CONSIDERATIONS REGARDING A NEW SETTLEMENT TYPOLOGY IN SERBIA

РАЗМАТРАЊЕ НОВЕ ТИПОЛОГИЈЕ НАСЕЉА У СРБИЈИ

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АПСТРАКТ

Подела насеља/подручја на урбана и рурална је традиционално примењивана у статистичком извештавању широм света. Ови извештаји се користе као база за креирање и имплементацију развојних политика и мера. Ипак, међународне политике попут оних креираних у оквиру Европске уније (ЕУ), као и националне политике, показују тенденцију ка препознавању, дефинисању и издвајању прелазних типова насеља. План имплементације *Просторног плана Републике Србије* (2010) позвао је на креирање нове дефиниције појма „насеље" и критеријума за одређивање нове типологије насеља до краја 2015. године. Осим теоретског доприноса, овај циљ није достигнут. С друге стране, сходно свом статусу земље која приступа ЕУ, ова заједница очекује од Србије креирање и примену трихотомне типологије. У том светлу, овај рад има за циљ да анализира и дискутује нову категоризацију насеља имајући у виду аспекте броја категорија, броја варијабли, одабира варијабли и територијални ниво на којем би се прикупљали подаци. Ови аспекти су тестирани емпиријски на сету података прикупљеном у *Анкети о приходима и условима живота* (SILC) у Србији. Подаци су анализирани кроз два приступа: дескриптивном и кластер анализом. У дискусији је повучена паралела са примерима из других земаља и другим теоретским препорукама, а на основу тога су дате и препоруке за Србију.

Кључне речи: типологија насеља, *Анкета о приходима и условима живота (SILC)*, кластер анализа, Србија

ABSTRACT

A division between urban and rural settlements/areas has been traditionally applied in statistical reporting worldwide. The reports applying these terms have been used to create and implement development policies and measures. However, international policies such as those featured by the European Union (EU), as well as national policies, also recognize, define and render transitional types of settlements. The Program of Implementation of the Spatial Plan of the Republic of Serbia (2010) called for a new definition of the term "settlement" determined by new criteria for a settlement typology by the end of 2015. Except for theoretical contributions, this task has not been completed yet. At the same time, a trichotomous settlement typology has been recommended to Serbia by the EU as a result of the accession process. Therefore, this paper aims to analyze and discuss a new settlement categorization, taking into account considerations on the number of categories, number of variables, choice of variables and territorial level for data collection. These aspects are empirically tested on a data set collected through the Survey on Income and Living Conditions (SILC) in Serbia. The data are analyzed using two approaches: descriptive and cluster analysis. A parallel with other countries and theoretical recommendations is drawn in the discussion, based on which some recommendations are presented.

Keywords: settlement typology, Survey on Income and Living Conditions (SILC), cluster analysis, Serbia

INTRODUCTION

Creating typologies is a common endeavour in science, since it separates elements from a complex reality in order to make a simplified picture that can be more easily understood and studied (Sekulić, 1984; Isserman, 2005; Drobnjaković, 2019). Besides their role in science, typologies have important practical applications, for example in the creation and application of development policies (Isserman, 2005; Drobnjaković, 2019). Scientifically grounded typologies help planners and decision-makers to create measures that are as suitable as possible (Gajić et al., 2021).

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The practical implication of distinguishing urban from rural and mixed settlements is that it is possible to perform statistical reporting and processing as a foundation for strategic, legislative and planning documents and data-based policies. This creates a positive impact on sociological, demographic, geographical, urban and economic development. Finally, a clear definition of urban and rural is a precondition for EU countries to be beneficiaries of EU development funds (Gajić, 2015), which is also a goal for Serbia as an accession country.

The urban-rural division has been the foundation of EU policies and funds, such as the Common Agricultural Policy since 1962 (European Commission, 2012) and the European Agricultural Fund for Rural Development. The definition of policy goals and measures has been based on the urban-rural dichotomy in a whole range of EU documents, such as the Guiding Principles for Sustainable Spatial Development of the European Continent (European Conference of Ministers Responsible for Regional Planning, 2000), the Europe 2020 strategy (European Commission, 2010) and the Territorial Agenda 2030 (European Union, 2020). In addition, the European Spatial Planning Observation Network (ESPON) is one of the typologies that classifies its territorial data as urban and rural (ESPON, 2018). One of the most common typologies is that of the OECD, which originally distinguished rural from urban based on the population density (delimitation value of 150 inhabitants/km^2), and later also included a remoteness criterion (distance from an urban centre) (Brezzi et al., 2011). At first, it recognized three types of areas – predominantly urban, intermediate and predominantly rural. After the introduction of the new criterion, the rural type was split into two sub-types – predominantly rural close to a city and predominantly rural remote, thus creating a typology with four types of areas. A significant settlement typology for EU and EU accession countries, applied by EUROSTAT, is a trichotomous one. To meet specific practical needs, European countries have developed many more common typologies such as EURUFU, EDORA, SERA, PLUREL, RUFUS, etc. At a national level, there is a significant variety of criteria and definitions for their use. They are also significantly embedded in national policies and legislation, for example the Mountain Ordinance in Austria, which was passed at the federal (national) level to secure development in rural areas, thus shaping spatial development (Pantić, 2019). In Austria, for example, there is only one delimitation criterion in use, whereas an entire range of definitions is applied in Germany, depending on the purpose of the typology and the territorial level (Bengs & Schidt-Thomé, 2006; Central Europe Cooperation for Success, 2012). The most common criteria relate to demographic aspects – population size and population density. The second most common group of criteria is related to occupation, daily migrations and settlement functions; on the other hand, legal definitions on settlement types are common in EU accession countries (Bengs & Schidt-Thomé, 2006). Most European countries rely on municipalities as delimitation units,

although some of them use built-up areas (Austria, France, Ireland, Norway, Sweden, Portugal) or commuter catchment areas (Belgium) (ibid.). Municipalities (LAU 2) are divided into two categories (urban and rural) in Slovakia, into three (densely populated areas (urban), intermediate areas (urban-rural) and sparsely populated areas (rural)) in Slovenia and into four types (urban agglomerations, suburban, intermediate and remote areas) in the Czech Republic (Central Europe Cooperation for Success, 2012). Regional differentiation at the NUTS 2 level in Germany distinguishes agglomerations, urbanized and rural areas (ibid.).

