Coding Historical Landscape Character: The Case of Büyük Menderes Delta[1]

Nergiz Belen[2], Şükran Şahin[3]

Abstract

The aim of the study is to develop a method for determining the coding and landscape pattern historical layers in the mapping method on the historical landscape character and to reveal the contribution of the cooperation of archaeology and landscape architecture professional disciplines on this axis. In this context; although the historical past goes back thousands of years, archaeological studies and findings obtained for this research allowed us to research the 2700-year historical past. When our area is examined, the Büyük Menderes Delta, which is rich in terms of flora and fauna and where landscape pattern changes and transitions are seen intensively, was selected as the study area because it has a historical landscape character. When its historical past is examined, it provides enlightening information about the changes in landscape pattern, settlement and economic development of the local people. In this sense, this study will also open a horizon for environmental archaeology. When we look at the historical landscape character studies conducted in the world and Turkey, it is seen that there is no specific coding system. The coding made in this study will be a prototype for HLCAn (Historical Landscape Character Analysis) studies. Is it possible to make a mapping covering all historical and archaeological layers in areas with deep-rooted historical and archaeological pasts such as Anatolia? In other words, can all historical layers be presented together on a prepared map? The questions of what should be the terminology that will include different layers of history in HLCAN's mapping were sought. The study method is composed of the study principles of historical landscape character analysis and similar studies and field-specific research. The findings obtained during the research were combined in the ArcGIS environment and a historical mapping was made; In this mapping, a coding system was developed based on the CORINE LU/LC infrastructure and similar studies. Since the research evolved into an original study in terms of expressing a 2700-year historical past on the same map and transferring landscape pattern changes as well as historical and archaeological elements, it is thought that it will contribute to scientific literature and further studies.

Keywords: Historical Landscape Character, Büyük Menderes Delta, Landscape, Archaeology, Multilayered Landscape

Tarihi Peyzaj Karakterinin Kodlanması: Büyük Menderes Deltası Örneği

---

[1] This article is based on Belen, N. (2021), "Historical Landscape Character Analysis and Its Evaluation in Terms of Tourism: The Case of Old and New Doğanbey Neighborhoods in Aydın Söke" PhD Thesis, Ankara University, Institute of Science, Ankara, PhD Thesis.

[2] Dr. Ministry of Agriculture and Forestry, Nature Conservation and National Parks 9th Regional Directorate, Ankara. nergiz.belen@milliparklar.gov.tr ORCID ID: 0000-0003-0610-3898

[3] Prof. Dr. Ankara University, Faculty of Agriculture, Department of Landscape Architecture, Ankara. sukran.sahin@ankara.edu.tr ORCID ID: 0000-0002-3730-2534

Özet

Çalışmanın amacı, tarihi peyzaj karakteri konusunda haritalama yönteminde bulunan kodlama ve peyzaj deseni tarihi katmanlarının belirlenmesi konusunda bir yöntem geliştirilmesi ve bu eksende arkeoloji ve peyzaj mimarlığı meslek disiplinleri işbirliğinin katkısının ortaya konulmasıdır. Bu bağlamda; tarihi geçmişi binlerce yıl eskiye gitmesine rağmen bu araştırma için arkeojeolojik çalışmalar ve elde bulgular 2700 yıllık tarih geçmişine araştırmamıza olanak vermiştir. Alanımız incelendiğinde flora fauna bakımında zengin, peyzaj deseni değişim ve geçişlerinin yoğun olarak görüldüğü Büyük Menderes Deltası tarihi bir peyzaj karakteri arz ettiği için çalışma alanı olarak seçilmiştir. Tarihi geçmişine bakıldığında peyzaj desenindeki değişimler, yerleşim ve yerel halkın ekonomik gelişimi konusunda aydınlatıcı bilgi vermektedir. Bu anlamda bu çalışma çevresel arkeoloji için de bir ufuk açacaktır. Dünya'da ve Türkiye'de yapılan tarihi peyzaj karakteri çalışmalarına bakıldığında belirli bir kodlama sistemi olmadığı görülmektedir. Bu çalışmada yapılan kodlamanın TPKA (Tarihi Peyzaj Karakter Analizi) çalışmaları için bir prototip olacaktır. Anadolu gibi köklü tarihi ve arkeolojik geçmişe sahip alanlar ile ilgili olarak, tüm tarihi ve arkeolojik katmanları kapsayan bir haritalama yapmak mümkün müdür? Diğer bir anlatımla, tüm tarihi katmanlar hazırlanan bir harita üzerinde bir arada sunulabilir mi? TPKA'nın haritalamasında tarihin farklı katmanlarını içerecek terminoloji ne olmalıdır sorularına cevap aranmıştır. Tarih peyzaj karakteri analizi çalışma prensipleri ve benzer çalışmalar ve alan özelinde yapılan araştırmalar incelenmesi araştırmanın yöntemini oluşturmaktadır. Araştırma süresince Elde edilen bulgular ArcGIS ortamında birleştirilerek tarihi bir haritalama yapılmış; Bu haritalamada CORINE alt yapısı ve benzer çalışmalarda yola çıkılarak bir kodlama sistemi geliştirilmiştir. Araştırma 2700 yıllık bir tarihi geçmişin aynı haritada ifade edilmesi, tarihi ve arkeolojik ögelerin yanında peyzaj deseni değişimlerinin de aktarılması anlamında özgün bir çalışmaya evrildiği için bilimsel yazına ve daha ileri çalışmalara katkıda bulunulacağı düşünülmektedir.

Anahtar Sözcükler: Tarihi Peyzaj Karakteri, Büyük Menderes Deltası, Peyzaj Arkeolojisi, Çok Katmanlı Peyzaj

1. Introduction

According to Gazi Mustafa Kemal ATATÜRK's philosophy "Societies that do not know their history are doomed to perish", it is necessary to know and understand the past in order to plan today and tomorrow. The Historical Landscape Character Analysis study follows the historical past, natural and cultural traces of an area.

Before explaining the concept of HLCAn (Historic Landscape Character Analysis), which is the main subject of this study, it would be correct to define landscape character analysis, which is defined as the classification of the natural and cultural values of the area (Anonymous 2003; Antrop 2005. However, although LCA is presented as a holistic form of assessment, it tends to focus on understanding the visual and rural characteristics of the landscape and does not address the historical dimension of the landscape in sufficient depth. Historical landscape characterisation studies are needed to address this shortcoming. According to the European Landscape Convention, published in the Official Journal in 2003, each country is obliged to analyse the landscape character and to determine its historical past. For this obligation it is necessary to combine archaeological and historical dimensions of a place (Turner 2006; Belen 2021).

In the definition of HLCAn; it reflects the whole historical character of today's landscapes and describes historical land uses, historical landscape patterns and features that have survived to the present day. It is defined as all the traces left by humans on the landscape (Swanwick 2002; Turner 2006; LANDMAP 2013; Demir and Demirel 2017). As can be seen from these definitions, it is important to map an area from first settlement to the present day. In addition, the benefits of HLCAn studies by experts in the field:

"-It provides an understanding and appreciation of historic landscapes and raises public awareness,

- It is a basic guide for regional and local development plans and strategic planning,

- It is necessary to assess heritage, wildlife, endemic plants and other cultural and natural landscape values together in the environmental impact assessment process,

-Provides guidance on the design of village settlements and makes an important contribution to the revitalisation of local and small towns and villages,

-ensuring the regeneration of rural areas, the sustainability of landscape management, the establishment of an agri-environmental programme, the development of woodlands and the diversification of agriculture,

-Enabling the development of design guidelines for traditional rural houses and settlements, windmill sites, main and green infrastructure systems,

-Providing data for use in tourism strategies, heritage strategies, local action plans and coastal zone management,

-Provides data on the historical background of nature conservation areas, natural and archaeological heritage sites, architectural conservation areas,

-provides material for studies and projects to be carried out at national, regional and local levels (Demir and Demirel 2017, Demir and Demirel 2018)". It is expressed as follows and its necessity for the field is emphasised.

