



Chronicles and geoheritage of the ancient Roman city of Pompeiopolis: a landscape plan

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Abstract

Kastamonu-Pompeiopolis is a protected area with historical, natural, and cultural value and has recently increased in popularity. The aim of this study is to ensure the sustainability of natural and cultural resources via an evaluation to reveal the necessary practices and precautions regarding the area's landscape plan decisions for the ancient city. Maps of Pompeiopolis were created and the Gülez formula (1990) was used to evaluate the city. Based on the data obtained from the area, we have determined that it has a high recreational potential, and hence this study. We find that the untapped recreational potential of Pompeiopolis has yet to be exploited and reached. According to the formula, Pompeiopolis's recreational potential is 72%, which means it is considered to be an area of high recreational potential. In conclusion, Pompeiopolis has a wealth of ecotourism activities, including historical and cultural tourism, bird watching, wildlife tours, adventure and sports tourism, photography, camping, picnic activities, and cave exploring. However, management and planning is needed for trekking, hiking, and the rest of the activities in order to ensure long-term sustainability.

Keywords Ecosystem activities · Evaluation · Landscape planning · Landscape management · Modeling · GIS · Protected area

Introduction

Urbanization has rapidly increased in recent years, which has transformed the character of urban green areas. Unplanned urbanization and technological developments have caused deteriorating health and increased psychological, physical, and socio-cultural problems (Cetin 2015a, b, c; Cetin and Sevik 2016; Cetin 2016). In Turkey, cities and their accompanying

environmental problems are rapidly growing. Cities create slums due to the influx of populations from rural areas and to the large, multi-story buildings that develop along with industrial or commercial activities. In a city that ignores ecological relationships, natural areas diminish and climate and soil conditions change. Bioclimatic comfort affects the sustainability of ecotourism areas for recreational activities (Cetin 2015a; Cetin 2016; Zeren 2016). In addition to housing issues, cities are an artificial living environment with harmful substances resulting from machines, vehicles, and industrial emissions. There is a correlation between the living conditions in an urban city and a feeling that, due to air pollution, overpopulation, fatigue, and noise, the environment is less accessible; these factors cause people to suffer from psychophysiological imbalances. Therefore, the environment changes people's desires and pushes them out of the city, where they choose to relax in green areas such as natural parks. The increase in the people's craving for relaxation, having fun, and refreshing themselves has led to a need to identify suitable areas for recreational use within forests and to make the necessary plans to develop such forests as recreational areas (Bathrellos et al. 2012; Dereli et al. 2013; Aricak 2015; Cetin 2015a, b, c; Cetin and Sevik 2016; Bathrellos et al. 2017; Cetin et al. 2018a, b; Yucedag et al. 2018).

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People are frequently overwhelmed by the stress of modern urban life and seek to relax by spending their leisure time in recreational areas for psychological relief. Thus, natural and cultural areas are often chosen by people who wish to relax by connecting with nature and experiencing the cultural characteristics of a place. However, unmanaged use of these areas has started to damage the natural and cultural elements of these places, especially the areas that are close to residences (Barros et al. 2013; Cetin 2015a, b, c; Cetin and Sevik 2016; Cetin 2016). It is vital to include ancient cities in the management plans of protected areas to sustain their cultural and natural values. Although these plans are prepared on a macro-scale at a national level, land-use plans at the regional level and landscape, tourism, and recreational plans that include a balanced use should be taken into account (Tomczyk 2011; Cetin 2015a,b,c; Cetin and Sevik 2016; Cetin 2016).

The purpose of this study is to develop a landscape plan with the aim of sustaining the cultural and natural landscape values of an area by considering landscape variables such as the number of potential visitors, vegetation cover, cultural values, and the topographic structure. ArcGIS was used as the geographical information system to evaluate the landscape variables, and the study data were obtained through a land survey, questionnaires, and mapping. Finally, landscape plan decisions were proposed based on the data that were obtained for the area.

One of the most important dilemmas surrounding natural resources, however, especially in the last century purely from an economic standpoint, is the disruption of the balance between nature and the environment. The type of careless use that has been both seen and experienced by humankind today is extremely harmful. Global warming, climate change, and the degradation of the ecological balance of air and water contribute to the contamination of food, causing all sorts of damage. Ultimately, people have noticed and understood the need for the sustainability of the resources in all aspects, especially in the tourism industry; thus, many attempts of intervention were made (Cakir et al. 2016; Nowak et al. 2005; Kaya 2009; Kaya et al. 2017; Yucedag and Kaya 2017; Maple et al. 2010; Cheung and Jim 2014; Cetin 2015c; Cetin 2016; Cetin et al. 2018a,b).

During recent years, most recreational activities have included different landscapes inspired by nature and people have increasingly preferred tourism. The sometimes intense and difficult living conditions of the city prompt people to choose naturally and culturally oriented tourist activities; they want to lessen the unpleasant effects and aftereffects of their daily urban lives. Therefore, natural, cultural, and historical areas have seen more interest in recent years. Conservation and development of the natural and cultural values of tourism, in aid of the promotion of the rapidly increasing interest in these areas, is required (Ngoka 2013; Cetin 2016; Cetin et al. 2018a).

People enjoy traveling to different regions to experience a variety of different tourism types, from natural and nature conservation awareness to cultural and holiday events and recreational activities, accompanied by a desire to learn about local traditions. This is why environmental protection is of great importance for sustainable tourism. Environmental protection based on tourism and recreational planning, as well as economic and social infrastructure, will undoubtedly lead to improved physical and social environments (Monz et al. 2010; Cetin and Sevik 2016; Cetin et al. 2018b). Ecotourism, which by definition means having as little an impact as possible on landscape and wildlife, provides a great example of the use of natural areas for special purposes, such as observation and natural tourist experiences. The promotion of natural and cultural fields, with an emphasis on the natural areas' rare characteristics, provides a positive contribution to ecotourism. Revenue from tourism in the areas that are the center of attraction can be used for the protection of the private sphere and the elements derived from the visitors. The natural and cultural areas of the ecotourism activities are conducive to an overall awareness of the use of a naturally and culturally rich environment. This is an efficient approach to the social and economic aspects of responsible tourism (Powell and Ham 2008; Ohl-schacherer et al. 2008; Cetin and Sevik 2016; Cetin 2016).

