



Evaluation of the Changing Character of the Rural Landscape in Konuralp – Düzce

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Abstract

Urbanization has been progressing at an incomparable rate worldwide throughout the history of humankind. Thus, urbanization frequently results in social and spatial fragmentation and in drastic changes in the surrounding rural landscapes. This paper aimed to assess and map the transformation of rural landscapes via GIS and by using a series of spatial data layers to examine the vulnerability of rural landscapes under urbanization. Topographical maps and satellite views from different periods were used to define the rural landscape character, which was mapped in the form of polygons and polylines via the GIS method. The modifications in land use, circulation networks and settlement patterns were described in time depth. The texture was determined by the minimal mapable units of the landscape types. Landscape metrics were then used to describe the density, distribution and composition of the rural landscape.

1. INTRODUCTION

For a common understanding, we use the definition of the European Landscape Convention: “Landscape” is: “..... an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors” (Anonymous, 2000). Landscapes are extremely important to us because they are part of our cultural heritage. Landscape reflects the relationship between people and place and thus tells the history of humankind over time; it is a product of the interaction of the natural and cultural components of our environment. Landscape Character Assessment assists us in discovering our landscapes. It also provides data that can be used in planning and making decisions concerning the management of change (Banderin and Oers, 2012).

Landscapes have changed over time and they will continue to change– change is invariable but outcomes vary (Tudor, 2014). A “cultural landscape” refers to a man-made artifact associated with past human cultural actions and values, and of present-day creation by our own cultural and social attitudes (Jackson, 1984; Rapoport, 1992; Mitchell et al., 2009; Plieninger and Bieling, 2012). The United Nations Educational Scientific and Cultural Organization World Heritage operational guidelines provide the following definition: "The term cultural landscape embraces a diversity of manifestations of the interaction between humankind and its natural environment". This definition admits that the cultural landscape is developed from the natural landscape by a cultural group. Culture is the main factor, the natural area is the medium, and the cultural landscape is the result (Rapoport, 1992; Anonymous, 2000; Anonymous, 2004). The general agreement is that a cultural landscape is an accumulation of a set of ideas and practices embedded in a place. The term "cultural landscape" encompasses a variety of landscape types, including rural agricultural land, small towns and national parks (Buckle, 2002). The classifications of the International Union for Conservation of Nature and Natural Resources (IUCN), the United States of America National Park Service, the United Nations Educational Scientific and Cultural Organization (UNESCO) and the Canada National Capital Commission (Melnick, 1984; Anonymous, 2004; Anonymous, 2008; Anonymous, 2014) have determined which cultural landscapes characteristics can be

used in landscape inventory. Those characteristics were outlined for ordinary landscapes, especially for rural settings, and they describe a list of elements to be considered in inventorying landscapes (Table 1).

Table 1. Characteristics for rural cultural landscapes

Characteristics	
1. Patterns of Spatial Organization	7. Vegetation
2. Land Use and Activities	8. Structural Types
3. Response to Natural Features	9. Outer Arrangement
4. Cultural Traditions	10. Archeological Sites
5. Circulation Networks	11. Small-Scale Elements
6. Boundaries	12. Perceptual Qualities

Rural landscapes are also important, showing us agricultural practices, spatial organization and property distribution crafted by accumulation of knowledge over time. Landscapes are affected by human activities, climate and land-use changes, and due to the dynamic relationship, they are not stable (Rössler, 2003). All those effects can change the mosaic structure, shape and size of plots in a landscape and all these changes can be seen as different spatial sizes and frequencies. Natural, political, socio-economic and technological forces and industrial activities are the main effective challenges in landscape change. Accessibility is the most important issue within these forces. Whenever people arrives in a land, they quickly start to change this property (Antrop, 2005; Van Eetvelde and Antrop, 2009).

Landscape Character Assessment has an important leading role in carrying out change. We must be certain that we obtain the outcomes of social, environmental and economic issues. It is essential to lead the change in order to ensure that sustainable outcomes will be achieved. A Landscape Character Assessment can outline a landscape with reference to the relevant features that make a place unique. It can provide spatial reference or evidence via mapped landscape character areas or types that can be used to develop policy, plans and strategies (Tudor, 2014).