The methods to be followed for HLCAn studies are generally listed by those working on them as follows:

Rouse (2008) evaluated it in five steps:

- "Identification of polygons,

- Record attributes (numbers, dates, areas, morphological patterns, morphological boundaries, boundary shapes, etc.),

- Assigning a valid HLC (Historical Landscape Analysis) type to each polygon,

- Assigning the previous HLC type to each polygon (adding source, period, etc.),

- Identify polygons (e.g. let's assume two different polygons are coloured red-blue; enter their characteristics such as size, date, boundary change, historical importance)".

Demir and Demirel (2018) list the stages of HLCAn as follows:

- Determining HLCAn Classification Levels

- Data source acquisition phase

- Classification Phase

- Determining HLCAN classification levels

- Mapping of HLCAN character types

- This is the creation of the landform.

In this study, multi-layered HLCAn maps, which are attempted to be made more detailed, cover both historical and archaeological periods, as well as Landscape Pattern Transition Areas (PDGA) based on boundary changes in aquatic and terrestrial environments as a new perspective.

 The HLCAn mapping method should cover all evidence-based temporal layers of site-specific nature-human interaction, as well as boundary shifts in aquatic and terrestrial environments resulting from Anatolia's long geological history and fluvial dynamics. Deltas, lakes and floodplains can be defined as the geomorphological memory of a landscape.

Ancient cities should be recorded with their palimpsest of archaeological and geomorphological landscape features, where their historical formation and transformation are staged. A strategy has been proposed to enable a more coherent understanding of the heritage values of these cities and their interactions with their location, as well as the development of more effective conservation and use strategies for the current landscape. Based on the idea that it is possible to map the historic landscape character that corresponds to all the archaeological and historic layers in a landscape, a mapping terminology has been developed to include all archaeological and historic layers. Furthermore, if we look at the historical landscape character analysis studies carried out in the world and in Turkey, although some studies examine archaeological periods, they mostly include landscape elements in a limited time depth (mostly from 15 centuries to the present). There is no literature that examines the spatial changes of aquatic and terrestrial landscapes during archaeological periods. However, these changes have been important factors in the differentiation of ancient settlements and nature-human relations. In this study, the historical depth of the area was linked to the archaeological periods and the boundary changes in the aquatic and terrestrial environments were reflected on the HLCAN maps. In this framework, the landscape characteristics of the study area, which has a 2700-year history, were examined in historical and archaeological processes within the framework of the available data. Table 1 shows the time depth and number of landscape characters identified in similar studies. The longer the depth of historical time, the more periods of landscapes superimposed on each other (Wilkınson 2003)

Table 1 Landscape characters and character areas identified in similar studies and time depth (Belen 2021)

Name of the study	Number of landscape characters identified	Number of landscape character areas identified	Time depth studied
Demir and Demirel 2017	84 landscape characters	10 landscape character areas	
Özman 2018		5 landscape character areas characters	
Lambrick et al. 2013	20 landscape characters	12 landscape character areas	1918- 2013

Crow et al. 2011	24 landscape characters		Early Byzantine-2011
Martin and Ford 2008	24 landscape characters		1800- 2008
Bannister 2006	14 landscape characters		1800- 2006
Tortara et al 2015	13 landscape characters		1848-2012
Şengül 2017	11 landscape characters		127 years of history
Tanrıverdi 2016	(studied on green areas)		1982-2015
Baser and Tuncay 2010			15th Century-2000
Sobrino 2015			1830-2015
Catharina et al 2019		8 landscape character areas	1990- 2040

The historical past of the region was examined using ancient sources. Geological sources have been used to describe the natural changes in the landscape of the area. The structural changes in the landscape character of the area, based on historical and archaeological research, shed light on the multi-layered historical landscape characteristics of the area and the identification of historical periods within the TKPAn. The Landscape Character Areas (LCA) of the area from the archaeological period to the present day have been mapped, and the landscape changes of the area and the effects of these changes on the settlement of the area have been studied using literature studies, field observations and the ArcGIS programme.

Historic Landscape Character Analysis (HLCA) provides a structured approach to tracing the temporal layers of landscape changes and their implications for human-environment interactions.

This study focuses on the Büyük Menderes Delta, a region with a profound historical depth spanning 2,700 years. The significance of this area lies not only in its rich archaeological and ecological attributes but also in its distinct landscape pattern transitions shaped by natural and anthropogenic processes. Despite the wealth of historical and archaeological studies conducted globally and in Turkey, a standardized coding and mapping methodology for integrating multilayered landscape patterns remains underdeveloped. This research addresses this gap by proposing a novel approach to HLCA, incorporating temporal and spatial dimensions into a comprehensive mapping framework.

The article is structured as follows: The Introduction outlines the study's significance, its objectives, and the research gap it aims to fill. The Materials and Methods section details the study area, the methodological framework, and the data sources used. The Findings section presents the developed coding system and discusses the temporal layers of landscape patterns revealed through the mapping process. Finally, the Conclusion evaluates the study's

contributions to landscape character research and its potential applications in planning and conservation.

2.   Material and Methods

In this section, detailed information about the study area and the methodology are explained.

The characteristics of the study area

The main material of the study is the Büyük Menderes Delta located in the Aegean region (Figure 1).
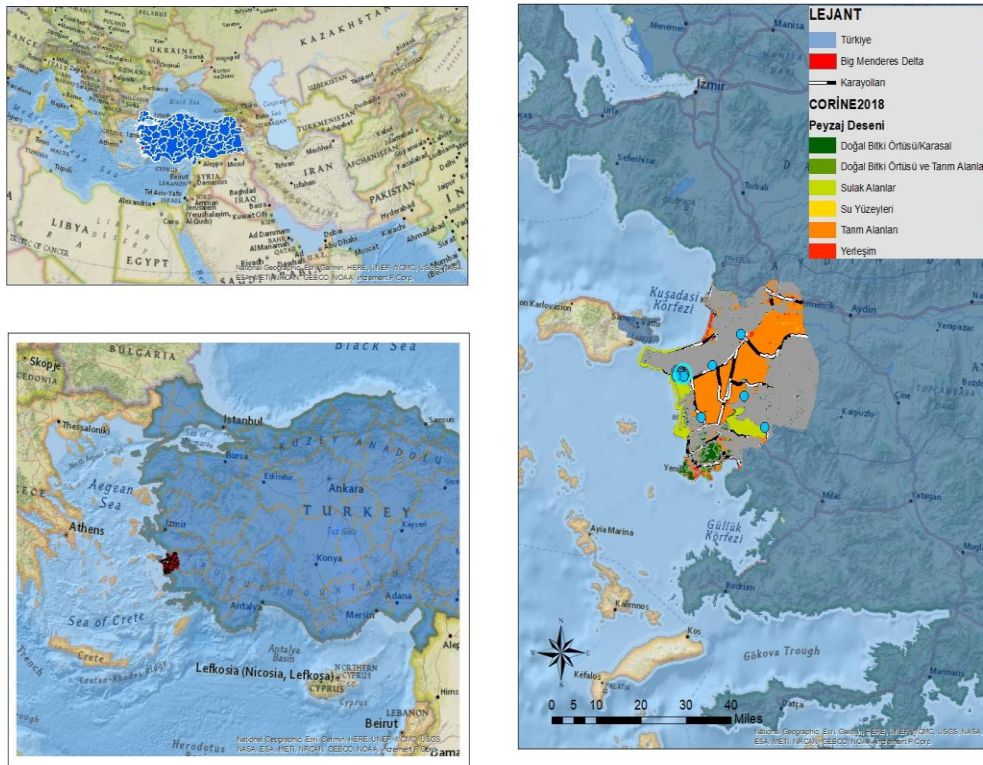

