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Suburbanization and sprawl in post-socialist Belgrade and Sofia

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ABSTRACT

The goal of this research is to examine the processes of suburbanization and sprawl in two post-socialist capital cities in Southeast Europe – Belgrade, Serbia and Sofia, Bulgaria. Our analysis begins with a survey of relevant historical developments in the two cities, which illustrates the impact of major political, economic and social drivers on urban development processes and form. We follow this with an empirical study aimed at identifying contemporary features of peri-urban processes occurring in the two cities. Specifically, we explore spatial patterns, general population trends and changes in urban densities. Our study confirms earlier observations by other researchers that processes of suburbanization are occurring in Belgrade and Sofia. Yet this research goes further and emphasizes the specific combination of conditions inherited from the era of state socialism and the features of South-east European urban culture. Thus regarding the form of urban expansion, we observe relatively weak trends of sprawl with strong local specifics. On this basis, we discuss our empirical results with the objective of identifying the specifics of studied processes in Belgrade and Sofia as a grounds for the articulation of an appropriate policy framework.

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1. Introduction

Suburbanization and sprawl are urban trends that are observed around the world. Yet, there are substantial differences in their characteristics in diverse regions across the globe. In this paper, we are interested in comparisons of these phenomena at the European level. Although the features of suburbanization and sprawl vary greatly even across the European continent, they are most clearly articulated and studied in the many, growing Western and Northern European cities (Hall & Hay, 1980; Leontidou, Afouxenidis, Kourliouros, & Marmaras, 2007; Oueslati, Alvanides, & Garrod, 2015; Reckien & Karecha, 2007). Researchers began to observe accelerated processes of suburbanization and sprawl in Central Europe and the Baltic states after the political changes that occurred in the early 1990s (e.g. Kok & Kovács, 1999; Tammaru, Kulu, & Kask, 2004; Timár &

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Váradi, 2001). Since then, these processes have been studied in these countries extensively. In Southeast Europe (SEE), substantial changes in peri-urban development were not observed until at least a decade later; however, respective studies in this part of the continent have been less plentiful and the features of suburbanization and sprawl require further investigation.

In this paper, we examine peri-urban processes in two post-socialist capital cities in SEE – Belgrade, Serbia and Sofia, Bulgaria through the period of transition, spanning the past two and a half decades. We explore the impacts of inherited conditions from the era of state socialism and the effects of the socio-economic changes of the transition on suburban form and trends. Our goal is to identify whether and to what extent these trends can be identified as suburbanization and sprawl and what the local specifics may be. Furthermore, we suggest some of the implications our findings may have on relevant urban policies.

We start with a brief literature review that identifies the widely accepted key characteristics of suburbanization and sprawl and their relationship to important socio-economic indicators. Next, we review the regional characteristics of trends in the suburbs of different European cities. In the third section, we survey historical developments in our case studies following World War II so as to correlate the impact of major political and socio-economic developments on urban form and trends. In the next sections, we define our methodology of analysis, followed by an empirical study aimed at identifying the key features of peri-urban processes over the course of the past two decades. Finally, we discuss our empirical results with the objective of identifying the specifics of studied processes in Belgrade and Sofia as a grounds for the articulation of an appropriate policy framework.

2. Characteristics and indicators of suburbanisation and sprawl

2.1. Characteristics, factors and drivers of suburbanization and sprawl

Suburbanization and sprawl are complex phenomena. Researchers use these terms to denote patterns of urban development, processes of extending the reach of urbanized areas, the causes of particular practices of land use, and the consequences of those practices (Galster et al., 2001, p. 681). For the purposes of this research, ‘suburbanization’ means any growth of urbanized land and/or urban function into peripheral areas. By ‘sprawl,’ we mean a specific type of urban expansion that is characterized by low or decreasing densities and dispersed suburban patterns. Couch, Leontidou, and Petschel-Held (2007, p. 4) compare sprawl to the changing form of a conical sandcastle. Over time, ‘the height of the peak of the centre of the cone is less, the angle of slope is reduced and the circumference is enlarged’. It can be surmised, that some of the key features of sprawl are: low/decreasing overall and suburban densities; dispersed, leapfrogging or ribbon suburban forms; population de-concentration; poor mix of uses, lack of well-defined service centres; high rates of automobile dependence; social segregation (Brueckner, 2000; Galster et al., 2001; Ewing, Pendall, & Chen, 2002; Chin, 2002; Song & Knaap, 2004; EEA, 2006; Couch et al., 2007; Reckien & Karecha, 2007, Huang, Lu, and Sellers (2007), Jaeger and Schwick (2014), Oueslati et al. (2015).