The economic conservation of natural and cultural values is important for the sustainability of tourism activities that contribute to these values, and it should be developed. Ensuring the protection and balance of use in these areas, which have been opened up to tourism, is important in terms of sustainability. Drawing attention to the interesting natural and cultural properties of these areas, and protecting sensitive ecosystem areas that lack environmental sustainability, can be served through ecotourism, scientific visitors, esthetics, and recreational or cultural experiences from the educational aspect of ecotourism, while the population living in areas of socio-economic development or fundraising can also be an asset (Nouri et al. 2008; Tsai et al. 2010; Chaminuka et al. 2012; Cetin 2016). The objectives at national and international levels for sustainable tourism include development, sustainable use of resources, protection of natural and cultural diversity, and support for the local economy via the inclusion of local communities. By planning and ensuring cooperation between the tourism industry and the local community, local governments are more likely to make tourists aware of the local people (Kumari et al. 2010; Dixit and Narula 2010; Cetin and Sevik 2016).

Methodology

The city of Pompeiopolis is located in the western Black Sea region of the city of Kastamonu, between 41° 30' 42" N north

latitude and 34° 12' 52" E east longitude. The ownership rights of Pompeiopolis and its surroundings belong to the General Directorate of Cultural Preservation, with the directorate of tourism as the commissioned authority to operate and preserve it. The park covers an area of 1811 km² and is 45 km away from the town center of Kastamonu.

The ancient city of Pompeiopolis and its surroundings have the following characteristics:

- Being a very important city center in the Roman time as well as our time
- Having interesting scientific and landscape characteristics of large urban cones
- Having vegetation and wildlife
- The architectural structure of the city
- A high recreational potential

The study area is composed of a once-very-lively Pompeiopolis and its surroundings. First of all, the current situation, problems, resource values, and recreational potential of the area were presented by using scientific studies, documents obtained as a result of a comprehensive literature survey. Subsequently, the existing sub-maps were digitized in order to realize the landscape planning and design of the ancient city and its surroundings. Planning and design studies were carried out on the computer with the help of ARCGIS, AutoCAD, and LandCADD programs.

Ancient city studies were carried out within the scope of survey, analysis, evaluation, and synthesis. With the survey study, natural-cultural and esthetic values related to inside and outside of the field were determined and these data were digitized. In the analysis phase, according to the available data, the existing area utilization and area boundaries were determined and the factors that could adversely affect the area were determined. The objectives and programs were determined and developed by taking into account the results of the survey conducted to reveal the wants and tendencies of the users; then, principles of planning, design, and implementation phases were determined, and the diversity, carrying capacities, and numerical status of the elements of the program were taken into consideration and their spatial functions, relationships, and space characteristics were determined.

At the synthesis stage, the data and spatial landscape planning and design layouts (1/2500 and 1/1000 scale) and detailed sheets of the ancient city and its surroundings were prepared and the principles and recommendations regarding the future use of the area were presented.

Taşköprü is a town and district of Kastamonu Province in the Black Sea region of Turkey. According to the 2000 census, the population of the district is 43,800 of which 16,181 live in the town of Taşköprü. The district covers an area of 1811 km², and the town lies at an elevation of 553 m. The town takes its name from the stone bridge constructed in the thirteenth

century by the Chobanids over the Gök River. The 68-m span is supported on seven arches and still carries automobile traffic. Taşköprü is 42 km from Kastamonu and is famous for its garlic. Taşköprü is surrounded by Sinop Province and Hanönü in the east, Çorum Province in the southeast, Tosya in the south, the central district in the west, and Devrekani and Çatalzeytin districts in the north. In the north of the valley where the district is founded lie the Ilgaz Mountains to the south of the Küre Mountains. Therefore, the north and south of the district are surrounded by forestland. Çangal and Elek Mountains, located in the north and east of Taşköprü, are the highest mountains in the district, with an average elevation of over 1500 m.

One of the most important streams of the district is Gökırmak. The wide terrain on both sides of the river is brought to life with many brackets and channels, and thus, soil crops such as hemp, garlic, sugar beet, cereals, and pulses are taken. Other than the drinking water of the region, Demirci Müezzin villages also have mineral waters in the vicinity of Elek Mountain. Mines such as copper, chrome, iron, and coal were also found in the district. In the district, summers are hot and dry and winters are cold and rainy. While the environs of the Gökırmak Valley are surrounded by steppe plants, willow-and-poplar-dense trees, and mountain slopes, pine, fir, beech, oak, and linden tree species can be seen in the forests surrounding the district. The ancient city of Pompeiopolis, which is the center of the province of Paphlagonia, is located just north of the district center called Zimbılı Hill. It is known that the provincial governor's palace, shrines, and the city's elders lived there. The town has a lot of rock structures. Furthermore, it has very rich natural and cultural values such as Girls Castle: It is on a natural rock to the east of Taşköprü. The walls and the bastions are made of rubble, brick, and mortar all dating back to the Roman time. Mazhar Oludeniz Castle: It was built on a natural hill near the village of Alisaray. Donalar Village Rock Tunnel: It was carved into the Castle Door Rocks in Donalar Village. The entrance of the tunnel at the top of this rock is like a horseshoe. The width of the tunnel is 2.2 m. It goes into the rock with a slope of 50°. The second tunnel is to the east of this rock and a mostly blocked entrance. The third tunnel is carved into the rocks opposite this large rock. Kılıç Rock Tunnel: It is on the mountain north of Kornapa Village. The mouth is a horseshoe. The tunnel goes down to the ground by making inclinations of 45°. Although several excavations have been carried out recently by the Kastamonu Archaeological Museum, systematic archaeological excavations have been carried out in the ancient city since 2006. The metropolis of the ancient Paphlagonia, which is the capital of Pompeiopolis both before and after the Roman Empire, has carried the concrete evidence about the splendor of the structure. The

ancient city, which is also important because of the fact that it is a city established from scratch during the Roman Period, would contain information about the structure of the Roman Period cities in Paphlagonia (Cetin 2015b; Municipality of Taskopru (Pompeiopolis) 2016; Turkish Republic Ministry of Agriculture and Forestry, General Directorate of Meteorology 2016; Turkish Republic Ministry of Forest and Aquaculture 2016).

The research area's geographical location is shown in Fig. 1.

The climate of the Black Sea is rainy most of the year. The mean annual temperature is 16.5 °C, and the highest temperature is 27.4 °C in July and 27.2 °C in August. The coldest month is January, with a temperature of −7.5 °C. The north slope of the area receives more rain (Municipality of Taskopru (Pompeiopolis) 2016; Turkish Republic Ministry of

Agriculture and Forestry, General Directorate of Meteorology 2016; Turkish Republic Ministry of Forest and Aquaculture 2016).

