



Rural typology with and inductive approach

Dilek Beyazlı¹ · Saliha Aydemir¹ · Ahmet Melih Öksüz¹ · Seda Özlü¹

Received: 5 January 2017 / Revised: 4 May 2017 / Accepted: 9 May 2017 / Published online: 18 May 2017
© University of Tehran 2017

Abstract Rural area planning in Turkey has been addressed at a settlement level using the same development-oriented solutions that are employed in urban areas following a traditional planning approach. However, in recent years, area base development planning statements have begun to be seen in some national policy documents. To overcome the shortfalls associated with this, rural area planning approaches need to be employed that deal with the physical and social dimensions of rural areas in a holistic manner, based on principles of rural diversity, efficiency and sustainability. Due to the diversities associated with these areas, methods that incorporate multivariate identifications and rating systems are widely accepted as appropriate. Accordingly, this paper presents a case study identifying the alternative approaches and methodologies that are applied in the definition of typologies. The study area is located in the Black Sea region of Turkey (total 206 rural settlements in the Çarşamba and Havza districts of the Samsun province), where social and economic diversification are high, and where there are many areas in need of protection. Rural typologies were defined following an inductive approach, while multivariate statistical analysis techniques were employed using core indicators, which were determined based on typology literature and available data.

Keywords Rural settlement · Rural typology · Inductive approach · Classification

Introduction

Planning theory and practice focuses mainly on urban areas, meaning that rural areas are largely overlooked. Rural areas are exposed to various kinds of natural and anthropogenic pressures and development dynamics, being legislated over by a great number of administrative units, and face different problems associated with their natural and cultural resources/values, their geographical location within the country, their contributions to the country's economy and their proximity to urban centers.

Some rural areas identified as an extension of the city (urbs in rure), becoming involuntary resource providers when host to natural mineral deposits and energy and transport routes, and this exposes them to urban-originated development constraints at different levels, while others may be subjected to demographic changes due to their own internal dynamics. Global climate change, in particular, and the expected depletion of water resources, desertification, etc., result in an irreversible deterioration of natural resources, and this has a severe impact upon rural activities. Such issues affect not only rural life, but also people living in urban areas, meaning that the sustainable management of above- and below-ground resources, the protection of watersheds, etc. are extremely important issues. In this regard, it is vital that rural and urban areas are considered together and subjected to appropriate approaches in planning and policy making (KAMAG-KOKAP 2015).

An evaluation of the different surveys and studies that can be found in the databases of many international organizations would show undoubtedly that Turkey has a high level of rurality, and this would be confirmed by a study of its environmental and demographic structures.

✉ Dilek Beyazlı
dilekbeyazli@gmail.com

¹ Karadeniz Technical University, Trabzon, Turkey

Despite the statistically proven potential of its rural areas, Turkey has been unable to optimize its benefits due to its failure to prioritize national rural development (Gülümser et al. 2007). However, after 2000, as part of the EU harmonization efforts, the government took a number of positive steps to address the rurality issue that included National Rural Development Strategies (SPO 2005; Ministry of Development 2014), Ministry of Development (2000), the National Action Program for Combating Desertification (Ministry Forestry and Water Affairs 2005, 2015), the Rural Development Plan and Rural Development Action Plan (Ministry of Food, Agriculture and Livestock 2010 and 2015, respectively), etc. Aside from these, the 9th and 10th National Development Plans (Ministry of Development 2007 and 2014, respectively) both mentioned the preparation of Rural Settlement Plans, while the Ministry of Food, Agriculture and Livestock (2010) cited above aimed to facilitate the development of compatibility in the working and living conditions of the rural community with those of urban areas, with the intention being to ensure the improvement and sustainable development of these areas.

Globally, typology studies tend to define rural areas in terms of their relationship with urban areas and explain their diversity, and this approach has gained importance with the shift from sectoral policies for rural development to more efficient locational policies. Typology studies offer the additional advantage of allowing comparisons between rural areas of different scales, and ranking these areas according to a certain threshold value.

The scope of this typology study is to obtain a true picture of the rural situation in Turkey, and to highlight the diversity and/or similarities of rural regions. The intention in this regard is to make positive recommendations for those involved in the development of policies, plans and governance at different levels, for which two types of typology produced. The first of these takes a disaggregative approach at a country level, and uses only a few variables to provide a rational base for macro level policies and planning (Öksüz et al. 2014), while the second takes an aggregative approach, aiming to compile a coherent, multi-dimensional and comprehensive picture of rural areas for the planning and implementation of policies at a local level.

This article addresses only the local typology and its production process, with the aim being to investigate the most appropriate methodology and variables to be used in defining a rural typology for Turkey. Rural areas are regarded as settlements with fewer than 20,000 inhabitants (Çezik 1982), corresponding typology units are village (NUTS 5) and small town. Different analysis methods are used for the assessment of the sample area of 206 settlements (villages, towns) in the Çarşamba and Havza

counties of the Samsun province, located in Black Sea Region of Turkey. In the future, similar typologies may be produced for other rural areas in the country through the application of the same sequence of methods.

Research background

Rural area typology

Typology, which refers to the classification of societies/objects with respect to their common features and is a method of distinguishing between the typical characters of each class, is a quantitative and operational classification that requires more than one source of empirical data. Rural typology studies are carried out mainly for purposes that can be pursued either independently or in combination to define/delimit rural areas (OECD 1994; Boscacci et al. 1999), to understand rural areas in more depth (Cloke 1977; Bengs and Schmidt-Thomé 2005; Ögdül et al. 2007; Scholz 2009), to provide a basis for rural planning/policies (Hodge and Monk 1996; Vidal et al. 2001; Scholz 2009; Kunitsa 2012) or solely for reasons of academic interest (Blunden et al. 1998; Gallego 2004; Uchida and Nelson 2008; Pinto-Correia et al. 2014). The broadest variety in typology studies is observed in the indicators and variables used and the measurement of these variables.

The indicators used in such studies have varied over time, although those related to settlement hierarchies have always tended to be based on population indicators, while those aiming to understand/compare rural characters tend to employ demographic, social and economic indicators (Cloke 1977; Openshaw 1985; Terluin et al. 1995; Hodge and Monk 1996; Ballas et al. 2003; Madsen et al. 2010). Environmental indicators gained importance particularly after the mid-2000s (Metzger et al. 2005; Pérez-Soba et al. 2012; Van Eupen et al. 2012), while more recently, “change” factors over time have been adopted as an independent indicator for the analysis (Pérez-Soba et al. 2012; Vargo et al. 2013; Van Leeuwen 2015; Li et al. 2015). To allow comparisons of international cases at different scales, bodies like the OECD and EUROSTAT have employed quantitative criteria based on population figures (OECD 1994; Boscacci et al. 1999), and this method has been improved over time to include also detailed accessibility indicators (OECD 2011; Eurostat 2010).

The technological, economic and social developments witnessed since the middle of the last century, particularly after the 1970s, have had a significant effect on the structure of the global economy and geographical specialization, and have affected also rural and urban relationships (Sotte 2003; UNECE, 2005). New spatial structures, such

as network relationships, counter urbanization, edge cities, etc. have been experienced to different degrees in different countries, and their social implications have blurred the relative distinction that existed between the rural and urban in the past, and have increased the diversity of rural areas.

In this regard, “there is a new policy requirement for the definition of rural areas with regard to their specific attributes or characters. Their multi-dimensional nature requires a comprehensive analytic framework to analyze and evaluate multi-sectoral, place-based approaches” (Van Eupen et al. 2012). There have been extensive discussions in the literature on the statistical and policy-related inadequacy of the rural area definition put forward by the OECD (1994), which is based solely on the univariate “population density” indicator, with concerns voiced that other variables should be included. Although there is consensus on need for a multivariate analysis and the utilization of qualitative data in areas with higher rural diversity (Gløersen et al. 2006; Ballas et al. 2003), there is no agreement on what indicators should be used. The most common typology indicators in the literature are “rurality”, “distance” and “periphery” (Raupeliene and Jazepcikas 2009). However, there is a common belief that typologies, hence indicators open a highly selective window to the world, meaning that the importance of indicator (and variable) selection should not be underestimated (Reimer 2002). Typology may become complex when faced with a large number of types, in that combinations of too many different indicators would result in inefficiently “unique” type-specific approaches. In this regard, when constructing typologies, using as few variables as possible is considered a prerequisite if one is to reach transparent and clear results (Novotny and Pokorná 2008).