Figure 1 Büyük Menderes Delta Study Area (Belen 2021)

The area covering part of the Büyük Menderes Delta was declared as Büyük Menderes Delta in 1966 and Dilek Peninsula and Büyük Menderes Delta National Park in 1994. The national park covers a total area of 27,598,00 ha, of which 10,985,00 ha is the peninsula and 16,613,00 ha is the delta area (Figure 2). The National Park better explains the importance of the Menderes Delta, which is very rich in flora and fauna. Due to this richness, the Dilek Peninsula has been declared a European Biogenetic Reserve by the Council of Europe. The area is also protected by the international conventions of Ramsar, Bern, Rio and Barcelona (Bingöl 2011).
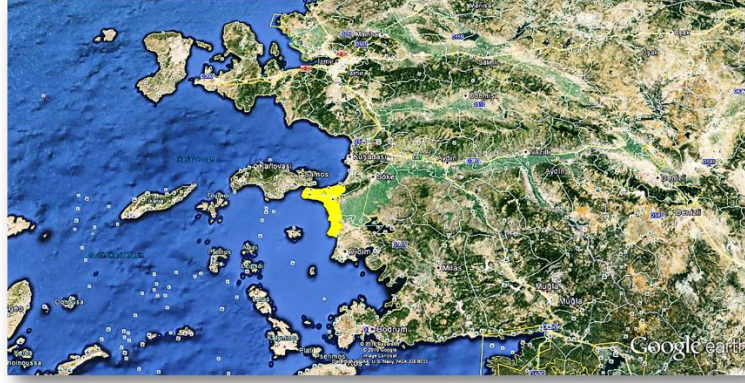
Figure 2 Satellite image of Dilek Peninsula Menderes Delta National Park (Belen 2021)

According to Greek mythology, Büyük Menderes (Maiandros) is the son of Okeanos and Tethys (Erhat 2003). The name Maiandros has not been a special name since ancient times, and due to the meandering course of the Büyük Menderes River, some motifs in art have been named after it, and this name has also been used for roundabout speech in language (Erhat 2003). Strabo mentions that Maiandros was born near Kelainai (Dinar), and after joining a river called Orgas, it flowed through a flat country with a soft and heavy current, and after flowing through Phrygia for a while, it formed the border between Caria and Lydia in a place called Maiandros Plain. He also mentions that because the current of the Maiandros is tortuous, everything that is so tortuous is called Maiandros'lamak (Strabo XII, 8.15). Herodotus mentions the Marsyas stream as a river that flows through the land of Idrias (around Yatağan) and joins the Maiandros (Herodotus X, 118). Strabo mentions that the upper part of the city of Priene, i.e. the area around the present peninsula of Dilek, was a region full of wild animals and covered with trees (Strabo XIV, 1.12).

Philippson's map of 1910 and Kiepert's map of 1911 show that the delta of the Büyük Menderes River is almost the same as it is today and that the alluvial filling of the Büyük Menderes River has slowed down.

The Büyük Menderes Basin, with its topographical structures suitable for settlement, ease of transport, fertile soils and climatic conditions, has been inhabited and maintained its cultural existence throughout human history. It is known that life began in this region during the Epipaleolithic period (20,000/18,000 BC to 10,000/9,000 BC) with rock paintings found in the Beşparmak Mountains of the Latmos region and stone tools found in rock shelters (Akdeniz and Akkurnaz 2018).

Surveys carried out within the borders of Aydın province have shown that there are many mounds and settlements in the province. The most famous of these is Deştepe, also known as Dedekuyusu Mound. This mound has been dated to 4500 BC. The first historical information about the province of Aydın comes from Hittite sources. These sources mention the river called Seha in the west and the valley it feeds. It is assumed that this river is the Büyük Menderes River. Also in the Hittite sources, the region north of Seha is called the land of Lukka. Based on the Hittite sources, it was determined that "Apasa is Ephesus, Milavanda is Miletus, Pariyana is Priene, Ilyalanda is Alinda and Waliwanda is Alabanda" (Sevin 2003).

Strabon, one of the writers of the ancient period; Aydin, for the name Tralleis at that time, states that it was founded by Argosian and Thracian tribes. In the following periods, we learn from the struggle of the Spartan general Thipron to take Aydin and its surroundings in the 400s BC that there was Persian domination in the region. In 344 BC, the Persian rule was ended by Alexander the Great. The province of Aydin was known as "Ceasarec" until the end of the Roman Emperor Nero. It was known as "Tralleis" in the 1st century AD. After the Battle of Magnesia in 260 BC, Aydın Province came under the Byzantine rule of the Kingdom of Pergamon and became the episcopal centre of the city. In the 12th century it came under Turkish rule (Büke et al, 2013)

2.1.   Methodology

Literature research used for the study was conducted. Geological data were examined. These data were transferred to arcGIS environment and CORINE Land Cover/Land Use 2018 and CORINE Land Cover/Land Use 1990 data were processed. Historical Landscape Character Analysis academic studies were examined and a new methodology and coding system was created by combining the methods used.

2.2.   Material

The first stage of the methodology adopted for the study is to examine the working principles of the Historic Landscape Character Analysis and similar studies and surveys carried out in the area. The second stage is the creation of a coding system based on the findings obtained and the categorisation of the coding according to historical development. The third stage was mapping. The CORINE land cover study and the data obtained were mapped by combining them in the arcGIS environment. The CORINE Land Cover/Land Use 2018 data were used; basic data such as roads, rivers, settlements, etc. were obtained from the open data providers OpenStreetMap (OSM) (https://www.openstreetmap.org) and Copernicus (https://land.copernicus.eu). The sources used for the study are listed in Table 2.

In the study, HLCAn was mapped with an original coding system based on CORINE LU/LC land cover data, ancient sources, studies on historical geological periods related to the area, landscape pattern level 1 and level 2 codes of Şahin et al. (2013) and Demir and Demirel (2017) which source Demir, which is considered to contain a grasp map key within the scope of the literature reviewed. All data and maps were prepared in a GIS environment using ArcGIS software.

Table 2 Data sources for HLCAn (Belen 2021)

Literature related to the area including all periods and scales and maps based on this literature, especially geological studies and maps
Ancient documents, edicts
Historical landscape character classification mapping techniques in the literature
Aerial photographs
Existing GIS data
CORINE Land Cover/Land Use 2018 ve CORINE Land Cover/Land Use 1990
Jeolojik araştırmalar

3.   Findings

The findings section of the study explains the current landscape pattern during the HLCAn mapping process and the changes in the area, even in a short time, based on the CORINE

LU/LC. The bibliography and methodology used to map the archaeological and historical periods are explained, as well as how the coding system was established and the resulting maps.

3.1. Contemporary landscape patterns of the Büyük Menderes Delta

Landscape patterns, marine geomorphological information from the literature and historical periods form the basic map components of HLCAns. In general, a landscape pattern inventory reflects (1) the structure revealed by land use and biophysical conditions in temporal and spatial terms, (2) spatial, point and linear landscape elements, and (3) perceptual and aesthetic features (Şahin et al., 2014). In this study, the "National Technical Guidelines for Landscape Character Analysis and Assessment at Regional and Subregional Scale" developed by Şahin et al. (2014) and based on the European Landscape Convention was used for mapping the landscape pattern. The coding of the landscape pattern is based on the landscape pattern classes of the Landscape Character Types Level 1 and Level 2 classification in the aforementioned guideline. The landscape pattern map, which will be the current base map data in the HLCAn studies, was created using CORINE LU/LC data for 1990 and 2018. Table 3 shows the landscape pattern types in the study area.