Generally, metric tools have been used to assess the landscape grain. Metrics are necessary to reveal the relations among structural features, landscape function and the modifications of the landscape as well as to assess the fragility emerging over time. Landscape metrics are used to calculate grain and configuration (Gökyer, 2013) using geographic information systems (GIS). The study of landscape metrics has made progress by the advancement of the GIS method and related technologies. In recent years they have been used mostly in studies related to landscape assessment because of the many possibilities they offer to the users (Atabeyoğlu and Bulut, 2013).

MATERIAL and METHOD

Material

Düzce is a city located in the Western Black Sea Region. Kemal Işıldak, Hüseyin Kıl, Bayram Gökmen settlements and Yörükler Village are neighborhood units of Düzce, and are the main focus of this study. The research areas consist of 11.67 km². Even though these research areas are in Konuralp, a district in Düzce, the legal division of this district was disincorporated via Municipal Law No. 5393, Article 11 after the 2014 local elections. The three neighborhoods and one urban village, once a part of Konuralp, have become part of Düzce with this legislative change. This research examined the land use and function of the neighborhoods with the help of GIS by using digital maps created to detect the landscape characters of these neighborhoods and the village.

Method

Between 1982 and 2015, changes detected in the landscape characteristics of the village and the three research neighborhoods located within the boundaries of the urban area were examined based on the material list which can be seen in Table 2. The distribution rate and changes of settlements, land usage,

green areas and roads were determined by digitizing them using ArcGis 10 software. The patch, as the smallest unit which can be mapped, was regarded as the key element. Research areas with the same characteristics were digitized with the help of polygons. The polygon, which represents the smallest unit, was defined as a patch. The distribution rate of the character types and changes of the ratio over the years were examined by using patches representing the character type.

Table 2. Dataset

Scale	Year	Material Quality	Layout
1/25 000	1982	Photometric Map	G26a1-2,
1/25 000	1997	Photometric Map	G26a1-2
*	2003.01.15	Quickbird Orthoready. resolution 50 cm 3 band, 8 bit	G26a1-2
*	2013.04.05	GE1: Orthoready. resolution 50 cm, 3 band, 8 bit	G26a1-2
*	2014.05.27	PL –PNP: Pleiades. Solubility 50 cm, 3 band, 8 bit	G26a1-2

Changes in landscape character types in the research area between 1982 and 2015 were represented as maps based on the study of Van Eetvelde and Antrop (2009). Settlements, land usage, roads and green areas were mapped thematically by using the ArcGIS 10.3 software. The features shown in Table 3 were examined for each historical period. These four research areas are rural districts under social pressure in terms of urbanization. The aim of this research was to detect the changes of the rural landscape characteristics of the four research areas between 1982 and 2015.

Table 3. Metrics explaining landscape features (Van Eetvelde and Antrop, 2009).

Landscape Metrics	Index for landscape character
A. Proportion of landscape character type (%)	Main character types
B. Number of plots	Degree of spatial fragmentation of character type
C. .Mean plot area	Geometric complexity, variation, landscape scale
D. Plot density	Landscape scale, size of landscape elements

RESULTS and DISCUSSION

The information was obtained from the maps formed by using GIS with the chart and data input. Land settlement maps were formed under the titles: maps of land use (trade, industry, chicken farms), roads, green areas (hazelnut plantations, farms, poplar groves, paddy fields, woodlands). These were created from the data obtained in the tables.

The research areas were settled on alluvial ground and first class topsoil (Fig. 1). The Tabak, Yaka, Melen and Kurtsuyu streams pass through the research areas (Fig. 2) and there are also irrigation ditches made in 1950 by the General Directorate of State Hydraulic Works in order to enable farm irrigation. According to Table 4, 88% of the Hüseyin Kıl neighborhood consisted of green areas in 2015 and the number of green area patches had increased because they were fragmented and the rate of land settlement had increased. Industrial area use in the land settlements has been increasing steadily. In parallel with this increment, the length of the roads has also increased by 100%.