Suburbanization and sprawl take on many different forms due to the numerous and complex factors that generate, drive and shape (sub)urban growth and expansion in

different contexts. For instance, in developed countries, suburbanization and sprawl are most often generated by intra-urban migration, a type of suburbanization generated by 'the flight' of middle and upper-class citizens from central to suburban areas in pursuit of higher standards of living (Fielding, 1989; Fishman, 1987). The resulting patterns exhibit explicitly the key features of sprawl: low densities and discontinuous or dispersed forms (Ewing et al., 2002; Galster et al., 2001). In contrast, suburbanization in developing or transitional societies, such as countries in SEE, is often fuelled by rural-to-urban migration of poor, rural strata, who move to the big cities in search of livelihood (Leontidou et al., 2007). These rural-to-urban migrants often settle on the urban fringe because of lower land prices (Korcelli, 1990). The resulting densities are generally higher than those caused by intra-urban migration and development patterns are less dispersed, although still discontinuous. Socialist urbanization in the 1960s, 1970s and 1980s resulted in the growth of yet another kind of suburbs, the 'socialist suburbs'. Because of the strict planning methods employed in developing these housing estates and the intention of communist governments to provide housing for the masses at the lowest price possible, they are characterized by compact spatial patterns and arguably, some of the highest suburban densities.

The specific features of suburbanization and sprawl are directly related to the causes and drivers that engender and sustain these processes. The EEA (2006) identifies seven groups of drivers: macro- and micro-economic and demographic factors, housing preferences, inner-city problems, transportation and regulatory frameworks. Some of the most cited drivers are: population growth (Chin, 2002), increased incomes and purchasing power (Dieleman & Wegener, 2004), housing preferences (Audirac, Shermeyen, & Smith, 1990), high rates of car ownership, and the development of transportation and road networks (EEA, 2006; Christiansen & Loftsgarden, 2011).

Another important consideration for our study is that suburbanization and sprawl can be understood as the initial phases in a greater cycle of urban enlargement (Fee & Hartley, 2011). In the first phase of a cycle, suburban areas are subject to low-density growth (i.e. sprawl), but if the city continues to grow in this direction, the next phases result in increasingly denser urban fabric. Hence, observable suburban patterns and densities can only partially be determined by the type of expansion – they are also contingent on the phase of urban growth.

2.2. Indicators for the study suburbanization and sprawl

Based on the research correlations of 26 variables, Schwarz (2010) concludes that 'the minimal set of indicators for urban form consists of seven indicators: the area of the discontinuous urban fabric, edge density, mean patch size, number of patches, compactness index of the largest patch, population number, population density.' Oueslati et al. (2015) focus on the spatial characteristics of sprawl, as do Jaeger, Bertiller, Schwick, and Kienast (2010), Jaeger and Schwick (2014), Soukup et al. (2015), and Nedović-Budić, Knaap, Sharmyan, Williams, and Slaev (2016). Table 1 outlines nine of the most often used indicators of sprawl. However, different studies designate different meanings to the same indicators, or they measure them in different ways. For instance, by urbanized territory (UA), some studies mean the total sealed area, while others consider only residential and industrial land. Furthermore, different research establishes different criteria for

Table 1. Most often used indicators of sprawl and 10 studies that employ these indicators.

	Galster et al. (2001)	Ewing et al. (2002)	Song and Knaap (2004)	Kasanko et al. (2006)	Reckien and Karecha (2007)	Huang et al. (2007)	Schwarz (2010)	Jaeger and Schwick (2014)	Inostroza, Baur, and Csaplovics (2013)	Oueslati et al. (2015)
<i>Spatial features</i>										
Urbanized (or residential) area				X	X		X	X	X	X
Centrality, Concentration	X	X			X	X	X	X		X*
Compactness/ Fragmentation	X		X	X		X	X	X	X	X
Complexity of urban form						X	X	X	X	
Accessibility, Connectivity		X	X				X			X*
Porosity						X	X		X	
<i>Demographic, social and functional features</i>										
Density	X	X	X	X	X	X	X	X	X	X
Social structure, incomes					X		X			X*
Mix of uses	X	X	X				X			

Note: X – used as an indicator/ measure; X* – used as an explanatory variable.

green areas to be included in the UA. Density is measured by several different dimensions: population density, residential density, built-up density, etc. Compactness is used to measure the complexity of the form of an urban patch (regularity or raggedness), but also the dispersion of patches.

