RESEARCH ARTICLE

International Journal of Agriculture, Environment and Food Sciences 2023; 7(2): 305-315
DOI: https://doi.org/10.31015/jaefs.2023.2.8

Determining the temporal and spatial variation of the land cover according to CORINE(1990-2018) in the basin of Kesis Stream (Southern Türkiye)

Fatih Karaosmanoglu[1]

[1] Bayram Karadag Secondary School, Yüregir/Adana, Türkiye

Citation: Karaosmanoglu, F. (2023). Determining the temporal and spatial variation of the land cover according to CORINE(1990-2018) in the basin of Kesis Stream (Southern Türkiye). International Journal of Agriculture, Environment and Food Sciences, 7 (2), 305-315

Received: 13 February 2023
Revised: 05 March 2023
Accepted: 06 March 2023
Published Online: 11 June 2023

Corresponding Author: Fatih Karaosmanoglu
E-mail: fatihkaraosmanoglu46@gmail.com

Available online at
https://jaefs.com/
https://dergipark.org.tr/jaefs

Abstract

Human has interfered with nature in many different ways and tried to benefit from it since the dawn of time. Especially during and after the Industrial Revolution, human pressure on nature exploded. Due to this increasing pressure, global warming and climate change have occurred, resulting in events such as landslides, floods, and droughts. In this study, CORINE land cover data were used to determine the temporal variation of land use/cover (1990-2018) in the basin of Kesis Stream. CORINE land use/cover data, which was created for periods of ten and six years (1990-2000-2006-2012-2018), was processed through geographic information systems (GIS) and presented with various figures, graphics, and tables. Accordingly, the discontinuous urban fabrics in the basin covered an area of 1.09 km^2 in the 1990-2000 period, while they covered an area of 1.35 km^2 with a partial increase in 2018. The basin is mainly covered with forest and agricultural fields. While the forest lands (1990-code; 311, 312, 313, 324) covered an area of 410.29 km^2 in 1990, they gradually increased to 446.39 km^2 in 2018. While the agricultural lands covered an area of 368.04 km^2 in 1990 (code-1990; 211, 212, 242, 242), they decreased to an area of 326.85 km^2 in 2018 a significant decrease. According to these results, it can be asserted that the morphological structure of the basin, with steep and deep valleys has restricted adverse human activities and reduced forest destruction in the last 28 years with the implementation of nature protection laws.

Keywords: Determination, Temporal-Spatial Variation, CORINE Land use/cover, Basin of Kesis Stream

INTRODUCTION

Human has used nature for their purposes since the dawn of time and has continued to benefit from it by changing its conditions. Human pressure on nature increased the use of natural resources especially during the Industrial Revolution and exploded today (Karaosmanoglu et al.,2022). Human interventions in the natural cause a variety of environmental problems such as air, water, and soil pollution, wrong land use, climate change, drought, and flood. Determining the effects of human interventions in nature and their temporal and spatial changes has been one of the important research topics, especially in recent years. The rapid population growth, industrialization, and technological advancements experienced since the Industrial Revolution have increased ground cover destruction and improper land use. This has brought about many natural and human environmental problems (Pektezel, 2016). Ekinci and Pektezel. (2012) emphasized that improper land use is one of the most important current problems encountered by humanity. Kahan et al.(2015) It has been stated that the formation of the upper soil layer accelerates and changes in the land cover by converting the forest destruction surfaces in the high slope landslide areas

into agricultural land and horticulture activities.The basic principle of proper land use is based on the use of the land as agriculture, grassland and forest by taking into account the topography (altitude, slope, slope exposure, landforms), parent material and soil characteristics (Atalay and Gündüzoğlu, 2015). Accordingly, human beings need to use the natural environment where they live properly, rationally, and sustainably.

All kinds of human activities outside of the sustainability approach not only impair the quality of water, soil and air, but also make access to food difficult. Therefore, land use planning and an understanding of ecosystem service accessibility are critical criteria for the survival of communities (Ding et al., 2015; Parveen et al., 2018). If the sensitive balance between natural and human environmental components is maintained, it becomes possible to continue a sustainable life and development (Pektezel, 2016). Land use land cover (LULC) maps play a significant and primary role in planning, management, and monitoring programs at local, regional, and national levels. It is necessary to monitor the ongoing process of LULC patterns for a while (Hamad, 2020). Information on LULC patterns play an important role in the development plan of any area. In addition, the information on the change in LULC is important for investigating the type and magnitude of land conversion and the associated land and environmental degradation taking place in a given area (Tiwari et al., 2021). Samie et al. (2017) they determined that dramatic changes in land use are associated with factors such as climatic, socio-economic, geophysical and proximity. Therefore, the importance of understanding land use mechanisms and developing models for future changes is emphasized.

Determining the current spatial distribution of LULC classes and examining the changes occurred during the constitutes an important basis for studies carried out in many economic and socio-cultural fields (Kaya et al., 2020). Determining the current status of the land cover/land use classes distributed over the earth as well as identifying their spatial distributions and examining the temporal changes constitute an important basis for studies carried out in economic, ecological, social, military and many other fields(Sertel et al., 2018). Researchers such as; Di Gregorio and Jansen.(2000) Karnieli and Rozenstein.(2011) stated that land cover and land use are used together. However, while emphasizing the importance of clearly defining these terms, they stated that land cover is the physical and biological surface cover on the ground such as discontinuous urban fabrics, forests, agricultural lands, semi-natural areas, and water resources.

On the other hand, the land use refers to human activities in areas described as settlement, industry, trade, agriculture, forestry and recreation (Kaya et al., 2020). More effective and sustainable land management can be achieved by detecting and monitoring land use/cover properties. One of the most widely applied methods in land use/cover is the CORINE system (Sarı and Özşahin, 2016). Several studies have been conducted to determine the current status and temporal change of land use/cover in Türkiye (Özdemir and Bahadır, 2008; Gülersoy, 2013; Gülersoy, 2014; Kaya and Toroglu, 2015: Bayrak et al., 2021; Timur et al., 2021). The use of Geographic Information System (GIS) and Remote Sensing (RS) techniques has increased rapidly in land cover/use change studies and has contributed to studies. Remote sensing is of great importance in the determination and numerical inquiry of land cover/use changes (Üzülmez, 2021).

