



Planning the Valley Located in the City as a Recreational Area: Trabzon Toklu Valley Example

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ABSTRACT

Changing land use for human activities on earth creates major ecological problems, especially in cities. Growing cities move to natural areas and pose a threat to the ecosystem in order to meet the demand of the population concentrated in the cities for various reasons. Green areas, such as environmental corridors, landscape connections, wildlife corridors, or waterside buffer zones, are areas that need to be protected to protect natural areas and provide recreation opportunities. The greenway system is an important part of creating a sustainable city where the balance between protection and use is established. In order for greenway systems to function properly, both ecological and sociological data must be processed together. Today, Geographic Information Systems (GIS) are used in the processing of this data. Although Trabzon is a city known for its green nature, the amount of open green areas where individuals can meet their recreation needs is small. Toklu Valley, where there is less construction and destruction than other valleys in the city, is a corridor that connects the coast and the countryside. In this study, it was decided to bring various functions and activities to the area in order for Toklu Valley to maintain its ecosystem services in a healthy manner and to meet the recreational needs of the city people. After determining the types of activities, it is aimed to determine the area usage decisions by conducting conformity analysis of the determined activities with the GIS method. Thus, by making the right area usage decisions of natural areas facing the danger of construction and degradation in the city, it will be provided both to serve the recreational needs of the people of the city and to be protected for the city ecosystem.

Keywords: Landscape Planning, Geographic Information Systems, Urban Ecosystem, Greenway, Recreation, Suitability Analysis

INTRODUCTION

Activities of human, deforestation, agricultural land, pastures and land use changes resulting from the recent growth of urban areas are a global problem that leads to increased energy and water consumption, as well as damage to biodiversity (Foley et al., 2005; Jetz et al., 2007; Oliver & Morecroft, 2014; Guo et al., 2018). Altering land use for human activities on earth, especially in cities poses major ecological problems (Baschak & Brown, 1995; Hua et al., 2017; Yang & Zeng, 2018; Moniruzzaman et al., 2018). In today, the existence of various institutions such as employment opportunities, social, health, education, etc. has caused the majority of the population to concentrate in the cities (Pathirana et al., 2014). In order to meet the increasing demand, the rapidly expansion of cities into natural areas poses a threat to the ecosystem (Bengston & Youn, 2006; Dewan & Tamaguchi, 2009). Urbanization and the negative impact of urbanization on the protection and development of natural resources and human health reveal the importance of creating more liveable cities for national and international sustainability (Wadhwa, 2002; Vasconcelos et al., 2007). The green areas such as environmental corridors, landscape links, wildlife corridors or waterfront buffer areas are important areas that must be protected to protect natural areas and provide recreation opportunities (Little, 1990;



Ahern, 1995). In the urban planning process, planners prefer green roads in order to make cities greener, healthier and liveable (Beatley & Manning, 1998; Lindsey, 2003). The green roads are linear corridors connecting natural corridors such as ridge, valley and riverside, converted canal or railway routes for recreational use, natural reserve areas or historical and cultural settlements to each other and other areas (Arslan et al., 2004). The green roads not only provide recreational opportunities for people, but also contribute to the protection of biodiversity, water resources and soil (Miller et al., 1998; Miller & Hobbs, 2000). The green roads are an important key to creating sustainable cities that provide a balance between conservation and use, both for the protection of nature and for economic development (Ahern, 1995).

The green road systems are divided into three main factors (Fabos, 1995). First, natural ridges, natural systems planned to ensure the continuity of biodiversity and wildlife migrations on rivers and shores, secondly urban or rural areas that connect recreation areas and visually important landscapes, and thirdly the green areas with historical and cultural values to attract tourists, entertainment, education and economic contribution.

Green road planning process consists of three stages: inventory and analysis, concept plan and master plan (Kurdođlu, 2002). In the inventory and analysis phase, the necessary data are obtained for evaluating the natural and cultural resource values of the area and evaluations are made. During the concept planning phase, the aims and objectives are clearly defined and the basis for the master plan is given to make choices and use of space decisions. Finally, in the master plan, options are determined and field usage decisions are made about them.

The land use planning is the process of assessing the existing potential of the area in order to ensure sustainable land use and determining the environmental limits by determining the level of compliance of the planned use (Steiner et al., 2000; Al-Shalabi et al., 2006; Bandyopadhyay, 2009). The suitability of the area for use according to the activity types is determined by determining criteria and conducting conformity analyses (Rossiter, 1996; Akbulak, 2010; Amiri & Shariff; 2012). Conformity analysis is the process of determining the level of compliance by comparing the needs of a particular type of use and the potential of the site (Beek, 1978; Akinci et al., 2013).