2.3. Regional characteristics of suburbanization and sprawl in Europe

The features which characterize suburbanization and sprawl vary not only between continents – e.g. between Europe and North America (Buehler & Pucher, 2012; Nivola, 1998), but also between regions within Europe. Regional differences in urban densities and tendencies towards centralization and dispersion can often be attributed to local traditions and urban cultures. Hall and Hay (1980) examine the ‘tendency towards decentralization’ in cities of different European regions. They observe that the trend towards decentralization in Northern/Western Europe is ‘completely contradicted by a strong tendency towards centralization still being the norm’ in many South European cities. Reckien and Karecha (2007) analyse ‘change in the percentage of the conurbation population living in the core city’ in 45 representative European cities in the period 1991–2001. They call any negative change of this measure ‘sprawl’. Reckien and Karecha use the classification of Hall and Hay, but add a new region of post-communist countries to the study. In the analysed period, they find the trends of urban growth and sprawl in most European regions to be quite similar, even parallel with somewhat higher rates of dispersion in some of the post-communist countries (Czech Republic, Slovakia, Hungary, Slovenia and Poland). Whereas only five of the 12 studied post-communist conurbations had grown in population, all except for Poland had sprawled. In an extensive research project, Schwarz (2010) explores 176 cities in all European regions with respect to total population, discontinuous areas, number, mean size and compactness of urban patches, and population densities. She identifies eight clusters of European cities (types of urban forms) and finds that most clusters appear in almost all parts of the continent. However, Schwarz discovers that cities with large discontinuous areas appear almost exclusively in Western and Northern Europe, whereas monocentric cities with very high population densities are more typical in Southern Europe. Other researchers have found that in many cities in Southern Europe, some of the characteristic features of sprawl (e.g. low densities, weak city centres, and high level of dispersion) are missing or blurred (Munoz, 2003; Salvati, Sateriano, & Bajocco, 2013).

Obviously, European cities exhibit a considerable variety of forms with regard to densities, dispersion and irregularity of (sub)urban patterns. The differences which manifest between Northern/Western and Southern Europe are among the most evident. Nevertheless, there is variety among South European cities as well. Tombolini et al. (2015) examine the urban forms of three Mediterranean cities – Barcelona, Rome and Athens and find that the cities are similar in their high densities, but the more dispersed patterns in Rome contrast the polycentric structure of Barcelona and compact forms of Athens. Leontidou et al. (2007) observe that suburban forms in Greater Athens and the Prefecture of Attica are sprawl-like in that they are usually strung out, ribbon-like and, in some cases, ‘leap-frogging’, but they are still more compact and denser than most of the suburbs in other European regions.

The study of Leontidou et al. is of particular interest to this research because the work analyses urban sprawl in our geographic region of focus. To explain the features of sprawl

in Greater Athens, the authors describe specific qualities of local urban culture and the tradition of *astyphilia* (friendliness towards the city) in Mediterranean cities. This 'Mediterranean' demeanour contrasts the 'anti-urbanism, which developed after the industrial revolution in Northern Europe and Anglo-American cultures in particular' (p.73). Leontidou et al. (p. 74) observe that

for historical reasons [related to] socio-economic development, rurality in a great part of Mediterranean Europe has been synonymous with economic backwardness, migration, poverty and insecurity; whereas urbanity, on the contrary, has been synonymous with economic prosperity, better job opportunities and social amenities or infrastructure linked to a higher quality of life.

Because of local perceptions of urbanity, central city areas are still preferred by the majority of the urban population in this region, including higher class residents. Migrants from rural areas who flock to the city must typically settle on the urban fringe, where land prices are cheaper. In addition to this, Leontidou et al. emphasizes the role of the condition of road infrastructure in the process of rural-to-urban suburbanization, which characterizes suburbanization in Attica and most Mediterranean countries. The research confirmed the link between suburbanization and road infrastructure, both of which significantly increased in Greece during EU accession and especially when Athens won its bid to host the 2004 Olympics.

In Western countries, a lack of infrastructure has not typically limited suburbanization. This is because intra-urban suburbanization is usually led by private developers with funding capacity who can bear the burden of the cost of development of infrastructure networks. Furthermore, the cost of infrastructure can to some extent be passed onto wealthier, intra-urban migrants. The situation with rural-to-urban migration is quite different. Historically, rural-to-urban suburbanization is characterized by small-scale developments led by the migrants themselves, who cannot afford to pay for infrastructure. Thus, the poor development of infrastructure networks around many South-European cities has contributed towards the development of denser and more compact suburban settlements. With the development of road networks for the 2004 Olympics, the trend of sprawl in Attica became much stronger and more evident. Yet even with a stronger trend towards sprawl, the dominance of the centre of most Mediterranean cities, including Greater Athens and the prefecture of Attica remains (Tombolini et al., 2015), due to the power of *astyphilia*.