As can be understood from the studies mentioned above, processes such as the eco-systemic changes of the natural environment, the effects of human intervention on the environment, the current state of the environment and its temporal changes can be determined. In the clear and understandable determination of these processes by the researchers; Geographical information systems(GİS), remote sensing(RS) techniques as well as programs and models other created for purposes are used. Thus, human can obtain significant knowledges thanks to advanced programs, models and techniques. In the light of this knowledges, human can easily learn the eco-systemic changes, temporal changes and the effects of human intervention in the natural environment where he lives in. Thanks to this knowledges, human can gain the opportunity to live in a sustainable natural environment compatible with the environment. In here, the basin of Kesis Stream was chosen as the research area. Basin of Kesis Stream; It is located in the southern of Türkiye with its rugged topographic structure consisting of steep and deep valleys (Figure 1). Spatial and temporal change of land use/cover on such a basin is the main subject of the research. For this reason, the current and temporal environmental change of the area will be examined by analyzing the coordination of information on the environment(CORINE) land use/cover data of the basin.

MATERIALS AND METHODS

Materials

By using RS techniques by the European environment agency, land cover classification is made with the help of satellite images called CORINE. CORINE has created forty-four(44) land cover classifications for this purpose. Positive and negative interventions by human beings to the environment and nature's own eco-system changes can be obtained by using CORINE data. Detection of land cover changes, especially in development; It is of great importance in making economic, ecological and social decisions. Therefore, the analysis and evaluation of the CORINE data of the research area was deemed appropriate. CORINE data should be used by geographers, urban planners, environmental engineers, and all branches related to human and nature.

Alos-Palsar (12.5 x 12.5) meter resolution physical map was used as location map to determine the general topographic view of the study area (Figure 1). CORINE land use/cover data for the years 1990-2000-2006-2012-2018(https://land.copernicus.eu/pan-european/corine-land-cover, 2022), with the help of programs and modules such as Arc.Map, Excell, Coral-Drawn, various shapes, graphics and tables produced in accordance with the purpose create research materials.

Area of Study

The study area is located in the Mediterranean region in southern Türkiye, between 37° 19′ 00″- 37° 51′ 00″ north latitudes and 36° 12′30″- 36° 36′50″east longitudes(Figure 1) (Karaosmanoglu et al., 2022). This area covers 826.49km^2 and has a very rugged structure and an altitude increasing from 163 m to 2300 m from south to north. It has steep and deep V-shaped valleys carved by rivers. When it is examined from the climate characteristics, it is seen that its temperature decreases from 19 °C to 12.4 °C from south to north and a decrease is detected in annual average temperature values. The precipitation values of the basin, on the other hand, increase from 743.2 mm to 1473 mm from south to north. In the basin of the Kesis stream, soil formation (pedogenesis) realize according to these climatic characteristics. Under the effects of the Mediterranean climate conditions that are effective in the basin; brown forest soils, red Mediterranean soils, and alluvial and colluvial soils formed in areas where hydrographic processes were effective. The vegetation of the study area, on the other hand, formed under the effects of the basin's landforms, climatic characteristics, soil types forming accordingly, and these three factors. Accordingly, plant species such as maquis, Pinus brutia, Pinus nigra, Cedrus libani from south to north are widely distributed in the basin (Karaosmanoglu et al., 2022).

Methods

The methods used in the study included the model flow of CORINE land use/cover created in the basin by the purpose, acquisition of CORINE land use/cover data with the help of RS techniques, processing of the CORINE data in integrated GİS based on Arc.Map, as well as the use of Coral-Drawn and Excel programs. The model flow of the aforementioned CORINE land use/cover is presented below (Figure 2).

RESULTS AND DISCUSSIONS

A previous study conducted in the basin of Kesis Stream (Karaosmanoglu et al., 2022) reported that climate, landforms, soil, and vegetation were effective on land use/cover. According to this study, it is possible to assert

