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MODELING OF VILLAGE CHARACTER USING LANDSCAPE CHARACTER ANALYSIS APROACH

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ABSTRACT

Landscape character analysis that has added to agenda of Turkey with European Landscape Convention in 2003 has important role determining interaction between protected areas and rural settlement areas. Despite protected area and rural settlement areas have affected as the social, economic and cultural aspects of each other, they have affected as spatial one another. In this study, the spatial interaction between the protected area and rural settlements is intended to identify with.landscape character analysis approach

In this study, context of landscape character analysis perspective, land survey and literature studies have been realized. Obtained data have been evaluated being used mapping and modeling programs (like Geographic Information System, AutoCAD, NetCAD, 3Dmax, Global Mapper, Lumion). As a result of modeling and analysis, settlement type analysis, interactions analysis between land use and forest area, landscape diversity analysis and population analysis, landscape character of villages which are on the periphery of Bartın-Kastamonu Küre Mountains National Park have been identified. Effect of identified landscape character type on natural area has been guestioned in the context of the landscape fragmentation.

Keywords: Landscape Character, Village Character, Bartın-Kastamonu Küre Mountains National Park, Kapısuyu Basin

1. Introduction

Landscape Character Assessment is a well-established tool for systematically, identifying, classifying and describing the landscape recognising it as a continuous system that does not adhere to administrative boundaries. By identifying, features and elements of the landscape (and their combination and expression), the essence or special character of a particular place can be revealed, explored and understood (Anonymous, 2007). Due to properties of landscape character analysis, landscape planning will be integrated to social and economic planning.

Importans effects of rural settlements areas on natural areas is landscape fragmentation. The rural feauture in Turkey has a quite complex structure with its socio-economic and cultural characteristics, therefore the outcoming of these identify current problems and setting goals for solution both in politics and in progress of these rural areas have a great importance. The unique feautures of these rural areas (to be away from urbanization, messy settlement, physical conditions) lead to many problems and prevent these areas to prosgress in terms of socio-economic way (Keleş, 2006a; Keleş 2006b).

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The legislation that the villages in Turkey are bound to is the Village Act (LAW NO. 442) issued on March 18th, 1924. According to this act, the village was defined as "a local government whose population does not more than 2000 and also has movable or immovable properties and takes decisions with its units about given duties, based on the Village Act. As the proposals related to spatial layout of these villages have not been applied by this law, there have been many problems about spatial layouts.

One of the most common problems in many developing countries and Turkey is chaotic spatial dispersions in numerical and functional terms of cities, towns and villages that make up the settlement system (Marin, 2010). The rural settlements are known to be dispersed in a large number and a wide range within the settlement system in Turkey (Marin, 2010). State Planning Organization (2000) states that there are a total of 75 631 rural settlements (35 014 villages and 40 617 units bound to these villages) in 2000.

Villages in Turkey have been classified according to their relationship with their spatial layout and the natural resource values. Classification that is done according to its spatial order are paid attention by considering Villages' collective, dispersed or less dispersed settlements. As for the relationship between villages and natural resource values is a classification that is done according to their proximity to the forest areas. In this classification villages are regarded as off-forest, in-forest and edge-forest. Türkdoğan (2006) has classified the villages and defined each class number in Turkey according to their distribution and relationship with forests. (**Tab. 1** and **Tab. 2**)

The high rate of units in rural settlements and the presence of low-population and dispersed units (Marin 2010) leads landscape fragmentation and habitat loss as well as economic and social problems. One of the significant rural settlements that leads landscape and habitat fragmentation is in-forest and edge-forest villages. These villages constitute the poorest part of the rural areas. These villages take form according to their physical conditionals and natural environment and their unique way of life. The diffrences can be observed among the regions, even in the same region or from one village to another, in rich culture of Anatolia in Turkey. The settlements are shaped by the topographic structure, cultural and physical environmental conditions they take place (Eminağaoğlu and Çevik 2007). The villages that are shaped and got identity within principles of exprerienced construction and layout in generally, (Eminağaoğlu and Çevik 2007) are in interaction with surrounding forest areas, cultivated areas, roads and landscape around them.

