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Model of Functional Urban Areas in Serbia

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ABSTRACT The aim of this paper is to research the processes and relationships between urban network and administrative divisions in the Republic of Serbia. The hierarchy of urban centers is established on the basis of two indicators of European Spatial Planning Observation Network (ESPON) methodology: the population morphological urban area (minimum of 15,000 inhabitants or close to this number in specific cases) and percentage of functional urban areas above 0.5 percent of the national population. On the basis of relevant data comparison is conducted of functional urban areas and the status of cities in the new territorial organization of local government in the Republic of Serbia.

INTRODUCTION

Researching centers in the settlements network can be accessed from two aspects: the aspect of potential that arises from the size and position of the settlement and from the aspect of actual functional hierarchy, or some combination of these two aspects. Further concerns may be considered factual and projected future state. The theory of the hierarchy of urban centers was established by Christaller (1933), later were created several other theoretical models (Cattan and Saint-Julien 1998). In Germany, the concept of central places (ger. Zentrale-Orte Concept) is the basis of spatial policy (Buholc and Grimm 1994). To determine the ranking of the planning centers, as well as the localization of public goods, the criteria of population and distance was applied (Hamilton et al. 2005; Zaborowski 2014; McFarlane 2016). The lower threshold of greatness "Metropolis", in which could be developed all the services of a higher order are not clearly identified in the literature (Göler and Lehmeier 2012). Moreover, this criterion is changeable in accordance with historical characteristics. Today, the populations of small countries, such as Serbia, centers are on the order of just under 200,000 inhabitants. In the rump or asymmetric network of settlements, such as Serbian, can be taken, and centers of lower order of magnitude. For example, in less populated peripheral areas, cities with 50,000 inhabitants corresponding to twice the centers in the area of economic and demographic nucleus of the country. This hypothesis is confirmed by Wróbel et al. (1986) with thesis that the size of the region is better rate than the urban center and its size. A more realistic measure of the size of the center can be determined on the basis of "living urban system", that is the space of everyday contacts with the central city (see: Davoudi 2003; Tošiæ 2009; Peck 2011; Merrifield 2012).

METHODOLOGY

Regional development of Europe gradually changes from monocentric towards strengthening polycentric model, where individual autonomous centers of development networks with the surrounding cities create wider functional urban areas (FUA). The development of a balanced, polycentric settlement system is one of the principal goals of the European Union's current regional policy (see: ESDP European Spatial Development Perspective - EC 1999 and Territorial agenda of the European Union - EU 2011), which has made optimal use of the territorial potential of the regions that comprise it (Grèiæ and Sluka 2006). The regional development of Serbia is highly polarized. The system of spatial organization of the settlements has a monocentric structure, in which the City of Belgrade has a leading, dominant role. This situation reflects a theory of central places of Christalller (Chri-

stalller 1933) and hierarchy model of Alonso (Alonso 1964). Whether the morphological and functional centrality, monocentric models always consist of two main elements - the city and its suburban zone (De Maesschalck 2011), and their interactions that affect the labor (Haggett and Chorley 1967). In Serbia, the polycentric settlement network model is the key concept of regional development policy (• ivanoviæand Gatariæ2013). The strategic documents of Regional Development and Spatial Planning of Serbia stands out as a goal of "de-belgradization" Serbia and the gradual transition from monocentric towards polycentric urban model (Slu•beni glasnik 2011). These studies aim to implement a new model of spatial organization, which is known in the literature as "network model", which will represent an alternative to the old "model of central places" (Campagni 1993; Batten 1995). "Polycentrism is a feature of spatial structure in which several cities play the role of autonomous centers of development bound by a network of cooperation" (Banski and Chapiewski 2015). Additionally, some studies argue that polycentric structure is more beneficial from an economic point of view (Darling 2017). The evolution of this type of system is propelled by the goal of coherent and balanced regional development, which includes the strengthening of multilateral relations among the primary urban centers (Batten 1995; Dielemen and Faludi 1998). The contemporary model of spatial structure distances itself from the notion of a monocentric region dominated by a single urban centre in favor of the polycentric region (Klosterman and Musterd 2001). Consequently, researches are transferring their main point of interest from the city to the region that surrounds it (Parr 2005; Davoudi 2008).