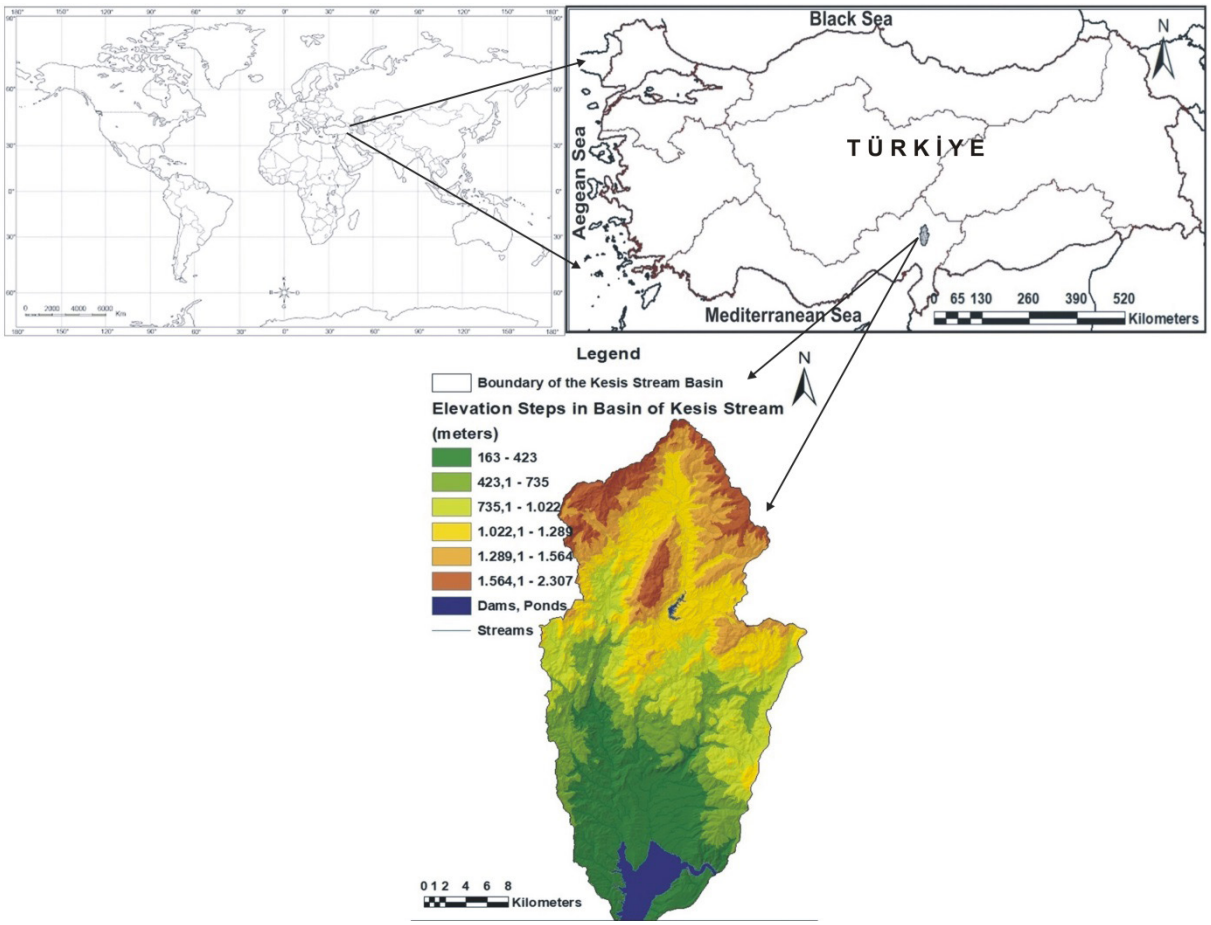

Figure 1. Location map of the Study Area(Karaosmanoglu, et al., 2022)
(Source: https://asf.alaska.edu/data-sets/sar-data-sets/alos-palsar)

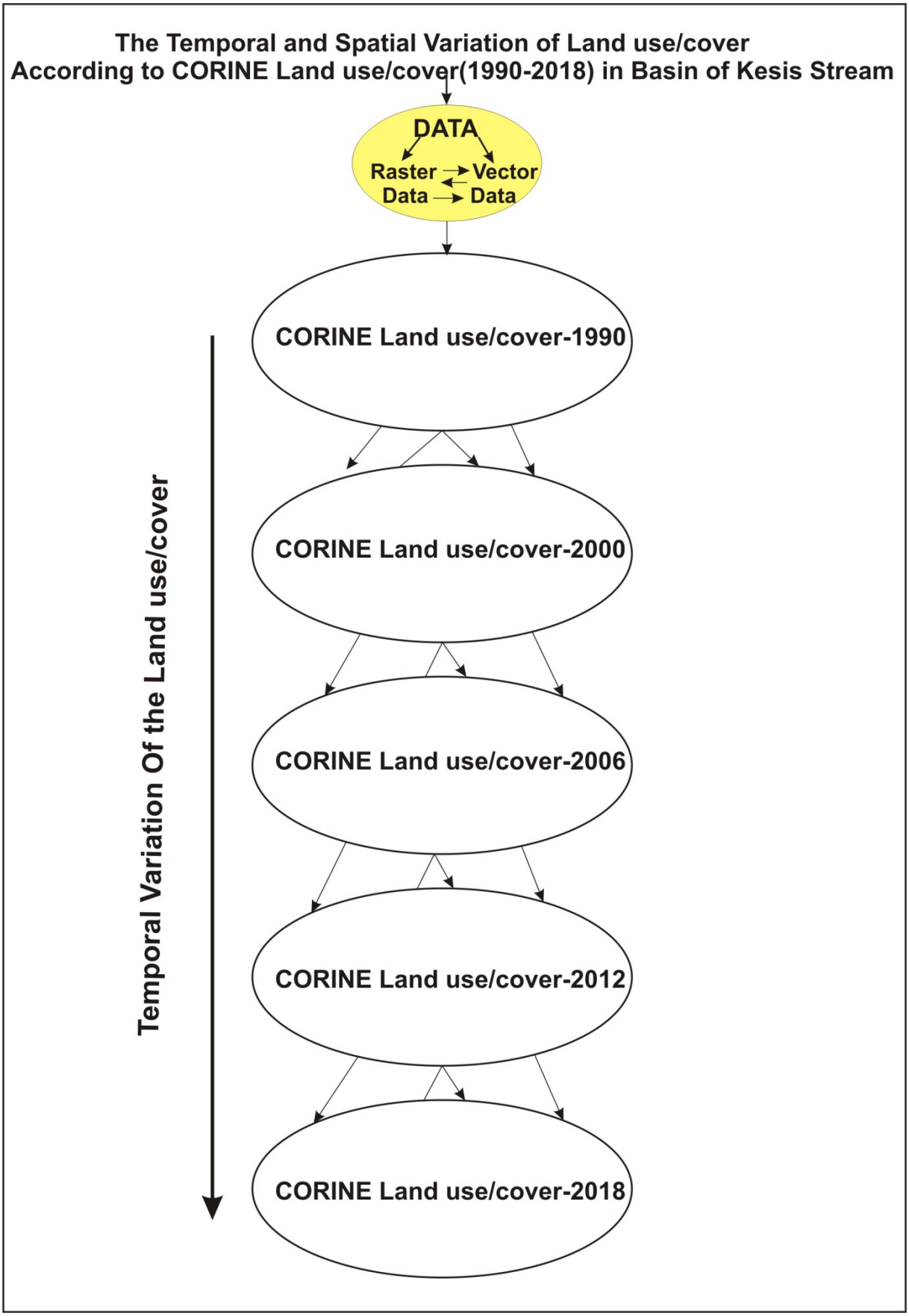

Figure 2. Model Flow of the CORINE Land use/cover in the basin of Kesis Stream (1990-2018)