The rate of this landscape character type in the land settlements was 3.30%. In Yörükler village between 1982 and 1997, 86% consisted of green areas, with 13 patches. After 2000, as a result of the earthquake in Düzce, land settlement areas with 45 patches were built. The average patch area was decreased in 2003 and the settlement area consisted of small scattered patches. The mean patch area shrank from 0.005 km² to 0.002 km² between 1982 and 2003. The number of the patches reached 48 due to its proximity to the University of Düzce and their size reached 0.003 km² in 2015. In addition to the growth of the size of the patches, new patches were added. In 2015, the rate of the green areas landscape character type decreased to 84%, while this rate reached 5.8% in the land settlements (Table 4).

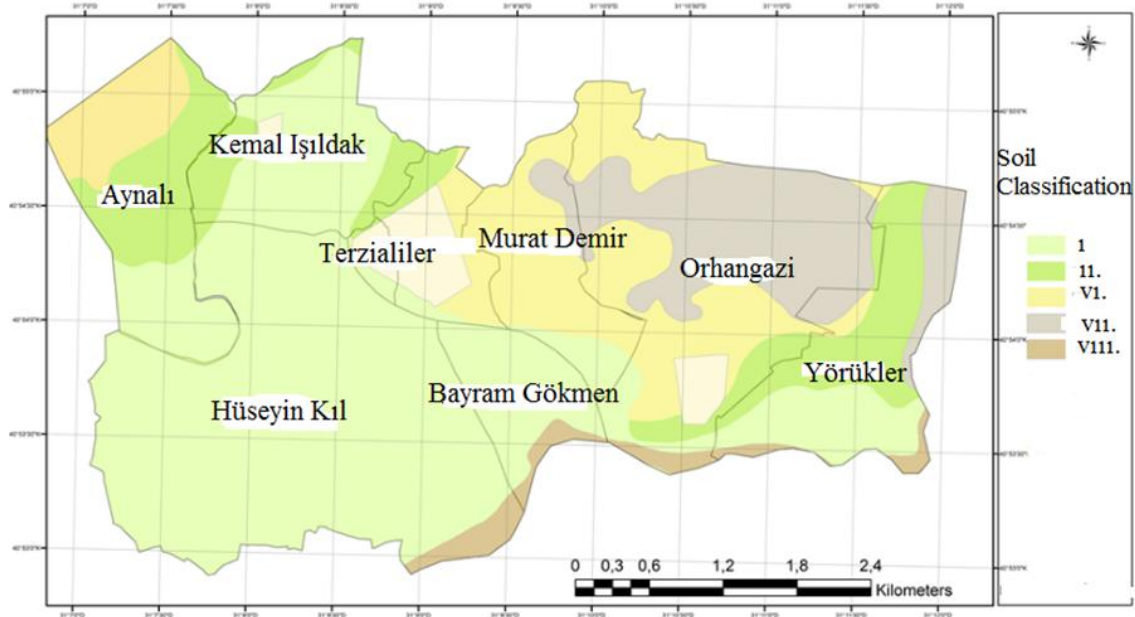


Fig 1. Soil classification

As seen in Figures 2 and 3 and the numeric data in Table 6, energy, trade and industry area use became denser along the roadsides and their number had increased over the years thanks to the improvement of the quality and capacity of the Akçakoca-Zonguldak highway.

New patches were formed and the number of land settlements increased in the Bayram Gökmen neighborhood between 1982 and 2015. However, the green areas landscape character type became 78%, reduced from the 88% before. The length of the roads increased by 42% between 1982 and 2015.

Table 4. Rates of landscape character types of H. Kıl neighborhood (district)

District	B/ number	District area/ m ²	D/ %	A/ %	C/ Km ²	Length of Roads (Km)	Incr. of the Length (%)
H. Kıl 1982							
Settlement	20	6.53	3.6	1.07	0.004		
Industry	2	6.53	10	0.47	0.001		
Green Areas	9	6.53	1.38	93	0.67	7.66	
H. Kıl 1997							
Settlement	23	6.5	3.5	1.83	0.005		
Farm	1	6.5	4.34	0.045	0.003		
Industry	5	6.5	22	0.45	0.006		
Green Areas	8	6.5	1.23	92	0.75	10.6	28
H. Kıl 2003							
Settlement	102	6.5	15.62	2.3	0.002		
Industry	4	6.5	4	0.46	0.008		
ChickenFarm	5	6.5	5	0.26	0.003		
Green Areas	21	6.5	3.21	89	0.3	13	18
H. Kıl 2015							
Settlement	115	6.5	17.6	4.6	0.003		
Industry	6	6.5	5	1.7	0.02		
ChickenFarm	11	6.5	10	0.08	0.0005		
Business	1	6.5	0.86	0.06	0.004		
Green Areas	29	6.5	5	88	0.2	15.55	16