In Serbia, research in the fields of demography (Stojanović, 1990), geography (Milošević et al., 2011), spatial planning (Pantić et al., 2010; Drobnjaković et al., 2014; Pantić, 2014), and income and living quality (Matković et al., 2015) relies on the urban-rural dichotomy. In addition, national legislative and strategic documents – the Poverty Reduction Strategy (2003), the Law on Agriculture and Rural Development (2009), the Spatial Plan of the Republic of Serbia 2010-2020 (2010) and the Agricultural and Rural Development Strategy of Serbia 2014-2024 (2014) – are shaped accordingly to urban-rural differences. The Employment and Social Reform Programme (2016), as part of the European Union accession process, also stresses the recognition of decisive differences in living quality between area types: poverty relates to working status, educational attainment level and residency in/outside of an urban centre.

Therefore, there is no universal definition of urban and rural (Isserman, 2005). A common understanding of urban settlements is that they are territories with a large population size, dense infrastructure, and cultural and other amenities, whereas rural settlements are understood as areas with agricultural production, pastures, meadows, forests and a low population concentration. Still, it is also common that rural is defined as "non-urban" or residual to urban (Isserman, 2005; Bogdanov, Meredith & Efstratoglou, 2008; Drobnjaković, 2019). Statistical reporting in Serbia relies on two settlement categories: "urban" and "other", which is often criticized by researchers and spatial planners (Živanović, 2018). This is one of the reasons that the Program of Implementation of the Spatial Plan of the Republic of Serbia (2010) stressed the need for a clear verbal definition and territorial delineation of the term "settlement" and the criteria for determining a new settlement typology, by the end of 2015. This typology has not yet been developed or adopted. Consequently, the quality and interpretation of precise and meaningful research and planning of urban and rural settlements/areas have been undermined.

In the past, spatial planners and other professionals in Serbia relied on Macura's trichotomous differentiation of settlements – urban, rural and combined, which were applied in statistical reports for the census years 1953, 1961 and 1971 (Rudež, 1981; Živanović, 2018). Kojić, who devoted a significant portion of his work to distinguishing between rural settlement types,

criticized the dichotomous categorization of settlements as being over simplified with regard to the number of settlement types and indicators used for their separation (population size and occupation of the population) (Drobnjaković et al., 2017). The OECD regional typology was criticized for the same reasons (Pizzoli & Gong, 2007; Van Eupen et al., 2012). Delegates of the OECD Working Party on Territorial Indicators, therefore, suggested a new typology by adding *distance to an urban centre* to population density criteria, thus distinguishing four types of areas (Brezzi et al., 2011).

With regard to their application, typologies with more than two categories are supported both in Serbia and other countries (Pušić & Pajvančić Cizelj, 2014; Rodrigues, 2015). Based on an analysis of settlement typologies from 1922 to 2015, Drobnjaković (2019) determined that settlements in Serbia are divided into at least two and up to a maximum of ten settlement types. These typologies are a product of theoretical considerations, but are rarely applied in practice, which is also the case in Croatia. There is a trichotomous settlement typology applied in statistical reporting in Croatia (Croatian Bureau of Statistics, 2011), whereas typologies of six (Svirčić Gotovac, 2006) and seven (Lukić, 2012) categories have only been considered in theory. There are eight settlement types in the United Kingdom (UK) national statistics (Pizzoli & Gong, 2007), with 15 theoretical types developed solely on the specific topic of CO_2 emissions in England (Baiocchi et al., 2015). In general, those who have considered theoretical divisions of solely rural settlements and areas have distinguished three or four types (Dossaa et al., 2011; Van Eupen et al., 2012; Drobnjaković et al., 2017).

The number of categories in settlement typologies certainly depends on the goal and choice of criteria. Kojić applied an anthropogeographic approach to his typology of rural settlements, which was justified for rudimentary research on settlements in Serbia. However, he stressed that it was crucial to introduce quantification in the development of a settlement typology (Kojić, 1969; Kojić & Simonović, 1975). Maybe that is why statistical and dimensional typologies are the most frequent nowadays (Pušić & Pajvančić Cizelj, 2014; Rodrigues, 2015). Rodrigues (2015) lists spatial, functional and multidimensional typologies. Drobnjaković (2019) also refers to the existence of a functional typology to accompany the demographic, morphological and socio-economic typologies. According to these authors, multidimensional typologies are the comprehensive ones, which combine several indicators from different fields. Zhang (1998), for example, elaborates on legal typologies.

Therefore, the nature of a typology depends on the number and features of the indicators chosen to distinguish the types within it. In his anthropogeographic typology, Kojić used non-quantified indicators such as settlement genesis, terrain morphology and a transport network (Drobnjaković et al.,

2017). Similar indicators were applied more recently by Čurović & Popović (2014) in the typology of architectural heritage. Although Cvijić (1905) explained the measurement of urban and economic functions as qualitative denominators, nowadays they are commonly quantified through indicators such as income, employees in non-agricultural activities, the share of agricultural households, the share of daily migrations, share of workers employed in the place of residence, etc. (Croatian Bureau of Statistics, 2011; Baiocchi et al., 2015; Živanović, 2018). Some indicators are not that common, such as the legal status of settlements applied in Croatia (Croatian Bureau of Statistics, 2011), whereas population size, often combined with population density, represents the most common indicator (Bogdanov, Meredith & Efstratoglou, 2008). The application of one indicator alone is criticized for being unable to reflect the complexity of reality (Kojić, 1969; Kojić & Simonović, 1975; European Commission, 1999; Pizzoli & Gong, 2007), and the most common practice is to combine two indicators (Macura, 1954; Brezzi et al., 2011). Technology, the improvements in software and remote data collection possibilities enable the use and testing of a larger number of indicators – 4, 21, 32, 59 or even 86 indicators (respectively: Živanović, 2018; Filip & Gavra, 2006; Van Eupen et al., 2012; Lukić, 2012).

An additional settlement typology issue in Serbia is related to criteria dissonance and the lack of an up-to-date context. Settlements in Serbia are assigned a settlement type locally and by diverse criteria, some of them originating from the 19th century, and these are applied in national statistical reports even today. Finally, the current division is not analogue with EUROSTAT statistical reporting, which is one of Serbia's obligations as an accession country. In order to secure the comparability of statistical data in EU and OECD countries, EUROSTAT has developed and applied the Degree of Urbanization (DEGURBA) (2011) as a trichotomous categorization that differentiates urban, rural and transitional areas based on population density and population size in geographical contiguity applied to 1 km² grid cells. Serbia's path to EU accession obliges the Statistical Office of the Republic of Serbia (SORS) to develop a compatible reporting system. Before it can be applied in the reporting of census data, SORS has tested the first version of the trichotomous classification in the Survey on Income and Living Conditions (SILC).

Following these theoretical discussions, examples of practice and presentation of the situation in Serbia, this research aims to consider the recommendations, argumentation and practical requirements for creating and implementing a new settlement typology in Serbia, which would potentially introduce transitional settlement types. For the sake of testing new and more diverse classification criteria, the SILC database was used in descriptive and cluster analysis approaches. The number of categories, number of variables, choice of variables and territorial level for data collection are the major issues discussed here.