Table 3 Landscape pattern types in the study area (adapted from Şahin et al. 2014)

Data	Typology
Landscape Pattern	Terrestrial Natural Landscape
	Wetlands
	Water Surfaces
	Agricultural Landscaping
	Settlement Landscape
	Agricultural Areas Mixed with Natural Vegetation

Büyük Menderes Delta Landscape Pattern Map of 1990 is given in Figure 3 and the areal size of the pattern types on the map is given in Table 3. Büyük Menderes Delta Landscape Pattern Map of 2018 is given in Figure 3 and the areal size of the pattern types on the map is given in Table 4.
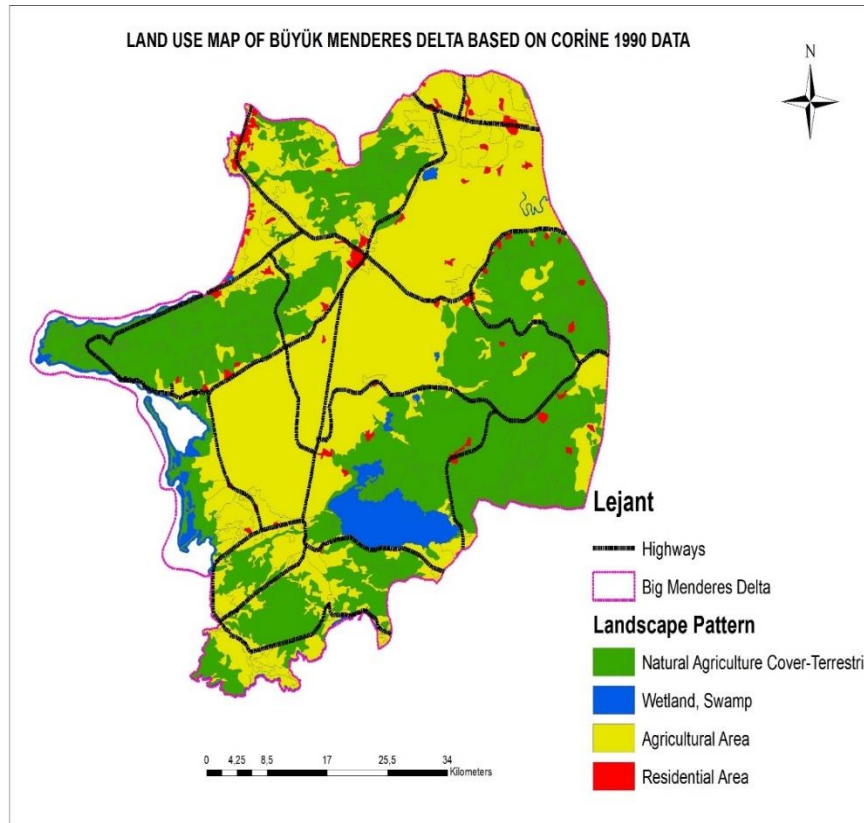
Figure 3 1990 Landscape Design (Belen 2021)

Table 4 Areal sizes of landscape pattern types in the Büyük Menderes Delta in 1990 (Belen 2021)

Landscape Pattern-1990	Code	Area (Ha)
Natural Areas	D	98696.46
Wetland, Swamp	S	11046.57
Agricultural Areas	T	109838.03
Settlement	Y	5541.31
Total		**225,122.37**

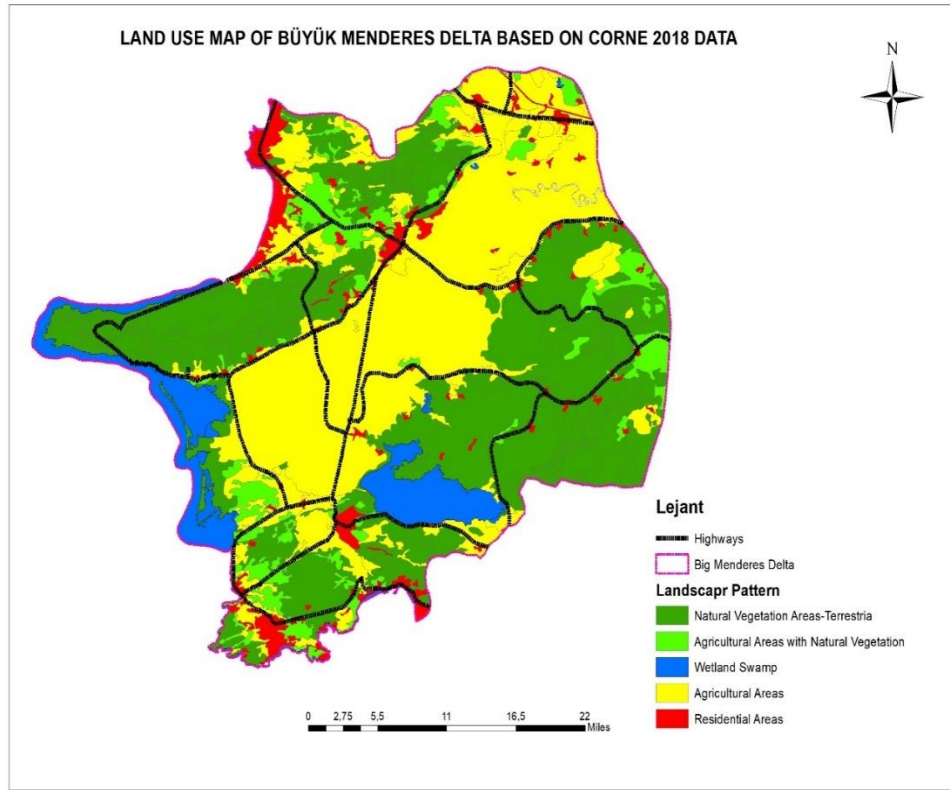**Figure 4** 2018 Landscape Pattern (Belen 2021)

Table 5. Areal sizes of landscape pattern types in the Büyük Menderes Delta in 2018 (Belen 2021)

Landscape Pattern-2018	Code	Area (Ha)
Natural Areas	D	94.792.84
Agricultural Areas with Natural Vegetation	DT	18.110.52
Wetlands, Swamps	S	17.544.06
Water Structures	SY	293.95
Agricultural Areas	T	89.176.70
Settlement	Y	11,666.83
Total Area		**231,584.90**

As can be seen from Table 4 and Table 5, the area has changed by 6,462 ha even over a period of 18 years. Figure 3 shows the landscape pattern in 1990 and Figure 4 shows the landscape pattern in 2018.

3.2. Aquatic and terrestrial landscape change map of HLCAn in historical and archaeological period

As part of this study, boundary changes in the aquatic and marine environments were investigated based on the literature. Historical and archaeological sources (Çelebi, E. 17th century, Herodotus 468-467 BC, Homer 7-8 century BC, Sophocles 430 BC. , Strabon 7th

century BC, Wilkinson, 2003, Turner 2007, Sevin 2003, Büke et al, 2013), the British Archaeological Institute survey, literature data (Müllenhoff et al. 2004, Brückner et al. 2017, Belen 2021, Belen and Şahin 2021, Güney 2012, Göney 1975, Brückner et al. 2017, Herda 2006) and ancient sources were used. The CORINE 2018 land cover was used as a basis.

The mapping of the HLCAn in the study area was based on the main periods and sub-periods determined on the basis of the natural and cultural events that occurred in the historical depth in the area, together with the statements (Table 5).