Table 5. Rates of landscape character types of Yörükler Village

District	B/ number	District/a rea/ m ²	D %	A/ %	C/ Km ²	Length of Roads (Km)	Incr. of the Length (%)
Yörükler 1982							
Settlement	14	2.25	6.22	3.3	0.005		
Chicken Farm	1	2.25	0.44	0.18	0.004		
Farm	1	2.25	0.44	0.18	0.004		
Green Areas	13	2.25	5.8	86	0.14	4.98	
Yörükler1997							
Settlement	14	2.25	6.22	3.3	0.005		
Green Areas	6	2.25	2.7	85	0.32		
Farm	1	2.25	0.44	0.17	0.004	5.88	15
Yörükler 2003							
Settlement	45	2.25	20	4.44	0.002		
Governmental	1	2.25	2.2	1.47	0.033		
ChickenFarm	1	2.25	2.22	0.17	0.004		
Green Areas	19	2.25	8.4	85	0.1	5.98	1.7
Yörükler 2015							
Settlement	48	2.25	21.3	5.8	0.003		
Business	1	2.25	2	0.13	0.003		
Governmental	1	2.25	2	1.33	0.033		
ChickenFarm	1	2.25	2	0.2	0.005		
Green Areas	17	2.25	3.6	84		8.74	32

Table 6. Rates of landscape character types of B. Gökmen neighborhood

District	B/ number	District/ area/ m ²	D %	A/ %	C/ Km ²	Length of Roads (Km)	Incr. of the Length (%)
B. Gökmen 1982							
Settlement	18.00	1.02	17.6	2.94	0.002		
Industry	2.00	1.02	1.1	0.686	0.004		
Green Areas	10.00	1.02	9.8	88	0.09	5.69	
B. Gökmen 1997							
Settlement	20.00	1.02	19.6	4	0.002		
Business	1.00	1.02	5	0.19	0.002		
Industry	2.00	1.02	10	0.88	0.01		
Green Areas	3.00	1.02	2.94	82.4	0.28	5.71	0.35
B. Gökmen 2003							
Settlement	54	1.02	53	7	0.001		
Business	3	1.02	6	0.6	0.002		
Industry	2	1.02	4	1.2	0.006		
Green Areas	20	1.02	20	80	0.040	7.24	21
B. Gökmen 2015							
Settlement	21	1.02	21	17	0.008		
Business	7	1.02	33	2.94	0.0040		
Industry	2	1.02	10	1.7	0.009		
Green Areas	6	1.02	6	78	0.130	8.05	10