The scope of this study involved reviewing the local and foreign literature related to the study area and collecting information on the area. The 1/25,000- and 1/10,000-scale plans in AutoCAD and the implementation and development plan that is currently being used by the local government were provided (Municipality of Taskopru (Pompeiopolis) 2016; Turkish Republic Ministry of Forest and Aquaculture 2016). The values of the landscape, climate, recreational facilities, and other characteristics of the study area and its immediate surroundings were determined based on the questionnaires and visual analysis. The “outdoor recreational potential determination” (Güleç 1990) formula was then used to determine the area's outdoor recreational potential. The mathematical formula shown below was used:

Fig. 1 The geographical location of Pompeiopolis and its immediate surroundings

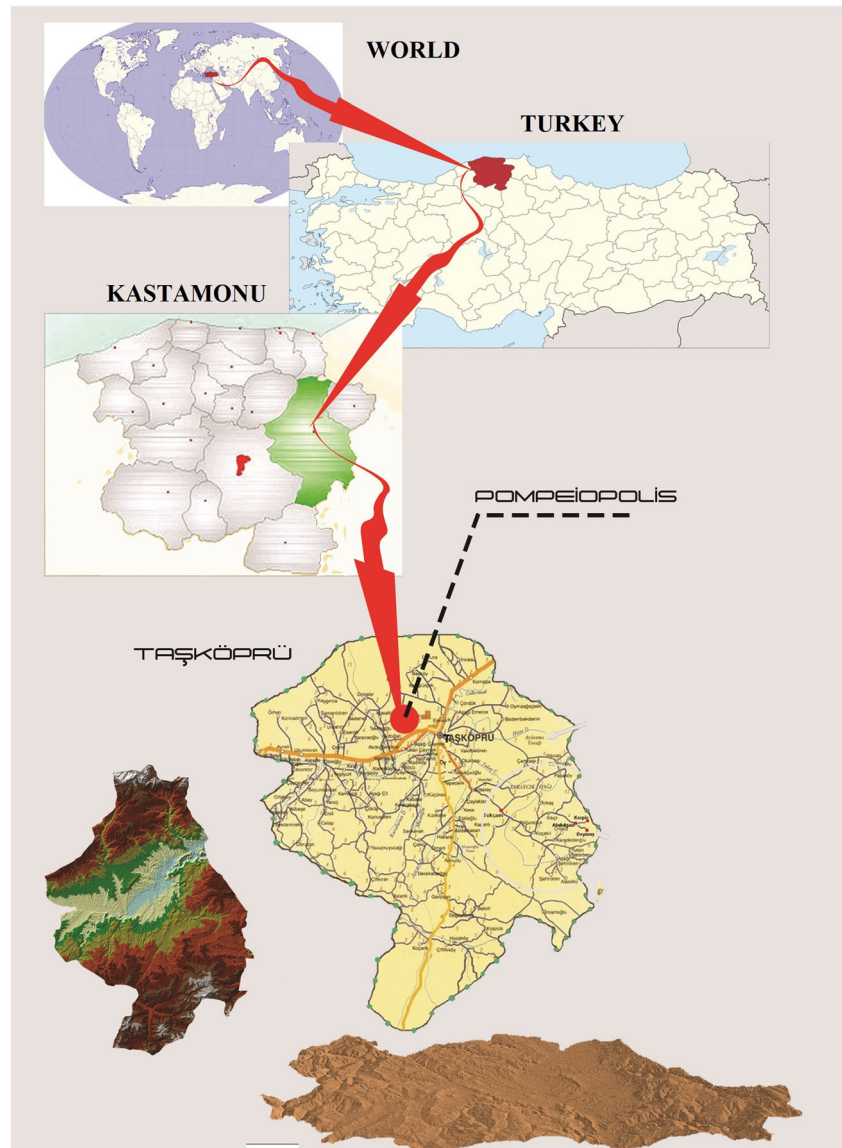


Table 1 Parameters used to determine recreation potential (RP)

Variables	Features	Explanation	Score	Evaluation
Landscape value (<i>L</i>)	Site size	> 10 ha	4	4
		5–10 ha	3	
		1–5 ha	2	
		0.5–1 ha	1	
	Nature of surface	Flat	5	2
		Slightly wavy	4	
		Low slope	3	
		Medium slope	2	
		High slope	1	
	Sea, lakes, rivers	Coast	7–8	5
		Lakeshore	6–7	
		River shore	4–5	
		Streams	1–4	
	Vegetation cover	Woods, bushes, meadows	7–8	8
		Only trees and meadows	6–7	
		Shrubs, meadows, and sparse trees	5–6	
		Meadow and sparse trees	4–5	
		Only meadows and bush	3–4	
		Meadows and sparse trees	3–4	
Meadows and sparse bush		2–3		
Visual quality	Panoramic views	3–4	4	
	Good views and vistas	2–3		
	Overall visual esthetic value of the area	1–3		
Other features	Caves, cultural and historical values, natural monuments, cascades, birds, wild animals, etc.	1–6	6	
Climate value (<i>C</i>)	Temperature	16–17, 18–19, 20–21, 22–23, 24–25, 34–33, 32–31, 30–29, 28–27, 26–25	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	9
	Rainfall	Total of summer months (June, July, August) mm 50, 100, 150, 200, 250, 300, 350, 400	8, 7, 6, 5, 4, 3, 2, 1	6
	Sun	Months of summer, mean cloudiness: 0–2, 2–4, 4–6, 6–8, 8–9	5, 4, 3, 2, 1	4
	Wind	Less than 1 m/s 1–3 m/s	2 1	1
Accessibility (<i>A</i>)	Touristic significance of the region	Mediterranean, Aegean, Marmara shore band	3–4	3
		Black Sea shore band	2–3	
		Important highway routes, priority tourist areas	1–3	
	Existence of a city with a minimum population of 100,000	Distance up to 20 km	4–5	4
		Distance up to 50 km	3–4	
		Distance up to 100 km	2–3	
		Distance up to 200 km	1–2	
	Minimum time of access (from the closest at least 5000 populated city)	Walking up to 1 h or 0–30 min by vehicle	4	2
		0.30–1 h by vehicle	3	
		1–2 h by vehicle	2	
2–3 h by vehicle		1		
Transportation (except taxi or personal vehicle)	Opportunity of reaching on foot or finding a vehicle at any time	3–4	3	
	Finding vehicles at certain times	1–3		
Other facilities in transport	For example, cable car existence, access from the sea	1–3	1	
Recreational facilities (RF)	Picnic facilities	Fixed picnic tables, stoves, etc.	1–4 (according to qualifications)	3
	Water	Existence of clean water to drink or use		2

Table 1 (continued)