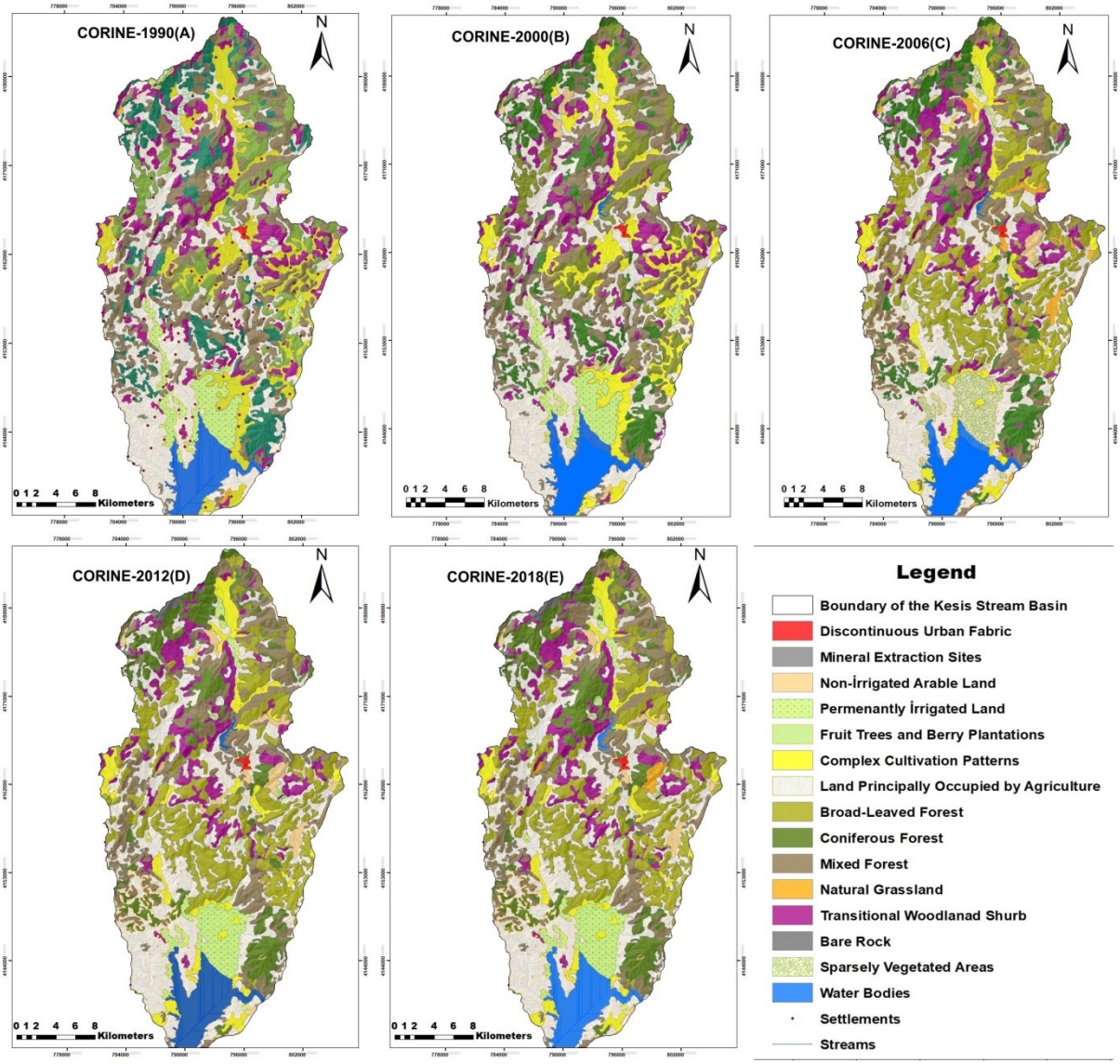

Figure 3. Area Distribution of the CORINE Land use/cover in the basin of Kesis Stream (CORINE 1990/A, CORINE 2000/B, CORINE 2006/C, CORINE 2012/D, CORINE 2018/E).

that climate and landforms have a fundamental effect, especially on the formation of land use/cover in the basin. Thus, it can be asserted that land class elements such as soil and vegetation in the basin are also shaped under the control of climate and landforms. In this context, the temporal and spatial changes of the CORINE land use/cover classes of the basin will be discussed below.

The areas occupying a large area in the basin according to the CORINE(1990-2018) 28-year temporal data of the study area included areas used for agricultural purposes, forest lands with intense vegetation, natural grassland, water bodies, bare rock, sparsely vegetated areas and discontinuous urban fabric and the lands covering a limited area. According to CORINE land use/cover, major changes were observed in the presence of land use/cover in the basin of Kesis Stream in the period of 1990-2018(Figure 3).

Area Distribution of the CORINE Land use/cover-1990 in the basin of Kesis Stream

According to the data of CORINE-1990 in the Basin of Kesis Stream, it was determined that agricultural lands and forest lands covered with vegetation covered a large area (Table 1, Figure 3). In the basin, the lands covering a smaller area were natural grasslands, bare rocks, water bodies, sparsely vegetated areas and discontinuous urban fabrics (Table 1, Figure 3/A). In the basin, the discontinuous urban fabric had an area of 1.09 km^2 (0.13%) the non-irrigated arable land had an area of 1.69 km^2 (0.20%), the permanently irrigated land had an area of 39.17 km^2 (4.74%), the complex cultivation patterns had an area of 101.98 km^2 (12.35%), lands principally occupied by agriculture had an area of 225.20 km^2 (27.25%), broad-leaved forest lands had an area of 75.81 km^2 (9.18%), coniferous forest lands had an area of 87.40

Table 1. Area and Ratio Distribution of the CORINE Land use/cover-1990 in the basin of Kesis Stream.

Code-1990	Land use/cover Classes	Area(km$^{2)}$	Ratio (%)
112	Discontinuous urban fabric	1.09	0.13
211	Non-Irrigated Arable land	1.69	0.20
212	Permanently irrigated land	39.17	4.74
242	Complex Cultivation Patterns	101.98	12.35
243	Lands principally occupied by agriculture	225.20	27.25
311	Broad-leaved Forests	75.81	9.18
312	Coniferous Forest	87.40	10.57
313	Mixed Forest	155.35	18.80
321	Natural Grassland	7.47	0.90
324	Transitional Woodland Shrub	91.73	11.09
332	Bare Rock	0.27	0.03
333	Sparsely Vegetated areas	1.74	0.21
512	Water Bodies	37.59	4.55
	Total Area of the Land use/cover	**826.49**	**100**

km^2 (10.57%), mixed forest lands had an area of 155.35 km^2(18.80%), natural grassland had an area of 7.47 km^2 (0.90%), transitional woodland shrub areas had an area of 91.73 km^2 (11.09%), bare rocks had an area of 0.27 km^2 (0.03%), lands with sparse vegetation had an area of 1.74 km^2 (0.21%), and water bodies had an area of 37.59 km^2 (4.55%) (Table 1, Figure 3/A).