Approaches and techniques in the construction of typologies

An examination of typology literature and strategic documents/reports reveals two main approaches, namely deductive (disaggregative) and inductive (aggregative), to the construction of typology methods. Other methods include index, z-score, spatial autocorrelation, cross-sectional regression, multi-criteria analysis, etc., which are used in a handful of studies (Hodge and Monk 1996; Gallego 2004; Pizzoli and Gong 2007; Kairyte and Meyers 2010; Lincaru 2014).

Disaggregative (Deductive) approach

In the disaggregative approach, rural units (region, settlement or grid) are divided step-by-step into groups according to pre-selected variables, taking into account the relative positions of the rural units in terms of the threshold values defined in the variables. In this approach, how the

threshold value of a variable is determined is important (Ballas et al. 2003). This can be considered an appropriate approach for classifications when only a limited number of variables exist (KAMAG-KOKAP 2015).

Aggregative (Inductive) approach

The overall aim of the aggregative approach is to group together similar rural units into a desirable number of clusters (Ballas et al. 2003) according to the predetermined variables. This aggregation may occur in various numbers. The grouping procedure followed in this approach is considered “objective” since the grouping follows a mathematical procedure, making external or direct interventions by the researcher impossible (Copus et al. 2008).

There are two stages to this approach, both of which utilize a multivariate analysis. The first stage, a factor analysis, aims to reduce large numbers of variables to a more manageable number while discarding the minimum amount of useful information. In this step, variables that are significantly correlated can be combined to create a much smaller number of synthetic factors, while capturing as much of the information contained within the raw data as possible and discarding much of the random statistical noise (Copus 1996). These factors, as new variables, have no direct relationship with the previous variables, and so have to be redefined/renamed, while the factor scores of each factor, which are associated with the variables entered into the analysis, should be calculated for each typology unit.

In the second stage, rural units are grouped through a cluster analysis that aims to bring together individual units (cases) according to their similarities, based on the factor scores defined in the first stage. This grouping aims to minimize the differences within the group and maximize the differences between the groups.

The benefits of this technique are its objectivity and its ability to provide a rapid general result when faced with a large data set. It should, however, be noted that a wide range of aggregative clustering methodologies exist that would produce alternative results (Ballas et al. 2003), which increases the importance of identification and validation studies for the clustering of results (KAMAG-KOKAP 2015). For each approach, thresholds that are subjective to a certain degree should be selected carefully. Flexibility, which allows potential users to apply thresholds to suit their own particular needs, is essential for a well-structured method (Patarchanova et al. 2012).

As a reference to the comparison and ranking operations, often z score values and the mean values of the variables are used, and it is suggested that each obtained type should be discussed with an expert group (Scholz and Herrmann 2010). Validation studies are equally important for typologies intended for use in policymaking.

Methodology

Data source: indicators and variables used in the construction of typologies

Statistics require the support of three pillars: the provision of data, the design of the statistical methodology, and the application and interpretation of the said methodology (Hill 2012). In the provision of data, the purpose of typology is one of the most important factors affecting the choice of indicators to be used in the building of typology, and a wide range of indicators exist that cover many different aspects, including population, migration, economic structure, performance, social welfare, equality, natural structure, environment and sustainability.

The choice of variables for the representation of the indicators is determined initially based on available data and at which NUTS level the study will be carried out. As the NUTS level increases, the range of available data expands, while at lower NUTS levels, the variable range becomes limited as long as primary data are not utilized.

In the present study, nine indicators and their explanatory variables were determined, considering:

- The purpose of the rural typology, which is, as stated above, gaining an in-depth understanding of rural areas to allow the drawing of a coherent and comprehensive picture for the creation of planning and implementation policies at a local level,
- Principles such as relevance, accuracy, sensitivity, timeliness, accessibility, etc., as articulated by international statistical bodies,
- Internationally recognized indicators such as the social, economic and physical characteristics of the rural structure, performance, quality of life, safety and human interventions, referring in this study to the level of consumption pressure on natural resources originating both internally (locally) and externally (regional, national, international), and

with the aim being to minimize the number of “missing data” cells in the database (KAMAG-KOKAP 2015).

This study did not include indicators related to natural values, as the theme of natural values is covered separately in another study entitled “Resource Value and Sensitivity Analysis”, the results of which were integrated with the results (rural area types) obtained in this study.

It is known that each indicator/sub-indicator can be represented by numerous variables and, in this case, the 86 variables defined for use in the typology design were grouped under nine indicators (Table 1). At this stage, the number of variables is kept as large as possible so that the most appropriate among them can be selected using statistical methods in an objective manner.

Data for the creation of a typology are obtained from three different channels: public institutions (including the Turkish Statistical Organization and the Provincial Directorate of Science, Industry and Technology), a field study, and published documents/literature on the specifics of the settlements.

The main data source was public institutions, with around 50 central government and local offices providing raw data that contained more than 90 items of demographic, social economic and land-use information, as well as visual documents, through official correspondence and meetings. Some information that could not be obtained officially, but which was important for the aim of study (such as land sales, as an indicator of consumption [human] pressures, seasonal migration and public transport accessibility), was collected during the field study of all the rural settlements in the study area. In the following stage, all the raw data obtained from the different sources were processed and converted into a data set (containing 86 variables) for use in the typology analysis.

The most significant problem during the data collection stage of the study was the difficulty in finding data at an NUTS 5 level that was appropriate for the purpose of the typology study. The main limitations of the study can be attributed to discontinuities in the data and missing elements of data.

The most recent general population census, which provides demographic, social, economic and quality of life information on the rural population at an NUTS 5 level, was undertaken by the SSO in 2000. In 2007, the SSO adopted Address-Based Population Registration System that records only the demographic aspects of the population at an NUTS 5 level. As a result, since 2000, there has been no official source for economic and social structure data in Turkey, and this has had an inevitable negative effect on the production, application and monitoring of rural development policies. This problem is exasperated by the fact that the social and economic dynamics in Turkey lead to a rapid transformation of rural areas in the country. Furthermore, for security reasons, data on NUTS 5 units that have populations below 150 are not made available to access in any way, and so were entered into the database established for the study as missing values. Before beginning an analysis, these missing values need to be completed statistically, although in areas where rural depopulation is high, the “missing value” can be so large that the quality of the database quality is severely affected.

Prior to data reduction process, the sufficiency of the sample on which the factor analysis would be conducted was measured using Kaiser–Meyer–Olkin (KMO) and Bartlett tests, and the fitness of the data for the analysis was determined.

Table 1 Typology indicators, variables and implications

Indicator	Variables	Justifications
Population and migration	Population size (2010) Population density (2010) (people/km ²) Average annual population change (2007–2010) (%) Average annual population change (1985–2000) (%) Elderly dependency rate 65+ (2010) (%) Youth dependency rate 0–14 (2010) (%) Total dependency rate (2010) (%) Seasonal net population change (%)	Population size, density, growth rate and migration are some of the indicators related to human intervention in land use (Leavy 1999). Population density is an indicator of the relative importance of built lands (according to CORINE) in land use and the degree of human intervention in the natural structure (Bengs and Schmidt-Thomé 2005). Also positively related to per capita gross domestic product (GDP), market size and development expectancy (ibid; Gløersen et al. 2006). It should be noted that low population densities do not always relate to rural areas (Ballas et al. 2003), as they may also be correlated with the natural structure, and so careful interpretation is required. Successful localities attract a working age population
Economic structure and performance—sectors	Ratio of agricultural employment (2010) (%) Average annual agricultural employment change (1985–2000) (%) Ratio of efficiently cultivatable arable land Per capita efficiently cultivatable arable land Efficiently cultivatable arable land per agricultural employment Ratio of pasture area (%) Pasture area per animal (ha) Number of poultry per 100 agricultural employment Number of beehives per 100 agricultural workers Fishing barge density (number of fishing barge/population) Number of fish farms Average fish farm capacity (tons/year) Tiddler density (number of tiddlers/population) Ratio of operable forest lands (2010) (%) Ratio of non-agricultural employment (2010) (%) Ratio of industrial employment (2010) (%) Ratio of service employment (2010) (%) Ratio of commercial employment (2010) (%) Number of hotels Number of hotel beds per 100 people Ratio of mini-sized plants (%) Ratio of small-sized plants (%) Ratio of medium-sized plants (%) Total number of industrial plants per 100 people Ratio of total industrial plants to number of total businesses Number of self-employed and employers (2000) Total number of businesses per 100 people	The correlation between land cover and GDP may be considered an acceptable indicator of land use efficiency/productivity, thus, sustainability (Gløersen et al. 2006). Sectoral specialization or diversity is an indicator of economic development level: specialization in agriculture indicates a rural structure, whereas the sectoral diversity level reflects an urban structure. Dependency on a single sector indicates a fundamental weakness in the economy. In modern rural areas, combinations of “new rural economy” industries [tourism and services (especially IT-based), recreation, niche commerce, etc.] are observed (Bryden 2002). The internal structure of the sectors (business size, labor characteristics, change, etc.) provides information about development potential, economic development/susceptibility to change. There is a high rate of self-employment in rural areas
Economic structure and performance-competitiveness	Ratio of land in organic agriculture Ratio of households adopting new products and innovations Ratio of secondary education graduates (2000) Ratio of higher education graduates (2000)	Susceptibility to market demand (new products, etc.) is a relatively urban characteristic. Education level is a significant measure in the determination of human resources and skill levels. In rural areas, workers have lower levels of skill, education and specialization than in urban areas (Pizzoli and Gong 2007)