Variables	Features	Explanation	Score	Evaluation
			1–3 (according to qualifications)	
	Accommodation facilities	Settled accommodation facilities	2	2
		Camping opportunities with or without tents	1–2	
	WCs	Depends on qualifications	1–2	2
	Parking lots	Depends on qualifications	1–2	2
	Rural-type refreshment bar, sales kiosk	According to qualifications	1–2	2
	Wardens and officers	Full time	2	1
		Weekend	1	
	Other facilities	Beach, cabin, shower and rental boat facilities; playgrounds, sports balls and facilities, etc. (according to qualifications)	1–3	2
Negative factors (NFs)	Air pollution	According to pollution rate	– 1, – 3	– 1
	Insecurity	Depends on the security situation	– 1, – 2	– 1
	Water pollution	For rivers, seas, lakes, etc.	– 1	– 1
	Lack of maintenance	Failure of adequate maintenance in the region	– 1	– 1
	Noise	Crowds, traffic, etc.	– 1	– 1
	Other negative factors	Gravel and stone quarries, construction and factory remnants, etc.	– 1, – 2	– 1
Total score or potential (%): RP				72

$$L + C + A + RF + NF = RP \quad (1)$$

where

- L* value of landscape
- C* value of climate
- A* accessibility
- RF recreational facilities
- NF negative factors
- RP recreation potential (%)

L refers to the area's landscape potential and is the most important variable in this study (Cetin 2015c). For this reason, the landscape value (*L*) makes up 35% of the value to the formula and is considered the most important component. The variable of climate is thought to have a great influence on recreational activities, and it is thus accepted that the climate value (*C*) should have a value percentage of 25% in the calculation (Kaya et al. 2009; Topay 2013; Cetin 2015b,c; Cetin and Sevik 2016). Climate value is determined by the parameters of "sun," "rain," "temperature," and "wind" (Güleç 1990). Based on that, the climate value is calculated according to the following formula:

$$\begin{aligned} \text{value of climate (25)} &= \text{sun (5)} + \text{rain (8)} \\ &+ \text{temperature (10)} + \text{wind (2)} \quad (2) \end{aligned}$$

Accessibility (*A*) is also an important parameter, and considering that the recreational potential of a region is directly

proportionate to its accessibility, the contribution of this variable to the formula is calculated as 20%. All existing recreational facilities have a positive impact on recreation potential; thus, the variable RF is calculated to have a weight of 20% in the formula (Kaya and Aytakin 2009; Chhetri and Arrowsmith 2008; Topay and Memluk 2011). NF are the factors that decrease recreational potential and have a negative (–) value in the formula.

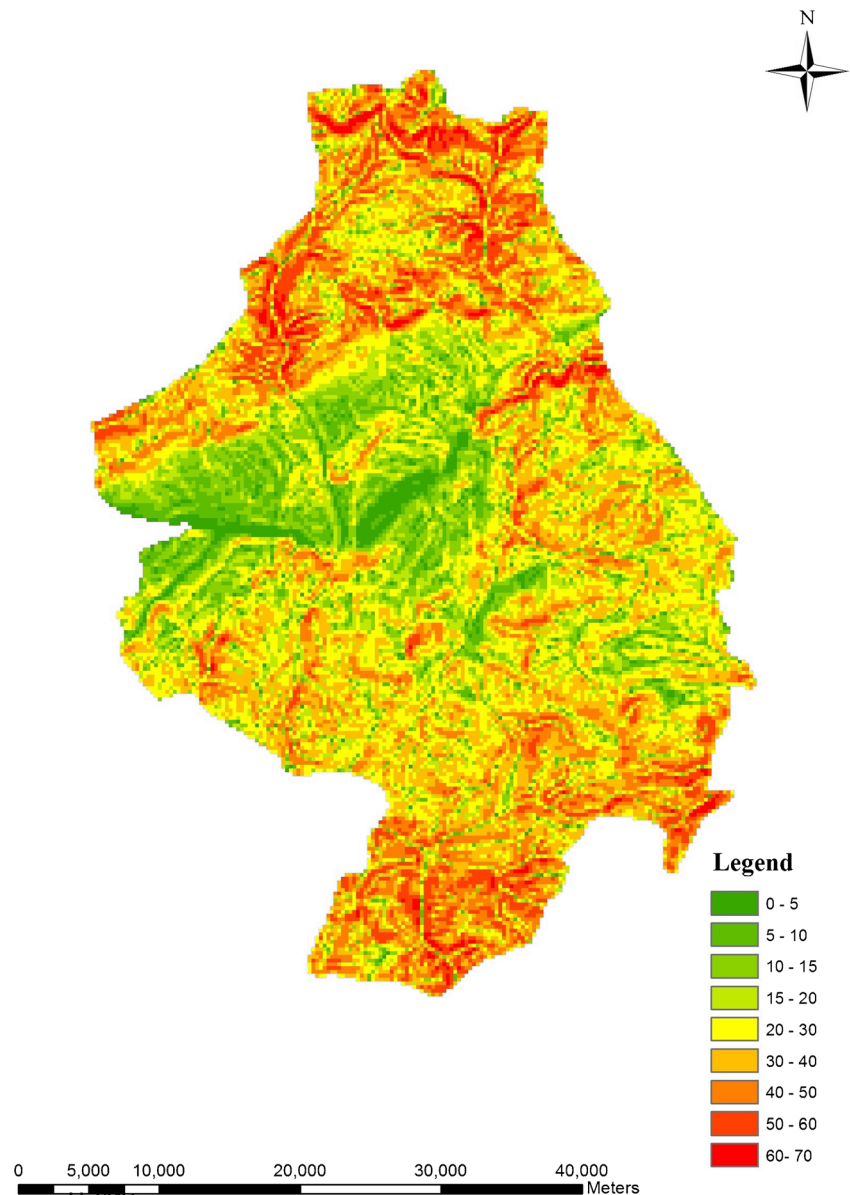
An area's recreation potential is determined through this method, and the results are classified in five groups as follows. If the result is less than 30%, recreational potential is very low; if it is between 30 and 45%, the recreation potential is low. If the result is between 46 and 60%, the recreational potential is medium. A result between 61 and 75% indicates high recreational potential, and a result that is higher than 75% shows a very high potential for recreation (Güleç 1990).

Mamat et al. (2018) mentioned that development of a regionalization plan provides a scientific basis for the protection and restoration of vulnerable historical and cultural values. Given the values and maps, we can make decisions and plan for the ancient city and urban life for the next 20 years.

Results

The recreational potential of Pompeiopolis is calculated according to the formula of Güleç (1990). Along with each

Fig. 2 The slope groups of Pompeiopolis and its immediate surroundings



element in the form, the evaluation score for Pompeiopolis is given in Table 1.

The area inside the ancient city has an important position on both the national and regional levels in terms of recreational, natural, and cultural resources. The natural and cultural variables were analyzed in this study with the aim of proposing landscape plans to protect and sustain the area's values. The results obtained through these analyses defined the area's slope groups shown in Fig. 2 (Municipality of Taskopru (Pompeiopolis) 2016; Turkish Republic Ministry of Forest and Aquaculture 2016).