Geographic Information Systems (GIS) is one of the most useful applications used in field conformity analysis and mapping (Hopkins, 1977; Banai-Kashani, 1989; Brail & Klosterman, 2001; Collins et al., 2001; Marinoni, 2004; Chandio et al., 2013). In the studies carried out by using GIS, various land use suitability analyzes such as habitat areas for animal and plant species, soil suitability for agricultural activities, landscape assessment and planning, regional planning were performed (Malczewski, 2004). Green roads are the systems that provide protection for wildlife while providing recreation area for people. In order for these systems to function properly, both ecological and sociological data should be evaluated together. Consequently, conducting conformity analyzes with GIS forms the basis of green road planning (Miller et al., 1998).

Although Trabzon is a city known for its green nature, the amount of open green areas where individuals can meet their recreation needs is small. Toklu Valley is a corridor connecting the coastal and rural areas with less construction and destruction compared to other valleys in the city. The green road potential of Toklu Valley has been revealed in BAP Project No. 10741 (Kurdoglu et al., 2015). In the project, considering the features of Toklu Valley, appropriate training, recreation, etc in the area has been defined and functions are specified. In this study, it is aimed to determine the types of activities that will serve the specified functions, and then to determine the area usage decisions by conducting conformity analysis of the determined activities with the GIS method. Thus, by making the right area usage decisions of natural areas facing the danger of construction and

degradation in the city, it will be provided both to serve the recreational needs of the people of the city and to be protected for the city ecosystem.

MATERIAL

The Toklu Valley connecting the rural area to the shore consisting of a 2,820 meters length and 110 Km² is located within the boundaries of Trabzon in the Eastern Black Sea Region and is located between the northern latitudes of 40 ° 58'55 "ile and the longitude of 39 ° 41'10" east. The height of the study area is ranged between 17 m. to 256 m. According to the long-term measurement period between 1929-2017 results are obtained as the average annual temperature is 14.7 ° C, the lowest temperature is 11.7 ° C and the average annual rainfall is 819.6 mm (MGM, 2019). In generally, land usage in the valley, it is seen that wide-leaved forests and various agricultural activities are carried out.

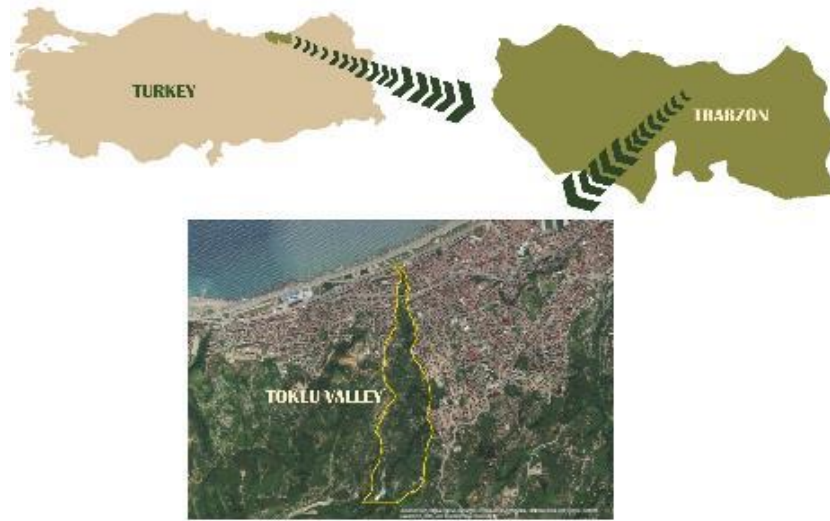


Figure 1 Toklu Valley Location

METHOD

The method of the research consists of four parts considering the landscape planning process. These are; (1) Gathering the ecological inventory of the area, (2) Deciding on the types of activities in line with the inventory analysis and literature review, (3) Determining the criteria and eligibility values for the activities, (4) Analyzing and mapping the use of suitable areas for the activities in the ArcGIS environment.

GATHERING THE ECOLOGICAL INVENTORY OF THE AREA

The Great Soil Groups (GSG)

Soil is a limited non-renewable natural resource that has a significant impact on planning studies (Şahin, 2011). The classification of the different soil types according to the need, whose characteristics vary by region, dates back to 4000 years (Baldwin et al., 1938). Knowing the soil class is one of the basic criteria in deciding the suitability of the soil for agricultural production (Akıncı et al., 2013). According to FAO large soil groups classification system within the working area there are Brown Forest Soils and Red-Yellow Podzolic Soil groups.