Table 1 continued

Indicator	Variables	Justifications
Physical structure (features) and accessibility	Ratio of agricultural land (km ²)	Land cover profile reflects the degree of human intervention and the existing land use (Bengs and Schmidt-Thomé 2005). There is an overall tendency for agricultural land, forestry and open fields to dominate rural areas. The share of artificial surfaces corresponds to the degree of human intervention, and should be conceived as a criterion of ecological sensitivity (Bengs and Schmidt-Thomé 2005). Populations in urban settlements are low in predominantly rural areas. Spread settlement structures, in which small, medium-sized cities are quite important, display a high level of connectivity and accessibility, indicating strong relations between the various urban and urban–rural settlements. In the case of concentrated settlement structures, one single major city dominates the entire system, and the intensity of relations between the urban and the rural areas decreases with increasing distance or accessibility (Bengs and Schmidt-Thomé 2005; Gløersen et al. 2006). The settlement morphology of a rural region (settlement size, number of settlements and distances in between, etc.) is an indicator of accessibility in rural areas, and hence socio-economic sustainability (Prezioso 2007)
	Per capita agricultural land (ha)	
	Agricultural land per agricultural employment	
	Ratio of forest area (km ²)	
	Per capita forests area (ha)	
	Ratio of natural green and open fields (km ²)	
	Per capita natural green and open fields (ha)	
	Number of urban centers accessible by public transport	
	Total population of urban centers served by public transport	
	Mean population of urban centers served by public transport	
	Unemployment rate	
	Ratio of economically inhabitable sloping land	
	Ratio of lands with positive exposure	
Mean village altitude (m)		
Precipitation (mm)		
Transportation and access	Distance from urban center(s) (km)	The level of accessibility affects the level of urbanization, and promotes “network relationships” between settlements. Access to services increases welfare level, and provides information on employment potential with the presence of an advanced highway and rail network (commuting). A relationship exists between the presence of an advanced highway and rail network and development (rural jobs). As distances increase in rural areas, social opportunities (access to services, etc.) decrease more than in cities
	Quality of public transport (weighting)	
	Density of provincial roads (km/km ²)	
	Density of state and provincial roads (km/km ²)	
	Distance to nearest primary education service (km)	
	Distance to nearest secondary education service (km)	
	Distance to nearest health service (km)	
Distance to nearest market center (km)		
Quality of life and welfare	Ratio of population on a low income (medicare) health insurance	Subject to human resources (employment, income, social security, access to housing, security, commute, household structure, etc.) and quality of physical environment (usage intensity, building age, infrastructure, etc.) (Bryden 2002; Novotny and Pokorná 2008)
	Ratio of population working outside the village (population working outside the village/total population)	
	Ratio of population working outside the village in total workforce (population working outside the village/total workforce)	
	Unemployment Rate (unemployed population/total population)	
	Ratio of unemployed population to employed population (unemployed population/total employed population)	
	Change in unemployment (%)	
	Mean household size (2000)	
	Change in mean household size (2000–2010)	
	Female-Child ratio (2000)	
	Presence of potable tap water	
Environmental problems	Problems of the village	Indicator of the predominant attitude of politicians and people towards the environment and quality of life
	Solutions to solid waste problems	
	Wastewater removal method	

Table 1 continued

Indicator	Variables	Justifications
Pressures on natural resources	Land sales intensity (count/km ²)	Soil as a productive asset, as well as natural and cultural heritage, are sub-indicators of social and political attitudes towards the environment. Natural green and open fields, water resources (including NATURA, GEF, RAMSAR, etc.) stress the significance of environmental sustainability, while cultural/historical/archaeological/sense of belonging values stress the significance of cultural sustainability and tourism potential. The density of intervention into such natural values and assets corresponds to the level of unsustainability
	Ratio of sold land size (%)	
	Intensity of functional change in lands sold (count/km ²)	
	Intensity of river-type hydroelectric plants (count/km ²)	
	Intensity of dam-type hydroelectric plants (active, in construction, in project)	
	Size of mining activities	
	Intensity of mining activities (count/km ²)	
	Intensity of power lines (km/km ²)	
Disaster and risk	Intensity of pipeline (oil, natural gas) (km/km ²)	Areas should be approached carefully in terms of land use for sustainability and the safety of society
	Disaster density (count/km ²)	
	Ratio of total lands exposed to disaster (km ² /km ²)	

Statistical analysis: constructing typologies with an aggregative approach

Spatial planning is becoming easier and simpler as urban and rural settlements are classified separately. Such typological classification facilitates better infrastructure and resource allocation, investment planning, land use and environmental planning, and for better fund allocation for governance (Firoz et al. 2014).

As stated above, the typology study at the local scale followed an aggregative approach involving multivariate statistical analysis techniques. In the first phase, the number of variables was reduced using various statistical techniques (autocorrelation, communality, etc.) and two kinds of factor analyses were made, after which the rural

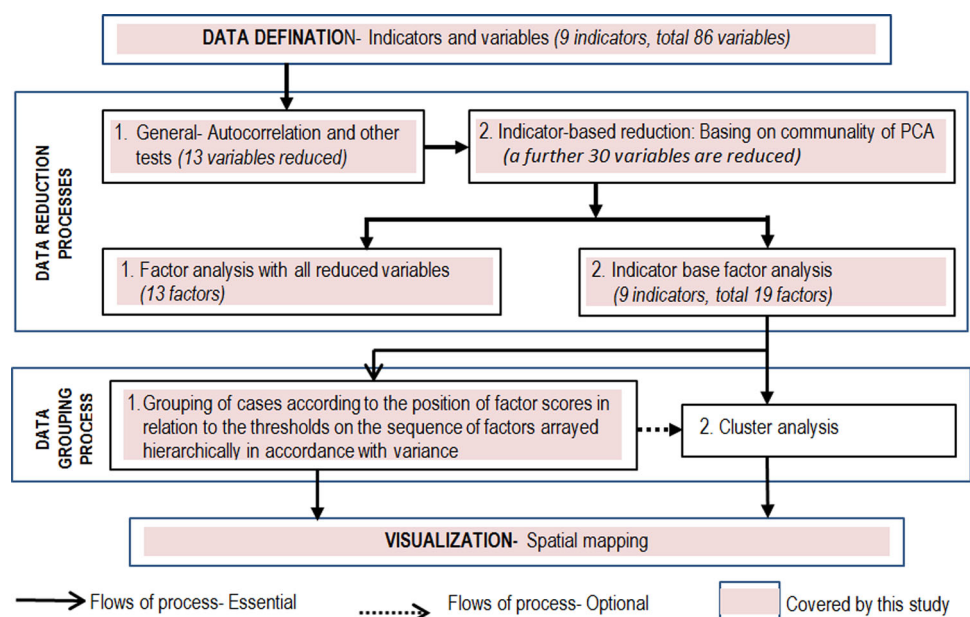
units (cases) were grouped (Fig. 1). In the present article, the first and part of the second phase of the aggregative approach, namely the factor analysis and its outcomes, are discussed, while the findings of the grouping and the spatial political implications and cluster of factors are excluded.