Table 1Spatial arrangement of villages in Turkey

Type of Village	Number of village	Population
Cumulative village	25.453 (71.9%)	13.160.279
Sparse village	5.467 (5.5%)	3.339.917
Less sparse	4. 192 (11. 8%)	2.189.975

Table 2 Proximity of village to forest

Position	Number of village	Population
Off-forest	19.746 (55.8%)	11.118.111
In-forest	5.093 (14.4%)	2.355.067
Edge-forest	7.225 (20.4%)	3.828.227

Landscape character analysis is essential for planning of rural area and protected areas. As Turkey joined European Landscape Convention in 2003, landscape character analysis has become important to national planning laws and regulations. Therefore mapping and modeling instruments get more important for defining, monitoring and protecting landscape characteristics.

In this study, which based on the basis of the requirements of the European Landscape Convention's biological diversity conservation, landscape management and landscape determination, the identity of villages, their effects over the forests and protected areas they are in or on the edge of are discussed within landscape character analysis technique. In this study it is thought that the classification defined as landscape character analysis in

village-scale will be useful for rural development, rural landscape planning, forest management, landscape management and nature conservation policies and strategies.

2. Material and Method

Kastamonu-Bartın Küre Mountains National Park covering an area of 37.000 hectares is one of these nine hot spots. Ministry of Forest launched a project in 1998 titled "Management of National Parks and Preserved Areas: Conservation of Bio-diversity and Rural Development" with the financial support of UNDP (United Nations Development Program) and FAO (Food and Agriculture Organization). Thanks to the "Küre Mountains Draft Development Plan" prepared within the framework of the project, a "planning zone" around the national park was planned aiming at reducing the threats caused by the immediate surrounding so as to secure "Kastamonu-Bartın Küre Mountains National Park" covering an area of 37.000 hectares and biodiversity within the national park, for the first time in Turkey (National park conservation zone is 37.000 ha and planning zone is 80.000 ha, total area is 117.000 ha). The core area (national park) is delineated by a range of cliffs and canyons that include pristine and semi pristine natural mixed deciduous and coniferous forest. The global significance of the Küre Mountains' biodiversity has been highlighted by its inclusion in the WWF's list of European forest hotspots for conservation. The site is considered to represent the best remaining example of deciduous and and coniferous forest. The global significance of the Küre Mountains' biodiversity has been highlighted by its inclusion in the WWF's list of European forest hotspots for conservation. The site is considered to represent the best remaining example of deciduous and coniferous forest of the North Anatolia ecoregion as well as being the best remaining example of the highly endangered karstic mountain areas of the 'Black Sea Humid Forests' ecotype (WWF, 2001). The Küre mountains hosts 40 out of the 132 mammals in Turkey, including large mammal species, such as gray wolf, brown bear, Eurasian lynx, red deer, roe deer and wild boar. The park and its buffer zone have been identified as one of the 122 Important Plant Areas (IPA), and also one of the 305 Key Biodiversity Areas (KBA) in Turkey (Anonymous, 1999; WWF, 2001; UNDP, 2008; Bann 2010).

Kastamonu-Bartın Küre Mountains National Park (KMNP) consists of two zone: KMNP Conservation Zone and KMNP Planning Zone. KMNP Conservation Zone that doesnt include settlements and agricultural areas have protection statue"and has been admitted "natural area". Rural areas that includes settlement and agricultural areas in KMNP Planning Zone doesnt have "protection statue". Study area, Kapısuyu Basin, is composed of KMNP Conservation Zone and KMNP Planning Zone. Forests in Kapısuyu basin divide to two groups: production forests and natural forests. Because of these different features, transistion has been occured between natural and cultural landscapes in Kapısuyu basin.