Figure 2 Toklu Valley Great Soil Groups Map

The Classes of Land Use Capability

Land use capability classification is a classification system that helps to make land use plans by combining all the necessary data to prevent soil degradation and to take appropriate usage or protection measures. The Land Use Capability Classes (LUCC) are in between the Class I where no soil degradation occurred, can be used in agriculture and the Class VIII which is not suitable for agriculture but can be used as national park, recreational activities which may be important for the wildlife (Standarts Turkey, 2019). According to LUCC, there are Class III, Class IV and Class VI land. The Class III and IV are the land suitable for the adoptive cultivated plants with forest, pasture and meadow plants, the Class VI are the lands suitable for grooving the natural species.



Figure 3 Toklu Valley Land Use Capability Classes Map

Land Use

Area usage maps, which are one of the important components of landscape planning, are the sources used to determine the misuse of a region and to observe the changes that occur and to make suggestion decisions (Demir et al., 2011). Sustainability of resources and conservation of biodiversity can only be ensured with the right area usage plans (Hobbs, 1999). Considering the land use map of Toklu Valley, the land usages are determined that; the land uses for broadleaf forest, settlement-agriculture, planted agriculture, meadow, hazelnut, shrubbery and shrub, city centre, industrial area. Accessibility is one of the important criteria in determining the recreational potential of an area (Akten et al., 2009). Due to the location of Toklu Valley on Yavuz Selim Boulevard and various transportation networks, close to residential and commercial areas, it is very easy for people to access the area.

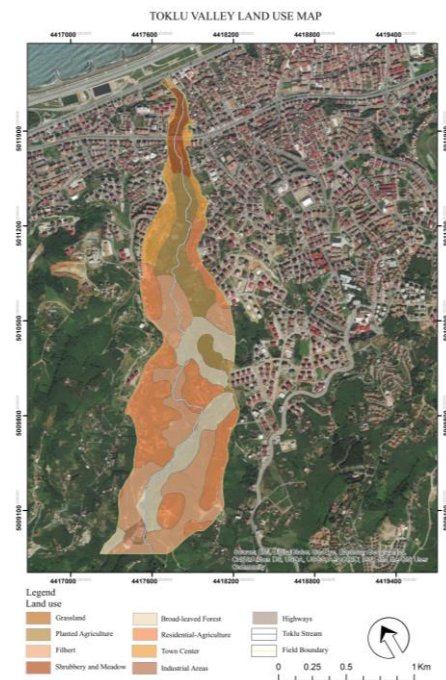


Figure 4 Toklu Valley Land Use Map

Slope and Aspect

When looking at the distribution of slope groups in the valley, it is seen that the valley floor has a slope between 0-14% along Toklu Creek. Due to the valley feature, a significant increase in slope is observed in the area in a short distance. In general, areas with a slope of 14-36% to 36-60% in the valley show more.

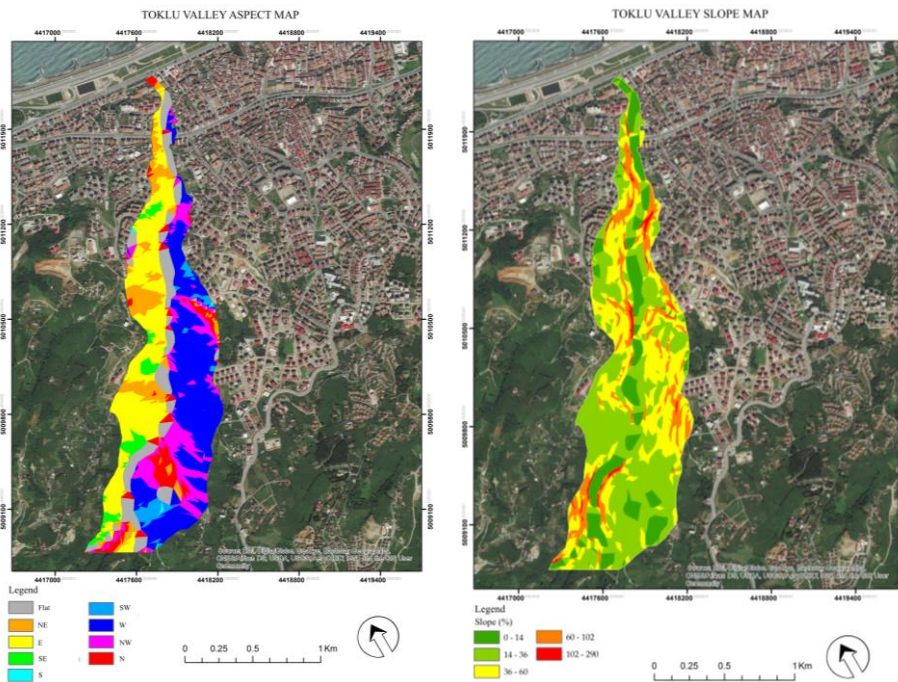


Figure 5 Toklu Valley Aspect (Left) and Slope (Right) Maps

Deciding on the types of activities in line with inventory analysis and literature review