Data reduction

Data reduction was carried out in four stages:

- To begin with, a correlation analysis was carried out of all variables and auto-correlated variables were identified. Only one of the auto-correlated variables was retained in the dataset, and the others were eliminated. A total of 13 variables were eliminated at this stage.

Fig. 1 Stages of typology construction using inductive approach



Afterwards, a Principle Component Analysis (PCA) was applied to each indicator for the further reduction of variables. Variables with high communality (>0.70) were selected for each indicator using SPSS (v. 1.6) software, which led to the elimination of a further 30 variables, leaving 43 variables in the final data set.

The next stage involved a factor analysis to identify common features in the underlying associations between the variable groups by examining reciprocal correlations between variables. In this stage, two-factor analyses were applied to the reduced dataset: one run with all variables together; and the other run separately with the variables of the indicators.

A PCA, as a factor production technique, was used in both analyses. The following steps were followed in both instances: To determine the optimal number of factors, those with an eigenvalue greater than “1” were selected. Then, using a “Varimax” rotation method, the factor matrix was rotated and the results were interpreted. The factors were then named, based on the variables with factor loads greater than 0.70.

Grouping process

Two types of data grouping techniques were employed in the study: Grouping based on a coding of units on the ranked factors (factor directory), and a cluster analysis.

- **Factor directory**
Factor scores for rural settlements were calculated for each factor. The obtained values were grouped based on the standard deviation, and factor surface maps were created. These maps are useful and necessary for the visualization of local differences and for the creation of policies.
- Given the impracticality in interpreting the many factor scores together in a typology study, an attempt was made to combine certain factors so as not to lose them: Firstly, the factor scores of each factor were converted to z-scores. Second, the settlements were coded either “1” or “2” for each factor, according to the position of the settlement relative to the mean value (“0”) of the factor scores. Throughout the coding process, the value “1” corresponded to urbanism in the rural–urban scale, while value “2” represented rurality. Third, if an indicator was explained by more than one factor, the factors were ranked in ascending order in terms of their value of variance. The factor with the lowest variance was placed on the “ones” digit, the second lowest factor is placed on the “tens” digit and so on. As the value of variances increased, factors were placed on the higher digits (hundreds, thousands, etc.), so that each indicator is expressed by a “factor directory”. Fourthly,

the codes of typology units were entered into the factor directory of the indicator.

- The process can be exemplified on the Population and Migration indicator that explained by two factors: the Decreasing-Aging Population and Youth Dependency. The variance of the former factor is higher than that of the latter. Taking a typology unit, suppose that the factor scores (converted into z scores) of both factors are greater than the mean values of factors. In this case, the codes placed on the “tens” and “ones” digits were “2” and “1”, respectively. In other words, this typology unit stands on the “factor directory” of this indicator as 21.
- After the coding, which was carried out based on this assessment, factor surface maps were prepared for each indicator. However, as the factor number explained an indicator increases, interpretation of factor surface map becomes very confusing.
- Cluster analysis:

In the second phase of the process of constructing a rural typology using an aggregative approach, a cluster analysis is conducted, for which the weighted factor scores of the indicator-based factors for each cluster were used. The aim at this stage is to gather similar or dissimilar units, based on the distances between the multivariate data and the units, to arrive at group definitions with common properties. This would make it possible to discuss the differences between the clusters formed by rural settlements, as well as the correlation between the most significant factors, and therefore the indicators, that form/affect them.

Results

Performing a local-rurality classification

- First Option-Factor analysis with all reduced variables

The factor analysis conducted using the dataset of 43 variables for 206 rural settlement sample areas, aimed at the formation of a rural typology, resulted in a determination coefficient of 77.3 percent, obtained with 13 factors (Table 2). The factors obtained through this process, which aimed to transform correlated data structures into relatively independent and smaller number “derived” structures (factors), and to define major-minor factors, were then transformed and named.

After the determination of variables was loaded onto 13 factors, the factor-naming process was concluded. As an example, as can be seen in Table 3, for agricultural employment, the education services and distance to the center variables have a negative loading, while the variables of employment in industry, and in the non-

Table 2 Total variance explained

Component	Initial eigenvalues			Extraction sums of squared Loadings			Rotation sums of squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %	Total	% Of variance	Cumulative %
1	7.79	18.54	18.54	7.79	18.54	18.54	4.12	9.82	9.82
2	4.49	10.69	29.23	4.49	10.69	29.23	3.84	9.15	18.96
3	3.13	7.46	36.70	3.13	7.46	36.70	3.65	8.70	27.66
4	2.67	6.35	43.04	2.67	6.35	43.04	3.31	7.87	35.54
5	2.25	5.35	48.39	2.25	5.35	48.39	2.78	6.62	42.16
6	2.19	5.21	53.61	2.19	5.21	53.61	2.24	5.33	47.49
7	1.77	4.21	57.82	1.77	4.21	57.82	2.05	4.87	52.36
8	1.62	3.87	61.69	1.62	3.87	61.69	2.01	4.78	57.14
9	1.59	3.78	65.47	1.59	3.78	65.47	1.94	4.62	61.76
10	1.37	3.26	68.73	1.37	3.26	68.73	1.81	4.31	66.07
11	1.28	3.06	71.79	1.28	3.06	71.79	1.62	3.86	69.93
12	1.22	2.91	74.69	1.22	2.91	74.69	1.57	3.75	73.67
13	1.11	2.65	77.34	1.11	2.65	77.34	1.54	3.67	77.34

Extraction method: principal component analysis

agricultural and commercial sectors are loaded positively. The factor was given the name “non-agricultural sectors”, implying an urban character.

Although the level of the total explanation of variance (77.3%) was a satisfying outcome, the representation of indicators on factors was insufficient, which was important for the aim of the study, and the unexplainable composition of certain factors was problematic. Accordingly, the results were regarded as unreliable for policy and planning purposes at a local scale, which led the researchers to analyze the indicators separately. It was believed that some benefit might be drawn from reducing the data and constructing a rural typology based on the indicators, which would facilitate a flexible grouping of various combinations of factors, according to the needs of the planners/policy-makers. In addition, the risk of eliminating or weakening indicators that may be important for planning/policy purposes will be averted in the data reduction process.

At the time of the study (2010), the approach, which combines the data reduction approaches set out by Gløersen et al. (2006) and Ögdül et al. (2007), was yet to be fully assayed in typology literature. The study of Gløersen, et al. reduced the number of variables from 18 to 10 by eliminating variables with low communality values, while that of Ögdül, et al., which classified Turkey’s districts (NUTS 4 level) according to six social, economic and flow indicators, reduced the data on the indicator base from 29 to six variables.

- The indicator-based factor analysis, shown as the second option in Fig. 1, was carried out using reduced variables, and new factors that define each typology indicator were obtained (Table 4).

All variables loaded on factors (positive or negative) were determined. For readability purposes, only variables with factor loads greater than 0.70 are shown in Table 5.

The analysis of *Population And Migration Indicators* resulted in two factors with a total variance of 83.5 percent. The two factors shared similar percentages in the total variance (44% & 39%), and their loading on factors demonstrated that the aging and decreasing population structure and also youth dependency are still significant criteria for rurality.

It is observable that the *Economic Structure And Performance-Sector Indicator* was described by four factors loaded with 11 variables. The factors explained 77.11 percent of the total variance, with their significance level being an additional important outcome. The first factor, “non-agricultural sector”, has the highest explanation of variance, while the final factor, “mini-small scale industry”, has the lowest (30.71 and 9.61%, respectively) (Table 4). Of the other factors, “agricultural sector” and “industrial sector” similarly explain the variance. These findings throw light on the transformation of the economic structure of rural areas, and show that the agricultural sector is no longer a commonly eligible or primary factor in the definition of rurality and the delimiting of rural areas. This finding is particularly meaningful for the study area, given its high agricultural potential at a regional level, but also at a national level.