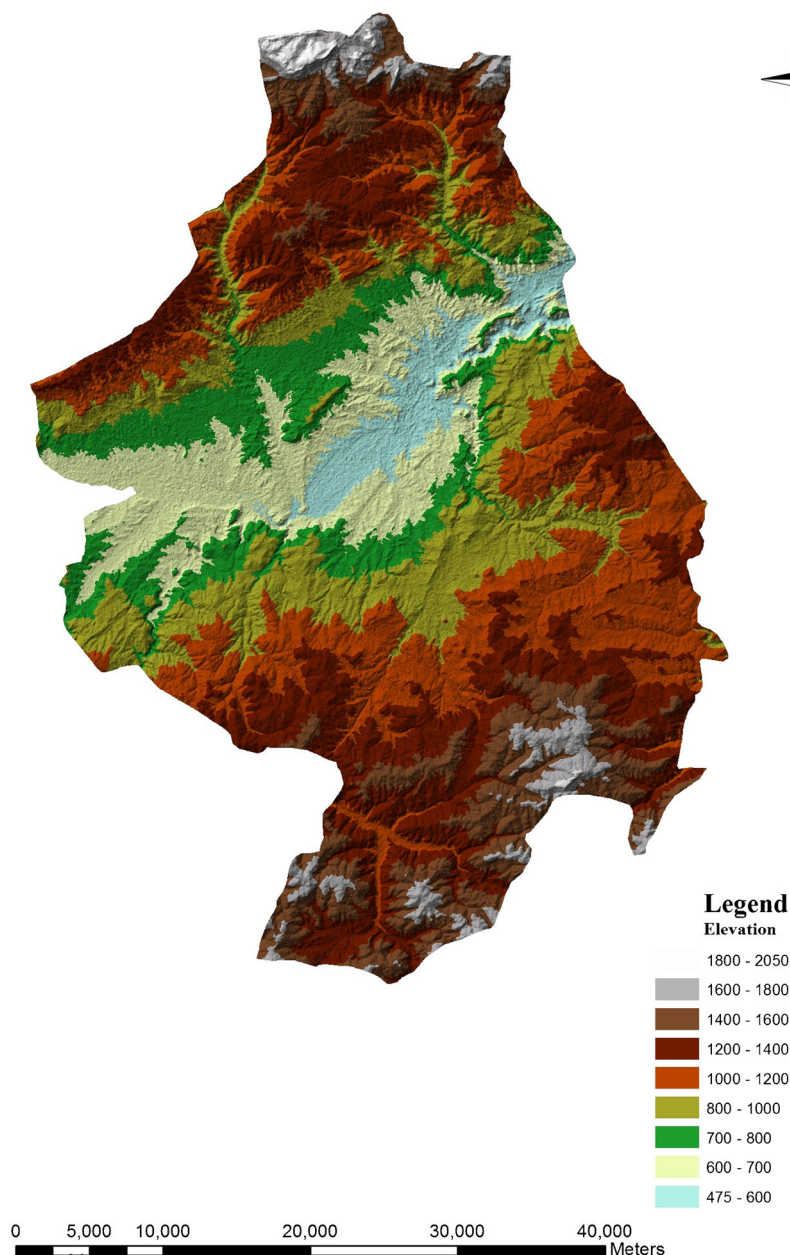
As the analyses of the cultural and natural landscape values of Pompeiopolis with its immediate surroundings were conducted, maps of the entire Taskopru district were produced from this study. As can be seen in Fig. 2, the most common slope group in the area consists of areas with slopes of 20–

30 m. The area on which Pompeiopolis sits and its immediate surroundings are mostly flat and include the slope groups of 0–5, 5–10, and 10–15 m of slope, making Pompeiopolis area mostly flat.

As shown in the topographic map of the area shown in Fig. 3, the area has a highly variable topographic structure, that is, it has a rich structure in terms of surface forms and therefore has a visual landscape value. This surface variety also makes the area rich in vegetation cover and climate values; this richness can be called location advantage. The Black Sea climate dominates this region and has enabled the formation of rich flora and therefore fauna variety. Although the summers are hot and the winters are warm in this area, the region receives sufficient rainfall in all seasons.

The cultural and natural values of the Pompeiopolis region are shown in Fig. 4. Pompeiopolis and its immediate

Fig. 3 The topographic map of Pompeiopolis and its immediate surroundings



surroundings have significant potential for camping and trekking with its numerous hiking trails and campsites. There are areas in this region that are suitable for hiking and rock climbing. The ancient cityscape of Pompeiopolis adds a distinct value to local camping and trekking activities. However, there are insufficient promotions, guides, and facilities to support these activities.

