | | | | | 100-200 m | 2 | 2nd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| | | | Stream | 35 | 0-100 m | - | Restricted |
| | | | | | 100-200 m | 2 | 2nd-degree |
| | | | | | 200 m+ | 3 | 1st-degree |
| Transportation Suitability Map | 5 | Transportation | Proximity to roads | 100 | 0-500 m | 1 | 3rd-degree |
| | | | | | 500-1000 m | 2 | 2nd-degree |
| | | | | | 1000-1500 m | 2 | 2nd-degree |
| | | | | | 1500 m+ | 3 | 1st-degree |