The factor analysis conducted using the *Economic Structure and Performance—Competitiveness Indicator* was defined by two factors that explained 92.42 percent of the total variance. The factors “Educated rural population” and “innovation—adoption of organic agriculture”

Table 3 Principal component matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
Ratio of agricultural land (km ²)	-0.85												
Ratio of forest area (km ²)	0.85												
Ratio of efficiently cultivatable arable land	-0.83												
Elderly dependency rate 65+ (2010) (%)	0.58			-0.31								0.31	
Disaster density (count/km ²)	0.56												
Total dependency rate (2010) (%)	0.56			0.44									
Ratio of industrial employment (2010) (%)		0.81											
Ratio of non-agricultural employment (2010) (%)		0.78				0.33							
Ratio of agricultural employment (2010) (%)		-0.76											
Ratio of commercial employment (2010) (%)		0.71											
Distance to nearest secondary education service (km)	0.50	-0.54											
Distance from urban center(s) (km)	0.39	-0.44											0.36
Agricultural land per agricultural employment			0.96										
Per capita agricultural land (ha)			0.95										
Total number of industrial plants per 100 people			0.83										
Per capita efficiently cultivatable arable land			0.60	0.50							0.35		
Efficiently cultivatable arable land per agricultural employment			0.58	0.47							0.32		
Ratio of natural green and open fields (km ²)				0.84									
Per capita natural green and open fields (ha)				0.81									
Elderly dependency rate 65+ (2010) (%)				0.81									
Total population of urban centers served by public transport					0.91								
Mean population of urban centers served by public transport					0.90								
Number of urban centers served by public transport					0.82								
Ratio of higher education graduates (2000)						0.80							
Solutions to solid waste problems						0.61							0.31
Ratio of secondary education graduates (2000)	-0.43					0.59							
Population size (2010)		0.34				0.47							-0.37
Ratio of population working outside the village							0.97						
Ratio of population working outside the village in total workforce							0.97						
Ratio of unemployed population to employed population								0.90					
Unemployment rate								0.86					
Density of provincial roads (km/km ²)		-0.35				-0.38		0.39					
Intensity of mining activities (count/km ²)									0.85				
Size of mining activities									0.72				
Ratio of small-sized plants (%)										0.83			
Ratio of total industrial plants to number of total businesses			0.34							0.66		0.47	
Density of state and provincial roads (km/km ²)		0.32								0.54			0.37
Ratio of total lands exposed to disaster (km ² /km ²)											0.75		

Table 3 continued

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
Problems of the village									0.43		0.62		
Ratio of mini-sized plants (%)			0.31									0.78	
Ratio of lands with positive exposure													−0.83
Ratio of land in organic agriculture													−0.32
Extraction method: principal component analysis. Rotation method: varimax with kaiser normalization	Rotation converged in 10 iterations.												

Table 4 Indicator-based factors and their determination ratios

Indicator	Factors	Variance (%)	Total variance
Population and migration (4 variables loaded, 4 variables eliminated)	Decreasing-aging population	44.464	83.532
	Young dependent	39.067	
Economic structure and performance- sectors (11 variables loaded, 9 variables eliminated)	Non-agricultural sector	30.708	77.111
	Agriculture sector	18.598	
	Industrial sector	18.196	
	Small industries	9.6075	
Economic structure and performance- competitiveness (3 variables loaded, 1 variables eliminated)	Educated population	59.074	92.428
	Innovation-adoption of organic agriculture	33.354	
Physical structure (features) and accessibility (10 variables loaded, 4 variables eliminated)	Urban settlement	25.060	81.218
	Agricultural villages	19.799	
	Forest villages	18.971	
	Intact villages	17.387	
Transportation and accessibility (4 variables loaded, 4 variables eliminated)	Periphery	39.413	73.517
	Road infrastructure	34.103	
Quality of life and welfare (4 variables loaded, 4 variables eliminated)	Mobility	48.605	94.317
	Unemployment	45.711	
Environmental problems (2 variables loaded, 0 variables eliminated)	Environmental problems	53.719	53.719
Pressures on natural resources (2 variables loaded, 5 variables eliminated)	Mining sector	79.757	79.757
Disaster and risk (2 variables loaded, 0 variables eliminated)	Disaster density	54.614	54.614

explained 59.07 and 33.35% of the variance, respectively, demonstrating that changes observed in the education profile of rural population imply an increase in skill levels at the periphery. Innovative approaches, on the other hand, which are measured from the level of “organic agriculture” in the survey area, are important in determining competitive power in rural areas. It is significant in the study area that as the conventional agricultural sector loses momentum, it is leaving its place to new products and innovative practices.

The factor analysis conducted with *Physical Structure and Accessibility Indicator* revealed that four factors explain 81.21 percent of the total variance, with relatively equal shares. Furthermore, three factors, identified as agriculture, forestry and intact villages, reflect the

geographical side of the settlements, while the initial/primary factor—“urban accessibility”, refers to the importance of connectivity and accessibility for urban settlements with populations of more than 50,000.

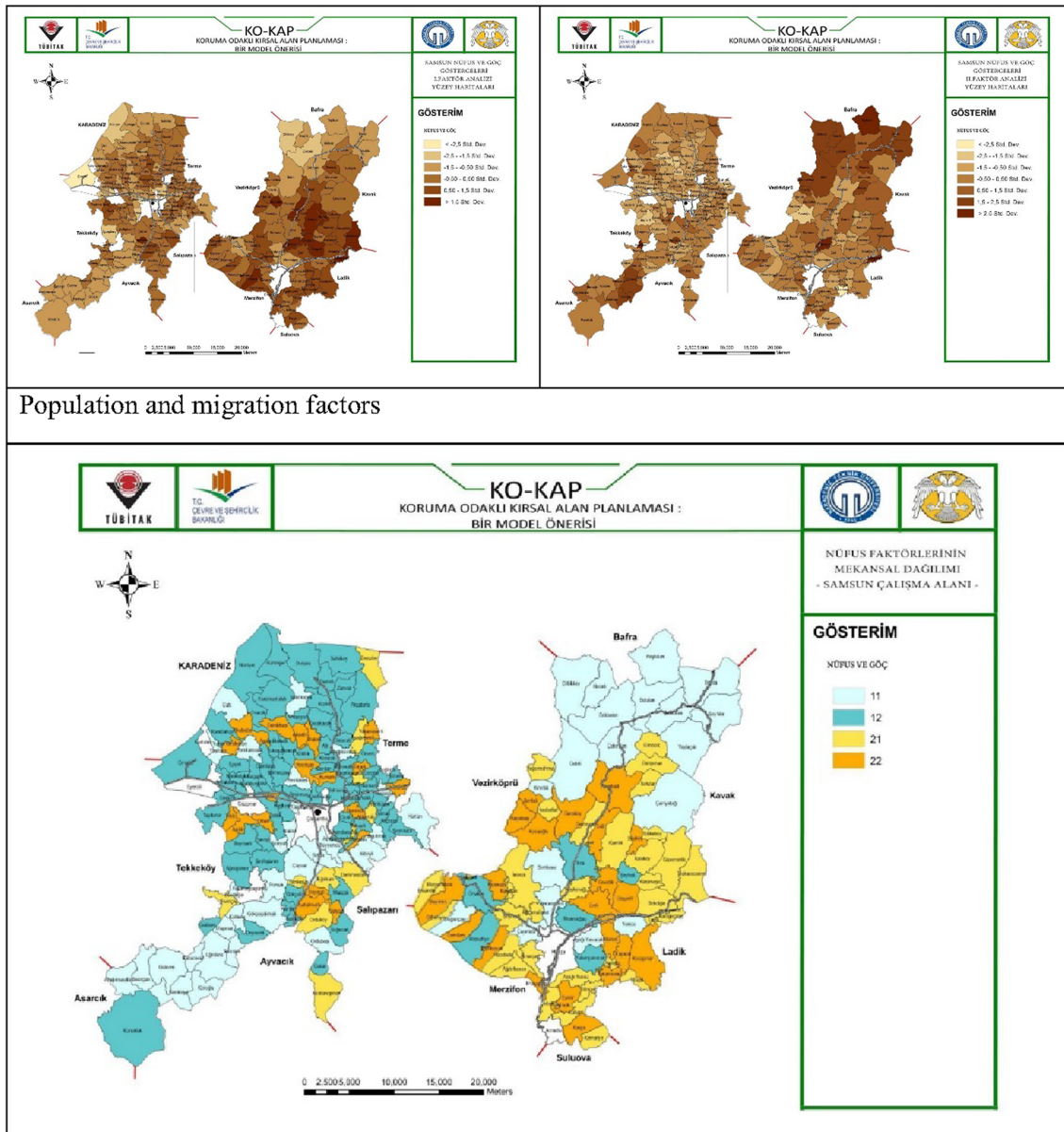
Consequently, land use and natural reasons were revealed as the most important determinants of settlement morphology.