3. Historical and socio-economic context of the current urban/suburban trends in Sofia and Belgrade

3.1. Expansion and suburbanization trends in the socialist period

Sofia and Belgrade are particularly salient case studies for urban growth and expansion in SEE, as both cities have experienced substantial and sustained growth through the twentieth and into the twenty-first centuries. Both cities experienced considerable industrial development both before and between the two world wars, which in turn brought about rapid population growth in this period. Urbanization processes hastened in the post-war period of recovery, a trend which is consistent with the rest of Europe. Yet, rates of urbanization were generally higher in the communist countries than in the

capitalist countries of Western Europe. This is due to the policies of ‘accelerated socialist industrialization’ led by the communist governments. These policies had a major impact on the dynamics of urban development and the evolution of urban culture and residential preferences.

First and foremost, socialist industrialization policies resulted in unprecedented urban growth. Between 1946 and 1992, Sofia grew from 435,000 to 1,190,000 residents (NSI, 2009, 2012); between 1948 and 1991, Belgrade grew from 634,000 to 1,602,000 (SORS, 2014). These trends were fuelled by the migration of rural migrants who were accommodated in the new, state-led developments located on the urban periphery.

This massive urban expansion was coordinated by the municipal authorities presiding over urban development and facilitated with new prefabricated construction technologies (Daskalova & Slaev, 2015, p. 43). Unlike the sprawling suburbs in Western metropolises, the ‘socialist suburbs’ were planned with clear-cut boundaries and high residential densities (Bertaud, 2004a). One reason that new housing developments were located in the urban periphery was that it was the only way to accommodate the large-scale socialist construction enterprises that needed vast, open areas to build prefabricated high-rise housing estates. While investment was pouring into the city periphery, central and traditional urban areas were neglected. What remained in many such areas was old, small and sometimes shabby housing. By the end of the socialist era, central areas in both Belgrade and Sofia were desperately in need of renovation and modernization. The similarities in urban form between the two cities during this era are evidenced by the similar development patterns shown in Figures 1 and 2.

While the political landscapes in Bulgaria and Yugoslavia resulted in some overarching parallels in their development, there are certain differences in the peri-urban developments of their capital cities. These can be attributed to the subtle differences between the two communist regimes at the time. In Sofia, the Mladost and Lyulin housing estates closely resembled the prototypical Soviet bloc estates, which were often plagued by poor building construction and environmental quality. The more open and liberal system of Tito’s Yugoslavia produced a greater variety of housing forms: from higher quality mass housing (e.g. Cerak Vinogradi and Bežanijska kosa) to large areas of unauthorized housing that was ‘tacitly tolerated by the communist/socialist regime’ (Zeković, Vujošević, & Maričić, 2015, p. 69). Thus, the periphery of Belgrade was characterized partly by well-planned urban forms and partly by scattered, ‘leap-frogging’ agglomerations of illegal settlements. This is unlike the homogeneity in Sofia’s urban periphery, which rendered illegal settlements rarer and ultimately resulted in uniformly poor-quality socialist blocks.

The industrialization policies during socialism had an effect not only on spatial forms and features of peripheral development but also on local urban cultures and residential preferences. Industrialization and mass urbanization, despite all the associated negatives, rendered cities in the SEE countries much more attractive than villages in the countryside during socialism. Thus, although the conditions driving people to cities were very different from those drivers observed by Leontidou et al. (2007) in Greater Athens and the Prefecture of Attica, the result, a sort of *astyphilia*, was actually very much the same. Socialist cities were a destination, as they presented job opportunities and services that the system of centralized planning did not deliver in villages. Villages became unpopular because of the constant shortage of goods and services. The prefabricated housing estates