Kurdođlu et al. (2016) in their study titled Green Road Planning Process in the Example of Toklu Valley, it is determined that there is population growth and construction, poor visual quality and social problems in the area, and in order highlighting biological diversity is preserved, thereby improving the recreational and ecotourism potential of this area as well as the educational function of such open-green areas, they carried out green road suitability analysis (Xu et al., 2019). Kurdođlu et al. (2016) determined the appropriate functions for the valley by making analysis and survey studies. The carried out studies have determined that the valley is suitable for recreation, landscape, ecological and educational functions. The literature studies also determined the suitability of the area for recreation, ecotourism and education. Considering the literature studies and area inventory, it is aimed that the Toklu Valley meets the recreational needs of the city people and that it is possible for both locals and tourists to visit and to be in contact with nature by dealing with agricultural tourism. In line with these goals, it was decided to bring bicycle, trekking, theme park and agricultural tourism activities to the area.

Determining the criteria and suitability values for the activities

Gıran Taşcıođlu (2016), in his study, the tourism potential of the region with the natural/cultural inventory, expert opinions and survey studies of the Northern Antalya Region (golf tourism, theme park, film studio, exhibition-congress and exhibition center, F3 -motorcycle off-road area, cycling route, hiking and agricultural tourism) revealed. It then taking into account certain criteria the suitability of these activities for the study area determined. Accordingly, the activities and eligibility criteria determined for Toklu Valley are given in Table 1.

Table 1 Suitability Criteria of Events (✓ Appropriate, ✓*Appropriate with the necessary measures, X Not Appropriate)

| | Criterion | Suitability Degrees | Suitability | | Criterion | Suitability Degrees | Suitability |
|----------------------------------|---------------------------------|------------------------|-------------------|-----------|---------------------------|------------------------|-------------|
| | Agricultural Tourism | Slope (%) | 0-5 | | ✓ | Hiking | Slope (%) |
| 0-15 | | | ✓* | 0-15 | ✓* | | |
| 15> | | | X | 15> | X | | |
| Aspect | | Flat | ✓ | Aspect | North (for Summer) | | ✓ |
| | | South | ✓ | | South (for Winter) | | ✓ |
| | | East | ✓* | | Other | | X |
| | | Other | X | | Other | | X |
| LUCC | | I, II, III | ✓ | GSG | Other | | ✓ |
| | | IV | ✓* | | Hydromorphic and Regosols | | X |
| | | VI | X | Lands use | Forest | | ✓ |
| Land use | | Forest | ✓ | | Filbert | | ✓ |
| | | Filbert | ✓ | | Meadow | | ✓ |
| | | Meadow | ✓ | | Scrublands and Meadow | | ✓ |
| | | Scrublands and Meadow | ✓ | | Cultivated Agriculture | | ✓ |
| | | Cultivated Agriculture | ✓ | | Residential-Agriculture | | ✓* |
| | Residential-Agriculture | ✓* | Other | | X | | |
| | Other | X | Other | | X | | |
| Accessibility (m) | 0-100 | X | Accessibility (m) | 0-100 | ✓ | | |
| 100> | ✓ | 100-200 | | ✓* | | | |
| Distance to Residential Area (m) | 0-3000 | ✓ | | 200> | X | | |
| | 3000> | X | Bicycle Route | Slope (%) | 0-5 | ✓ | |
| Slope (%) | 0-5 | ✓ | | | 0-15 | ✓* | |
| | 0-15 | ✓* | | | 15> | X | |
| | 15> | X | | Land use | Forest | ✓ | |
| LUCC | I, IV, VI | ✓ | | | Filbert | ✓ | |
| | Other | X | | | Meadow | ✓ | |
| | Distance to Industrial Area (m) | 0-1000 | | | X | Scrublands and Meadow | ✓ |
| 1000> | | | | | ✓ | Cultivated Agriculture | ✓ |
| | | ✓ | | | Residential-Agriculture | ✓* | |
| | | | | | Other | X | |
| | | | | | 0-100 | ✓ | |
| | | | | 100-200 | ✓* | | |
| | | | | 200> | X | | |
| | | 200> | | X | | | |