Study has been realized in 13 villages which are forest village according to numbered 6831 Turkey Forest Law (Fig.1).

2.1 Obtaining land cover/Land use map

The data bases of working field (Rapideye satellite images, present layouts of village, Forest Management Plans, Land Use Map, Digital Elevation layouts) have been digitized by Remote Sensing (RS) and Geographic Information Systems (GIS) techniques. ERDAS 8.7 software has been utilised for the classification of Raster data (satellite imagery) and ArcGIS 9.2 software has been used for the vector data digitizing and analysis. The accuracy control of spatial data obtained from RS and GIS has been provided with GPS (The Global Positioning System) based on the projection of coordinates of with UTM (Universal Transverse Mercator) WGS84 (World Geodetic System) in the field.

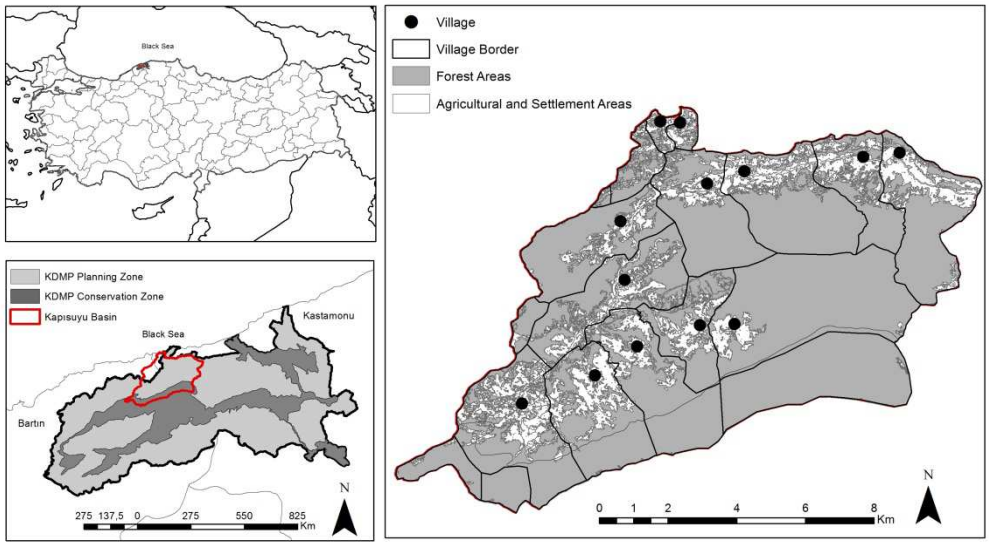

Fig.1 Location of study area

2.2 Identifying village landscape character variables

To determine the type of landscape character of each village a series of following analyses have been carried out: The settlement pattern analysis, analysis of interaction land use and forest areas, analysis of landscape diversity, population analysis (Fig. 2).

The settlement pattern analysis: Villages have been classified according to topographic position (Geray, 1985; Kurtkan Bilgiseven, 1988; Roberts, 2003; Türkdoğan, 2006), land arrengement (Kurtkan Bilgiseven, 1988; Türkdoğan, 2006; Roberts, 2003; Görmüş, 2012) and settlement patterns (Roberts, 2003; Görmüş 2012) (Tab. 3).

Analysis of the interaction land use and Forest areas: Land use map and patches and the edge density of these patches on the land cover have been determined by using landscape metrics (McGarigal, 2002). Weighted average of all values has been calculated. The forest-agricultural land interaction of the villages of which edge intensity is over the average value have been considered as negative; and those of which edge intensity is below the average value have been considered as positive (Tab. 3).

Analysis of landscape diversity: After borders of the villages have been assigned to the of land use and land cover maps, landscape diversity in each village has been obtained by the number of stains and Shannon Diversity Index (SDI) (McGarigal, 2002) calculations. Weighted average of values of all the villages have been calculated. The landscape diversity of he villages of which SDI value is over the average value have been considered as high; and those of which SDI value is below the average value have been considered as low (Table 3).