The aim of this study is to define the level of polycentricism in Serbia, and starts is with the hypothesis that despite the concept of growing polycentrism in Serbia, which is declared in the strategic documents, the current socio-economic development trends do not indicate an increase in the role of sub-regional centers and increasing their ranking compared to the City of Belgrade. Geographical inertia relativized planning instruments and complicates the management mechanisms of the link between regional and sub-regional centers in the spatial structure of Serbia. There are three possible scenarios of polycentrism in regional policy of Serbia: 1) The growing dominance of Belgrade in the Serbian system of cities, intensive globalization and networking in the system of metropolis in South East Europe; 2) Balanced market-oriented development trends through regional development policy "metropolis balance" (Novi Sad, Niš), and 3) Full polycentric model based on encouraging medium-sized cities as "the nucleus of development".

Demographic Parameters of the Network of Settlements in Republic of Serbia

The Republic of Serbia is a small country with a surface of 88 361 km^2. It consists of two autonomous provinces - Vojvodina (24.3% of the territory) and Kosovo and Metohija (12.4 percent) that is temporarily under the international protectorate administered by UNMIK. Degree of urbanization in Serbia by the census from 2011 is 56.7 percent, which is below the European average (72.2%). The concept of the city in Republic of Serbia was changing. According to censuses from 1953 to 1971, the demographic statistical criterion determining the concept of the city was applied, made by the famous Serbian demographer M. Macura, who took into account two components - population size of settlements and the percentage share of the agricultural population (• ivanoviæ 2015). The lower threshold population size of the town was only 2000 inhabitants, on the condition that over 90 percent of non-agricultural population. With an increase in the category of up to 15,000 has decreased the upper threshold of the agricultural population to 30 percent. For larger settlements criterion of non-agricultural population was not relevant. All the settlements studied according to this method were classified into three groups - urban, mixed and rural. According to censuses from 1981 until 2011, settlements were administrative and legal decision was classified into two groups - urban and rural.

RESULTS AND DISCUSSION

On the territory of Serbia after the 2011 census there were 6,158 settlements, of which 193 were urban settlements. The largest number of cities fall into the category of small settlements with majority of the population concentrated in four major cities - Belgrade, Novi Sad, Niš and Kragujevac (24.1%). In general, insufficiency of Serbian urban system is directly related to the

recent geopolitical developments in the region. In fact, the modern structure of the network of cities is "mutilated" part of a wider urban structure of the former Yugoslavia. Due to its dissolution at the end of the 20th century, specific urban systems were Slovenian, Croatian, Serbian, Montenegrin, Macedonian and in Bosnia and Herzegovina where the urban system is divided between the Serbian Republic and the Federation of Bosnia and Herzegovina. This has undermined not only the homogeneity of the previously unified system of cities, but also many historically formed functional connections of long distance. In addition, it questions the additional expansion of depopulated areas and reducing the demographic potential of the growing number of cities. Since 4,681 the settlement of Serbia (without province Kosovo and Metohija), 3,847 constantly losing population, and only 834 showed a population increase (Winkler 2012). In addition to the already mentioned low level of urbanization, it further complicates the inclusion of towns in Serbia in a unified European urban system and integration (Grèiæand Tosiæ 2007; De Maesschalck 2011; Darling 2017).

Network of cities in Serbia is characterized by a large disproportion in terms of size and regional location. The urban network is polarized so that it dominates metropolitan area of Belgrade, where is concentrated twenty-three percent of the population of Serbia or twenty-seven percent of the total urban population. The range between the first center (Belgrade - 1,167,000 inhabitants) and the second largest (Novi Sad - 232,000 inhabitants) indicates the asymmetry of the urban network and the lack of large cities that would be a counterweight to Belgrade, and that could take on macro-regional functions. This reflects the disproportion in regional development, which has deepened, despite being made back in 1966, and adopted the concept of decentralization, territorial and economic development of Serbia and the formation of a polycentric urban system (Grèiæ and Tošiæ 2007). The possibility of decentralization and regionalization of Serbia was opened in the Constitution of the Republic of Serbia in 2006, but with very little instruction on how to perform it. Administrative districts, which were established in 1991 as a formal administrative and statistical region, do not solve the very serious issue of regionalization and the role of cities in the process of development.