Analysis and mapping of the use of suitable areas for events in the ArcGIS environment

In order to ensure the balance of human use and nature protection of the determined activities, it is necessary to determine the suitability of land use based on certain criteria. The conformity analysis developed by McHarg for determining the suitability of the uses planned to be brought to the site in 1992 by overlapping the ecological inventory of the area by overlapping the maps (Nayim, 2011). First of all, the ecological inventory (large soil groups, land use capability classes, land use, slope and aspect) of the area that will form the basis of the conformity analysis has been mapped using GIS. The ecological inventory of the area was then classified by the classification method in the ArcGIS environment according to the determined degrees of compliance. Finally, with the Overlay command developed based on the coincidence method developed by McHarg in 1992, ecological inventory was overlapped and the conformity analyzes of the planned uses were performed. Thus, field use decisions that serve conservation-use balanced sustainability have been determined.

RESULTS

Agricultural Tourism

Rural development aims at both sustaining the living conditions of the rural society and strengthening the rural economy by protecting local potentials and resources (Kiper & Arslan, 2007). Rural life, which is accepted as a recreation type today, has provided its visitors with social, environmental, educational, relaxing and various rural activities, making agricultural tourism the fastest developing tourism sector in the world (Nilsson, 2002; Seong-Woo & Sou-Yeon, 2005; Wacker, 2006; Özşahin & Kaymaz, 2014). In this context, in Toklu Valley, where hazelnut cultivation and planted agricultural areas are

present, areas for agricultural tourism have been determined in order to provide both rural development and to meet the needs of visitors interested in agricultural tourism.

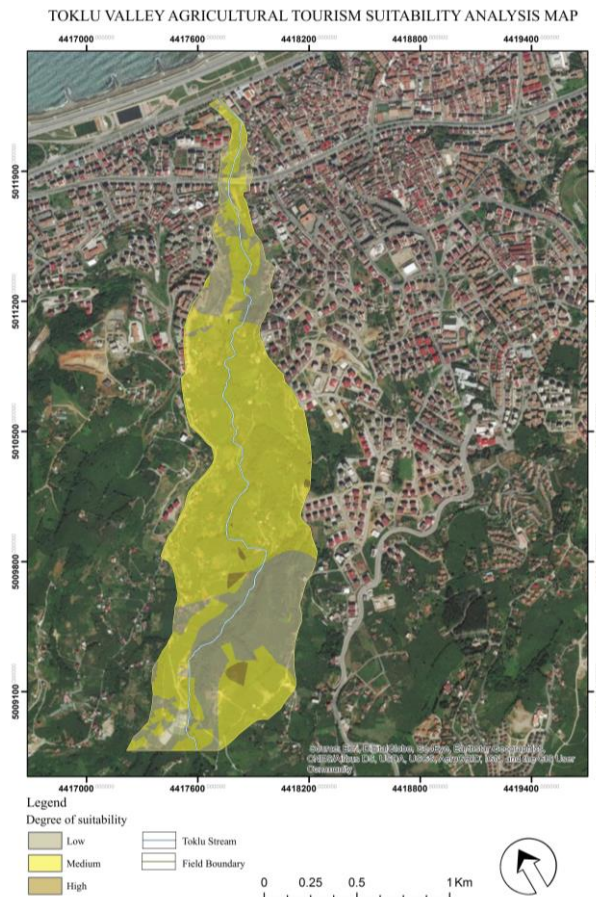


Figure 6 Toklu Valley Agricultural Tourism Suitability Analysis Map

Theme Park

Theme parks, unlike other recreation areas, are remarkable entertainment areas that can contain one or more thematic identities that develop the imagination, knowledge and skills of visitors based on certain criteria (Clavé, 2007). Theme parks, in which scientific, cultural and historical issues are animated with audio and visual techniques within a certain theme, are examples of open air museums (Gök & Bingöl, 2017). These areas, which are especially preferred by families with children, that are effective in preserving entertainment, education, natural, cultural and historical values, are areas that enable children to gain awareness about these issues at a young age (Tuna, 2018). Considering the educational facilities in the vicinity of Toklu Valley, it has been deemed appropriate to bring themed park activities into the area in order to ensure that children gain environmental awareness and to be sustainable by protecting natural and cultural. In this way, while the ecology-themed park will be created, children will have information about the presence of plants and animals around them, and they will also be able to develop their physical skills at their unique children's spaces resources.