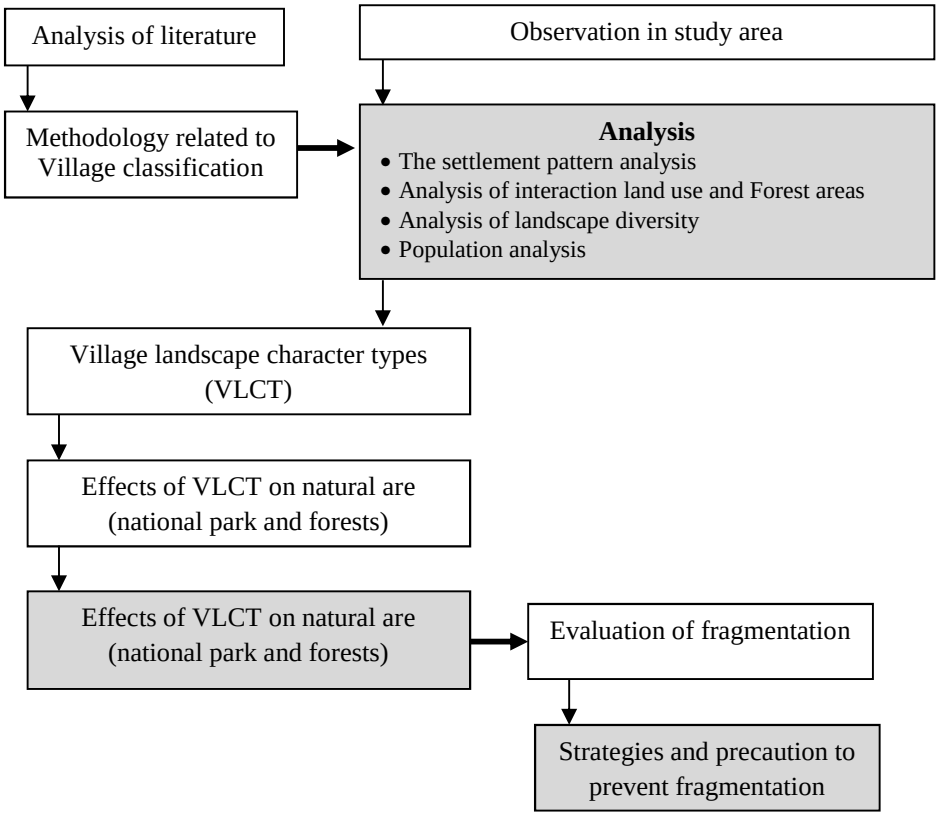

Fig. 2 A flowchart describing the process of identify of village landscape character

Population analysis: Main variables of the migration rate, the necessity of village-organization and the size of the village have been used in this analysis (Tab. 3).

Immigration rate: Migration rate has been determined according to the censuses between the years 1960-2010.

Necessity of local village-organization unit (According to the latest census): The necessity of village-organization is based on population data in the Village Act. According to the act, to establish and organization in a village, the population should not be less than 150 and more than 2,000.

Size of village: Village classification for Kapısuyu Basin has been expressed in line with classification method developed by Mitkovic et al. (2002) which is based on current population data. According to this classification, villages separate as very small villages (population: 0-100), small villages (population: 100-500), medium-sized villages (population: 500-2000) and the large village settlements (population greater than 2000).