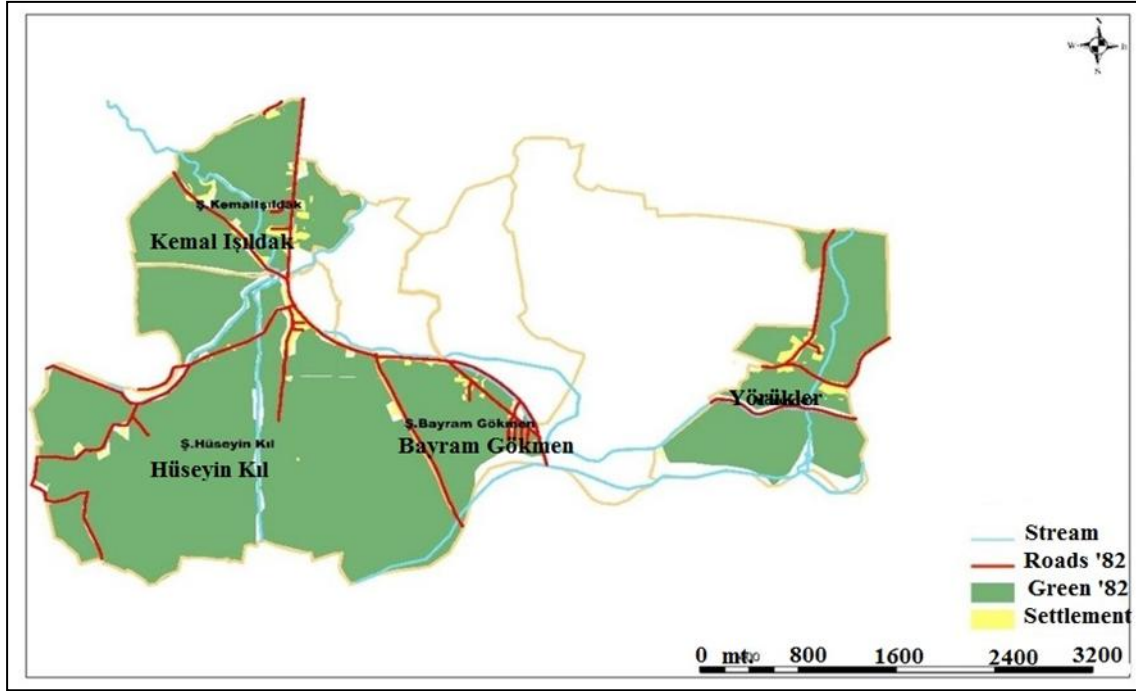


Figure 2. Land use map 1982

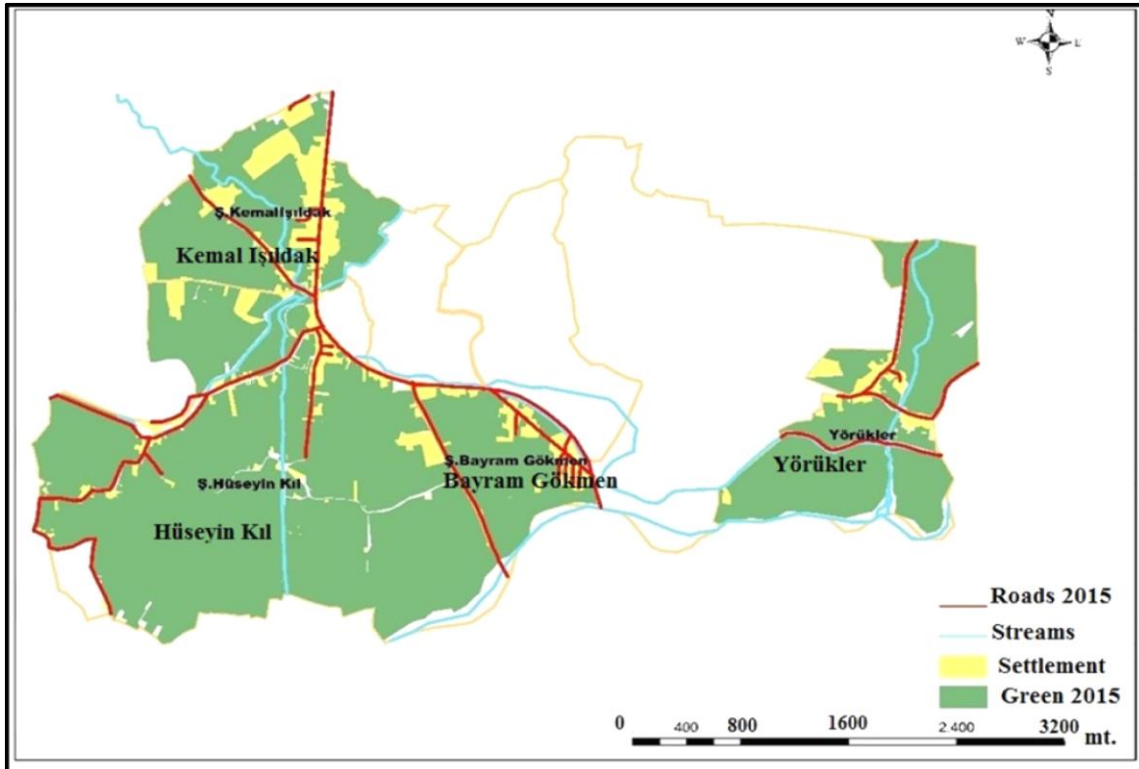


Figure 3. Land use map 2015

The areas of trade and industry use also increased. The mean patch area used for industry reached 0.009 km², up from 0.004 km². Roadside trade use areas in particular had increased, from 0 in 1982 to 2.94% with seven patches in 2015. There had been no increment in the industrial use area since 1982, but the number of patches had increased.