Considering these data in the study area, it was determined that while the total area of agricultural lands was 368.04 km^2 (44.53%), the total area of forest lands was 410.29 km^2 (49.64%). While discontinuous urban fabric areas, bare rocks and natural grasslands had a very limited area and percentage in the basin, water bodies were 37.59 km^2 (4.55%) (Table 1, Figure 3/A). According to the CORINE-1990 land use/cover classification of the basin, it was determined that forest lands occupied the most, followed by agricultural lands. The sum of forest lands and agricultural lands was 94.17% with an area of 778.33 km^2. Here, the other land use/cover classes of the basin had very limited area and proportional values such as only 5.84% with an area of 48.16 km^2.

Area Distribution of the CORINE Land use/cover-2000 in the basin of Kesis Stream

According to CORINE-2000 data, agricultural lands and forest lands covered with vegetation showed a wide distribution in the study area, similar to CORINE-1990 data (Table 2, Figure 3/B). In the basin, water bodies, grasslands, bare rocks, sparsely vegetated areas and discontinuous urban fabrics covered limited areas (Table 2, Figure 3/B).

According to table 2 data in the study area, the total area of non-irrigated arable lands, permanently irrigated lands, complex cultivation patterns and lands principally occupied by agriculture was 363.9 km^2 (44.03%), while the total area of broad-leaved forests, coniferous forests, mixed forests and transitional woodland shrubs was 418.25 km^2 (50.60%). While forest lands corresponded

Table 2. Area and Ratio Distribution of the CORINE Land use/cover-2000 in the basin of Kesis Stream

Code-2000	Land use/cover Classes	Area(km$^{2)}$	Ratio(%)
112	Discontinuous urban fabric	1.09	0.13
211	Non-Irrigated Arable land	1.19	0.14
212	Permanently irrigated land	36.50	4.42
242	Complex Cultivation Patterns	101.72	12.31
243	Land principally occupied by agriculture	224.49	27.17
311	Broad-leaved Forest	80.55	9.75
312	Coniferous Forest	84.83	10.26
313	Mixed Forest	157.24	19.02
321	Natural Grassland	7.47	0.90
324	Transitional Woodland Shrub	88.16	10.67
332	Bare Rock	0.27	0.03
333	Sparsely Vegetated areas	1.74	0.21
512	Water Bodies	41.24	4.99
	Total Area of the Land use/cover	**826,49**	**100**

to half of the basin, agricultural lands covered a large area in second place (44.03%). In the basin, total area of forest lands and agricultural lands was 782.15 km^2 (94.64%) and very large area. The study area covered a very limited area such as 6.26% with an area of 51.81 km^2 in discontinuous urban fabrics, sparsely vegetated areas, natural grasslands, bare rocks, and water bodies. When CORINE-1990 and CORINE-2000 data were compared, it was determined that there was a decrease of 4.14 km^2 in the total area of agricultural lands and an increase of 7.96 km^2 in the total of forest lands (Table 1, 2). The discontinuous urban fabrics, sparsely vegetated areas, natural grasslands, bare rocks and water bodies covered an area of 48.16 km^2 according to CORINE-1990 data, while there was a decrease of approximately 3.82 km^2 with an area of 44.34 km^2 in CORINE-2000 data (Table 1, 2). Thus, it is found that while a limited decrease was observed in agricultural lands in the temporal period from 1990 to 2000, there was a partial increase in forest lands.

Area Distribution of the CORINE Land use/cover-2006 in the basin of Kesis Stream

According to CORINE-2006 data, agricultural lands and forest lands covered with vegetation covered a large area in the basin, similar to previous years (Table 3, Figure 3/C). In the basin, water bodies, natural grasslands, bare rocks, sparsely vegetated areas and discontinuous urban fabrics showed a limited distribution (Table 3, Figure 3/C). When CORINE-2000 and CORINE-2006 data were compared, it was determined that total area of non-irrigated arable lands, permanently irrigated lands, complex cultivation patterns and lands principally occupied by agriculture were 363.9 km^2 according to CORINE-2000 data and 332.07 km^2 according to CORINE-2006 data (Tables 2 and 3); accordingly, there was a decrease of 31.83 km^2. In this case, the area of broad-leaved forests, coniferous forests, mixed forests and transitional woodland shrubs increased from 418.25 km^2 to 444.2 km^2, resulting an increase of 25.95 km^2 (Table 3, Figure 3/C).

In the study area, total area of agricultural and forest lands was 782.15 km^2 (94.64%) based on CORINE-2000 data and 776.27 km^2(93.93%) based on the data of CORINE-2006 showing a limited decrease. In the basin, discontinuous urban fabrics, sparsely vegetated areas, natural grasslands, bare rocks and water bodies covered an areas of 44.34 km^2 based on CORINE-2000 data and 50.02 km^2 based on CORINE-2006 data, resulting in a slight increase of 5.68 km^2.

Area Distribution of the CORINE Land use/cover-2012 in the basin of Kesis Stream

The CORINE-2012 data indicated that agricultural lands and forest lands covered with vegetation covered a large area of 770.97 km^2 in total (93.28%) in the study area similar to previous years (Table 4, Figure 3/D). In the basin, water bodies, natural grasslands, bare rocks, sparsely vegetated areas and discontinuous urban fabrics had a limited area covering 55.52 km^2 (6.71%) (Table 4, Figure 3/D).