Tab 3 Desription of the analysis of village landscape character

The Settlement pattern analysis	Variables	Source
Topographic position	Plain village (Pl)	Geray 1985, Kurtkan Bilgiseven, 1988; Türkdoğan, 2006; Roberts, 2003; Görmüş, 2012
	Valley foot village (Vf)	
	Valley slope village(Vs)	
	Mountain village(Mo)	
	Mountain slope village(Ms)	
Land arrangement	Nucleition village(N)	Türkdoğan, 2006; Roberts,2003; Görmüş, 2012
	Dispersion/scattered village(D)	
	Line village(L)	
Settlement patterns	Random (Rm)	Türkdoğan, 2006; Roberts, 2003; Görmüş, 2012
	Regular(Rr)	
	Clustered(Cd)	
	Mixed (linear random (Lr), clustered random (Cr), clustered (Cl) lineer)	
Analysis of interaction land use and Forest areas Using landscape metrics: Edge Density Patch Area,	Villages that have low pressure on forest areas (F+) Villages that have high pressure on forest areas (F-)	Görmüş, 2012
Landscape diversity analysis Using landscape metrics: Patch Number in village Landscape Richness in village Shannon Diversity Index in village	Villages that have low landscape diversity (Ld+) Villages that have high landscape diversity (Ld-)	Görmüş, 2012
Population Analysis Immigration rate	Immigration rate (1960-2010) Villages with a pozitive immigration rate (I+) Villages with a negative immigration rate (I-)	Görmüş, 2012
Necessary of local village goverment unit (Accordingin to lastest cencus)	Villages that can be established local village goverment unit (G+) Villages that can not be established local village goverment unit (G-)	Turkey Village Act (law no. 442); Görmüş, 2012
Size of village (Accordingin to lastest cencus)	Small village (Sv) Medium village(Mv Large village(Lv)	Mitkovic et al.,2002; Görmüş, 2012

2.3 Calculating and visualizing variables

By using mapping and modeling programs (like Geographic Information System, AutoCAD, NetCAD, 3Dmax, Global Mapper, Lumion) landscape character of villages which are on the periphery of Bartın-Kastamonu Küre Mountains National Park, is identified. Using cadastral, slope, elevation, topographic maps and social-cultural maps are realized analysis. Landscape character variables have been quantified and visualized by means of the programs mentioned below (Tab. 3, Fig. 3).

Tab. 3 variables and programs

Analysis		**The program used**
Settlement Analysis		Arc view/ Surface Analysis, Global Mapper Cadastral Data / AutoCAD/Netcad/3D Max
Analysis of interaction land use and Forest areas		Arc view/ Patch Analysis
Analysis of landscape diversity		Arc view/ Patch Analysis
Population analysis	Legal statistical data/ SPSS	