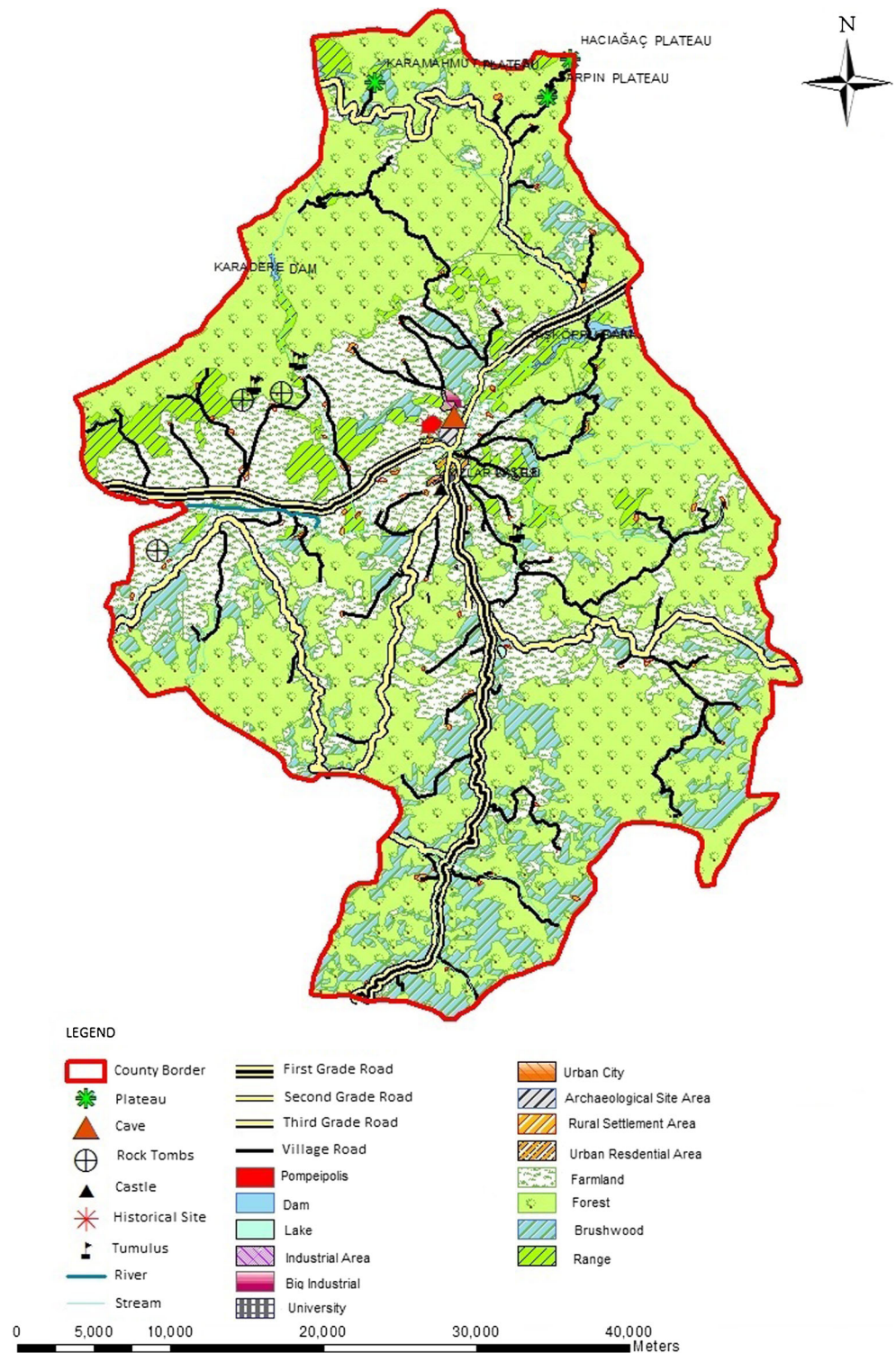
The region has a rich historical heritage that provides high potential for ecotourism activities such as adventure and sports tourism, bird watching, photography, cultural and historical tourism, horseback riding, cave exploration, wildlife tours, picnic activities, camping, and cycling. Given its unique nature and proximity to the Kastamonu City center, this region can attract a high demand for tourism activities.

Pompeiopolis is an ancient city with great potential for cultural tourism, nature tourism, trekking, nature walks, and wildlife observation. The potential landscape activities for cultural and nature tourism are depicted in Fig. 5.

Discussion

Cultural areas have high recreational potential due to the presence of ancient cities. However, if recreational areas are addressed with holistic planning instead of unhealthy planning, i.e., planning that minimizes the negative effects on the ecosystem, the natural environment can be preserved. In this context, this study established the long-term landscape activities

Fig. 4 The natural and cultural values of Pompeiopolis and its immediate surroundings

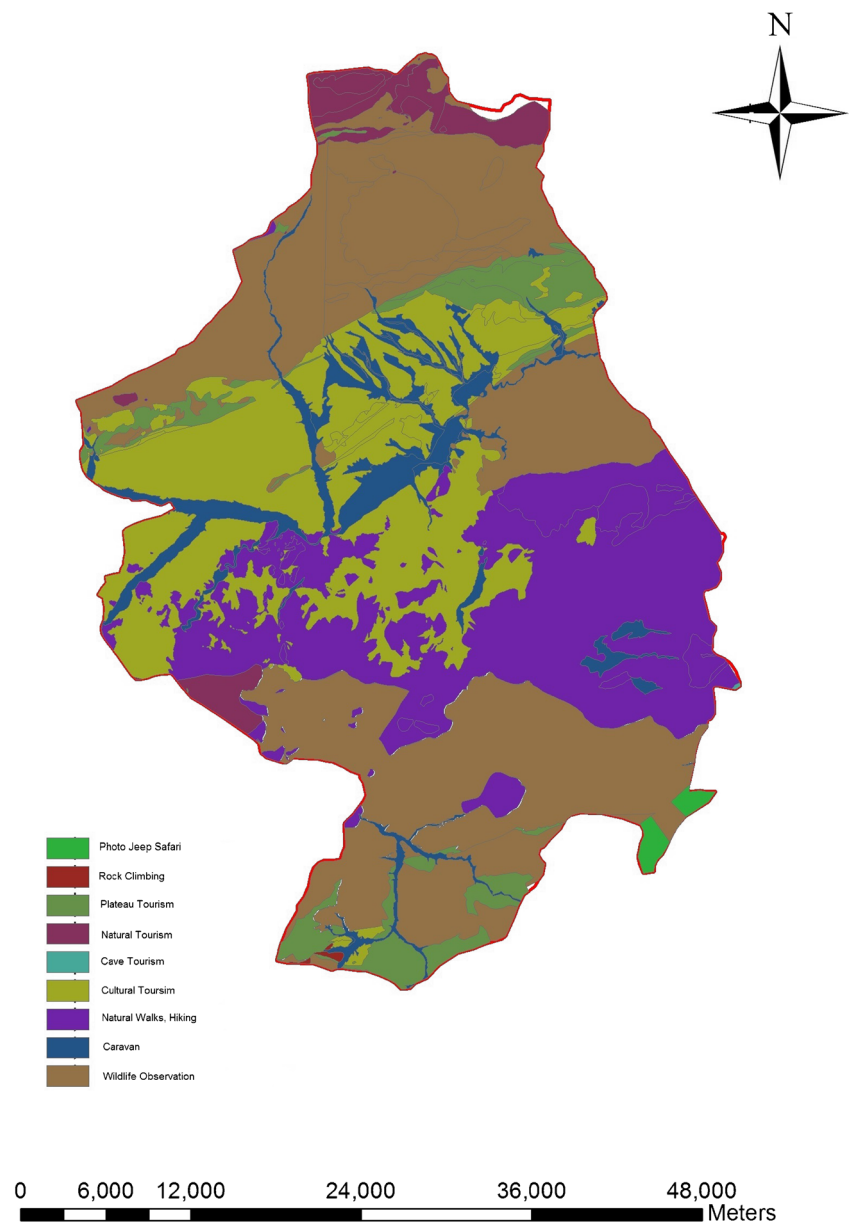


in this area, predicted the possible effects of these activities, and proposed plan decisions. For this purpose, the long-term landscape potential of Pompeiopolis was analyzed.