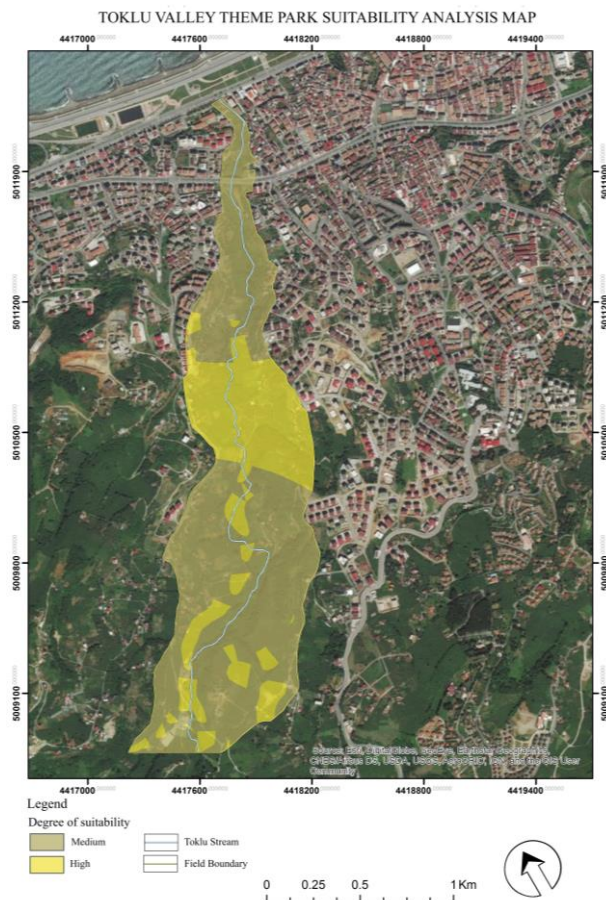


Figure 7 Toklu Valley Theme Park Suitability Analysis Map

Hiking

In the line with technological and economic developments. Changes in our habits also occurred in our life, which was reshaped. In addition to the positive contributions of these changes, a number of problems have arisen. Inactivity, which is the main problem of our age, has been effective in the formation of some health problems. It is known that today, walking, which is one of the most important physical activities, contributes to public health (Faucheur et al., 2007). City residents who spend most of their day working can meet their daily sports needs by spending a few hours a day walking. In this context, in the city, people are in need of an open green area where they may relax by walking. Toklu Valley in Trabzon city is the most naturally preserved valley where construction is minimal, where residents can come and walk in their free times and rest. In this regard, in order to determine the appropriate walking routes in Toklu Valley, conformity analysis was made in line with the determined criteria. Appropriate areas laid out can be an important outdoor recreation area that can be brought to the city with the right planning-design decisions.

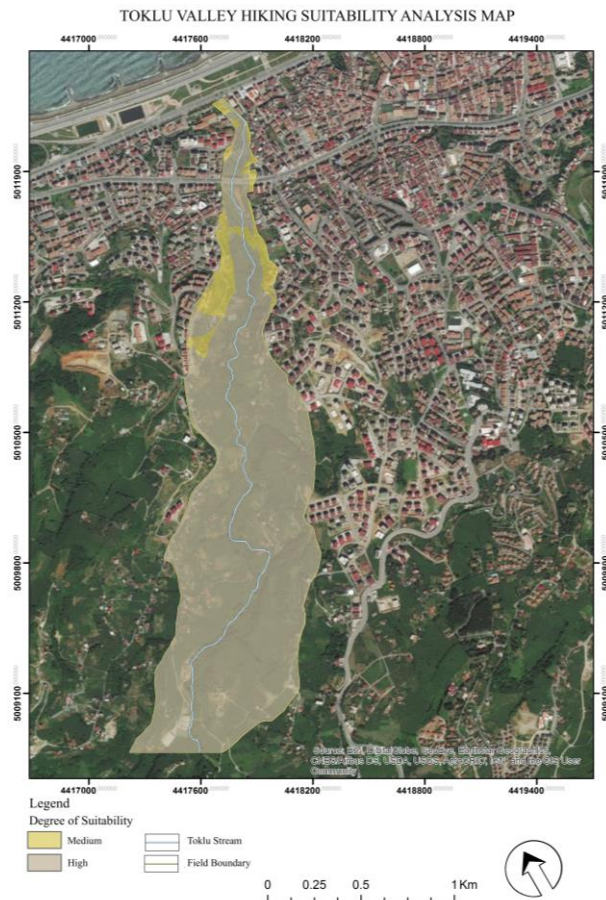


Figure 8 Toklu Valley Hiking Suitability Analysis Map

Bicycle Route

According to Austroads (2005), bicycle use is widely encouraged in the century we live, as it helps both protect public health by reducing exercise and reduces motor vehicle use, and reducing environmental pollution and traffic (Dalley & Rissel, 2011). Bicycles are an alternative type of transportation as well as offering recreation opportunities for people using entertainment and sports purposes (Aydın, 2015). According to the conformity analysis conducted, it has been determined that the regions in the valley floor are suitable for planning as a bicycle route because of the low slope. In addition, it is possible to develop route suggestions with various functions to the visitors by dividing the areas where the slope is increased to be moderately suitable by dividing these areas into difficult racetracks.