When CORINE-2006 and CORINE-2012 data were compared, it was determined that while there was an increase of 7.13 km^2 from 332.07 km^2 to 339.2 km^2 in agricultural lands, there was a decrease of 12.43 km^2 in forest lands from 444.2 km^2 to 431.77 km^2. While water bodies, natural grasslands, bare rocks, sparsely vegetated areas and discontinuous urban fabrics had an area of 50.02 km^2 according to CORINE-2006 data, they had an area of 55.52 km^2 according to CORINE-2012 data and there was an increase of 5.5 km^2 between both data. When these data were analyzed, it was determined that while agricultural lands showed a partial increase in the previous six (6)-year period, forest lands showed a partial decrease for this period. In addition, a very limited increase was observed in the total area of water bodies,

Table 3. Area and Ratio Distribution of the CORINE Land use/cover-2006 in the basin of Kesis Stream

Code-2006	Land use/cover Classes	Area(km^2)	Ratio(%)
112	Discontinuous urban fabric	1.20	0.14
211	Non-Irrigated Arable land	12.71	1.54
212	Permanently irrigated land	37.70	4.56
222	Fruit Trees and Berry Plantations	0.35	0.03
242	Complex Cultivation Patterns	47.57	5.75
243	Land principally occupied by agriculture	233.74	28.28
311	Broad-leaved Forest	155.69	18.84
312	Coniferous Forest	81.42	9.85
313	Mixed Forest	117.83	14.27
321	Natural Grassland	5.05	0.62
324	Transitional Woodland Shrub	89.26	10.80
332	Bare Rock	1.14	0.14
333	Sparsely Vegetated areas	4.43	0.54
512	Water Bodies	38.40	4.64
	Total Area of the Land use/cover	**826.49**	**100**

natural grasslands, bare rocks, sparsely vegetated areas and discontinuous urban fabrics compared to the previous period.

vegetated areas and water bodies had a very limited area of 52.9 km^2 (6.4%) in total (Table 5, Figure 3/E).

Table 4. Area and Ratio Distribution of the CORINE Land use/cover-2012 in the basin of Kesis Stream.

Code-2012	Land use/cover Classes	Area(km^2)	Ratio(%)
112	Discontinuous urban fabric	1.35	0.16
211	Non-Irrigated Arable land	12.87	1.56
212	Permanently irrigated land	37.48	4.54
242	Complex Cultivation Patterns	56.20	6.80
243	Land principally occupied by agriculture	232.65	28.15
311	Broad-leaved Forest	146.20	17.69
312	Coniferous Forest	87.11	10.54
313	Mixed Forest	119.02	14.40
321	Natural Grassland	5.05	0.61
324	Transitional Woodland Shrub	79.44	9.61
332	Bare Rock	3.66	0.44
333	Sparsely Vegetated areas	4.94	0.60
512	Water Bodies	40.52	4.90
	Total Area of the Land use/cover	**826.49**	**100**

Area Distribution of the CORINE Land use/cover-2018 in the basin of Kesis Stream

According to the CORINE-2018 land use/cover data in the basin of Kesis Stream, broad-leaved forests, coniferous forests, mixed forests, and transitional woodland shrubs had an area of 446.39 km^2 (54.01%,), thus, total area of forest lands took place on the top; whereas, the total area of non-irrigated arable land, permanently irrigated areas, orchard areas, and lands principally occupied by agriculture was 327.2 km^2 (39.59%), leading agricultural lands to be ranked as the second (Table 5, Figure 3/E). In the basin, discontinuous urban fabrics, mineral extraction areas, natural grasslands, bare rocks, sparsely

When the CORINE-2012 and CORINE-2018 data of the study area were compared, it was determined that while an increase of 14.62 km^2 was observed in forest lands compared to the previous one, there was a decrease of 12 km^2 in agricultural lands (Table 4, 5). The total area of land use/cover classes such as discontinuous urban fabrics, natural grasslands, bare rocks, sparsely vegetated areas and water bodies covered an area of 55.52 km^2 according to CORINE-2012; whereas, according to CORINE-2018, the total area of land use/cover areas including discontinuous urban fabrics, mineral extraction sites, natural grassland, bare rocks, sparsely vegetated areas, and water bodies was 52.9 km^2, showing a very limited decrease of 2.62 km^2. Considering

Table 5. Area and Ratio Distribution of the CORINE Land use/cover-2018 in the basin of Kesis Stream

Code-2018	Land use/cover Classes	Area(km^2)	Ratio(%)
112	Discontinuous urban fabric	1.35	0.16
131	Mineral Extraction Sites	0.38	0.04
211	Non-Irrigated Arable land	12.87	1.56
212	Permanently irrigated land	37.48	4.54
222	Fruit Trees and Berry Plantations	0.35	0.04
242	Complex Cultivation Patterns	46.09	5.58
243	Land principally occupied by agriculture	230.41	27.88
311	Broad-leaved Forest	166.72	20.18
312	Coniferous Forest	92.62	11.20
313	Mixed Forest	116.05	14.04
321	Natural Grassland	5.05	0.61
324	Transitional Woodland Shrub	71	8.59
332	Bare Rock	3.66	0.44
333	Sparsely Vegetated areas	1.94	0.24
512	Water Bodies	40.52	4.90
	Total Area of the Land use/cover	**826.49**	

Table 6. Area Distribution of the CORINE Land use/cover (1990-2018) in the basin of Kesis Stream

CORINE Land use/cover Classes	CORINE-1990(km²)	CORINE-2000(km²)	CORINE-2006(km²)	CORINE-2012(km²)	CORINE-2018(km²)
Discontinuous Urban Fabric	1.09	1.09	1.2	1.35	1.35
Mineral Extraction Sites	0	0	0	0	0.38
Non-Irrigated Land	1.69	1.19	12.71	12.87	12.87
Permanently Irrigated Land	39.17	36.5	37.7	37.48	37.48
Fruit Trees and Berry Plantations	0	0	0.35	0	0
Complex Cultivation Patterns	101.98	101.72	47.57	56.2	46.09
Land Principally Occupied by Agriculture	225.2	224.49	233.74	232.65	230.41
Broad-Leaved Forest	75.81	80.55	155.69	146.2	166.72
Coniferous Forest	87.4	84.83	81.42	87.11	92.62
Mixed Forest	155.35	157.24	117.83	119.02	116.05
Natural Grassland	7.47	7.47	5.05	5.05	5.05
Transitional Woodland Shrub	91.73	88.16	89.26	79.44	71
Bare Rock	0.27	0.27	1.14	3.66	3.66
Sparsely Vegetated Areas	1.74	1.74	4.43	4.94	1.94
Water Bodies	37.59	41.24	38.4	40.52	40.52
Total of the Study Area	**826.49Km²**	**826.49Km²**	**826.49 Km²**	**826.49 Km²**	**826.49 Km²**

all these explanations, CORINE-2018 data on the Basin of Kesis Stream indicated that an area of 773.59 km² of forest lands and agricultural lands corresponded to the majority of the basin (93.60%). Other land use classes in the field, on the other hand, remained very limited with an area of 52.9 km² (6.4%) (Table 5, Figure 3/E).