METHODOLOGY

Data collection

The main source of data for this research was the SILC database – the data collected by SORS from households and individuals (respondents) in Serbia for the Survey on Income and Living Conditions in 2013. The reliance on the SILC 2013 database was conditioned by the Secondary Analyses Project in which SORS enabled partial use of the database by the project participants, otherwise unavailable for external use.

The SILC 2013 interviews encompassed 6,501 households and 20,069 individuals, almost equally men and women (48.8:51.2%) (Matković et al., 2015). The sample was created to achieve an equal distribution of respondents in three DEGURBA areas: cities (densely populated areas: 32.7%), towns and suburbs (intermediate density areas: 28.6%) and rural areas (thinly populated areas: 38.7%). In the DEGURBA approach, first of all, urban centres, urban clusters and rural grid cells were defined. Urban centres were taken as groups of grid cells populated with at least 1,500 inhabitants/km² and in a spatial continuum of neighbouring cells, with a population of at least 50,000 inhabitants. Urban clusters had at least 5,000 inhabitants scattered to constitute at least 300 inhabitants/km², with rural grid cells encompassing the remaining space. The classification of the grid cells was then applied within the borders of local administrative units, in the case of Serbia at the settlement level. Thus, settlements with at least 50% of the population living in urban centres were considered as cities; settlements with at least 50% of the population inhabiting rural grid cells were considered as rural areas and towns, and suburbs were all the settlements in between (less than 50% of the population in urban centres, or in rural grid cells) (EUROSTAT, 2018). In the context of this research, the DEGURBA areas were equalized with the following terms: urban settlements are consistent with cities, mixed-type settlements (transitional settlements) with towns and suburbs, and rural settlements with rural areas.

Research design

The ambition of the research was to use the SILC 2013 database to the highest extent possible. Therefore, all SILC parameters that depict the lifestyle of a certain settlement type were used, but still excluding those that could be interpreted as characteristic of both urban and rural surroundings. For example, collective housing, living costs, complete sanitary equipment, more activities in leisure time, and higher risk of criminal activities were assumed to be typical for urban settlements, whereas less noise, a healthier environment and lower accessibility were assumed to be typical for rural settlements. The research design represents an extension of the previous work of Pantić (2016), with the purpose of contextualizing the consideration of a trichotomous settlement typology within a broader theoretical and practical discussion. As Gajić et al. (2021) notice, there is a need to introduce additional variables into settlement and area

typologies, particularly those related to environmental and life quality. As a result, 32 parameters were analyzed and divided into eight diverse categories containing from one up to nine variables:

Category 1 – housing

1. Type of dwelling unit,
2. Median of the housing cost burden,
3. Ability to keep the home adequately warm,
4. Access to own bath or shower in the dwelling,
5. Access to own indoor flushing toilet,
6. Monthly rent;

Category 2 – needs related to contemporary society

1. Possession of a telephone – including a mobile phone,
2. Possession of a computer,
3. Ability to afford a one-week annual holiday away from home,
4. Lowest possible amount to make ends meet,
5. Affordability of an internet connection at home,
6. Visit to a doctor,
7. Overly priced services as the main reason for not visiting a doctor,
8. Visit to a dentist,
9. Overly priced services as the main reason for not visiting a dentist;

Category 3 – the environment

1. Noise from neighbours or the street,
2. Polluted environment,
3. Crime, violence or vandalism in the area;

Category 4 – economic activities

1. Agricultural production in the household,
2. Months currently unemployed,
3. Age at the time of first employment;

Category 5 – leisure time

1. Ability to afford to get together with friends or family for a drink or meal at least once a month,
2. Affordability of hobbies and regular leisure activities;

Category 6 – the notion of emotional satisfaction

1. Satisfaction with recreational and green areas,
2. Satisfaction with the environment,
3. Satisfaction with personal relationships,
4. Satisfaction with financial status;

Category 7 – accessibility

1. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a doctor,
2. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a dentist,
3. Use of public transport,
4. Satisfaction with time spent in transportation;

Category 8 – education

1. The highest level of education attained.

Each variable corresponds to one or a few questions in the SILC database. With a few exceptions, all the questions in the survey were multiple-choice questions.

Data analysis

The variables were used in two quantitative approaches. *The descriptive statistical method* was the first approach. The share of respondents who answered a question affirmatively was calculated for each DEGURBA area separately (cities, towns and suburbs, rural areas). After this, the share of respondents in transitional settlements was compared to the share in cities on the one hand and the share in rural settlements on the other. The comparison indicated which of the other two settlement types the transitional settlements were more similar to. The results obtained in this approach were used to label the newly formed urban and rural clusters in the second approach.

Cluster analysis, conducted in STATA, was the second approach. As before, the analysis was carried out for each variable individually. Since most of the chosen variables were categorical, the production of clusters prevailingly resulted from *K-median clustering*, whereas other variables (continuous) went through *K-means clustering*. The classification was set in advance to form two clusters – one to represent urban

settlements and the other rural settlements. Namely, newly formed clusters represented urban settlements when they contained a higher share of respondents from cities, as defined in the first approach. And vice versa – newly formed clusters represented rural settlements when they contained a higher share of respondents from rural areas. Even though two clusters were created, the aim was to analyze the presence of intermediate settlements in those clusters, and thus interpret whether their character was clearly urban, rural or both, and by which aspects. The approach was expected to show the nature of intermediate settlements and whether more complex typologies are justified or redundant.

RESULTS

The first approach

The first approach aimed to reveal whether the transitional areas are more similar to urban or rural areas. The similarity was tested at the indicator, variable and category levels, as well as the comprehensive level (Table 1). The percentages showed that no indicator in Table 1 scored 100% in total because not all of the respondents answered all the questions. Also, only those answers related to the area typology were taken into account in the case of variables with multiple choice answers (e.g. answers about Other types of accommodation were not considered within the Type of dwelling variable).