The rate of the green areas landscape character type in the Kemal Işıldak neighborhood was reduced to 73.3%, while the rate of land settlement increased after the 1999 earthquake in Düzce. There was no increment in land settlement in the Kemal Işıldak neighborhood between 2003 and 2015 and there were 17 patches, with the landscape character type at 24% at that time. The green areas consisted of four patches whose mean area was 0.34 km². The rate of this green areas landscape character type was 73.3%, 27% of which was open farm land with wide panoramas. The length of the roads increased by 10% between 2003 and 2015 (Table 7).

Table 7. Rates of landscape character types of K. Işıldak neighborhood

District	B/ number	District/ area/ m ²	D %	A/ %	C/ Km ²	Length of Roads (Km)	Incr. of the Length (%)
K. Işıldak 1982							
Settlement	30	1.86	16	5.9	0.004		
Industry	4	1.86	13.3	0.53	0.003		
Business	2	1.86	6.7	0.04	0.0004		
Chicken Farm	2	1.86	6.7	0.3	0.03		
Green Areas	14	1.86	7.5	86	0.12	3.55	
K. Işıldak 1997							
Settlement	22	1.86	11.76	10.7	0.009		
Industry	4	1.86	18	1.069	0.005		
Business	2	1.86	9	0.04	0.0004		
Energy plant	2	1.86	9	4.27	0.04		
Green Areas	6	1.86	3.2	83	0.3		
Chicken Farm	1	1.86	4.5	0.1	0.002	5.02	29
K. Işıldak 2003							
Settlement	17	1.86	9.1	24	0.003		
Industry	7	1.86	41	2.13	0.006		
Chicken Farm	1	1.86	6	0.1	0.002		
Business	2	1.86	12	0.042	0.0004		
Energy plant	2	1.86	12	4.27	0.04		
Green Areas	4	1.86	2.14	73.3	0.34	7.26	30
K. Işıldak 2015							
Settlement	17	1.86	9.1	24	0.003		
Industry	7	1.86	41	2.13	0.006		
Business	2	1.86	12	0.042	0.0004		
Energy plant	2	1.86	12	4.27	0.04		
Chicken Farm	1	1.86	6	0.1	0.002		
Green Areas	4	1.86	2.1	73.3	0.34	8.02	9.5

This research examined four neighborhoods which were rural-style districts threatened with urban sprawl. Even though these four neighborhoods were settled on irrigable topsoil, there has been an increment in non-agricultural land usage since 1982. The integrity of the rural areas has been destroyed due to the fragmentation caused by urban sprawl. The increment in industrial, trade and residential buildings leading to the increment the road length has resulted in a decrease in the number of green areas patches. However, according to the rates of the landscape character types, these four neighborhoods still have the features of rural style. There has been a dominant pattern of industrial and trade land usage, especially located along the Akçakoca highway. Since 2003, Yörükler Village has been a popular settlement area due to its proximity to the university campus. A consistency has been seen in the green areas near Melen Stream. Even though this rate is decreasing steadily, this area still has the highest rate.

The rates of the changing landscape character type of the four neighborhood studied between 1982 and 2015 have facilitated the evaluation of the effects on the rural area of some social, political and natural events, including the foundation of the university, the earthquake disaster and construction of the Akçakoca-Zonguldak highway. Furthermore, this is useful not only in detecting the sensitive areas and the direction of change in the area, but also in examining the area in terms of historical change.