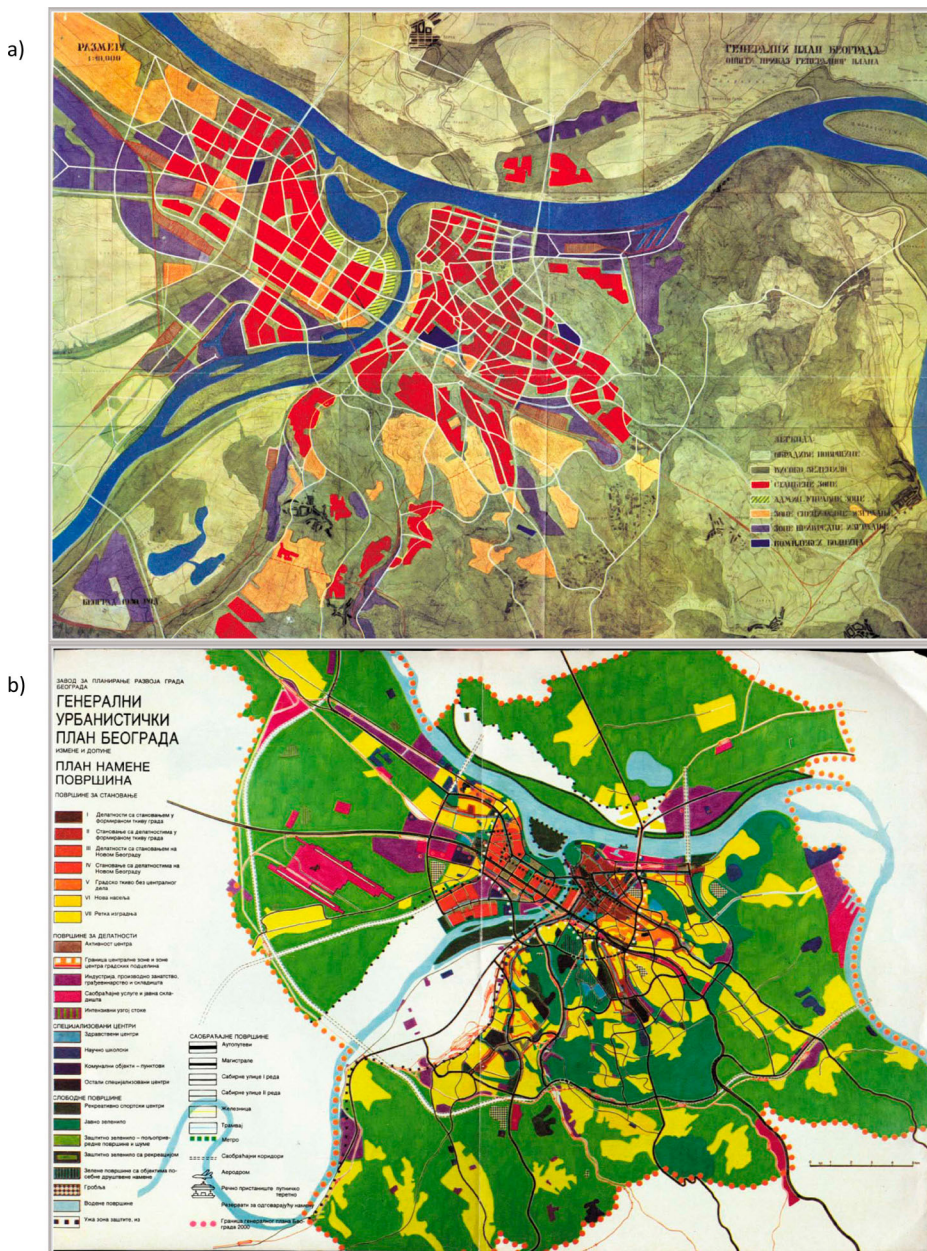


Figure 1. General urban plans of Belgrade from a) 1950 and b) 1972. Source: Urbanistički zavod Beograda, http://www.urbel.com/default.aspx?ID=uzb_bg_planovi.

located in the urban periphery were quite unpopular as well, because of the perception of poor quality construction. Central urban areas were the dream of urban residents but good quality housing in these sought-after areas was quite limited. Relatively few citizens of the capital were lucky enough to have access to the limited number of newly built housing units in the core urban areas.