In order to map the HLCAn, the boundaries of the maritime area in the archaeological period were investigated and Landscape Pattern Transition Areas (LPTAs) were defined. For this purpose, the studies of Müllenhoff et al. (2004) and Brückner et al. (2017) were used, in which the filling times of the Menderes Delta with alluvial material were determined in the light of geological data. The studies of Kazancı et al. (2009) were used for the riverbed changes. The resulting coastal boundary changes were then transferred to the ArcMap environment. The ancient landscapes were also completed based on the data from ancient sources (Herodotus, Sophocles and Strabo). As a result, the HLCAn map produced covers both the current landscape pattern and the HLCAn periodically.

In the context of the above, the terminology, including historical periods and HLCAn map coding, is given in Table 6. Not every historic landscape element coded in this table has an equivalent in the study area. However, the codes can be used in the mapping exercise on the assumption that new information can be obtained. In addition, these codes have been included as a model for other studies even though there is no proven data in the study area.

Table 6 Structure of coding system used in HLCAn mapping (Belen 2021)

Rule		Coding/Description
1	HLCAn Landscape Pattern Codes D: Terrestrial Natural Landscape	D: Terrestrial Natural Landscape SY Water surfaces S: Wetlands T: Agricultural landscape Y: Settlement landscape Şahin et al. (2014) Landscape Character Type Level 1 and Landscape Unit Level 2 classes are proposed. This ensures consistency with the Technical Guidelines for National Landscape Character Analysis and Assessment.
2	HLCAn coding	[CURRENT LANDSCAPE DESIGN] _[CURRENT LANDSCAPE DESIGN PERIOD]. Example code: Y_IN Code Open name: Ancient Settlement (e.g. Doganbey Ancient Settlement)

3	HLCAn Landscape Pattern Transition Areas [LPTAr] Coding	[HLCAn#]_[TRANSITION PERIOD]. Example code: HLCAn1-2_INS in Current Agricultural Areas Code Open name: Transition from Early Marine to Swamp-Swamp to Agricultural Landscape in Current Agricultural Areas For areas where the marine landscape is transitioning to a terrestrial landscape: HLCAn 1: HLCAn transition from marine to marshland HLCAn 2: HLCAn transition from swamp to agricultural landscape HLCAn 3: HLCAn transition from agricultural landscape to settlement (New HLCAn numbers (HLCAn 4, HLCAn 5) may be assigned if information on different changes in the landscape pattern (e.g. from field to cultivated agricultural areas or from lake landscape to swamp etc.) is found. These areas are defined as those in which landscape pattern changes can occur over long geological time periods or in the short term as a result of various catastrophes. INTERIOR: Early age OÇ: Middle Ages YÇ: New Era These periods should be analysed for each study area, in particular sub-periods should be identified within the framework of spatial elements, patterns and/or events that demonstrate nature-human interaction.
4	HLCAn Characteristic natural, cultural, historical or archaeological landscape pattern	[CURRENT SUBLANDSCAPE PATTERN#] _[CURRENT SUBLANDSCAPE PATTERN CREATION PERIOD]. Example code: T1_IN Code Open name: Old olive grove landscape (if identified in the study area) T: Agricultural landscape, T1: Characteristic olive groves in the agricultural landscape Within the study area, historical spatial data in this direction are not yet available, except for HLCAn.
5	[HLCAn #]_[TRANSITION PERIOD].	In order to define the landscape character types, geomorphological (or physiographic) and climatic information is required, especially for historical periods. As this study does not cover these analyses and/or such data are not yet available, the HLCAn map was applied to the Landscape Characteristics and Landscape Characteristics Transition Areas based on marine geomorphological information from the literature.

This study was carried out using ArcGIS 10.5 GIS software. CORINE LU/LC land cover data, literature information and old maps were used in this study, and the 2018 CORINE LU/LC land cover study was used as a base. Early settlements were identified, coded and labelled as Y_IW. Old agricultural areas; considering that settlements should be within walking distance, the following calculation was made.

In the study, it was found by examining the studies on ancient roads that the coastal edge line was 30 meters above the current sea level. The research shows that in ancient times, the important roads in the region started from the ancient port of Ephesus and passed to Anatolia via the Menderes Basin. If you go south from the city of Ephesus, you can go to Priene and Miletos from Panonium. If you go to the East; The road extends to Tralles (Aydın), Nysa (Sultanhisar), Mastavra (Nazilli) and Laodikeia (Denizli) and as far away as Sezare (Kayseri) (Özgün and Yapucu 2019). Natural areas and wetlands were taken from the CORINE LU/LC data. Although it is assumed that the natural vegetation cover of the area is forested based on the information on cedar trade mentioned in ancient sources (Güler 2006), the necessary documentation for mapping was not provided.

The data used for this study and the changes in the coastal edge line were determined using Brückner et al. 2017, Güney 2012, Göney 1975, Brückner et al. 2017, Herda 2006.

The maps that form the basis of the studies carried out in the Büyük Menderes Delta are shown in Figures 5, 6 and 7. These maps are the basis for the maps produced in this study. The similarity between all the studies carried out and this thesis supports the correctness of the starting point and approach of the thesis.
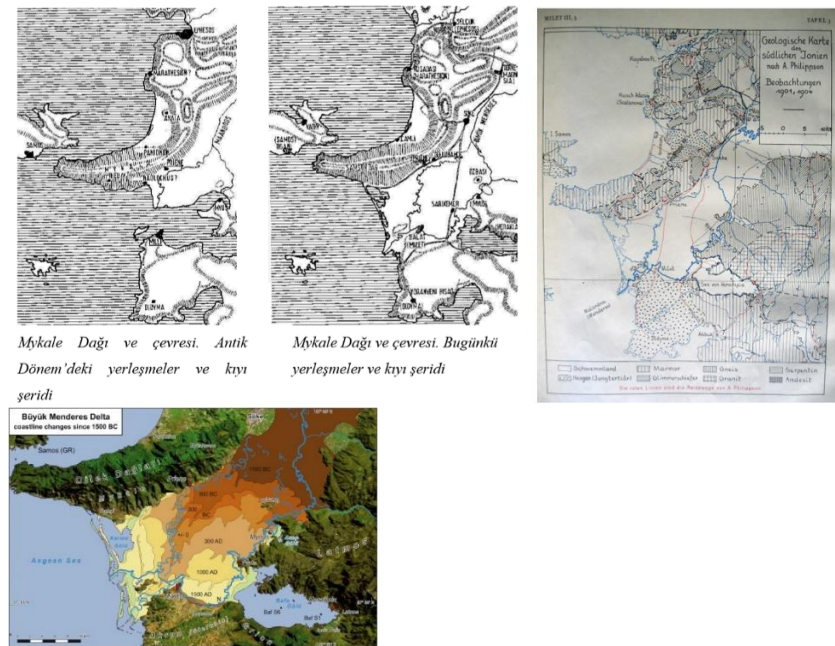

Mykale Dağı ve çevresi. Antik Dönem'deki yerleşmeler ve kıyı şeridi

Mykale Dağı ve çevresi. Bugünkü yerleşmeler ve kıyı şeridi

Figure 5 6. Büyük Menderes Delta Change (Gürses Söğüt 2010) Figure 7 Büyük Menderes Delta Coastal Edge Change (Brückner et al. 2017)

The above maps show that the Büyük Menderes Delta was once part of the sea. In addition, archaeological data show that the ancient cities of Priene, Myus, Heraclea and Miletus were port cities.