The *Transportation and Access Indicator* identifies two factors that explain 73.51 percent of the total variance, divided almost equally between them. The first factor is the “periphery”, while the second factor, being “road infrastructure”, points to strong transportation connections between villages and other settlements.

The main variable used in typology construction studies has been the level of “periphery” (Raupeliene and

Table 5 Factors specific to Samsun study area

Indicators	Variables	Components			
		F1	F2	F3	F4
Population and migration	Elderly dependency rate 65+ (2010) (%)	0.93			
	Population size (2010)	−0.74			
	Total dependency rate (2010) (%)	0.38	0.91		
	Youth dependency rate 0-14 (2010) (%)	−0.48	0.85		
Economic structure and performance—sectors	Ratio of non-agricultural employment 2010 (%)	0.92			
	Ratio of commercial employment (2010) (%)	0.84			
	Ratio of agricultural employment (2010) (%)	−0.84			
	Ratio of industrial employment (2010) (%)	0.79			
	Ratio of efficiently cultivatable arable land	0.52	0.51		
	Efficiently cultivatable arable land per agricultural employment		0.94		
	Per capita efficiently cultivatable arable land		0.91		
	Ratio of total industrial plants to number of total businesses			0.91	
	Total number of industrial plants per 100 people			0.75	
	Ratio of small-sized plants (%)			0.47	3.00
	Ratio of mini-sized plants (%)	0.33		0.56	−0.65
	Competitiveness	Ratio of higher education graduates (2000)	0.94		
Ratio of secondary education graduates (2000)		0.94			
Ratio of land in organic agriculture			0.99		
Physical structure and accessibility	Total population of urban centers served by public transport	0.94			
	Mean population of urban centers served by public transport	0.91			
	Number of urban centers accessible by public transport	0.88			
	Agricultural land per agricultural employment		0.99		
	Per capita agricultural land (ha)		0.99		
	Ratio of forest area (km ²)			0.97	
	Ratio of agricultural land (km ²)			−0.95	
	Ratio of natural green and open fields (km ²)				0.91
	Per capita natural green and open fields (ha)				0.90
	Ratio of lands with positive exposure				0.75
Transportation and access	Distance to nearest secondary education service (km)	0.89			
	Distance from urban center(s) (km)	0.88			
	Density of provincial roads (km/km ²)		0.83		
	Density of state and provincial roads (km/km ²)		0.81		
Quality of life and welfare	Ratio of population working outside the village (population work outside the village/total population)	0.99			
	Ratio of population working outside the village in total workforce (population work outside the village/total workforce)	0.99			
	Ratio of unemployed population to employed population (unemployed population/total employed population)		0.96		
	Ratio of unemployment (unemployed population/total population)		0.96		
Environmental problems	Problems of the village	0.73			
	Solutions to solid waste problems	0.73			
Pressures on natural resources	The number of mining activities	0.89			
	Intensity of mining activities (count/km ²)	0.89			
Disaster and risk	Disaster density (count/km ²)	0.74			
	Ratio of total lands exposed to disaster (km ² /km ²)	0.74			



Population and migration factors

Fig. 2 Spatial maps for population and migration indicators constructed by coding

Jazepcikas 2009), which has been reflected in empirical findings and makes it a significant factor in defining rurality. The second factor that supports the hypotheses, defining the relationship between accessibility and rurality, relates to the periphery level of the Samsun sample area, which has a dispersed settlement structure.

In the analysis conducted with the *Quality of Life and Welfare Indicator*, two factors explained 94.31 percent of the total variance. The first welfare factor, defined as “mobility”, reflects the economic relationships between the periphery and the city that result from the increasing transportation/access opportunities, while the “unemployment” variable is the other significant factor with a direct effect on quality of life. The welfare indicators related to

the employment opportunities outside the village (commuting) for the human resources were particularly prominent in the empirical study.

Only one factor was obtained from the *Environmental Problems Indicator*, and this factor explained the lowest proportion of the total variance. Data on the “village problems” variable, obtained from a field survey questionnaire filled in by village headmen, and solid waste problems were included in the environmental problems factor. That said, the resulting factor that indicates the problems of the community reveals an insensitivity to environmental sustainability.

Only two variables out of the nine were entered into the factor analysis conducted with the *Pressures On Natural*

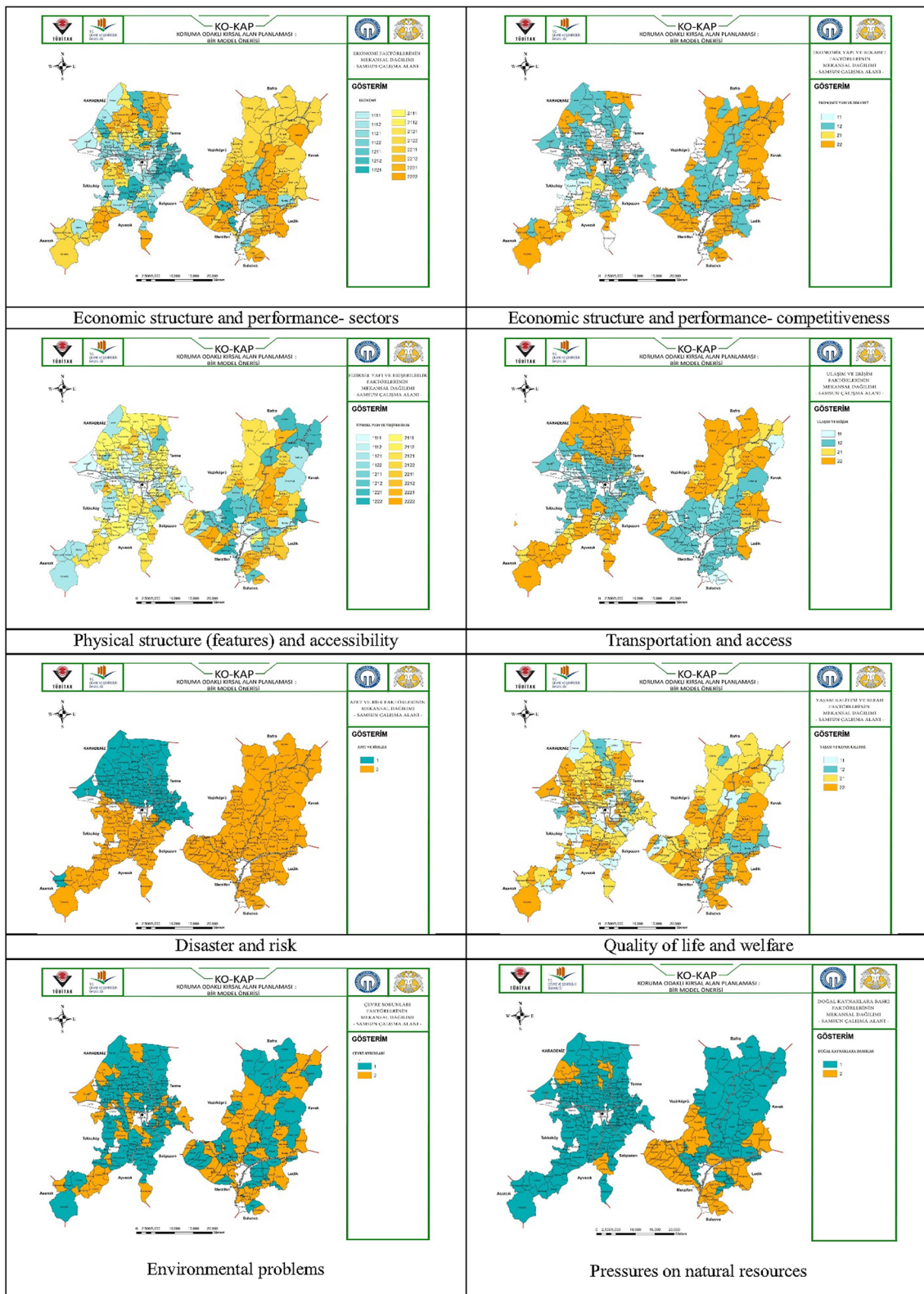


Fig. 3 Indicator-based factor surface maps

Resources Indicator, as all others were eliminated based on the “communalities” value. The “mining sector” factor that explained 79.75 percent of the total variance was defined based on the density of the mining activities variables.