Disproportion in the density of the network of regional centers is one of the terms of differentiation spatial structure of the country. Premises with diluted centers are characterized by low population density, while the concentration of centers in the northern and central part corresponds to the increased density. However, this statement does not answer the question as to whether the cause of the low population density of diluted network of centers, or the lack of pre centers is the cause of this low density. Surely these phenomena are interdependent.

The Hierarchy of Centers

In spatial plans of Serbia for over decades decentralization of Belgrade has been prepared and it tends to the system of moderate polycentric concentration. According to the Law on Spatial Planning and Regional Plan of the Republic of Serbia from 2010 to 2020 were defined conditions, objectives and directions of sustainable development of the country, including among others the basic elements of the settlement network (Slu•beni glasnik 2011). In this document, in the section "The polycentric urban system" proposed the following hierarchy of settlement centralization (supra-local level):

- Capital, or center in the category MEGA (Metropolitan Growth Area) - Belgrade;
- Centers of international significance: Novi Sad, Niš, Priština;
- Centers of national importance, Subotica, Sombor, Sremska Mitrovica, Zrenjanin, Panèevo, Šabac, Loznica, Smederevo, Kragujevac, U•ice, Èaèak, Kraljevo, Kruševac, Leskovac, Valjevo, Vranje, Novi Pazar and Prizren;
- Centres of regional importance: Kikinda, Vršac, Pirot, Po•arevac, Jagodina, Zajeèar, Kosovska Mitrovica, Đakovica, Gnjilane, Uroševac, Peæ;
- Centers of local (sub-regional) character;
- Other local centers.

In this paper as titular regional centers were discussed together in the first four categories: main city, centers of international, national and regional importance. It is believed that the regional center, in a certain time horizon, should perform a specific set of central functions for the respective region. Consequently, the question arises about the conditions to be met by the center that could be counted in a given planning category.

Local Governments

According to the current law on territorial organization of the Republic of Serbia the concept of the city is related solely to the type of local government units and those urban environments that are defined by law as a city with a special territorial-administrative status, which the European Nomenclature of Territorial Units for Statistics, for now, corresponds to the level LAU1 (Local Administrative Units). The Republic of Serbia in the administrative-territorial division has autonomous province (2), administrative districts or regions (29), and the City of Belgrade which has a special status (Obradoviæ 2007). Territorial units of local self-government are municipalities and towns. According to the Law on Local Self-Government Act of 2007 cities in Serbia are the territorial local governments, which are economic, administrative, geographical and cultural centers of the wider area and have more than 100,000 inhabitants. Exceptionally, when there are special economic, geographical or historical reasons, it can be determined that the city and territorial unit is the one which has less than 100,000 inhabitants. This Law on Territorial Organization of Serbia (Slu•beni glasnik 2007) and its amendments from 2016 defined the 27 cities. The territory which is formed by the city is a geographical whole, an economically connected area which possesses built communication among the places of the city as based gravitational center. City carried jurisdiction of the municipality as well as other responsibilities and tasks of state administration which are conferred on it by law. City Cancel may establish two or more town municipalities. Some cities have a share of the city municipality.

Definition of the concept of the city is open dilemma whether it is defined as a functional urban area (FUA), or as a morphological urban area (MUA). Looking at cities as regional centers there is no doubt that the whole FUA has a significant role if it is really within the MUA. Urban settlements, therefore, defined according to their morphological urban area (MUA) and according to their functional urban areas (FUA). MUA presents continuous built urban fabric of urban settlements, while FUA represents MUA together with the zone of influence of the city, therefore, the economic zone, which covers the smaller towns and villages in the region (Šeæerov and Neveniæ2009).