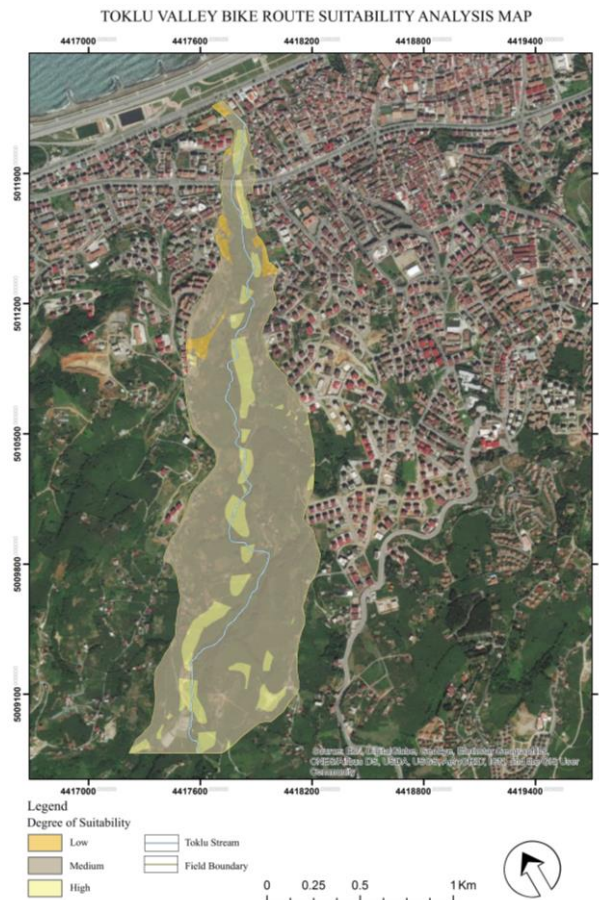


Figure 9 Toklu Valley Bicycle Route Suitability Analysis Map

DISCUSSION

According to Chang et al (2020), people living in urban areas prefer greenways to protect their physical and mental health, to meet the need for outdoor recreation and to increase their commitment to nature. It points out that increasing the welfare level of the society depends on reducing environmental stress such as noise and air pollution. Recent studies focus on the social and physical benefits of green roads to city residents. In order to increase the welfare of the society and eliminate environmental and social negativity, attention is drawn to the well-constructed open green areas. Toklu, one of the rare valleys that remained natural in the city of Trabzon, is an important area that will help improve the quality of society and city health. For this reason, it was decided to plan the activities that the city residents can meet their recreational, mental and physical needs within the valley. The suitability of Trabzon Toklu Valley, which is a natural city valley for the moment, has been analyzed for agricultural tourism, scientific theme park, open air museum, bicycles and trekking activities. Sustainable land use decisions for these events are revealed through spatial analysis carried out in the GIS environment.

We also see that the pandemic, which poses various material and moral difficulties to societies around the world, brings us different teachings today. The slowdown in production and consumption, and the opportunity for nature to renew itself to some extent, has enabled it to understand how much damage human beings have to the only existence that humanity can sustain, namely our planet. The damage caused by our wrong habits to our limited natural resources will cause us to face various ecological and economic problems that are difficult to repair in the future. The global epidemic crisis we are experiencing today has enabled our awareness in this direction to occur or increase. The common point of today's landscape planners is to protect naturally preserved areas such

as valleys, coasts and forests for the benefit of ecosystems and to plan for events that will contribute to sustainable urban life. Landscape planning scenarios should be created in this direction for these areas, which will have an important contribution for future generations to learn and realize holistic ecological approaches in human environment interaction and to develop ecological societies by developing ecological egos. Integrated planning decisions should be made by analyzing the abiotic, biotic and cultural components of the area to be planned for sustainable use decisions.