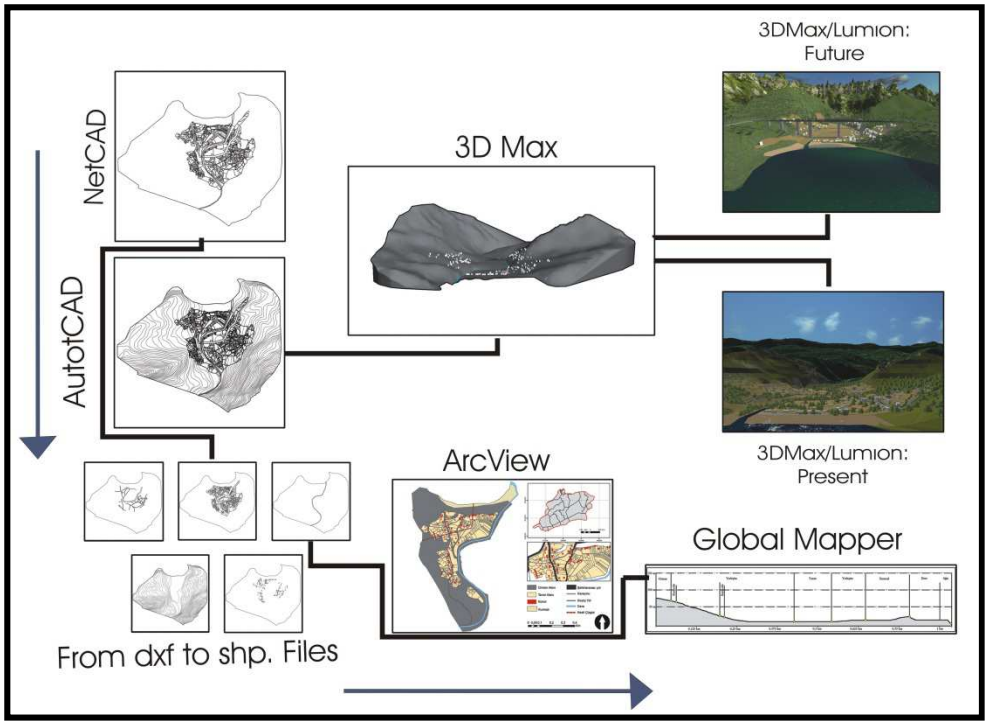

Fig. 3 Process of digital data

3. Results

Obtained data from analysis are classified in order to present landscape character of villages. To determine the type of landscape character of each village a series of following analyses have been carried out: the settlement pattern analysis, the interaction land use with forest areas analysis, analysis of landscape diversity and population analysis.

As a result of these analyzes, landscape character types that primarily cause fragmentation of the landscape have been obtained. Obtained some of village landscape character types are as follows:

•**Vf_ N_Cr_F$^-$_Ld$^+$_I$^+$_G$^+$Mv** (Başköy): Nucleation at the foot of valley, clustered in random order, highly repressive to the forest area, high landscape diversity, the sum of migration rate is positive, medium-sized village settlement (Fig. 4).

•**Ms_N_Cr_ F$^-$_Ld$^-$_I$^-$_G $^+$Sv** (Kaleköy): In a mountain slope, nucleation, random clustered, highly repressive to the forest area, low landscape diversity, the sum of migration rate is negative, a small village settlement where a local village goverment unit can be established (Fig. 4).

Vs_D_Lr_F¯_Ld¯_I¯_G¯SV (Nanepınarı): Scattered in the valley slope, linear random, highly repressive to the forest area, low landscape diversity, the sum of migration rate is negative, a very small village settlement where a local village goverment unit cannot be established (Fig. 4)