The structural change of the marine/terrestrial landscape during the archaeological periods (First Age) in the study area was used to determine the Landscape Pattern Transition Areas (LPTAr). The resulting map is shown in Figure 8.
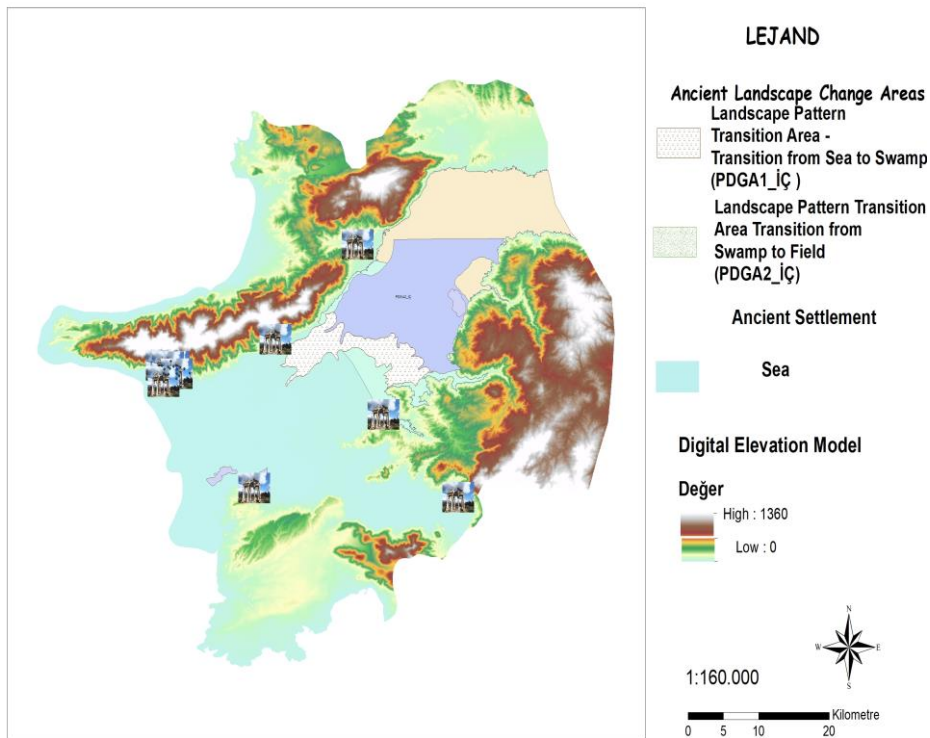

Figure 8 Ancient Landscape Pattern Transition Areas in the Büyük Menderes Delta (Belen 2021)

Drawings were made with ArcGIS 9, the programme used for the study. The simplified form of CORINE LU/LC data for this study is given in Table 7.

Table 7 Simplified form of CORINE LU/LC land cover study (Belen 2021)

Name.	Landscape pattern level 1	Landscape pattern level 2
Settlement	Y	Y_İÇ Y_OÇ Y_R Y_M Y_MY Y_ME
Agricultural fields	T	T_İÇ T_OÇ T_R T_M
Natural and semi-natural areas	D	D_İÇ D_OÇ D_R D_M
Agricultural land mixed with forest	DO	DO_İÇ DO_OÇ DO_R DO_M
Agricultural Areas with Natural Vegetation	DT	DT_İÇ DT_OÇ DT_R DT_M
Wetlands	S	S_İÇ S_OÇ S_R S_M
Water Structures	SY	SY_İÇ SY_OÇ SY_M SY_R:
Sea	DN	DN_İÇ DN_OÇ DN_R DN_M: KY_M:
Coastal borders	KY	KY_İÇ KY_OÇ KY_R
The area where the olive groves are located	SKTMB	SKTMB_Z_İÇ SKTMB_Z_OÇ SKTMB_Z_R SKTMB_Z

Landscape Pattern Transition Area	PDGA	PDGA1_İÇ
		PDGA2_İÇ
		PDGA3_İÇ
		PDGA1_OÇ
		PDGA2_OÇ
		PDGA3_OÇ
		PDGA1
		PDGA2
		PDGA3

The HLCANn map prepared in the light of the data obtained is shown in Figure 9.
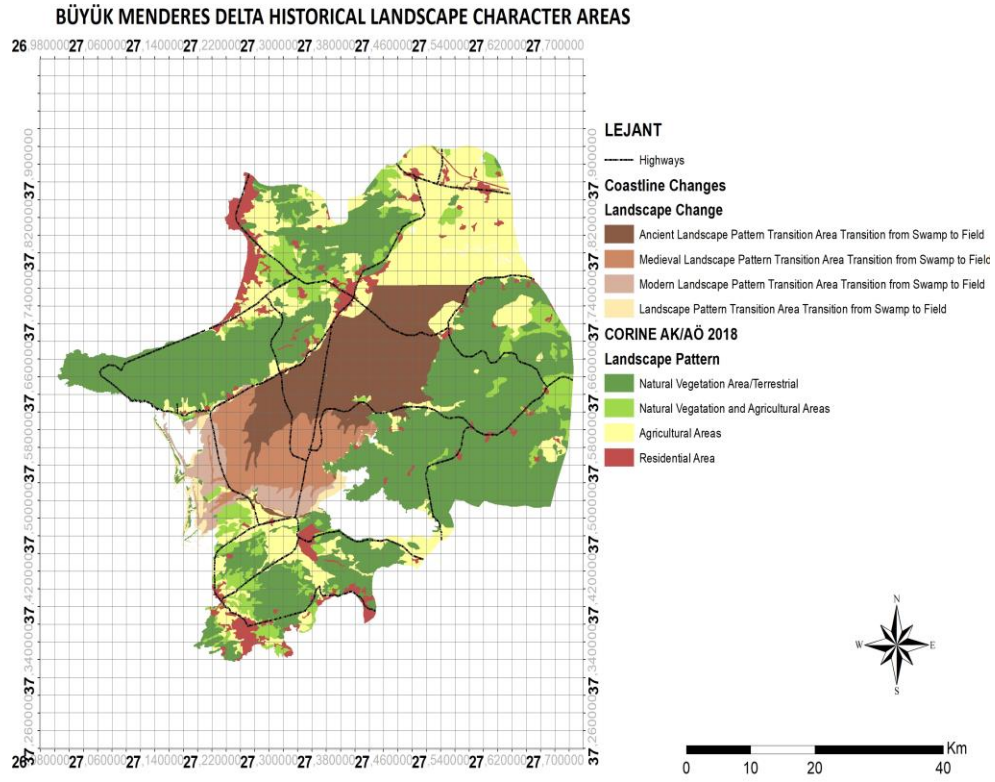

Figure 9 Büyük Menderes Delta Historic Landscape Character Areas (Belen 2021)

4.   Conclusion and Discussion

George Bancroft famously said, 'The ruins of the past are the warnings of the present.' As it can be understood from, the sentence knowing the past plays an important role in the construction of today. It is the duty of humanity to learn from the mistakes made in the past. This is how progress is made. HLCAn studies go exactly on this subject and reveal the changes that humanity has undergone since the first settlement. It is a great deficiency that such a study does not have a common terminology. This study takes an important and necessary step to overcome this deficiency. It is a pioneering study with its findings and mapping system.

As mentioned in similar studies, 'archaeological and historical landscapes, in other words, historical landscape character areas, are places that have the potential to carry information about an area belonging to past cultures to the present. At the same time, these places shed light on how past landscape character or landscape change has shaped cultural landscapes. Therefore, by mapping the historical landscape character areas, the memory-space relationship that takes place in ancient cities and their landscapes will be recorded.'

When similar studies are examined, although there are studies including archaeological periods, they are mostly based on the 15th century and later. A limited number of studies (e.g. Demir and Demirel 2017) cover the recent periods before Christ. This study is one of the pioneering studies with a time depth of 2700 years.