Functional Urban Areas

Functional urban areas (FUA) consist of the urban centers and the wider area around it, which is economically integrated with the center. The labor market is the basic indicator, in terms of the size of the urban center of at least 15,000 people and over 50,000 in the wider area. For smaller countries such as Serbia, urban center should have at least 15,000 inhabitants, a functional urban area of more than 0.5 percent of their total population, as well as some features of national and regional importance (Stojkov and Đorðeviæ2005). For the purpose of this paper is an analysis of the size of functional urban areas in the Republic of Serbia by combining two indicators by ESPON methodology: the population morphological urban areas (minimum 15,000) and percentage of its FUA, which is more than 0.5 percent of the total population of Serbia (Table 1).

According to the first indicator, the number of inhabitants of urban centers (MUA), 48 urban settlements in the Republic of Serbia has more than 15,000 inhabitants, and two are below the defined minimum (Prijepolje and Bujanovac).

For the size of the functional urban areas (FUA) shows the population of the municipality urban center as a daily urban system, this is the best indicator that the municipal urban center predominantly attracts labor from its administrative territory. The statistical results show that in two of the 50 urban centers in the Republic of Serbia, their municipality does not meet the requirement for prescribed functional urban area, because they have less than 0.50 percent of the total population of Serbia (Senta 0.43% and Èuprija 0.32%). However, Èuprija and neighboring municipality Despotovac, which makes its catchment size of FUA 0.75 percent and Senta with the municipality of Ada have FUA size of 0.56 percent (Obradoviæ2010). So, according to the applied indicators of ESPON methodology 48 urban centers in Serbia (MUA) have more than 15,000 inhabitants and FUA greater than 0.50 percent of the national population. Specific cases are urban settlements Prijepolje (0.52%) and Bujanovac (0.60%) which have FUA greater than 0.50 percent of the national population but have no MUA more than 15,000 residents (Table 2). Bujanovac in 2011 (when the Albanians boycotted the census), most likely, already had MUA

Table 1: Model of functional urban areas in the Republic of Serbia international and national importance

Functional urban area FUA	*Population from census 2011*		*Index FUA/MUA*	*FUA participation in the population of Serbia (%)*
	MUA	*FUA*		
1. Belgrade – city	1166763	1659440	1.42	**23.09**
2. Novi Sad – city	231798	307760	1.33	**4.28**
3. Niš – city	183164	260237	1.42	**3.62**
4. Kragujevac – city	150835	179417	1.19	**2.5**
5 Leskovac – city	60288	144206	2.39	**2.01**
6. Subotica – city	97910	141554	1.45	**1.97**
7. Kruševac – city	58745	128752	2.19	**1.8**
8. Kraljevo – city	64175	125488	1.96	**1.75**
9. Panevo – city	76203	123414	1.62	**1.72**
10. Zrenjanin – city	76511	123362	1.61	**1.72**
11. U•ice – city	52546	78040	1.49	1.08
Bajina Bašta, ajetina		118807		**1.65**
12. Šabac – city	53919	115884	2.15	**1.61**
13. Po•arevac - city	44183	75334	1.71	1.05
•abari, Malo Crnie, Veliko Gradište		115782		**1.61**
14. Èaèak, – city	73331	115337	1.57	**1.6**
15. Sombor – city	47623	85903	1.8	1.2
Sombor, Apatin		114832		**1.6**
16. Srem. Mitrovica – city	37751	79940	2.12	1.11
Sremska Mitrovica, Šid		114128		**1.59**
17. Loznica – city	19212	79327	4.13	1.1
Krupanj, Mali Zvornik		109104		**1.52**
18. Smederevo – city	64175	108209	1.69	**1.51**
19. Jagodina - city	37282	71852	1.93	0.99
Rekovac, Svilajnac		106458		**1.48**
20. Valjevo – city	58932	90312	1.53	1.26
Valjevo, Mionica		104647		**1.46**
21. Vranje – city	55138	83524	1.51	1.16
Vranje, Vladèin Han		104395		**1.45**
22. Zajeæar - city	38165	59461	1.56	0.83
Boljevac, Knja•evac		103946		**1.45**
23. Novi Pazar – city	66527	100410	1.51	**1.4**

more than 15,000 inhabitants, and Prijepolje is very close to reach (Obradoviè 2015).