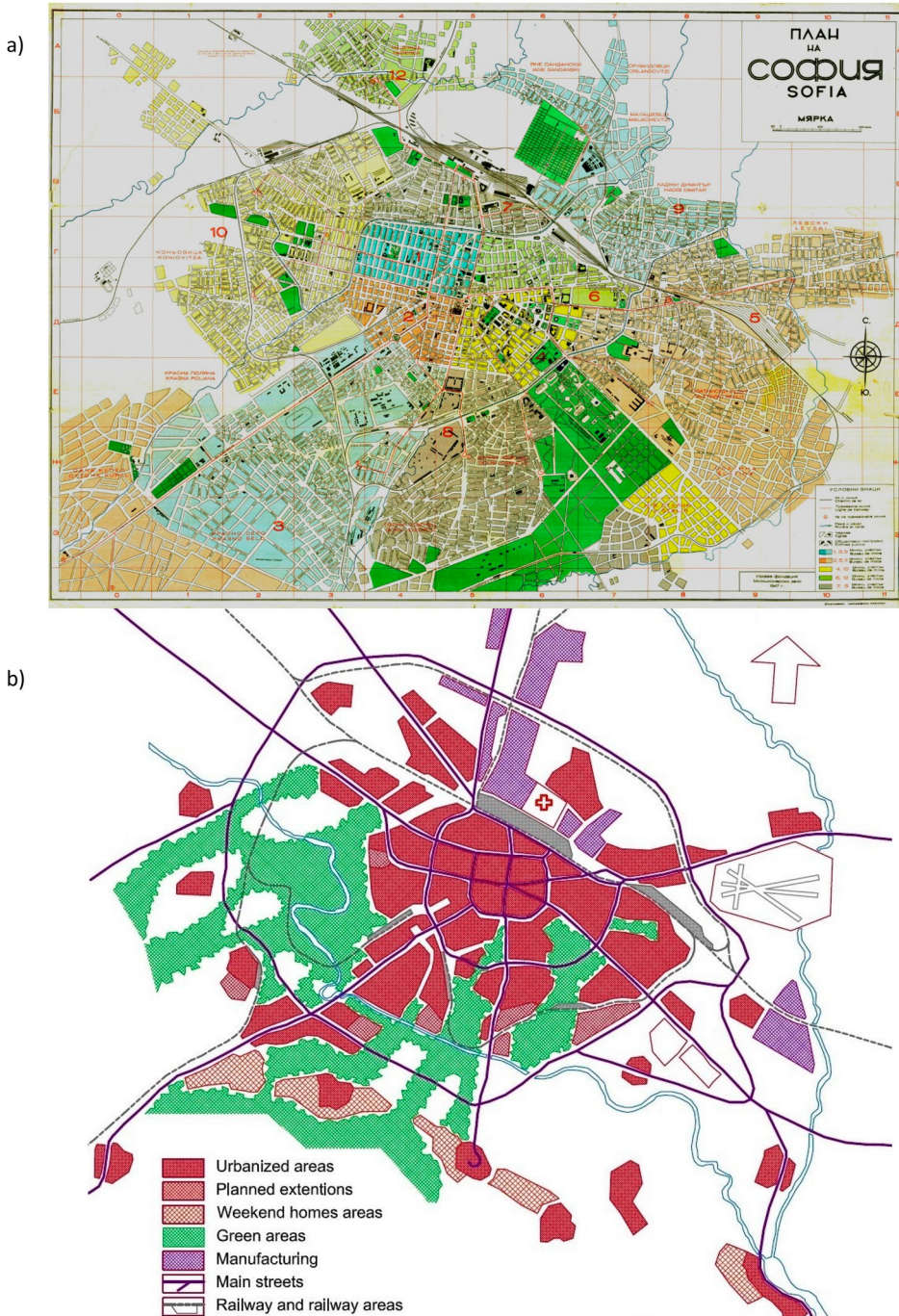


Figure 2. a) Map of Sofia 1947* and b) scheme** of the general urban plan of 1961. Sources: *Anamneza/ Historical journal, <http://www.anamnesis.info> and ** Hirt (2007b)/ National Library of Bulgaria.

The state of infrastructure and particularly road networks was another important factor influencing peri-urban trends in Bulgaria and Serbia during socialism. Perhaps on account of the 'bold' political aspirations to catch up to the Western economies, governments of

the two countries invested disproportionately into state industries rather than infrastructure. Throughout the socialist period, SEE states were (and continue to be) among the countries with least developed road networks in all of Europe. The effects of poorly developed road networks on the development of the urban regions of Sofia and Belgrade have been quite similar to those observed in Athens, especially since the growth of all three cities has been fuelled primarily by rural-to-urban migration.

3.2. The context of suburbanization and sprawl in the transition period

During the transition period (i.e. since 1990) several important factors determined the intensity and other specifics of suburbanization and sprawl in Belgrade and Sofia. First is the built-up environment inherited from the socialist period: the existing housing stock and the development of infrastructure. At the start of the transition, nearly 45% of Sofia's housing stock (NSI, 2009) was made up by prefabricated housing in the 'socialist suburbs', whereas large central areas were in urgent need of redevelopment. In Belgrade, at the beginning of the 1990s, the collective housing sector comprised 73% of its total new housing (Grubovic, 2006). Meanwhile, the state monopoly on urban development was being replaced by market mechanisms and private initiative (Nedović-Budić & Cavrić, 2006; Nedović-Budić, Zeković, & Vujosević, 2012; Slaev, 2016, 2017; Slaev & Kovachev, 2014; Zeković et al., 2015). The large-scale construction enterprises for prefabricated housing, which were instrumental during the socialist era, were no longer practical for development in the city centre, where demand was driving property development. These behemoth enterprises were quickly dissolved and replaced by smaller, traditional construction companies that were much better suited to develop high-rise, multifamily buildings on small plots in dense urban areas.

Another determining element in the built environment has been the road infrastructure inherited from the socialist era. In 2000, the road density in Bulgaria was 17.2 km/100 sq. km and 50.48 in Serbia. In Western countries, these figures are much higher; 180.4 in France, 314 in the Netherlands, 159.2 in Italy and 180.3 in Germany (Knoema, 2018). The poor road networks in the capital regions of Bulgaria and Serbia effectively disincentivised peripheral housing development. Central city areas with well-developed road networks were far more attractive for development than suburban and remote areas, which were lacking road infrastructure.