In the factor analysis conducted using the *Disaster and Risks Indicator*, the factor loaded with the disaster density and lands exposed to disaster variables explained 54.61 percent of the total variance.

Natural disaster (landslides, floods, earthquakes, etc.) density is commonly encountered in Turkey’s Black Sea Region geography. The findings, in this respect, were valuable in revealing local characteristics and sensitivities, and, accordingly, in developing the required policies within this context.

The spatial pattern of local-rurality classification

The best way of understanding the homogenous/diverse geographical pattern of rural characteristics in the sample area is by plotting the factor scores of typology units on a map of the study area. To this end, the sample units were coded for each indicator following the steps explained in the section “[Statistical analysis: constructing typologies with an aggregative approach](#)”. After the coding was completed, separate factor surface maps were prepared for each indicator (Figs. 2, 3). As an example here, only the factor surface map of Population and Migration indicator is evaluated.

Figure 2 reveals a general problematic structure in the Population and Migration indicator for the central and southern parts of the rural settlements of the Havza district, while the northern section, on the whole, has a balanced population structure. This area was prominent in terms of its population profile. The population displays a balanced structure in the Çarşamba district, with the Alibeyli village and its environs attracting particular attention as a prominent broom production center with significant employment opportunities due to its youth dependency rate. Such findings indicate the value of the each local characteristic, although they should be interpreted with caution. Furthermore, these findings are consistent with the information gathered during the field survey, which points to the success and reliability of the empirical study.

All the factor surface maps of rural typology indicators can be interpreted separately. However, as the factor number explained an indicator increases, interpretation of factor surface map becomes very confusing.

Conclusions and discussion

In the planning hierarchy, upper-level plans require more general information, while local plans require detailed information on specific subjects. In this respect, in addition

to classifications from which general inferences can be made with a small amount of easily obtained data, there is also a need for classifications that make special inferences, although these require more detailed analyses, demanding the largest number of variables possible.

In such a situation, the selection of the most appropriate approaches when constructing and interpreting typologies is important. An indicator-based classification, in which spatial characteristics, problems and opportunities are covered in detail, can serve as a highly useful and stimulating source of information for spatially specific policy formation and spatial planning practices at a local scale.

In the present study, indicator-based local typology analyses were carried out at rural settlements, with the boundaries of the typology area corresponding to the district level (NUTS 4), which are the sub-regional/sub-provincial unit in the planning hierarchy. The typology area can also be a provincial unit. If the geographical size of a typology unit is too small, then more than one units that are preferably interdependent to each other can be analyzed together. At a local level, however, typology indicators are fixed for all typology units (NUTS 3 and/or NUTS4), although their contents (number and type of variable) may change in accordance with local characteristics.

The methodology behind the typology used in this study offers the advantage of enabling different groupings of typology units based on the factors obtained from an aggregative approach. Groupings may be based on factors, indicators or indicator groups, or all in conjunction—in which situation, methods such as weighing, AHP, etc. should be used—depending on the specific demands of the planners/policy makers.

Thus, diverse and unique rural areas could be classified, similar planning tools and approaches for similar settlements could be built and a guide that could assist in developing local scale policies and how to approach periphery in planning could be produced.

Acknowledgements This paper prepared from the work package of RURAL AREA TYPOLOGIES (IDA 2.2) that is part of a research project named CONSERVATION-ORIENTED RURAL AREA PLANNING: A MODEL PROPOSAL (TUBITAK, KAMAG 1007 project, No. 108 G 173) oriented to be practice in whole country. The project coordinated by the Karadeniz Technical University (KTU) Department of City and Regional Planning. The work package coordinators; Ahmet Melih ÖKSÜZ (KTU), Çiğdem ÇİFTÇİ ULUSOY and Ali Osman ÇIBIKDİKEN (Selçuk University (SU)). Reserchers: Saliha AYDEMİR, Dilek BEYAZLI, Cenap SANCAR, Ersin TÜRK, Aygün ERDOĞAN (KTU Group); Abdullah TOPÇUOĞLU, Orhan ÇOBAN, Rahmi ERDEM (SU Group). Research assistants: Beydullah SULAK, Seda ÖZLÜ, Muhammet İkbal EKŞİ (KTU group); Neslihan SERDAROĞLU SAĞ, Mehmet Akif SAĞ, Sinan LEVEND, Hale AKSEKİ, Mert DEDEOĞLU, Nurullah OSMANLI (SU Group). The data set used in this proceeding is prepared by Mesut YEŞİLTEPE and Seda ÖZLÜ; the digitalization of the maps are completed by Atilla ATEŞ.

Compliance with ethical standards

Funding This work was supported by the TÜBİTAK.