Based on official Serbian Census data from 2011, as well as additional research, it is possible to perform a hierarchy of functional urban areas in the Republic of Serbia (by ESPON methodology) as follows:

- Centers of international importance (3) - Belgrade, Novi Sad and Nis;
- Centers of national importance (20) - Kragujevac, Leskovac, Subotica, Kruševac, Kraljevo, Panèevo, Zrenjanin, U•ice, Šabac, Po•arevac, Èaèak, Sombor, SremskaMitrovica, Loznica, Smederevo, Jagodina, Valjevo, Vranje, Zajeèar and Novi Pazar;
- Centers of regional importance (19) - Kikinda, Pirot, Vršac, Bor, Ruma, Baèka Palanka, Prokuplje, Lazarevac, Obrenovac, Paraæin, Aranðelovac, Mladenovac, Smederevska-Palanka, Èuprija, Stara Pazova, Negotin, Aleksinac, Prijepolje and Bujanovac;
- Centers sub-regional importance (8) - Inðija, Gornji Milanovac, Vrbas, Beèej, Senta, Kula, Velika Plana, and Trstenik

According to the presented model, functional urban areas and the hierarchy of urban centers in the Republic of Serbia, the administrative status of only 26 cities in Serbia is not a true reflection of the situation size of urban centers and their unique operations on the surrounding area. Status of the city, as well as units of local self-government in Serbia, should have all city centers not only national, but also regional importance which FUA has more than 50,000 inhabitants, as well as eight sub-urban centers that meet both indicators at ESPON methodology, namely:

Table 2: Model of functional urban areas in the Republic of Serbia regional and sub-regional importance

Functional urban area FUA	*Population from census 2011*		*Index FUA/MUA*	*FUA participation in the population of Serbia (%)*
	MUA	*FUA*		
1. Kikinda – city	38065	59453	1.56	**0.83**
2. Pirot – city	38785	57928	1.49	**0.81**
3. Vršac – city	36040	52026	1.44	**0.72**
4. Bor	34160	48615	1.42	0.68
Bor, Majdanpek		67301		**0.94**
5. Ruma	30076	54339	1.81	**0.76**
6. Baèka Palanka	28239	55528	1.97	**0.77**
7. Prokuplje	27333	44419	1.63	0.62
Prokuplje, •itoraða		60787		**0.85**
8. Lazarevac	26006	58622	2.25	**0.82**
9. Obrenovac	25429	72524	2.85	**1.01**
10. Paraæin	25104	54242	2.16	**0.75**
11. Aranðelovac	24797	46225	1.86	0.64
Aranðelovac, Topola		68554		**0.95**
12. Mladenovac	23609	53096	2.25	**0.74**
13. Smederevska Palanka	23601	50284	2.13	**0.71**
14. Æuprija	19471	30645	1.57	0.43
Æuprija, Despotovac		53836		**0.75**
15. Stara Pazova	18602	65792	3.54	**0.92**
16. Negotin	16882	37056	2.20	0.52
Negotin, Kladovo		57691		**0.80**
17. Aleksinac	16685	51863	3.11	**0.72**
18. Prijepolje	**13330**	37059	2.78	0.52
Prijepolje, Nova Varoš		53697		**0.75**
19. Bujanovac (census 2002)	**12011**	43302	3.61	0.60
Bujanovac, Preševo (census 2002)		78206		**1.09**
20. Inðija	26025	47433	1.82	**0.66**
21. Gornji Milanovac	24216	44406	1.83	**0.62**
22. Vrbas	24112	42092	1.75	**0.58**
23. Beèej	23895	37351	1.56	**0.52**
24. Senta	18704	23316	1.25	0.32
Senta, Ada,		40307	1.56	**0.56**
25. Kula	17866	43101	1.49	**0.60**
26. Velika Plana	16088	40902	1.44	**0.57**
27. Trstenik	15282	42966	1.42	**0.60**