Another important trait, which was inherited from the more distant past and strengthened during socialism, has been the urban culture, or the tendency towards *astyphilia*, and the associated housing preferences. The preferences for urban living in Sofia and Belgrade, when combined with the elements of the built environment, have cemented the trend of development in central areas. Even today, the strong preferences for central city living prevail, although some suburban areas have also become very popular.

A third, critical factor that has influenced urban growth and expansion has been the sudden and drastic economic transformation experienced in this region. After 1990, the transition from highly centralized socialist economies to democratic market societies proved to be particularly difficult in SEE countries. The economic processes that accompanied the transition caused a 'drop of almost all macroeconomic indicators' (Zeković et al., 2015) in both countries. In the 1990s, Bulgaria's economy faced major challenges. The banking system collapsed almost entirely and the country went through a

period of hyperinflation. In 1997, a currency board was established, but it was not before the next decade that trends of economic recovery were observed. Hyperinflation was even greater in Serbia through the 1990s and the country was also severely afflicted by regional war and international isolation. Thus, Serbia suffered an even deeper crisis in this decade of 'blocked transition' (Hirt, 2008).

Still, despite all economic difficulties, the two capitals maintained substantial competitive advantages compared to provincial cities and towns (see Buckwalter, 1995, on Sofia and for comparison – Kovács, 1994, on Budapest) and were relatively successful in attracting national and foreign capitals. This in turn attracted numerous migrants from the countryside – generally people who had lost their jobs in the former socialist enterprises and were seeking employment. Hence, even in the period of transition, population trends in the two cities were characterized by strong rural-to-urban migration. As a result, the population of Belgrade grew from 1,374,547 to 1,427,721 between 1991 and 2011 and that of Sofia from 1,190,135 to 1,291,591 between 1992 and 2011. Both cities needed new housing to accommodate this population growth.

In the course of these immense socio-economic changes, some social groups were able to greatly improve their living standards and gain access to higher-class, even luxury lifestyles (Hirt, 2007a, 2008). The emerging upper class, with their higher incomes and aspirations to express individual preferences and status, began to build their homes in suburban areas, resembling spatial typologies typically found in Western and developed countries (Hirt, 2007a). However, due in part to the well-established urban culture and strong preferences for central city living, demand for housing in the traditional, compact city was sustained. Thus, while some of the city's better-off residents became attracted to the idea of suburban living, others maintained their preference for high-quality new housing in the city.

Contemporary market trends tend to corroborate these observations. For the past two decades, the highest rates of development in Sofia and Belgrade have indeed been in the compact city and in a few, particular suburban territories. In Sofia, 56.72% of the newly built housing units were in the compact city areas and 42.14% in the popular suburban areas to the south of the city in the period 2002–2011. In Belgrade, in 2015, the intensity of new housing construction (newly built units per 1000 residents) was 4.7 in the central districts and 0.7–1.0 in suburban areas. On the other hand, many people of lower socio-economic status were driven towards cheaper property values in some peri-urban areas (Daskalova & Slaev, 2015; Petrić & Bajić, 2015). In Belgrade, unauthorized, spontaneous housing continues to play a substantial role in shaping the urban periphery. Unauthorized construction was accelerated especially by the large numbers of disenfranchised people seeking refuge during the Yugoslav wars. This trend was enabled by an 'alliance between the illegal actors and politicians who tolerate[d] it to secure, among other things, electoral votes', as well as by 'reactivated solidarity micro-networks found in the grey zone of urban development in Belgrade, motivated by necessity' (Vujović & Petrović, 2007, p. 379). These economic and social trends influenced and continue to influence the development of the compact city and the urban periphery, which offered new opportunities both to the city's better off residents and to poorer migrants.

Finally, we should mention the policies enacted to manage urban growth in the two capitals. In the early 1990s, the years directly following the transition, any and all planning initiatives were viewed with disdain; as an archaic part of the former system of communist

rule, especially in Sofia (Anderson, Hirt, & Slaev, 2012; Nedović-Budić et al., 2012; Slaev & Kovachev, 2014). Public attitudes soon changed and with the turn of the century, both city governments adopted new master plans. Respectively, Belgrade's plan was prepared and adopted in 2000/2003 and Sofia's plan was prepared and adopted in 2001/2007. Neither of the plans demarcated sprawl as a threat to the city. In fact, both plans promoted low-density urban expansion. In Belgrade, expansion was considered necessary to balance the so called 'over-domination' of the centre. Similar justifications were made in Sofia, in addition to the argument for low-density expansion for 'higher-category' housing for the 'new middle class'.