References

- Ballas D, Kalogeris T, Labrianidis L (2003) A comparative study of typologies for rural areas in Europe. 43rd European congress of regional science ass., 27–30 August 2003, Finland
- Bengs C, Schmidt-Thomé K (eds) (2005) Urban-rural relations in Europe, ESPON 1.1.2, Final Report, ESPON Coordination Unit, Luxembourg. http://www.espon.eu/export/sites/default/Documents/Projects/ESPON2006Projects/ThematicProjects/UrbanRural/fr-1.1.2_revised-full_31-03-05.pdf. Accessed 15 Jan 2017
- Blunden JR, Pryce WTR, Dreyer P (1998) The classification of rural areas in the European context: an exploration of a typology using neural network applications. *Reg Stud* 32(2):149–160
- Boscacci F, Arcaini E, Camagni R, Capello R, Porro G (1999) A typology of rural areas in Europe. Study programme on European spatial planning of the European commission Politecnico di Milano, Milano
- Bryden J (2002) Rural development indicators and diversity in European union. http://srdc.msstate.edu/trainings/presentations_archive/2002/2002_bryden.pdf. Accessed 15 Jan 2017
- Çezik A (1982) Kent Eşiği Araştırması—Türkiye İçin Kent Tanımı. DPT Yayınları, Ankara
- Cloke P (1977) An index of rurality for England and Wales. *Reg Stud* 11:31–46
- Copus A (1996) A rural development typology of European NUTS III regions, working paper 14, agricultural and rural economics department, Scottish Agricultural College, Aberdeen
- Copus A, Psaltopoulos D, Skuras D, Terluin I, Weingarten P (2008) Approaches to rural typology in the European union: JRC scientific and technical reports. http://www.eurosfair.pr.fr/7pc/doc/1241423679_rural_typology_jrc_48464.pdf. Accessed 15 Jan 2017
- EUROSTAT (2010) Regional typologies overview. http://ec.europa.eu/eurostat/statistics-explained/index.php/Regional_typologies_overview. Accessed 15 Jan 2017
- Firoz CM, Banerji H, Sen J (2014) A methodology to define the typology of rural urban continuum settlements in Kerala. *J Reg Dev Plan* 3(1):49–60
- Gallego (2004) Mapping rural/urban areas from population density grids, Institute for environment and sustainability, JRC—EC, ISPRA, Italy. http://81.47.175.201/urban_rural/documents/docs_others/Gallego_urban_rural.pdf. Accessed 15 Jan 2017
- Gløersen E, Dubois A, Copus A, Schürmann C (2006) Northern peripheral, sparsely populated regions in the European Union and in Norway. *Nordregio Rep* 2006:2
- Gülümser AA, Baycan Levent T, Nijkamp P (2007) Mapping rurality: analysis of rural structure in Turkey. Association de Science Régionale de Langue Française. 44th Congress, Local governance and Sustainable Development, Paris, France
- Hill B (2012) Statistics for rural development policy. Rashid Solagberu Adisa (Eds.), *Rural development—contemporary issues and practices*, University of London, London, pp. 241–256
- Hodge DJ, Monk S (1996) Redefining the rural development areas: the limits of spatial targeting. *Reg Stud* 30(2):207–214
- Kairyte E, Meyers WH (2010) Territorial indicators for rural development: targeting lagging areas in Lithuania. <http://etalpykla.lituanistikadb.lt/fedora/objects/LT-LDB-0001.J.04~2010~1367172449865/datastreams/DS.002.1.01.ARTIC/content>. Accessed 15 Jan 2017
- KAMAG-KOKAP (2015) Kırsal Alan Tipolojileri (İDA 2.2). Koruma Odaklı Kırsal Alan Planlaması: Bir Model Önerisi- Sonuç Raporu, Proje No. 108 G 173, TÜBİTAK, KAMAG 2015
- Kunitsa MN (2012) Typology of rural settlements in central Russia: demoeological aspect. *Reg Res Russia* 24:307–312
- Leavy A (1999) Urban morphology and the problem of the modern urban fabric: some questions for research. *Urban Morphol* 3(2):79–85
- Li Y, Long H, Liu Y (2015) Spatio-temporal pattern of China's rural development: a rurality Index Perspective. *J Rural Stud* 38:16–26
- Lincaru A (2014) Periurban areas and population density clustering model. *Rom J Reg Sci* 8(2):29–44
- Madsen MF, Kristensen SBP, Fertner C, Busck A, Jørgensen G (2010) Urbanisation of rural areas: a case study from Jutland, Denmark. *Geografisk Tidsskrift-Danish J Geogr* 110(1):47–63
- Metzger MJ, Bunce RGH, Jongman RHG, Mucher CA, Watkins JW (2005) A climatic stratification of the environment of Europe. *Glob Ecol Biogeogr* 14:549–563
- Ministry of Development (2007) 9th National development plans. <http://www.kalkinma.gov.tr/Pages/KalkinmaPlanlari.aspxalkin>. Accessed 15 Jan 2017
- Ministry of Development (2000). <http://www.kalkinma.gov.tr/Pages/EylemVeDigerPlanlar.aspx>. Accessed 15 Jan 2017
- Ministry of Development (2014) 10th National development plans. <http://www.kalkinma.gov.tr/Pages/KalkinmaPlanlari.aspx>. Accessed 15 Jan 2017
- Ministry of Food, Agriculture and Livestock (2010) Rural development plan. http://www.tarim.gov.tr/TRGM/Lists/KutuMenu/Attachments/1/Kirsal_Kalkinma_Planı.pdf. Accessed 15 Jan 2017
- Ministry of Food, Agriculture and Livestock (2015) National environmental action plans. <http://www.resmigazete.gov.tr/eskiler/2016/06/20160601-10-1.pdf>. Accessed 15 Jan 2017
- Ministry Forestry and Water Affairs (2005) The National action program for combating desertification. http://www.surdurulebilirlikalkinma.gov.tr/wpcontent/uploads/2016/06/Collesme_ile_Mucadele_Eylem_Planı.pdf. Accessed 15 Jan 2017
- Ministry Forestry and Water Affairs (2015) The National action program for combating desertification. http://tarim.kalkinma.gov.tr/wp-content/uploads/2015/01/collesme_Strateji-Belgesi-04-11-2014.pdf. Accessed 15 Jan 2017
- Novotny V, Pokorná I (2008) Assessment of the effects of the core-periphery phenomena on life quality. A case study of Prague and central bohemian district. 2008 Regional Studies Association Conference, Prague.
- OECD (1994) Creating rural indicators for shaping territorial policy. OECD, Paris
- OECD (2011) OECD regional typology, directorate for public governance and territorial development. https://www.oecd.org/cfe/regional-policy/OECD_regional_typology_Nov2012.pdf. Accessed 15 Jan 2017
- Öğdül H, Uluçay, H, Öngel S (2007) Kent Çevresindeki Kırsal Alanlarda Değişim Biçimleri, SOBAG—105k076, İstanbul
- Öksüz, A M, Beyazlı D, Aydemir S (2014) Kırsal Alan Sınıflaması: Ülkesel Boyut, Ulusal Bölge Bilimi ve Planlama Kongresi, 14. Bölge Bilimi Türk Milli Komitesi & İTÜ Şehir ve Bölge Planlama Bölümü, İstanbul, 18–19 Aralık 2014
- Openshaw S (1985) Rural area classification using census data. *Geogr Pol* 51:285–299
- Patarchanova E, Kastreva P, Kuleva G (2012) Classifications of the rural areas in Bulgaria. *J Settl Spat Plan Spec Issue* 1:103–108
- Pérez-Soba M, Mücher S, Danes M, Eupen M, Pedroli B, Hazzeu G, Feliu E, Garcia G, Tapia C, Fons J (2012) EU-LUPA European Land Use Pattern, Draft (Final) Report, ESPON

- Pinto-Correia T, Guerra C, Guimóar NG, Ribeiro S (2014) Towards a new typology of rural Europe: integrating countryside consumption and protection in new modes of rural Occupation. IALE-Europe thematic workshop 2014: advances in spatial typologies: how to move from concepts to practice? 4–5 July 2014, Instituto Superior Técnico, Lisbon
- Pizzoli E, Gong X (2007) How to best classify rural and urban? <http://www.stats.gov.cn/english/icas/papers/p020071114325747190208.pdf>. Accessed 15 Jan 2017
- Prezioso M (2007) Regional reports on collection of existing data (Action 1.3), ESPON. http://www.espon-usespon.eu/dane/web_usespon_library_files/658/pub6_prezioso_2007_veneto_region_polydev.pdf. Accessed 15 Jan 2017
- Raupelienė A, Jazepčikas D (2009) Typologies of rural areas in EU-27 for spatial analysis: rural labour market approach. Proceedings of the international scientific conference: rural development, 2009, vol 4, Issue 1, 127–134
- Reimer B (2002) Exploring diversity in rural Canada, paper prepared for USDA, economic research service. https://www.researchgate.net/publication/228377860_Exploring_Diversity_in_Rural_Canada. Accessed 15 Jan 2017
- Scholz J (2009) Rural regions in Europe—a new typology based on regional development potentials. Conference ESEE, 29 June–2 July 2009, Ljubljana
- Scholz J, Herrmann S (2010) Rural regions in Europe. A new typology showing the diversity of European rural regions, RUFUS Discussion Paper, EU FP7 Project RUFUS. http://sup05.umwelt.uni-hannover.de/rufus/files/DiscussionPaperNo4_Scholz.pdf. Accessed 15 Jan 2017
- Sotte F (2003) An evolutionary approach to rural development. Some lessons for the policymaker. Associazione Alessandro Bartola, Collana Appunti, No. 3, Ancona, Italy
- SPO (2005) Ulusal Kırsal Kalkınma Stratejisi Türkiye Cumhuriyeti Başbakanlık Devlet Planlama Teşkilatı
- Terluin IJ, Godeschalk FE, Von Meyer H, Post JH, Strijker D (1995) Agricultural income in less favoured areas of the EC: a regional approach. *J Rural Stud* 11(2):217–228
- Uchida H, Nelson A (2008) Agglomeration index: towards a new measure of urban concentration, World Development Report, Reshaping economic geography, Background paper. <http://siteresources.worldbank.org/INTWDR2009/Resources/4231006-1204741572978/Hiro1.pdf>. Accessed 15 Jan 2017
- UNECE, FAO, OECD, World Bank (2005) Rural household's livelihood and well-being: statistics on rural development and Agriculture household income, Handbook, Geneva
- Van Eupen M, Metzger MJ, Perez-Soba M, Verburg PH, Van Doorna A, Bunce RGH (2012) A rural typology For strategic European policies. *Land Use Policy* 29:473–482
- Van Leeuwen E (2015) Urban–rural synergies: an explorative study at the NUTS3 level. *Appl Spat Anal* 8:273–289
- Vargo J, Habeeb D, Stone B Jr (2013) The importance of land cover change across urban-rural typologies for climate Modeling. *J Environ Manage* 114:243–252
- Vidal C, Eiden G, Hay K (2001) Agriculture as a Key Issue for Rural Development in the European Union. CAESAR, Rome, www.unece.org/stats/documents/ces/ac.61/2001/wp.2.e.pdf. Accessed 15 Jan 2017