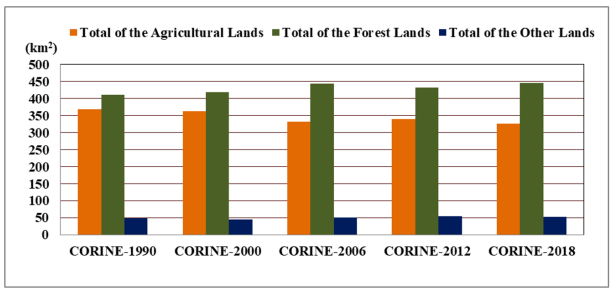

Figure 4. The total areas of the Agriculture Lands, the Forest lands and the other Lands according to CORINE-1990-2018 data in the basin of Kesis Stream.

When the CORINE (1990-2018) 28-year land use/cover of the study area was analyzed together, it was determined that while residential areas showed a partial increase, non-irrigated arable areas showed a significant increase about seven and a half (7.5) times. Permanently irrigated agricultural lands, on the other hand, generally showed a stable course with minor ups and downs. Again, in the same period, complex cultivation patterns in the basin showed a serious decrease since 2000, and by 2018, it decreased by more than half with an area of 46.09 km². In the same period, although there was no significant change, a partial increase was observed in priority areas in agriculture. While there was a partial increase in broad-leaved forest lands between 1990 and 2000, there was an increase of more than two times in 2006. Although there was a partial decrease in 2012, a significant increase was realized with an area of 166.72 km² again in 2018. There was little fluctuation in a total area of the coniferous forest until 2012; however, a partial increase was observed in 2018.

While a stable course was observed in total area of mixed forests between 1990 and 2000, there was a serious decrease in 2006, a partial increase in 2012, a partial decrease in 2018, and a significant decrease in the last 18 years in general. Transitional woodland shrubs showed a gradual decrease over time (Table 6). There was a partial decrease in the natural grasslands in the basin; whereas, a partial increase was observed in the sparsely vegetated areas. Spatial changes in natural grasslands and sparsely vegetated areas can be interpreted as a sign of partial drought depending on climate change. In addition, in the context of climate changes, erosion and transport activities increase on steep slopes of the basin due to irregularities such as sudden rapid and flooding precipitation. As a result, it can be asserted that the area of bare rocks in the basin has increased. While the surface area of water in the basin increased by 3.65 km² from 1990 to 2000, there was a partial decrease in 2006. In the period between 2012 and 2018, it is observed that there is a partial increase again and it covers an area of 40.52 km²(Table 6). The reason for the increase in the surface areas of the water in the basin, the surface area of the water has increased thanks to the ponds built on the area since 2000. It can be said that factors such as lack of precipitation due to climatic changes and drought are effective in the narrowing of water surfaces. when the land use/cover was classified as agricultural lands, forest lands and other areas in the study area, significant changes took place in the 28-year time period (Figure 4). Here, while a gradual decrease occurred in the total

area of agricultural lands, the total area of forest lands increased gradually (Figure 4). While the grassland areas, which are expressed as other areas, showed a partial decrease, the vegetation, sparse areas, bare rocks and water bodies showed partial increases.

CONCLUSION

As a result, the CORINE data of the Kesis Stream basin successfully reflected the land classification and changes of the area in the 1990-2018 period. During this time period, while the forest lands of the area gradually expanded in area, the agricultural lands, on the contrary, gradually narrowed. In the same process, It has been determined that no negative interventions such as serious deforestation and wrong land use have been made by human beings to the environment. In fact, the rugged topographic structure of the basin, consisting of steep and deep valleys, has limited environmental pollution and adverse human intervention. Again in this process, although the basin has a limited area, While dry agricultural lands and bare surface lands have expanded, natural grasslands have narrowed. While the water bodies have expanded with the pond structures, the bodies of the water have narrowed in some periods. The spatial variation of these surfaces proves that global climate change has partial effects on the field. According to these data, According to these data, the plans, projects and investments to be made in the basin today and in the future should be sustainable by preserving the current balance without polluting the field.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contribution

The author read and approved the final manuscript. The author verifies that the Text, Figures, and Tables are original and that they have not been published before.

Ethical approval

Not applicable.

Funding

No financial support was received for this study.

Data availability

Not applicable.

Consent for publication

Not applicable.

REFERENCES

Atalay, İ ve Gündüzoğlu A.G., (2015). Türkiye'nin Ekolojik Koşullarına Göre Arazi Kabiliyet Sınıflandırması. Cilt 1, (Meta Basım Matbaacılık Hizmetleri), İzmir:1-272, ISBN,9786056610301 (in Turkish).

Bayrak, M., Yulu, A., Öztürk, Y., (2021). Balıkgöl (Ağrı) Kıyılarında Arazi Örtüsü/Kullanımının Zamansal Değişimi (1989-2021). Turkish Journal of Geographical Sciences, 20 (1), 282-309, (in Turkish). https://doi.org/10.33688/aucbd.1063557

Di Gregorio, A., Jansen, L.J.M., (2000). Land-Cover Classification System (LCCS): Classification Concepts and User Manual. FAO, Rome, ISBN 92-5-104216-0.