For HLCAn and mapping studies, a coding and terminology has been developed that will be used holistically and will create a common language phenomenon, which will make a great contribution to science in this sense.

The proposed Historic Landscape Character Analysis (HLCAn) method and the width of the time period considered and the proposed mapping terminology produced for this study are original.

'Landscape Pattern Change Area' is proposed as a new layer to show the historical periods in the creation of HLCAn and HLCAn maps. The multi-layered HLCAn maps proposed in this study cover both historical and archaeological periods and Landscape Pattern Transition Areas based on boundary changes in aquatic and marine environments as a new perspective. These transition areas and layers have influenced the development and change of settlements. It has caused the destruction of many areas and the establishment of new areas. The best example of this is the relocation of the harbour cities of the ancient period due to these landscape changes. Such Landscape Pattern Transition Areas, based on the literature (Kazancı et al. 2009, Brückner et al., 2017), can be said to have occurred on many coasts along the Mediterranean Sea.

'There is an infinite well whose water increases every day; History.' The well mentioned by R. Necdet Kestelli with this quote is the best example of the change of the Menderes delta. Documentation of this delta with its multi-layered (palimpsest) archaeological and geomorphological landscape features is important in terms of showing how landscape, archaeology and history are intertwined. It is thought that the mapping technique used in this study will provide an insight on other interdisciplinary studies.

References

Akdeniz, E., & Akkurnaz, S. (2018). Latmos is a world cultural heritage in Aydın. Archeology and Art Publications, İstanbul.

Anonymous. (2003). European Landscape Convention. Official Journal of 27.07.2004.

Anonymous. (2025). Aydın. kulturportali.gov.tr/, access date: 14.01.2025

Antrop, M. (2005). From holistic landscape synthesis to transdisciplinary landscape management. From landscape research to landscape planning: aspects of integration, education and application. New York: Springer, 27-50.Bannister N.R. 2006. West Weald Landscape Project. Sussex & Surrey Historic Landscape   Characterisation Projects.

Belen (2021). Analysis and Evaluation of Historic Landscape Character for Tourism: The Case of Aydın Söke Eski Ve Yeni Doğanbey Neighbourhoods. Doctoral Thesis, Ankara University Institute of Science and Technology, Doctoral Thesis.Ankara.

Belen, N., and Şahin, Ş.. (2021). Historic Landscape Character Areas as Memory Carriers: The case of the ancient city of Priene. Gsı Journals Serie C: Advancements In Information Sciences And Technologies, 4(2), 38-57.

Bingöl B. (2011). A research on recreation planning of Dilek Peninsula - Büyük Menderes Delta National Park in terms of conservation and utilisation principles. Ankara University, Institute of Science and Technology, Department of Landscape Architecture, Doctoral Thesis, Ankara.

Brückner H., Herda A., Kerschner A., Müllenhoff M., Stock F. (2017). The life cycle of estuarine islands: from the formation to the landfall of former islands in the vicinity of Miletos and Ephesos in western Asia Minor (Turkey). Journal of Archaeological Science: Reports 12, 876-894.

Büke, A., Gültekin, M., Aksoy, A., Dıvrak, B. B., Göcek, Ç., Berke, M. Ö., Çeşmeci, H. (2013). Büyük Menderes Basin Atlas. World Wildlife Fund-Turkey, 978-605.

Catharina J.E., Schulpa C.J., Levers C., Kuemmerle T., Koen F., Tieskensa P., Verburga H. (2019). Mapping and modelling past and future land use change in European cultural landscapes. ScienceDirect journal Land Use Policy, 332-344 www.elsevier.com/ .

Collins, A.S. (1997). Techtonic evolution of Tethys in the Lycian Taurides, Southwest Anatolia. Doctoral thesis, University of Edinburgh. https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.643352, accessed 09.10.2021.

Çelebi E. (2003). Evliya Çelebi Travelogue in Modern Turkish: Kütahya, Manisa, İzmir, Antalya, Karaman, Adana, Aleppo, Damascus, Jerusalem, Mecca, Medina. 9th book, volume I, prepared by Seyit Ali Kahraman, YKM Publications, Istanbul.

Demir S. and Demirel Ö. (2016). Landscape change in protected areas and landscape planning approach with landscape character analysis: Meryemana Valley example. Trabzon İnönü University Journal of Art and Design. ISSN: 1309-9876, Volume 6, Issue 13, 155-174.

Demir S. and Demirel Ö. (2017). Historical landscape classification and evaluation. Journal of International Scientific Researches, 2, 186-195.

Demir, S. and Demirel Ö. (2018). A new historical and archaeological approach to the European Landscape Convention.Ibad Journal, Volume 3, Issue 2, 546-562.

Erhat, A. (2003). Mitoloji sözlüğü (12. Basım). İstanbul: Remzi Kitabevi.

Erol O. (1997).Photo-Geomorphological Investigation of Büyük Menderes Delta.Journal of Aegean Geography, Issue:9, 1-6, Izmir.Eser O. 2009.The First Victim of Renaissance Thought, A Critic Etienne Dolet, The Light Thrown by Critical Theory on Ideological Translation Decisions.Çukurova University Institute of Turkology, Adana.Fairclough G., Lambrick G., Hopkins D. "Historic Landscape Characterisation in England and a case study of Hampshire".

Göney S. (1975). Büyük Menderes Region.Istanbul University Faculty of Literature Publications No: 1895, Istanbul.

Görmüş S. and Oğuz D. (2013). The role of landscape character analysis in assessing the interaction between rural settlements and protected areas: Example of Kapısuyu Basin. Journal of Agricultural Sciences, Volume 19, Issue 4, 310 - 322.

Güler T. (2006). Antik Çağ Doğu Akdeniz Ticareti ve Ticaret Gemileri. Selçuk Üniversitesi, Sosyal Bilimler Enstitüsü, Arkeoloji Ana Bilim Dalı, Klasik Arkeoloji Bilim Dalı, Yüksek Lisans Tezi, Konya.

Güney H. (2012). Historical geography of the Lower Büyük Menderes Basin in the Late Bronze Age. Adnan Menderes University, Institute of Social Sciences, Department of Archaeology, Master's Thesis, Aydın.

Gürses Söğüt S. (2010). Doğanbey (Domatia) Köyü"nde Yapısalcı Tipolojik Çözümleme Yöntemi ile Mekânsal Değişime Bakış. Mimar Sinan Güzel Sanatlar Üniversitesi, Fen Bilimleri Enstitüsü, şehir ve Bölge Planlama Anabilim Dalı, Kentsel Koruma ve Yenileme Programı, Yüksek Lisans Tezi, İstanbul.

Herda A. (2006). Panionion-Melia, Mykalessos-Mykale, Perseus und Medusa.Überlegungen zur Besiedlungsgeschichte der Mykale in der frühen Eisenzeit.Istanbuler Mitteilungen, 56, 43-102.Iles L., Longford C., Salvagno L. and Wallace M. 2023 Living Through Change:The Archaeology of Human-Environment InteractionsIntroduction to the Special Issue Envıronmental Archaeology 2023, VOL. 28, NO. 4, 223-227 https://doi.org/10.1080/14614103.2022.2159171.

Kaya Tanrıverdi A. (2016). Method for Assessment of the Historical Urban Landscape. World Multidisciplinary Civil Engineering-Architecture Urban Planning Symposium 2016, WMCAUS 2016, Procedia Engineering 1697 - 1703.

Kazancı, N., Dündar, S., Alçiçek, M.C. and Gürbüz, A. (2009). Quaternary deposits of the Büyük Menderes Graben in western Anatolia, Turkey; implications on a river capture and the longest Holocene estuary of the Aegean Sea. Marine Gelogy 264, 165-176. https://www.tandfonline.com/doi/full/10.1080/17445647.2020.1764874 (23.06.2021).