Table 1: Comparison between transitional and other area types / Табела 1: Поређење прелазног и осталих типова подручја

Category/variable/indicator	Share of respondents according to DEGURBA			Deviation from an area type[1]
	Cities (U)	Transitional	Rural (R)	
HOUSING				U (15.8%) **R (15.2%)**
1. Type of dwelling unit				U (28.8%) **R (27.5%)**
Detached building	31.6%	59.7%	89.4%	**U (28.1%)** R (29.7%)
Apartment or flat in a multiple dwelling unit building	57.0%	27.4%	2.1%	U (29.6%) **R (25.3%)**
2. Median of the housing cost burden				**U (1.0%)** R (2.4%)
High	66.3%	65.2%	62.5%	**U (1.1%)** R (2.7%)
Insignificant or no burden	33.3%	34.3%	36.5%	**U (1.0%)** R (2.2%)
3. Ability to keep the home adequately warm				U (3.6%) **R (0.6%)**
Yes	83.7%	80.1%	79.5%	U (3.6%) **R (0.6%)**
4. Access to own bath or shower in the dwelling				**U (2.4%)** R (8.4%)
Yes	98.8%	96.4%	88.0%	**U (2.4%)** R (8.4%)

1 The values at the indicator level (white fields) represent deviation of transitional areas from cities (U) and rural areas (R); at the variable level (yellow fields) represent average indicator deviation within the variable; at the category level (gray fields) represent average indicator deviation within the category. The overall deviation represents indicator average deviation for all 46 indicators.

5. Access to own indoor flushing toilet				**U (3.3%)** R (9.5%)
Yes	99.1%	95.8%	86.3%	**U (3.3%)** R (9.5%)
6. Monthly rent				U (57.5%) **R (43.0%)**
Amount	14,153.7	8,987.1	5,126.0	U (57.5%) **R (43.0%)**
NEEDS RELATED TO CONTEMPORARY SOCIETY				**U (4.5%)** R (6.9%)
1. Possession of a telephone – including a mobile phone				**U (0.5%)** R (1.9%)
Yes	98.8%	98.1%	95.2%	**U (0.7%)** R (2.9%)
No, cannot afford it	0.7%	0.7%	2.2%	**U (0.0%)** R (1.5%)
No, for other reasons	0.5%	1.2%	2.6%	**U (0.7%)** R (1.4%)
2. Possession of a computer				**U (7.3%)** R (10.9%)
Yes	69.2%	58.2%	41.9%	**U (11.0%)** R (16.3%)
No, cannot afford it	13.0%	17.4%	25.1%	**U (4.4%)** R (7.7%)
No, for other reasons	17.8%	24.4%	33.0%	**U (6.6%)** R (8.6%)
3. Ability to afford a one-week annual holiday away from home				U (13.2%) **R (12.8%)**
Yes	44.3%	31.1%	18.3%	U (13.2%) **R (12.8%)**
4. Lowest possible amount to make ends meet				U (16.3%) **R (14.0%)**
Amount	93,753.7	80,629.6	69,353.8	U (16.3%) **R (14.0%)**
5. Affordability of an internet connection at home				**U (4.2%)** R (8.9%)
Yes	39.1%	33.8%	20.2%	**U (5.3%)** R (13.6%)
No, cannot afford it	8.0%	9.1%	11.3%	**U (1.1%)** R (2.2%)
No, for other reasons	23.8%	30.0%	41.0%	**U (6.2%)** R (11.0%)
6. Visit to a doctor				**U (1.1%)** R (3.9%)
Unmet need	16.2%	15.1%	19.0%	**U (1.1%)** R (3.9%)
7. Overly priced services as the main reason for not visiting a doctor				**U (0.0%)** R (2.4%)
Too expensive	3.9%	3.9%	6.3%	**U (0.0%)** R (2.4%)
8. Visit to a dentist				**U (0.6%)** R (3.6%)
Unmet need	17.7%	17.1%	20.7%	**U (0.6%)** R (3.6%)
9. Overly priced services as the main reason for not visiting a dentist				**U (0.7%)** R (2.1%)
Too expensive	9.2%	8.5%	10.6%	**U (0.7%)** R (2.1%)

ENVIRONMENT				**U (6.3%)** R (6.6%)
1. Noise from neighbours or the street				**U (4.4%)** R (8.3%)
Yes	18.5%	14.4%	6.1%	**U (4.4%)** R (8.3%)
2. Polluted environment				**U (4.1%)** R (6.9%)
Yes	22.8%	18.7%	11.8%	**U (4.1%)** R (6.9%)
3. Crime, violence or vandalism in the area				U (10.4%) **R (4.6%)**
Yes	27.8%	17.4%	12.8%	U (10.4%) **R (4.6%)**
ECONOMIC ACTIVITIES				**U (11.6%)** R (15.8%)
1. Agricultural production in the household				**U (33.9%)** R (45.7%)
Average value of the products produced for own needs	35,363.8	53,534.9	78,008.3	**U (33.9%)** R (45.7%)
2. Months currently unemployed				**U (0.2%)** R (0.3%)
Average	2.0	2.2	1.9	**U (0.2%)** R (0.3%)
3. Age at the time of first employment (persons above 15)				**U (0.6%)** R (1.4%)
Average	22.2	21.6	20.2	**U (0.6%)** R (1.4%)
LEISURE TIME				**U (2.6%)** R (4.7%)
1. Ability to afford to get together with friends or family for a drink or meal at least once a month				**U (0.7%)** R (3.0%)
Yes	47.2%	48.4%	43.7%	**U (1.2%)** R (4.7%)
No, cannot afford it	18.8%	19.0%	20.6%	**U (0.2%)** R (1.6%)
No, for other reasons	4.8%	5.4%	8.1%	**U (0.6%)** R (2.7%)
2. Affordability of hobbies and regular leisure activities				**U (4.5%)** R (6.4%)
Yes	28.5%	23.4%	13.6%	**U (5.1%)** R (9.8%)
No, cannot afford it	20.7%	20.0%	20.1%	**U (0.7%)** R (0.1%)
No, for other reasons	21.7%	29.5%	38.7%	**U (7.8%)** R (9.2%)
NOTION OF EMOTIONAL SATISFACTION[2]				**U (0.4%)** R (0.6%)
1. Satisfaction with recreational and green areas				**U (0.4%)** R (0.5%)
Average rating	5.8	5.4	4.9	**U (0.4%)** R (0.5%)
2. Satisfaction with the environment				**U (0.7%)** R (1.2%)
Average rating	5.8	5.1	3.9	**U (0.7%)** R (1.2%)

2   "I do not know" answers were not taken in account.