Compared with recent studies Zeren 2016, Cetin and Sevik 2016, Cetin et al 2018b, Yesilyuva Natural Park, Serife Baci Natural Park and Kastamonu Ilgaz Mountain National Park,

Pompeiopolis found that the most important resource value of them are their natural forest structure. In the current planning area, the forest ecology and the landscape’s esthetic and functional values are strengthened, adding green areas for the people, entertainment and sporting opportunities to meet their needs, and nature-oriented recreational and tourist activities

Fig. 5 The potential for landscape activities involving cultural and natural tours in Pompeiopolis and its immediate surroundings



near the Kastamonu. They are located in the Kastamonu, which has a population that has been growing in recent years, and offers winter tourism and summer camping, hiking, and day picnics. They contain wildlife, clean air, and a panoramic view of the area's natural beauty.

A sustainable ecotourism plan at the 1/10,000-scale objective of the development plan has been made of the remaining over 10 ha of the Kastamonu Province borders. Biodiversity concerns need to guide the Serife Baci Natural Park, in terms of its size, geology, and the protection of its natural and cultural landscape resource value in the long term, in order to develop it and pass it on to future generations. It is important to establish an organic link between the urban and natural areas within the planning area and between its natural recreational opportunities and its recreational activities with visual

resource values. The park must also raise visitor awareness of nature and the sustainability of its protected status and use this balance to meet basic needs and make decisions.

The purpose of the ecological park development plan is to improve the biological and environmental quality within the planning area, provide climatic benefits (linking CO₂ and oxygen production, keeping solid contaminants in the air, or using filtration to reduce the effects of poison gas), protect soil and water, and improve water quality, plant communities, and wildlife to ensure the continuity of suitable habitats. An additional purpose of the recreational park development plan is to enable different types of visitors to visit the forest area with its natural charm, to spend their leisure time actively, and to provide opportunities both to experience a day of relaxation and recreational sporting activities and to be introduced to natural habitats.

To respond to the industrialization and urbanization of the artificial urban environment and enable the physical and mental regeneration of individuals through their emerging outdoor recreation needs, they provide the unspoiled parts of nature and natural preserves that visitors prefer. This will allow the park visitors to engage in a variety of mental and physical activities in a specific forest ecosystem.

Conclusions

Based on the results of this study, the following conclusions can be made:

- The ancient city of Pompeiopolis has significant potential in terms of its natural and cultural landscapes and its ecological, biological, geological, and geomorphological resources. Sustainable protection-utilization plans must be implemented to ensure the sustainability of these resources.
- An area with high recreation potential may face future air, soil, water, and noise pollution due to overuse; thus, necessary precautions should be taken in planning against these threats.
- As an ancient city, Pompeiopolis has naturally, culturally, and esthetically important characteristics. In regulating the use of these areas, the protection of natural equilibrium is as important as the conservation of cultural and natural properties. Providing active leisure activities through individual attention and spatial identity can help to preserve the natural balance. In this way, the recreational potential of the area can be raised, and services can be provided to meet user expectations.
- In the new settlements in the region and in the improvement of existing buildings, natural and esthetic design should be considered and maintained, and practices that contradict the existing landscape of the region should be avoided.
- The technical and administrative measures necessary to protect natural habitats and living species must be taken, and if necessary, statutes that legally protect vulnerable areas should be developed.
- A single central administration that controls, preserves, and plans the activities that are performed in the region can solve many problems.
- Promotional activities should be prioritized to reveal the potential of the region, and national and international promotions should be provided.
- Concerning the rational use of natural resources, the sub- and super-structures should be improved in the areas where various activities are planned, and facilities should be provided to meet users' needs.
- Ecological balance must be maintained to ensure the continuity of protected natural and cultural areas. Therefore, ecological balance must be given high priority in all proposed plans in these areas.
- The staffs that provide the required guide services for the local and foreign tourists who come to this region should be trained to meet the needs of users. These services will create local job opportunities.

It is vital to establish a management model for the long-term landscape planning of the ancient city of Pompeiopolis that adheres to the above conclusions.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

- Aricak B (2015) Using remote sensing data to predict road fill areas and areas affected by fill erosion with planned forest road construction: a case study in Kastamonu Regional Forest Directorate (Turkey). *Environ Monit Assess* 187(7):417. <https://doi.org/10.1007/s10661-015-4663-7>
- Barros A, Gonnet J, Pickering C (2013) Impacts of informal trails on vegetation and soils in the highest protected area in the southern hemisphere. *J Environ Manag* 127:50–60. <https://doi.org/10.1016/j.jenvman.2013.04.030>
- Bathrellos GD, Gaki-Papanas tassiou K, Skilodimou HD, Papanastassiou D, Chousianitis KG (2012) Potential suitability for urban planning and industry development by using natural hazard maps and geological–geomorphological parameters. *Environ Earth Sci* 66(2): 537–548. <https://doi.org/10.1007/s12665-011-1263-x>
- Bathrellos GD, Skilodimou HD, Chousianitis K, Youssef AM, Pradhan B (2017) Suitability estimation for urban development using multi-hazard assessment map. *Sci Total Environ* 575:119–134. <https://doi.org/10.1016/j.scitotenv.2016.10.025>
- Cakir G, Muderrisoglu H, Kaya LG (2016) Assessing the effects of long-term recreational activities on landscape changes in Abant Natural Park, Turkey. *J For Res* 27(2):453–461. <https://doi.org/10.1007/s11676-015-0141-x>