- Sixteen centers of regional importance - Bor, Ruma, Baèka Palanka, Prokuplje, Lazarevac, Obrenovac, Paraæin, Aronðelovac, Mladenovac, Smederevska Palanka, Èuprija, Stara Pazova, Negotin, Aleksinac, Bujanovac and Prijepolje;
- Eight centers of sub-regional importance - Inðija, Gornji Milanovac, Vrbas, Beèej, Senta, Kula, Velika Plana and Trstenik

Fulfilling both criteria by ESPON methodology, 16 centers of regional importance and 8 centers of sub-regional importance, deserve and should be given the administrative status of the city as a territorial local government in Serbia. This has, in addition to the 26 cities, the number of administrative cities in the Republic of Serbia (excluding Kosovo), almost doubled and reached number 50. Each of these 50 cities has a statutory right to establish on its territory two or more urban municipalities, which significantly contributes to the quality development of territorial local governments in Serbia and form the basis of decentralization and balanced development of all its parts. In accordance with importance of the cities for equal state development, special subventions of Republic of Serbia have to improve development of major cities of national and regional significant. In Serbia, the relationship competences are not sufficiently clarified, rights and responsibilities between the city and the municipality, which creates a huge disproportion in the level of development between municipalities and thus to an enormous delay in activating territorial capital at the regional or city

level (Winkler 2012). On the other hand, a system in which cities and municipalities are dependent on the central decision-making and budgeting have major limitations when deciding on development and development projects. It is therefore very important question of the role and responsibilities of the city in the spatial development of the region (areas) in the context of decentralization of Republic of Serbia.

CONCLUSION

Cities are drivers of development and the backbone of the entire territory of the Republic of Serbia, and their functional urban area of influence is the basis of decentralization and regional development of its parts. On the basis of concrete indicators ESPON methodology 50 urban centers in Serbia has its own functional urban area of more than 0.50 percent of the national population, and two (Prijepolje and Bujanovac) have morphologically urban area of less than 15,000 inhabitants, but they are very close to form it. Therefore, the administrative status of only 26 cities did not reflect the true size of the state of national and regional centers in Serbia and their unique operations on the surrounding area. Status of the city, as well as units of local self-government in the Republic of Serbia shall have all city centers not only national, but also regional importance which FUA has more than 50,000 residents. Also, the administrative status of the city and all deserve sub regional urban centers in Serbia, which fulfill both indicators at ESPON methodology, and they are, for now, a total of eight. The current division of the Republic of Serbia on the administrative districts does not match the geographic and demographic conditions, and the functional urban areas are much better basis for the division of the territory of Serbia at NUTS regions, as determined by complex economic, demographic and spatial analysis and give a correct idea of the spatial relationships of cities in narrower or wider region. The complex research of functional urban areas in Serbia has not been implemented completely so far.

RECOMMENDATIONS

The results of these analyses can be used for further research correctness of territorial division at the regional level. In fact, they form the basis of the selection nodal centers (practical capitals authorities), which should take over the function of the poles of development of wider areas. Inadequate hierarchy of the cities can cause social problems. Still, there is the need to explore the possibilities of establishing new centers in relation to the areas that are most distant from the existing regional centers. By ESPON definition FUA consists of the urban center and its environment which makes the area commuting between place of residence and place of work. A more detailed analysis of these migrations, as the dominant criteria for the analysis, gained a real insight into the current workforce and with a few additional criteria adapted to modern conditions of transition to get a realistic picture of functional urban areas in Serbia. Establishing new regional centers in peripheral areas of the country would require leveling disproportions in terms of availability and density of the network of settlements in this part of the country, but would also contribute to reducing the disproportion between the development of perspective and "critical" of the region.

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