3. Satisfaction with personal relationships				U (0.1%) R (0.1%)
Average rating	8.2	8.1	8.2	U (0.1%) R (0.1%)
4. Satisfaction with financial status				U (0.4%) R (0.4%)
Average rating	4.4	4.0	3.6	U (0.4%) R (0.4%)
ACCESSIBILITY				**U (0.2%)** R (0.6%)
1. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a doctor				**U (0.1%)** R (1.1%)
Too far, no adequate transportation	0.2%	0.3%	1.4%	**U (0.1%)** R (1.1%)
2. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a dentist				**U (0.0%)** R (0.3%)
Too far, no adequate transportation	0.1%	0.1%	0.4%	**U (0.0%)** R (0.3%)
3. Use of public transport				**U (0.1%)** R (0.8%)
No, station/stop is too far or inaccessible	0.3%	0.2%	1.0%	**U (0.1%)** R (0.8%)
4. Satisfaction with time spent in transportation[3]				U (0.6%) **R (0.2%)**
Average rate	6.1	5.5	5.7	U (0.6%) **R (0.2%)**
EDUCATION[4]				**U (7.8%)** R (11.9%)
1. The highest level of education attained				**U (7.8%)** R (11.9%)
Elementary education	17.2%	27.1%	43.5%	**U (9.9%)** R (16.4%)
Middle education	54.2%	54.9%	44.6%	**U (0.7%)** R (10.3%)
High education	28.1%	15.2%	6.2%	U (12.9%) **R (9.0%)**
OVERALL DEVIATION				**U (6.3%)** R (7.8%)

3   Ibid.
4   Elementary education in Serbia refers to those who completed obligatory education; middle education refers to those who completed technical, vocational school or grammar school; and high education refers to those who obtained a university degree.

At the comprehensive level, the results showed that transitional areas, such as those defined by DEGURBA, are more like urban than rural areas (6.3:7.8% deviation). The indication is similar when observed at the category level – the only exception is the Housing category. When observed at the category level, the exception is found in: the type of dwelling unit (apartment or flat in a multiple dwelling unit building indicator), ability to keep home adequately warm, monthly rent (Housing); the ability to afford to pay for a one-week annual holiday away from home, lowest possible amount to make ends meet (Contemporary society needs); crime, violence or vandalism in the area (Environment); affordability of hobbies and regular leisure activities (cannot afford it) (Leisure time); satisfaction with time spent in transportation (Accessibility); and share of highly educated (Education). Hence, the resemblance to urban areas in some categories is clear at all levels, whereas there are also categories in which variables indicate mixed resemblance both to urban and rural areas.

Transitional areas do not deviate from urban or rural areas to a similar extent according to all variables and indicators. In most categories, variables and indicators show a slight difference between transitional areas and other types of areas (less than 10%), while the differences are more distinguished in the following categories: type of dwelling unit, monthly rent (Housing); possession of a computer, ability to afford to pay for a one-week annual holiday away from home, lowest possible amount to make ends meet (Needs related to contemporary society); crime, violence or vandalism in the area (Environment); average value of the agricultural products produced for one's own needs (Economic activities); and educational attainment

(Education). The differences are diminished particularly regarding satisfaction with personal relationships and satisfaction with financial status. In contrast, the largest differences are found in the variables and indicators measured by absolute (monetary) values: lowest possible amount to make ends meet (14.0-16.3%), the average value of the agricultural products produced for one's own needs (33.9-45.7%), and monthly rent (43.0-57.5%).

The second approach

Two clusters were created in the second approach, one representing urban and the other rural settlements, which is the number of settlement types currently applied in Serbian statistical reports. Clusters were made for each variable. The share of respondents from transitional areas (settlements) was then identified in both clusters. This information was used to determine whether transitional settlements hold mixed urban and rural elements, thus justifying more complex typologies than the dichotomous urban-rural categorization (Table 2).

The majority of respondents from DEGURBA transitional settlements pertain to the urban cluster measured by 17 out of 32 variables. Regarding the remaining 15 variables, the majority found their place in the rural cluster. The division between categories was equal: 4:4, making the distribution of respondents appear to be rather balanced, although in slight favour of urban areas. Housing, Needs related to contemporary society, Notion of emotional satisfaction and Accessibility are

Table 2: The cluster analysis results / Табела 2: Резултати кластер анализе

Category/variable	Transitional settlements		Similarity to urban/rural
	in cities (U) (%)	in rural areas (R) (%)	
HOUSING			**U (63.4%)** **R (36.6%)**
1. Type of dwelling unit	27.4	72.6	**R**
2. Median of the housing cost burden	65.5	34.5	**U**
3. Ability to keep the home adequately warm	80.1	19.9	**U**
4. Access to own bath or shower in the dwelling	96.7	3.3	**U**
5. Access to own indoor flushing toilet	96.4	3.6	**U**
6. Monthly rent	14.3	85.7	**R**
NEEDS RELATED TO CONTEMPORARY SOCIETY			**U (58.9%)** **R (41.1%)**
1. Possession of a telephone – including a mobile phone	98.9	1.1	**U**
2. Possession of a computer	75.6	24.4	**U**
3. Ability to afford a one-week annual holiday away from home	31.1	68.9	**R**
4. Lowest possible amount to make ends meet	16.2	83.8	**R**
5. Affordability of an internet connection at home	45.1	54.9	**R**
6. Visit to a doctor	85.2	14.8	**U**
7. Overly priced services as the main reason for not visiting a doctor	53.2	46.8	**U**
8. Visit to a dentist	83.6	16.4	**U**
9. Overly priced services as the main reason for not visiting a dentist	41.6	58.4	**R**
ENVIRONMENT			U (16.9%) **R (83.1%)**
1. Noise from neighbours or the street	14.4	85.6	**R**
2. Polluted environment	18.8	81.2	**R**
3. Crime, violence or vandalism in the area	17.4	82.6	**R**
ECONOMIC ACTIVITIES			U (45.9%) **R (54.1%)**
1. Agricultural production in the household	93.2	6.8	**U**
2. Months currently unemployed	17.3	82.6	**R**
3. Age at the time of first employment (above the age of 15)	27.3	72.7	**R**
LEISURE TIME			U (48.8%) **R (51.2%)**
1. Ability to afford to get together with friends or family for a drink or meal at least once a month	65.6	34.4	**U**
2. Affordability of hobbies and regular leisure activities	31.9	68.1	**R**

NOTION OF EMOTIONAL SATISFACTION			U (57.8%) R (42.2%)
1. Satisfaction with recreational and green areas	37.8	62.2	**R**
2. Satisfaction with the environment	69.8	30.2	**U**
3. Satisfaction with personal relationships	54.0	45.9	**U**
4. Satisfaction with financial status	69.6	30.4	**U**
ACCESSIBILITY			U (52.9%) R (47.1%)
1. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a doctor	53.2	46.8	**U**
2. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a dentist	58.4	41.6	**U**
3. Use of public transport	40.1	59.9	**R**
4. Satisfaction with time spent in transportation	59.8	40.2	**U**
EDUCATION			U (17.4%) **R (82.6%)**
1. The highest level of education attained	17.4	82.6	**R**
OVERALL RESEMBLANCE			**U (51.8%)** R (48.2%)

the categories in which transition areas have a prevailingly urban character. On the other hand, Environment, Economic activities and Education level are fields where transition settlements resemble rural areas. Leisure time is a category in which an equal number of variables indicates belonging equally to urban or rural areas.