Ding, J., Jiang, Y., Fu, L., Liu, Q., Peng, Q., & Kang, M. (2015). Impacts of land use on surface water quality in a subtropical River Basin: A case study of the Dongjiang River Basin, Southeastern China. Water, 7(8), 4427-4445. https://doi.org/10.3390/w7084427

Ekinci, D. ve Pektezel, Ö. (2012). Uzaktan Algılama Teknolojileri İle Bolu İlinde Arazi Kullanımındaki Değişimin Tespiti. İstanbul Üniversitesi Edebiyat Fakültesi Coğrafya Bölümü Coğrafya Dergisi, sayı 24, sayfa 18-37. (in Turkish)

Gülersoy, A. E. (2001). Gömeç Ovası'nda bugünkü arazi kullanımı ile arazi sınıflandırılması arasındaki ilişkiler, Yüksek Lisans tezi(Tez No. 103840), Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, İzmir, 1-280 (in Turkish).

Gülersoy, A. E. (2013). Marmara Gölü Yakın Çevresindeki Arazi Kullanım Faaliyetlerinin Zamansal Değişimi (1975-2011) ve Göl Ekosistemine Etkileri. Türk Coğrafya Dergisi, Sayı 61: 31-44, İstanbul. (in Turkish).

Gülersoy, A.E, (2014). Seferihisar'da Arazi Kullanımının Zamansal Değişimi (1984-2010) ve İdeal Arazi Kullanımı İçin Öneriler. SDÜ Fen-Edebiyat Fakültesi Sosyal Bilimler Dergisi Nisan 2014, Sayı: 31,155-180.(in Turkish).

Hamad, R., (2020). An Assessment of Artificial Neural Networks, Support Vector Machines and Decision Trees for Land Cover Classification Using Sentinel-2A Data. Applied Ecology and Environmental Sciences. 8(6), 459-464. https://doi.org/10.12691/aees-8-6-18

Kaya, E., & Toroglu, E., (2015). Kayseri'nin şehirsel gelişiminin izlenmesi ve değişim analizi. Türk Coğrafya Dergisi 65 (2015), p: 87-96. (in Turkish). https://doi.org/10.17211/tcd.37722

Karnieli, A., Rozenstein, O., (2011). Comparison of methods for land-use classification incorporating remote sensing and GIS inputs. Applied Geography, 31(2): 533-544. https://doi.org/10.1016/j.apgeog.2010.11.006

Kaya, N.S., Turan, İ.D., Deniz, O., Saygın, F., (2020). Farklı konumsal çözünürlüğe sahip uydu görüntüleri kullanarak CORINE arazi örtüsü/arazi kullanım sınıflarının belirlenmesi. Türkiye Tarımsal Araştırmalar Dergisi, 7(2): 207-218,(in Turkish). DOI:10.19159/tutad.739537.

Karaosmanoglu, F., Sındır, R., Dogan, T., (2022). Affects determination of the natural factors such as climate, soil, vegetation and geomorfology on landuse/cover by helping geography information system (gis) in the kesis stream basin (south of turkiye). International Journal of Applied Science and Research, Volume 5 (6): 101-112, https://doi.org/10.56293/IJASR.2022.5459

Khan. J.H, Parveen. S. & Ahmed. N. (2015). Regional Analysis of Sanitation Facilities in Uttar Pradesh. Journal of Humanities and Social Sciences(IOSR-JHSS), 20(10), 48-56. https://doi.org/10.9790/0837-201054856

Özdemir, M.A., Bahadır, M., (2008). Yalova İlinde Arazi Kullanımının Zamansal Değişimi (1992-2007). İstanbul Üniversitesi, Edebiyat Fakültesi, Coğrafi Bölümü, Coğrafya Dergisi, Sayı 17, Sayfa:1-15 (in Turkish).

Parveen, S., Basheer, J., & Praveen, B. (2018). A Literature Revıew On Land Use Land Cover Changes. Int. J. Adv. Res. 6(7), 1-6. http://dx.doi.org/10.21474/IJAR01/7327

Pektezel, H. (2016). Çorlu çayi havzasinda (Trakya yarimadasi) arazi kullanimi değişiminin tespiti, haritalandirilmasi ve analizi. Route Educational and Social Science Journal, Volume 3(2), April 2016, p: 57-77. (in Turkish).

Sarı, H., Özşahin, E., (2016). CORINE Sistemine Göre Tekirdağ İlinin AKAÖ (Arazi Kullanımı/Arazi Örtüsü) Özelliklerinin Analizi. Alıntern, (30) B, p.13-26. (in Turkish).

Samia, A., Deng, Xiangzheng., Jia, S., Chen, D., (2017). Scenario-Based Simulation on Dynamics of Land-Use-Land-Cover Change in Punjab Province, Pakistan. Sustainability 2017,(9),p1-17 https://doi.org/10.3390/su9081285

Sertel, E., Musaoğlu, N., Alp, G., Yay Algan, I., Kaya, Ş., Yüksel, B., Yılmaz, A., (2018). 1:25.000 ölçekli ulusal arazi örtüsü/kullanımı sınıflandırma sistemi ile HGK TOPOVT Veritabanının Karşılaştırılması. Harita Dergisi, 160(1): 34-46. (in Turkish).

Timur, Ö.B., Aytaş, İ., Acet, B., (2021). Arazi Kullanımının Zamansal ve Mekânsal Değişimi: Nazilli İlçesi Örneği. Kent kültürü ve Yönetimi Dergisi, Cilt 14(1), S: 230-240 (in Turkish). https://doi.org/10.35674/kent.847926

Tiwari, A., Tomar, S.S., Katare, V.,Vyas, S.P., and Dhinwa, S.P., (2021). Long-term monitoring of land-use/land-cover change in Morena district, Madhya Pradesh, India, using EO satellite data. Current Science, Vol. 121, No. 12, 25 December, p:1584-1593.

Üzülmez, M., (2021). Ahmetli (Manisa) İlçesinde Arazi Örtüsünün/Kullanımının Zamansal Değişimi (1995-2015). Mavi Atlas, 9(2)2021: 133-147, (in Turkish). https://doi.org/10.18795/gumusmaviatlas.998457

Digital Elevation Model. (2022). https://asf.alaska.edu/data-sets/sar-data-sets/alos-palsar

CORINE Land use/cover, (2022). https://land.copernicus.eu/pan-european/corine-land-cover