- Cetin M (2015a) Determining the bioclimatic comfort in Kastamonu City. *Environ Monit Assess* 187(10):640. <https://doi.org/10.1007/2Fs10661-015-4861-3>
- Cetin M (2015b) Evaluation of the sustainable tourism potential of a protected area for landscape planning: a case study of the ancient city of Pompeiopolis in Kastamonu. *Int J Sust Dev World Ecol* 22(6): 490–495. <https://doi.org/10.1080/13504509.2015.1081651?src=recsys&journalCode=tsdw20>
- Cetin M (2015c) Using GIS analysis to assess urban green space in terms of accessibility: case study in Kutahya. *Int J Sust Dev World Ecol* 22(5):420–424. <https://doi.org/10.1080/13504509.2015.1061066>
- Cetin M (2016) Determination of bioclimatic comfort areas in landscape planning: a case study of Cide coastline. *Turk J Agric-Food Sci Technol* 4(9):800–804
- Cetin M, Sevik H (2016) Evaluating the recreation potential of Ilgaz Mountain National Park in Turkey. *Environ Monit Assess* 188(1): 52. <https://doi.org/10.1007/2Fs10661-015-5064-7>
- Cetin M, Adiguzel F, Kaya O, Sahap A (2018a) Mapping of bioclimatic comfort for potential planning using GIS in Aydin. *Environ Dev Sustain* 20:361–375. <https://doi.org/10.1007/s10668-016-9885-5>
- Cetin M, Zeren I, Sevik H, Cakir C, Akpinar H (2018b) A study on the determination of the natural park's sustainable tourism potential. *Environ Monit Assess* 190(167):167. <https://doi.org/10.1007/s10661-018-6534-5>
- Chaminuka P, Groeneveld RA, Selomane AO, Van Ierland EC (2012) Tourist preferences for ecotourism in rural communities adjacent to Kruger National Park: a choice experiment approach. *Tour Manag* 33:168–176. <https://doi.org/10.1016/j.tourman.2011.02.016>
- Cheung LTO, Jim CY (2014) Expectations and willingness-to-pay for ecotourism services in Hong Kong's conservation areas. *Int J Sust Dev World Ecol* 21:149–159. <https://doi.org/10.1080/13504509.2013.859183>
- Chhetri P, Arrowsmith C (2008) GIS-based modelling of recreational potential of nature-based tourist destinations. *Tourism Geogr* 10(2):233–257. <https://doi.org/10.1080/14616680802000089>
- Dereli Z, Yucedag C, Pearce JC (2013) Simple and low-cost method of planning for tree growth and lifetime effects on solar photovoltaic systems performance. *Sol Energy* 95:300–307. <https://doi.org/10.1016/j.solener.2013.06.019>
- Dixit SK, Narula VK (2010) Ecotourism in Madhav National Park: visitors' perspectives on environmental impacts. *South Asian J Tour Herit* 3:109–115
- Gülez S (1990) An evaluation method for determination of inside of forest recreation potential. *Istanbul Uni J Fac For* 40(2):132–147
- Kaya LG (2009) Assessing forests and lands with carbon storage and sequestration amount by trees in the State of Delaware, USA. *Sci Res Essays* 4(10):1100–1108
- Kaya LG, Aytakin A (2009) Determination of outdoor recreation potential: case of the city of Bartın and its environs, Turkey. *Fresenius Environ Bull* 18(8):1513–1524
- Kaya LG, Cetin M, Doygun H (2009) A holistic approach in analyzing the landscape potential: Porsuk Dam Lake and its environs, Turkey. *Fresenius Environ Bull* 18(8):1525–1153
- Kaya LG, Yucedag C, Bingol B (2017) Usage of ineffective mining quarries for recreational purposes: the case study of Burdur City, Turkey. *J Grad Sch Nat Appl Scien MAKU* 8(2):184–190
- Kumari S, Behera MD, Tewari HR (2010) Identification of potential ecotourism sites in West District, Sikkim using geospatial tools. *Trop Ecol* 51:75–85
- Mamat K, Du P, Ding J (2018) Ecological function regionalization of cultural heritage sites in Turpan, China, based on GIS. *Arab J Geosci* 10:90. <https://doi.org/10.1007/s12517-017-2892-5>
- Maple LC, Eagles PFJ, Rolfe H (2010) Birdwatchers' specialisation characteristics and national park tourism planning. *J Ecotour* 9:219–238. <https://doi.org/10.1080/14724040903370213>
- Monz CA, Cole DN, Marion JL, Leung YF (2010) Sustaining visitor use in protected areas: future opportunities in recreation ecology research based on the USA experience. *Environ Manag* 45:551–562. <https://doi.org/10.1007/s00267-009-9406-5>
- Municipality of Taskopru (Pompeiopolis) (2016) [online], [cited 21 March 2016]. Available from Internet: <http://www.Pompeiopolis-bld.gov.tr/Pompeiopolis/sayfalar/default.asp>. Accessed 02 June 2017
- Ngoka PC (2013) Capacity and levels of utilization of tourism potentials of Yankari and Cross River National Parks—implications for optimistic ecotourism development in Nigeria. *African J Hosp Tour Leis* 2(4):1–12
- Nouri J, Danehkar A, Sharifipour R (2008) Evaluation of ecotourism potential in the northern coastline of the Persian Gulf. *Environ Geol* 55:681–686. <https://doi.org/10.1007/s00254-007-1018-x>
- Nowak D, Walton JT, Dwyer JF, Kaya LG, Myeong S (2005) The increasing influence of urban environments on US Forest. *J For* 103(8):377–382
- Ohl-Schacherer J, Mannigel E, Kirkby C, Shepard GH Jr, Yu DW (2008) Indigenous ecotourism in the Amazon: a case study of Casa Matsigenka in Manu National Park, Peru. *Environ Conserv* 35: 14–25. <https://doi.org/10.1017/S0376892908004517>
- Powell RB, Ham SH (2008) Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behaviour? Evidence from the Galapagos Islands. *J Sustain Tour* 16:467–489. <https://doi.org/10.1080/09669580802154223>
- Tomczyk AM (2011) A GIS assessment and modelling of environmental sensitivity of recreational trails: the case of Gorce National Park, Poland. *Appl Geogr* 31(1):339–351. <https://doi.org/10.1016/j.apgeog.2010.07.006>
- Topay M (2013) Mapping of thermal comfort for outdoor recreation planning using GIS: the case of Isparta Province (Turkey). *Turk J Agric For* 37:110–120
- Topay M, Memluk Y (2011) Suitable for recreational area events choice for a new method approach: a case study of Bartın-Uluyayla. *SDU J Fac For* 12(2):141–147
- Tsai WH, Chou WC, Lai CW (2010) An effective evaluation model and improvement analysis for national park websites: a case study of Taiwan. *Tour Manag* 31:936–952. <https://doi.org/10.1016/j.tourman.2010.01.016>
- Turkish Republic Ministry of Agriculture and Forestry, General Directorate of Meteorology (2016) Pompeiopolis the meteorological data of between 2000 to 2015 years
- Turkish Republic Ministry of Forest and Aquaculture (2016) Pompeiopolis forest map. Department of Kastamonu Forest Region. Turkish Republic Ministry of Forest and Aquaculture. Department of Forest Management [online], [cited 10 March 2016]. Available from Internet: <http://www.ogm.gov.tr/Sayfalar/OrmanHaritasi.aspx>. Accessed 02 June 2017
- Yucedag C, Kaya LG (2017) Chapter 104. Recreational trend and demands of people in Isparta-Turkey. In: H Arapgirlioglu, A Atik, RL Elliott, E Turgeon (eds) Book: Researches on science and art in 21 st century Turkey. Gece Publishing, ISBN: 978-605-180-771-3
- Yucedag C, Kaya LG, Cetin M (2018) Identifying and assessing environmental awareness of hotel and restaurant employees' attitudes in the Amasra District of Bartın. *Environ Monit Assess* 190(60):60. <https://doi.org/10.1007/s10661-017-6456-7>
- Zeren I (2016) Determination of bioclimatic comfort in Kastamonu Nature Park, The Scientific and Technological Research Council of Turkey (TUBITAK) during the 2209-A-2015/2 period (University Students Domestic Research Projects Support Program) working on projects numbered 1919B011502715, 2016