In this study, between 1982 and 2015, the rural settlement areas surrounding Düzce-Konuralp town were examined using the GIS landscape character method. The study results showed that the landscape character of the study area predominantly consisted of green areas. However, due to the earthquake in the urban settlements and the foundation of the university, and due to the spread of agriculture to the plains, it was evident that the rural areas were under pressure. In the field works carried out after 2015 in particular, it was observed that under the influence of the university, housing, student dormitories, etc. had taken the place of the rice paddies.

CONCLUSION

The research showed that the neighborhoods have the features of a rural area because they are settled on irrigable topsoil where farming could be done and green areas have a role in identifying the urban landscape. The urban landscape is a distinctive feature of every city and a value that must be preserved and enhanced through policies and public participation.

The town has mostly engaged in agriculture. Corn and hazelnuts are grown, along with large quantities of rice, which has been produced here since Ottoman times. The rice, known as “town rice” (kasaba pirinçi), became the crowning dish of the Ottoman palace dinner tables (Özlü 2009). The study showed that roads had been opened in rural areas, and parcels were shrinking. Fragmentation, a decrease in green areas and regularly increasing construction were seen. In particular, the cultivation areas of the Konuralp rice, which has been grown here since the Ottoman era, seem to have shrunk.

In the construction plan to be made, it is thought that these areas, consisting of first-grade irrigable agricultural land, should be classified as rural cultural landscapes. It is necessary to protect the production area of these rice fields in particular, as a cultural landscape which has a historical past. Therefore, it is proposed that the production techniques that have been carried out in the past be determined in order to protect them as a cultural heritage.

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REFERENCES

- Anonymous, 2000. European Landscape Convention. http://www.heritagecouncil.ie/fileadmin/user_upload/Publications/ (Access date: 10.03.2017).
- Anonymous, 2004. www.ncccn.gc.ca/sites/default/files (Access date: 21.02.2014).
- Anonymous, 2008. <http://whc.unesco.org/archive/opguide08-en.pdf#annex3> (Access: 30.09.2018)
- Anonymous, 2014. <https://www.iucn.org/content/cultural-landscapes-and-protected> (Access: 30.09.2018)
- Antrop M, 2005. Why Landscapes of the past are important for the future. *Landscape and Urban Planning*, 70: 21-34.
- Atabeyoğlu Ö, Bulut Y, 2013. Character analysis of urban landscape of Ordu city. *Academic Agriculture Journal*, 2(1): 1-12.
- Banderin F, Oers VR, 2012. *The Historic Urban Landscape-managing heritage in an urban century*. First Edition, Wiley-Blackwell Publication, 255p.
- Buckle R, 2002. *Managing cultural landscapes a case study of Stirling, Alberta*. The University Of Calgary Faculty Of Environmental Design, (unpublished) Master Thesis, 153p.
- Gökyer E, 2013. *Understanding landscape structure using landscape metrics*. First Edition, Ed. Murat Özyavuz, *Advances in Landscape Architecture*, Intech, ISBN 978-958-51-1167-2, 25: 663-676.
- Jackson BJ, 1984. *Discovering the Vernacular Architecture*. First Edition, Yale University Press, 75p.

- Melnick RZ, 1984. Cultural Landscapes: Rural Historic Districts in the National Park System. First Edition, USA, 88p.
- Mitchell N, Rössler M, Tricaud PM, 2009. World heritage Cultural Landscapes A Handbook for Conservation and Management, (whc.unesco.org. (16.07.2014).
- Plieninger T, Bieling C, 2012. Connecting cultural landscapes to resilience, Ed: T. Plienger, C. Bieling, Resilience and Cultural Landscape, Cambridge University, New York, 3-27.
- Rapoport A, 1992. On cultural landscapes, traditional dwellings and settlements review. IASTE, Berkeley University of California, III: 33-47.
- Rössler M, 2003. Liking nature and culture: World Heritage Cultural landscapes, World Heritage Center, 2-10.
- Tudor C, 2014. An approach to landscape character assessment, natural England https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/281111/20140310_Landscape_Character_Assessment.pdf (Accessdate: 10.03.2017).
- Van Eetvelde V, Antrop M, 2009. Indicators for assessing changing landscape character of cultural landscape in Flanders (Belgium). Land Use Policy, 26: 901-910.