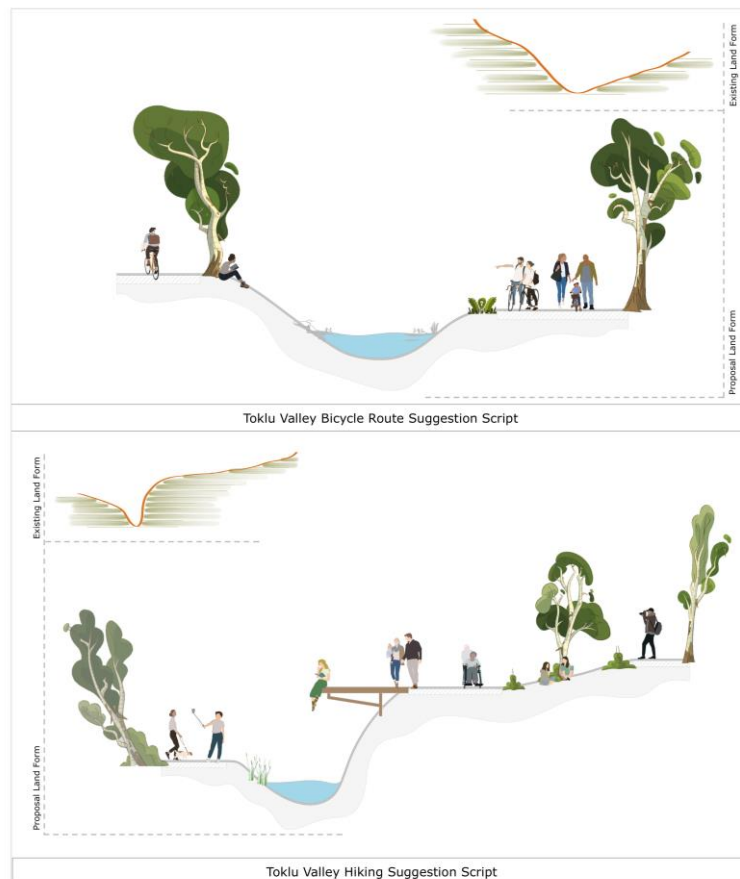


Figure 10. Toklu Valley Bicycle Route and Hiking Suggestion Script

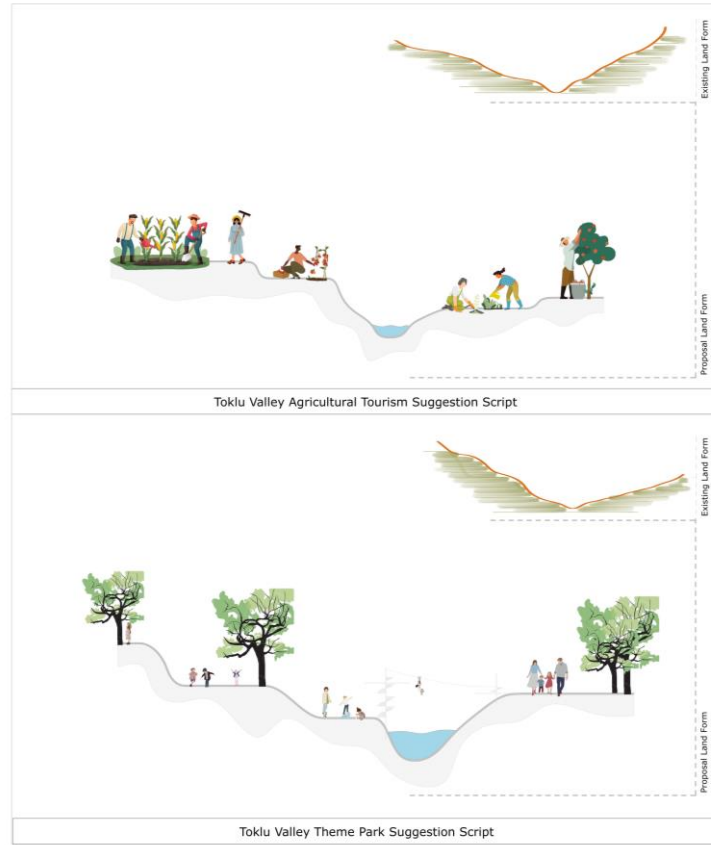


Figure 11. Toklu Valley Agricultural Tourism and Theme Park Suggestion Script

In addition, as the tendency of people towards recreational activities increases after the global epidemic, it is extremely important to create new areas in the city to meet this need. Bicycle and nature trails, theme parks and agricultural activities planned to be built in the area are expected to keep people's physical and mental health under control, as well as to increase people's commitment to nature.

By displaying a holistic perspective for the entire city, it can be made part of a "green formal system" that is ecologically contributing to the urban ecosystem in green continuity by associating this valley with other recreation areas and green areas. In this way, the level of accessibility of the valley will increase. Thus, it can be used by more urban residents.

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