When observed at the category level, there is no completely urban category in which transitional settlements show prevailingly urban character regarding all variables. In contrast, there are two categories in which transitional settlements express rural character according to all variables: Environment and Education.

Most of the variables indicate a clear distinction between the urban and rural clusters when judged by the share of respondents from transitional settlements. However, the distinction level differs. Namely, there are aspects for which the differences are strongly pronounced (above 90%) – e.g. sanitary and technical equipment in households (bath, shower, flushing toilet, telephone) and agricultural production (value of agricultural goods produced for personal use). In contrast, there are aspects in which the differences between urban and rural are insignificant (up to 10%): accessibility to the internet, no visits to a doctor and/or dentist due to high costs of services or inaccessibility, and level of satisfaction with personal relationships.

Comparison of results for the two approaches

The fact that DEGURBA areas are based solely on the population density criterion should be taken into account in the interpretation of the results. Thus, with regard to population density, households and individuals living in transitional settlements are more similar to inhabitants in densely populated than sparsely populated areas.

The differences between the results in the first and second approaches indicate that the similarity of transitional settlements to urban or rural depends on the definition of transitional settlements. If the transitional settlements are defined as suburban (based on density and the total number of inhabitants), they are closer to urban settlements for all of the criteria, except housing type for which they have both urban and rural character (Table 3).

In the second approach, the share of transitional settlements was observed in urban and rural areas and defined irrespective of the DEGURBA criteria, with the aim of checking whether the definition of the settlement/area type depended on the criteria selected. The results indicated a dependency and showed that the similarity of transitional settlements to urban or rural depends on the chosen settlement typology criteria. Thus, depending on whether settlement types are defined based on population density or a series of subjectively evaluated aspects, transitional settlements can be more like urban or rural areas, even when they are compared using the same criteria.

DISCUSSION AND CONCLUSIONS

The need for a more complex settlement division than the urban-rural dichotomy was already accentuated by authors in Serbia at the beginning of the 20th century (Drobnjaković et al., 2017). This need for a more complex settlement typology has increased in parallel with the rising complexity of economic diversification (Lukić, 2011; Van Eupen et al., 2012; Pušić & Pajvančić Cizelj, 2014; Eder, 2019). Often, classification according to "urban" and "rural" space additionally indicates that a simple division of space does not correspond to reality or the needs of a contemporary society (Van Eupen et al., 2012; Beyazli et al., 2017; Živanović, 2018). Dichotomous typologies

Category/variable	Results	
	Approach I	Approach II
HOUSING	R	U
1. Type of dwelling unit	R	R
2. Median of the housing cost burden	U	U
3. Ability to keep home adequately warm	R	U
4. Access to own bath or shower in the dwelling	U	U
5. Access to own indoor flushing toilet	U	U
6. Monthly rent	R	R
NEEDS RELATED TO CONTEMPORARY SOCIETY	U	U
1. Possession of a telephone – including a mobile phone	U	U
2. Possession of a computer	U	U
3. Ability to afford a one-week annual holiday away from home	R	R
4. Lowest possible amount to make ends meet	R	R
5. Affordability of an internet connection at home	U	R
6. Visit to a doctor	U	U
7. Overly priced services as the main reason for not visiting a doctor	U	U
8. Visit to a dentist	U	U
9. Overly priced services as the main reason for not visiting a dentist	U	R
ENVIRONMENT	U	R
1. Noise from neighbours or the street	U	R
2. Polluted environment	U	R
3. Crime, violence or vandalism in the area	R	R
ECONOMIC ACTIVITIES	U	R
1. Agricultural production in the household	U	U
2. Months currently unemployed	U	R
3. Age at the time of first employment (above 15)	U	R
LEISURE TIME	U	R
1. Ability to afford to get together with friends or family for a drink or meal at least once a month	U	U
2. Affordability of hobbies and regular leisure activities	U	R
NOTION OF EMOTIONAL SATISFACTION	U	U
1. Satisfaction with recreational and green areas	U	R
2. Satisfaction with the environment	U	U
3. Satisfaction with personal relationships	=	U
4. Satisfaction with financial status	=	U
ACCESSIBILITY	U	U
1. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a doctor	U	U
2. Large distance or inaccessibility of adequate transportation as the main reason for not visiting a dentist	U	U
3. Use of public transport	U	R
4. Satisfaction with time spent in transportation	R	U
EDUCATION	U	R
1. The highest level of education attained	U	R
OVERALL RESEMBLANCE	U	U

Table 3: Comparison of results for the two approaches / Табела 3: Поређење резултата примењених приступа

are seen as oversimplified because they do not correspond to the more complex spatial variations that are still being treated with no difference (Laurin, Pronovost & Carrier, 2020). In the introduction, it was stated that a trichotomous typology used to be applied in statistical reporting in Serbia from 1954-1971, which has again been advocated more recently by Stamenković (2004), Lukić (2011) and Mitrović (2015).

The theoretical considerations recommend, therefore, a more complex division of settlements than a dichotomous typology.

It appears that the number of categories depends on the purpose of the classification, which can be seen in trichotomous typologies used by EUROSTAT (The New Degree of Urbanization, 2011), statistical reporting in Croatia (Croatian Bureau of Statistics, 2011), the four-types typology of regions by OECD (Brezzi, Dijkstra & Ruiz, 2011), and the eight-types typology applied in statistical reporting in the UK (Pizzoli & Gong, 2007). This indicates both that a dichotomous divide is outdated and that the introduction of a more complex typology in statistical reporting is possible. In the case of Serbia, Živanović (2018) recommends a four-type typology, differentiating urban settlements, suburban settlements, rural centres and rural settlements. Although the analysis by Gajić et al. (2018) recognizes five types of areas and Gajić et al. (2021) identify six types of settlements, a four-type classification could be the right measure in balancing the actual varieties existing in the settlement system in Serbia and practical statistical reporting. However, this would create the problem of adapting such a typology to EUROSTAT requirements, which is a precondition for the reliable comparison of Serbia with other EU and accession countries. A potential solution would be a definition of settlement types in the form of sub-types within the DEGURBA categories; however, the procedure might be challenging, if indeed possible at all, due to the different criteria used in different typologies.

The first approach in this research tested the justification for more complex typologies than simply a dichotomous one, and it showed that differences between intermediate settlements defined solely on the population density criterion are insignificant when compared to urban and rural settlements using other socio-economic or environmental criteria. Following this logic, there would be no need to force the separation of the third settlement type if all three types are already similar. However, it should be taken into account that the DEGURBA settlement classification is based solely on the population density criterion in a continuous space. In contrast, the second approach showed that when urban and rural clusters are defined by a range of variables, transitional settlements show similarity to urban areas in some aspects, and to rural areas in others. Namely, they showed a mixed character, which justifies the use of additional categories (at least one additional category) in a settlement typology.