Kim K. H. And Pauleit S. (2007). Landscape character, biodiversity and land use planning: The case of Kwangju City Region, South Korea. Land use policy, 24(1), 264-274.

Köse Y. and Şahin Ş. (2017). Landscape Features of Evciler Neighbourhood as a Rural Settlement. Journal of Ankara Studies, DOI: 10.5505/jas.2017.62634

Krähe J., Turner S., Vionis A. K. (2011). Characterising the historic landscapes of Naxos. Journal of Mediterranean Archaeology, 24.1, 111-137 ISSN (print) 0952-7648, ISSN (online) 1743-1700.

Lambrick G., Hınd, J. and Waın I. (2013). Historic Landscape Characterisation in Ireland: Best Paractice Guidance. Published by The Heritage Council, The Heritage Council of Ireland Series, 93. ISBN 978-1-906304-21-8.

LANDMAP (2013). Historic Landscape, Natural Resources Wales, LANDMAP Methodology: Guidance for Wales,.pp.23

Lohmann H, Kalaitzoglou G. and Gundula L. (2009). Survey in der Mykale (Dilek Mountains/Aydın). 26th Research Results Meeting Proceedings, Volume 2,103-118, Ankara.

Lohmann H. (2006). Survey in the Mycale, 3rd Campaign: The Discovery of the Archaic Panionion. 23rd Research Results Meeting Proceedings, Vol. 1, 241-252, Ankara.

Lohmann H. (2007). Forschungen und Ausgrabungen in der Mykale 2001-2006: mit Beiträgen von Hermann Büsing, Frank Hulek, Georg Kalaitzoglou, Gundula Lüdorf, Marc Müllenhoff und Philipp Niewöhner. Istanbuler Mitteilungen, 57, 59-178.

Lohmann, H. and Böhne K. (2011). Survey in Theben an der Mykale (Dilek Dağları/Aydın) 2009, 7 Kampagne. Research Results Meeting, 28.

Müllenhoff, M., Handl, M., Knipping, M., & Brückner, H. (2004). The evolution of Lake Bafa (Western Turkey)–Sedimentological, microfaunal and palynological results. *Coastline Reports*, *1*(2004), 55-66.

Özman K. O. (2018). Historical Landscape Character Assessment in the Case of Amasra City. Bartın University Institute of Science and Technology, Department of Landscape Architecture, Master's Thesis, Bartın.

Özgün, C., & Yapucu, O. P. (2019). Road Network of Western Anatolia: Research-I Kuşadası Port and Caravan Routes. History School Magazine, The History School May-August 2011. Number X, 59-71.

Rouse, L. J. (2018). Phenomenology and Geographic Information Science: experiencing landscape through geospatial technologies and Higuchi-style indices. West Virginia University.

Sakinç, M., & Yaltırak, C., (1997). Marine Pleistocene deposits and palaeogeography along the Southern Thrace coastal area, MTA Journal, 119, 43-62.

Scazzosi L. (2004). Reading and Assessing the Landscape as Cultural and Historical Heritage. Landscape Research, 29(4), 335-355.

Sevin, V. (2003). Anatolian Archaeology. Der Publications,İstanbul.

Simensena, T., Halvorsena, R. Erikstada, L. (2018). Methods for Landscape Characterisation and Mapping: A Systematic Review. Land Use Policy 75, 557-569.

Sobrino Simal J. (2015). Los Paisajes Históricos de la Producción en Sevilla. Sevilla: Instituto Andaluz.

Sophocles (1992). King Oedipus. Translated by Bedrettin Tuncel Ministry of National Education Publications: 2054, Science and Culture Works Series: 365, Theatre Works: 47, Istanbul.

Suffolk County Council (2009). Historic Landscape Characterisation Map. https://heritage.suffolk.gov.uk/media/pdfs/hlcsuffolk.pdf

Swanwick, R. (2002). Sign bilingual deaf children's approaches to writing: individual strategies for bridging the gap between BSL and written English. Deafness & Education International, 4(2), 65-83.

Şahin Ş., Perçin H., Kurum E., Uzun O. and Bilgili C. (2013). National Technical Guide for Landscape Character Analysis and Assessment at Regional-Sub-Regional (Provincial) Scale. Client Institutions; Republic of Turkey Ministry of Interior, Republic of Turkey Ministry of Environment and Urbanisation and Republic of Turkey Ministry of Forestry and Water Affairs, Executing Institution; Republic of Turkey Ankara University and TUBITAK KAMAG 1007 Programme 109G074 numbered PEYZAJ-44 Project.

Şahin, Ş., Köse, Y., Yılmaz, F.Ç. and Güneş, M. (2019). The Role of Landscape in Shaping and Preserving Collective Memory: Gallipoli Peninsula National Park 1915 Battlefields. TMMOB Chamber of Landscape Architects 7th Congress, Antalya. https://www.researchgate.net/publication/355476538

Şengur S. (2018). A New Method Approach in The Analysis if The Landscape: Historic Landscape Characterisation. The Most Recent Studies in Science ind Art, Volume 1 Chapter 67, 875- 886, Ankara.

Tortora A., Statuto, D, Picuno, P. (2015). Rural Landscape Planning Through Spatial Modelling and Image Processing of Historical Maps. Land Use Policy 42, 71-82, Contents lists available at ScienceDirect Land Use Policy journal home page: www.elsevier.com/locate/landusepol.

Turner S. (2006). Historic Landscape Characterisation: A landscape archaeology for research, management and planning. Landscape Research, 31:4, 385-398, DOI: 10. 1080/0142639060100437642.

Turner S. (2006a). Historic Landscape Characterisation in Devon (UK): a short introduction Paper Presented at the Forum. UNESCO University and Heritage 10th International Seminar "Cultural Landscapes in the 21st Century" NewcastleuponTyne, 1116 April 2005.

Turner S. (2007). Landscape Archaeology for the Past and Future: The Place of Historic Landscape Characterisation. Landscapes, 8:2, 40-49, DOI: 10.1179/lan.2007.8.2.40

Van Eetvelde V., and Antrop M. (2009). A stepwise multi-scaled landscape typology and characterisation for trans-regional integration, applied on the federal state of Belgium. Landscape and urban planning, 91(3), 160-170.

Wang J. (2012) Problems and solutions in the protection of historical urban areas 2012 Higher Education Press Limited Company. Production and hosting by Elsevier

Wilkinson, T. J. (2003). Archaeological landscapes of the Near East. University of Arizona Press.

Ancıent Sources

Çelebi, E. 17th century. Evliya Çelebi travelogue in modern Turkish: Kütahya, Manisa, İzmir, Antalya, Karaman, Adana, Aleppo, Damascus, Jerusalem, Mecca, Medina. 9th book, 1st volume, prepared by Seyit Ali Kahraman, YKM Publications, Istanbul, 2003.

Herodotus 468-467 BC. History of Herodotus. (Translated by Müntekim Ökmen), Istanbul, 2006.

Homer 7-8 century BC. Iliad. trans. Azra Erhat and A. Kadir, Can Sanat Yayınları, Istanbul, 2005.

Sophocles 430 BC. King Oedipus. Translated by Bedrettin Tuncel), Ministry of National Education Publications: 2054 Scientific and Cultural Works Series: 365 Theatre Works: 47 Istanbul, 1992.

Strabo 7th century BC. Ancient Anatolian Geography. Book XII, XIII, XIV, Archaeology and Sanat Publications, (translated by Prof. Dr. Adnan Pekman), 2000.