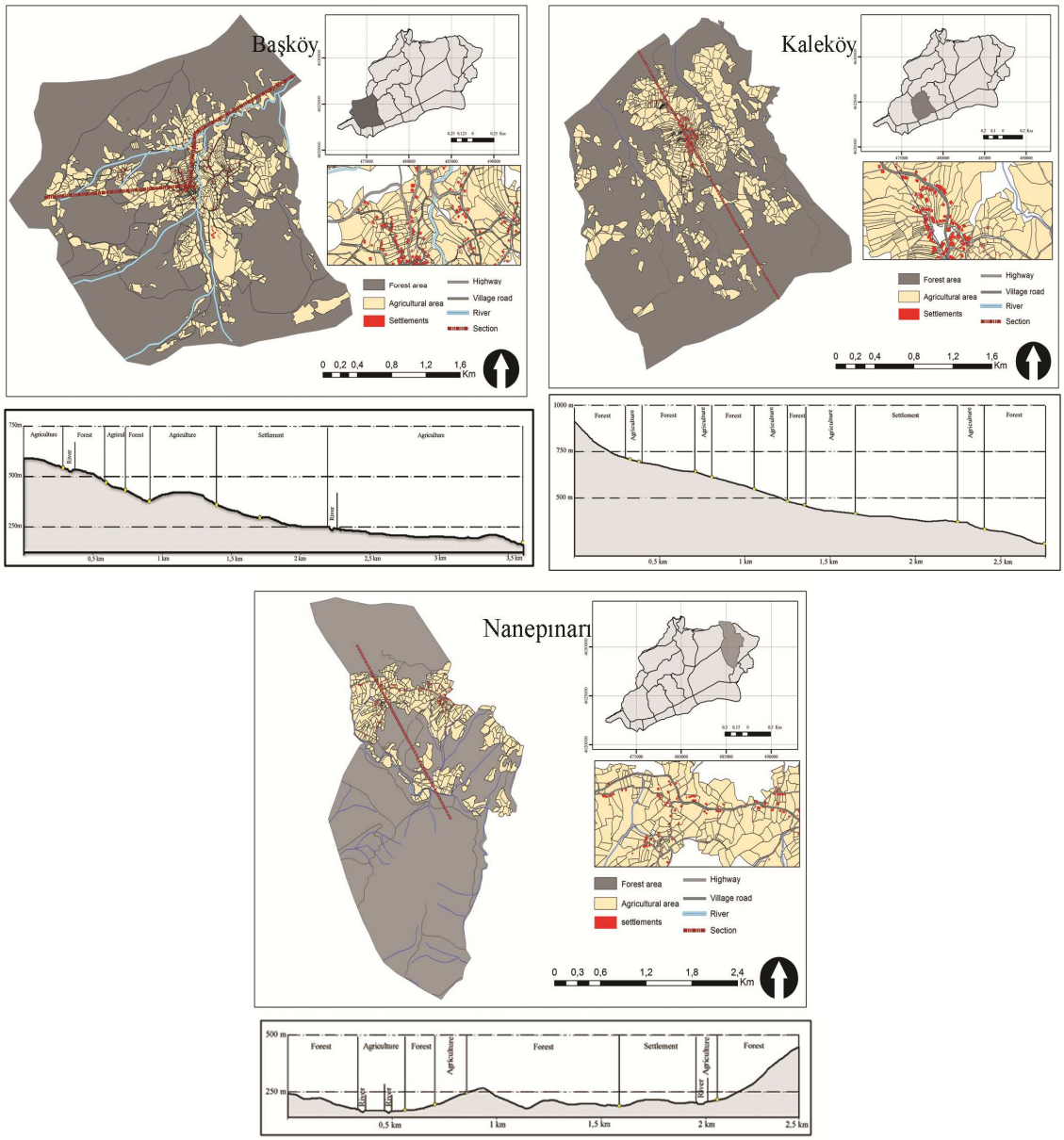

Fig. 4: Village maps

4. Conclusion

Landscape fragmentation affects biodiversity in spatial and temporal scales. The decrease of landscape types and species causes an increase in the rate of fragmentation in landscape. As increase of patchiness and decrease of connectivity restrict the movement of populations (Shukla, 2002). Landscape fragmentation affects the pattern-process relationship. By splitting large stains in the landscape into small ones, fragmentation leads to loss of original habitat, reduction of habitat stains and increase of isolation between habitat stains (Botequılha Leıtão and Ahern 2002).

That agricultural land parcels are irregular in shape and position may lead to an increase in edge habitat types. However, this causes a decrease in biodiversity. According to Odum and Barrett (2008), species richness between two different land cover is defined as the edge effect. Special arrangements have been advised in order to increase the number of species between the field and forest. As it causes reduction in species diversity, precise boundary or sudden and sharp edge between the two habitats is not desirable. On the other hand, more irregular edges means reduction of biological diversity.

There are direct and inverse proportions among landscape diversity of villages, migration rate and land use with its interaction with forest area. When these variables are compared to analysis of the settlement pattern, the following conclusions are reached.

The concept of diversity of landscape does not only include natural landscape features but also includes cultural landscape elements. For this reason, "landscape diversity" concept includes both positive and negative effects. While landscape diversity is high in the villages that are at slope of the valley, that of villages at the foot of the mountain is low. There is not a significant difference between landscape diversity and forest areas interaction in the villages that have "cluster-randomized" and "linear-randomized" layout. Landscape diversity of the villages of which field order is "line" type is higher and their negative impact to the forest areas is lower. "Messy" nature of villages' landscape diversity is low but their impact to the forest area is the least.

In this study, the most important criterion that determines villages' impact to the forest area and landscape diversity has been found to be location. Location of land and housing layout take shape according to topographic scheme. For this reason, the location of villages around the national park and their negative effects arising from the location should be especially evaluated.

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