Creating a typology (category thresholds) is already a substantial effort that becomes significantly more complex when trying to secure its applicability in statistical reporting, research, development policies and compatibility for an up-to-date situation in a certain space. Application of the DEGURBA classification in high-density countries and/or polycentric countries is more reasonable than in the case of Serbia. First, testing of the DEGURBA methodology in Serbia (application of statistical units instead of a 1 km² grid) showed unacceptable differences, with the City of Belgrade and Vojvodina on one hand being very similar to each other, but on the other hand

being significantly different from the rest of the country.[1] The difference in topography and cadastre municipality size resulted in a dominantly rural south, with barely any urban or transitional settlements, and the north with a more balanced distribution between settlement types (Figure 1). This indicates that application of the DEGURBA typology, if not approached differently, will not be fair in policy and spatial development in Serbia.

Choosing the number of criteria and their delimitation values depends on the intended goal for the typology (Muller et al. 2006; Van Eupen et al., 2012; Pušić & Pajvančić Cizelj, 2014; Drobnjaković, 2019). Some research goals require the typology to reflect the distribution of lifestyles among the inhabitants (e.g. Baiocchi et al., 2015), whereas others are interested in the application of rural development policies (e.g. OECD) or research about architecture (e.g. Čurović & Popović, 2014). Indeed, Van Eupen et al. (2012) stated that a single definition of "urban" and "rural" is not even possible. How the typology corresponds to the reality of certain territory might be easily endangered depending on the common definition for different realities. If we want to count the world's rural population, we need to apply the same criteria for "rural" in each country. However, Pušić & Pajvančić Cizelj (2014) and Gajić et al. (2021) state that villages or rural space in Serbia can only be compared with rural areas in the neighbouring countries, since they are vastly different from rural areas in the wider European context, for example in Germany, the Netherlands or Spain. The previously stated comparison between northern and southern Serbia also shows that when the criteria choice is simplified, it can lead to useless typology, even within the borders of a specific country (one reality). In addition, socio-political and demographic changes can easily and quickly cause the transition of a town into a rural settlement or vice versa (Lukić, 2011; Pušić & Pajvančić Cizelj, 2014; Gren & Andersson, 2018), which suggests the need for regular revision of the settlement typologies adopted. As Pumain (2004) states, an evolutionary approach in settlement systems is required in order to keep up with constant and inevitable change. In the case of Serbia, the application of the DEGURBA approach may remain a solution for complying with EU requirements, but parallel to it a new typology should be developed that will be more appropriate to policy development and policy implementation.

Alongside increasing the number of categories, there is also a trend of increasing the number of criteria (Pizzoli & Gong, 2007; Drobnjaković, 2019). The European Commission (1999) and Drobnjaković (2019) have criticized the one-dimensionality in the selection of criteria, because they doubt that the diversity of settlements and regions can be reflected in such typologies. Pizzoli & Gong (2007) give an overview of the variables used in the settlement categorization by depicting 1) economic activities, 2) socio-economic structure, 3) educational level, 4) spatial dimension and 5) natural characteristics. The first

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[1] Based on an unpublished SORS map created within an internal project run by the Poverty Reduction Team of the Government of the Republic of Serbia.
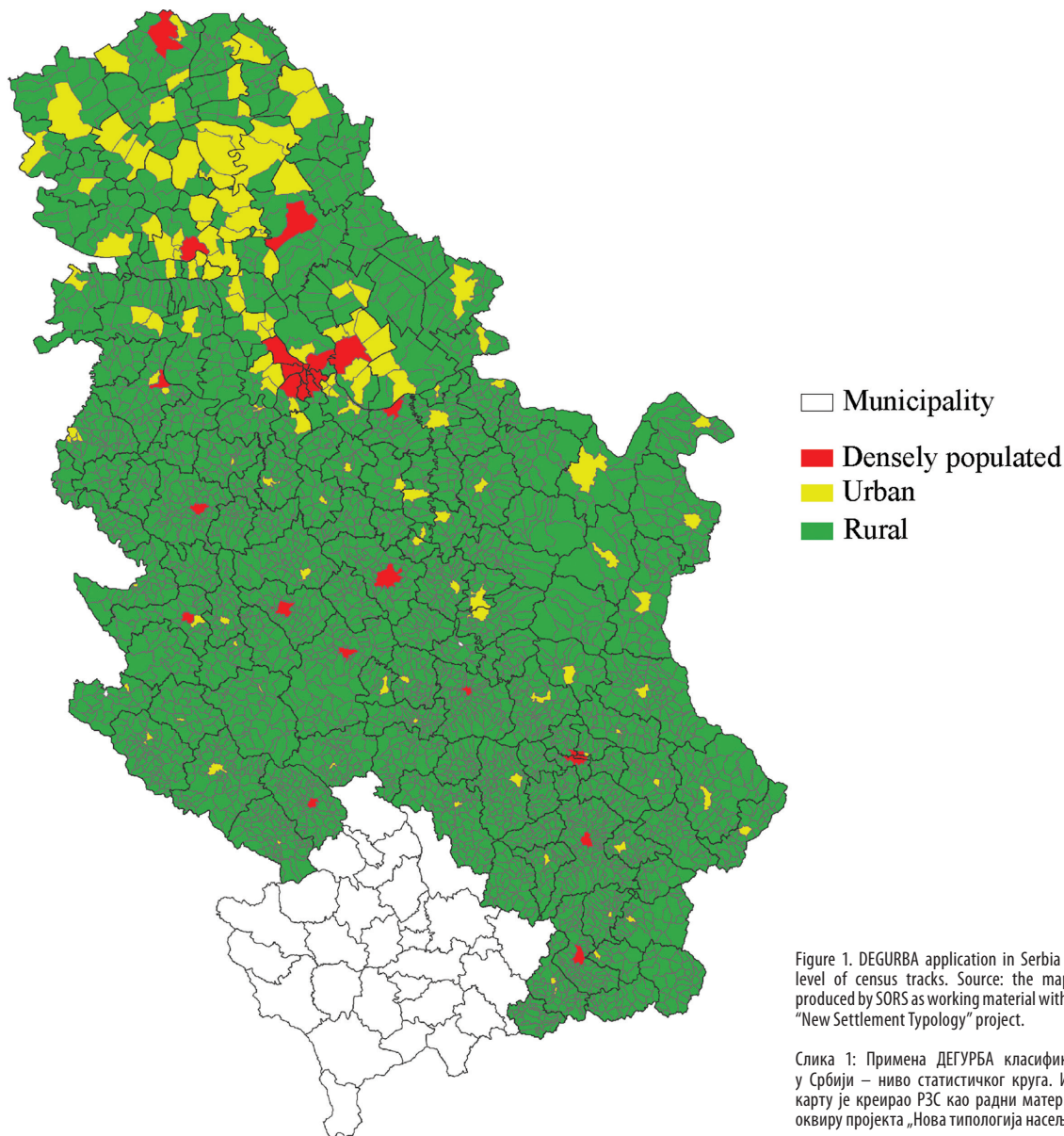
Figure 1. DEGURBA application in Serbia – the level of census tracks. Source: the map was produced by SORS as working material within the "New Settlement Typology" project.

Слика 1: Примена ДЕГУРБА класификације у Србији – ниво статистичког круга. Извор: карту је креирао РЗС као радни материјал у оквиру пројекта „Нова типологија насеља".

group of variables usually relies on measuring the size of the population occupied in agriculture or non-agricultural activities. Alongside the population size and density, these variables are commonly used in settlement classifications. Socio-economic variables measure demographic resources (Nejašmić & Mišetić, 2010), reflecting the lifestyle (Van Eupen et al., 2012), infrastructure (Albrecht, 2006) and life-quality in terms of household equipment, neighbourhood and the environment (Svirčić Gotovac, 2006). Through the educational level, settlements are evaluated according to the skills and knowledge of their population, showing whether manual or intellectual labour prevails (Pizzoli & Gong, 2007; Gajić et al., 2018). Spatial dimension variables are based on physical distribution and connections such as roads, railways and public transport, measured by distance from public services, density of public services per km^2, length of the road, etc. They can be also called accessibility variables, which Van Eupen et al. (2012) noted as often used in settlement typology. Variables related to natural characteristics are represented by land use, topographic rigidness (flatland, hills and mountains) and

climate characteristics, which are factors that shape human behaviour and opportunities.

Specifically addressing Serbia, Kojić claimed that demographic variables, such as population size and occupation, which are variables based on economic activity, are not sufficient for a proper settlement typology. Both Kojić (Drobnjaković et al., 2017) and later Stamenković (2004) emphasize that variables should also reflect the functions of settlements. Stamenković (1987) and Lukić (2011) believe that functions of a settlement indicate the relevance of the settlement in a settlement system, which can be measured by daily migrations. In accordance with this, Živanović (2018) suggests the use of four indicators: number of inhabitants, the share of employees in non-agricultural activities, the share of agricultural households and the share of daily migrations. However, it should be borne in mind that with increased physical accessibility, the progression of freelance jobs and remote working (emphasised by COVID-19 circumstances), daily migrations lose their role as a benchmark of the settlement hierarchy and the "rurality" and "urbanity" of a settlement. For example, this research showed that

settlement types are becoming equal with regard to internet access. Therefore, a more comprehensive combination of criteria and indicators, such as the 86 indicators reflecting demographic factors, socio-economic status, land-use, seasonal migration and public transport accessibility by Beyazli et al. (2017), would contribute to a more realistic classification. Relying on available statistical data and the international GIS land-use database, Gajić et al. (2018) applied 15 indicators in area classification and Gajić et al. (2021) used 16 indicators in settlement typology.

The second approach presented in this research combined indicators from all the above listed variable groups. Even though aggregated data at the level of the categories (urban, transitional and rural) applied in this approach do not allow the division of specific settlements in Serbia into a particular category, the variables by which transitional settlements significantly inclined towards urban or rural (over 80%) should be given a priority when choosing criteria for the future settlement typology. This refers to variables such as sanitary and technical equipment in households (bath, shower, flushing toilet, telephone), environmental quality (noise from street, pollution, crime, violence or vandalism), education attainment and economic aspects (existence of agricultural production in the household, monthly rent payment, amount of income required to make ends meet, months in unemployment). The first approach showed that variables reflecting personal satisfaction cannot be representative (similar results throughout all types of settlements) because the place of residence might be a matter of choice and not external pressure.

Even though the use of a comprehensive set of indicators might appear to be the best solution, variable/indicator availability might get in the way (Isserman, 2005; Pizzoli & Gong, 2007). This is why international classifications stick to a more general set of criteria (Rodrigues, 2015). The variables tested in this research are not part of statistical reporting at the settlement level, therefore, they could not be used in their current form. However, there is a possibility of finding or creating available data sources that would approximate the targeted categories of variables, as well as the variables themselves. Isserman (2005) suggests a solution: the cooperation of institutions in charge of data collection, innovations in geographical information systems, and obliging companies to collect and report relevant data. According to Isserman's estimation (2005:474), "the costs in disseminating the new data would be negligible. Once the geocoded data exist, their usefulness is unbounded. … Urban and rural research can be conducted over continuous space instead of in discrete space with its boxes of counties, zip codes, and rural areas". Obligating each local self-government unit to keep an updated GIS database on at least basic spatial indicators could play a significant role in a settlement typology.

The last topic to discuss here is the territorial level for data collection and reporting. Muller et al. (2006) emphasize the relevance of sub-national classification in order to take local differences into account. There are examples in which municipalities are considered to be too large (European Commission, 1999) and in which binding to administrative units is a problem in general (Pizzoli & Gong, 2007; Van Eupen et al., 2012; Drobnjaković, 2019). Therefore, the geo-referencing of statistical data is a goal (Pizzoli & Gong, 2007), as is the reliance on high-resolution raster data of 1 km^2 resolution (Van Eupen et al., 2012). The data can subsequently be aggregated to any administrative level (Van Eupen et al., 2012), which SORS strives to apply in the methodology for the 2031 population census.

The simplified DEGURBA typology (based primarily on density and secondarily on population size) enables a clearer understanding of the transition from urban to rural, but the consideration of a series of other criteria (e.g., type of housing, communal equipment, presence of public services, professions performed by employees) shows that diversity of transitional settlements surpasses simple division. The definition of criteria and data collection to distinguish three or more settlement types might be difficult. However, for the sake of adapting policy creation and implementation to a complex spatial continuum, the effort appears to be justified. Not only would citizens benefit from measures that better match their needs but the social, economic and financial return on investment could also be maximised. So, one of the findings from this research is that a settlement classification with more than two settlement types is justified and that it should be adapted to statistical reporting and to the creation of custom-tailored development policies. However, the number of categories may vary depending on the national context and the purpose of the categorization; therefore, perhaps more emphasis should be placed on improving data collection at the local level (at least the settlement level), which researchers and statisticians can easily rely on when required.

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