4. Empirical research

4.1. Thesis of the paper

Our first goal in this paper is to identify whether processes of suburbanization and sprawl are present in the conurbations of Belgrade and Sofia. Our study thus far confirms a trend towards suburbanization and sprawl, if only on account of the considerable in-migration flows to each city and intra-city migration, resulting from the improvement of living standards among certain social strata. We posit that the specific features of suburban development stem from important local factors, e.g. cultural attitudes such as preferences for urban living, the availability (or lack) of urban services and associated higher densities and compact housing forms. The existence of large, attractive territories that are ready for (re)development in the compact cities as well as the shortage of suburban roads are other key factors. Because of these factors, we would expect continued trends of development both in the urban core and in suburban areas, granted suburban developments would occur in close proximity to the compact city, in areas near existing infrastructure. We also expect that suburban development will continue to reflect the cultural preferences for higher densities and compact patterns. Ultimately, empirical research is needed to assess the magnitude of these trends and their specifics. In the next sections, we conduct such research through a detailed examination of the features of the patterns of urban growth and expansion.

4.2. Methodology

Our methodological approach to the analysis of the peri-urban trends in Sofia and Belgrade is informed by the findings of the literature review. To answer our research question we examine whether and to what extent the processes of expansion of Belgrade and Sofia display explicit features of suburbanization and sprawl. To this end, we explore the physical/spatial characteristics of urban development and the general population trends and densities. We use data from the European Environment Agency (EEA), namely Corine Land Cover (CLC) data from the EEA site and from the National Statistical Institute of Bulgaria (NSI) and the Statistical Office of the Republic of Serbia (SORS). To distinguish between the trends in central and suburban areas, we differentiate between the Urban Morphological Zone (UMZ), which we consider to be the compact city, and non-UMZ urbanized areas – that is, urbanized areas outside the UMZ, which we regard as suburban areas. For UMZ, we adopt the definition established by the European Topic Centre on

Terrestrial Environment, according to which a UMZ is a ‘set of urban areas laying less than 200 m apart’. An urban area is an area containing only the following urban classes: 1.1.1, (Continuous urban fabric) 1.1.2 (Discontinuous urban fabric) 1.2.1 (Industrial or commercial units) 1.4.1 (Green urban areas) 1.4.2 (Sport and leisure facilities) and 1.2.2 (Road and rail networks and associated land).

We further evaluate the urbanization/expansion trends in Belgrade and Sofia by employing indicators from those listed in [Table 1](#). We look primarily at the changes between indicator values at different points in time: spatial data are available from EEA for 1990, 2000, 2006 and 2012, whereas population data are available from censuses of 1991, 2002 and 2011 for Belgrade and 1992, 2001 and 2011 for Sofia. The indicators we use are:

- (1) Total number of population. The increase in the number of urban population is urban growth.
- (2) Share of the population living in the UMZ – this share is indicative of the domination of the centre of an urban structure, i.e. the ‘rate of monocentricity’ (Slaev & Nedović-Budić, 2017). A high rate of monocentricity counteracts urban sprawl. Conversely, an increase in the share of non-UMZ population indicates suburbanization.
- (3) Total urbanized area, area of the UMZ and non-UMZ patches. The growth of the total urbanized area is urban expansion; an increase of the UMZ area indicates growing monocentricity, whereas an increase in non-UMZ territory indicates suburbanization.
- (4) Number of non-UMZ (suburban) patches per km². An increase in the number of non-UMZ patches (i.e. suburban patches) is a key indication of sprawl (Oueslati et al., 2015).
- (5) Mean Suburban Patch Size (MSPS), i.e. the total non-UMZ urbanized surface divided by number of non-UMZ patches. If the MSPS is decreasing, then there is a higher dispersion of suburban patterns indicating sprawl.
- (6) Compactness index of the largest patch (CILP). $CILP = (\sqrt[2\pi]{s/\pi})/p$, where ‘s’ is the area and ‘p’ is the perimeter of the largest patch. Decreasing CILP indicates higher irregularity of urban form.
- (7) Edge density of a patch is the total length of the edge of this patch divided by its total sealed area. The Edge Density the Largest Patch (EDLP), when decreasing, indicates higher compactness and, when increasing – growing irregularity of urban form.
- (8) Mean Suburban Edge Density (MSED): the total length of the edges of all non-UMZ patches divided by their total sealed area. Higher MSED features higher dispersion or higher irregularity of suburban patches, i.e. a trend towards sprawl.
- (9) Overall and suburban population densities. Falling overall and, especially, suburban densities indicate sprawl.

4.3. Empirical findings

First, in the studied period population trends in both cities were positive, but population grew mainly in the UMZ: by 146,524 inhabitants in Belgrade’s UMZ (1991–2011) and by 93,634 in Sofia’s UMZ (1992–2011). Simultaneously, suburban (non-UMZ) population in Sofia grew by only 7822 inhabitants, whereas Belgrade’s suburban population decreased by 93,350 – [Figure 3](#).

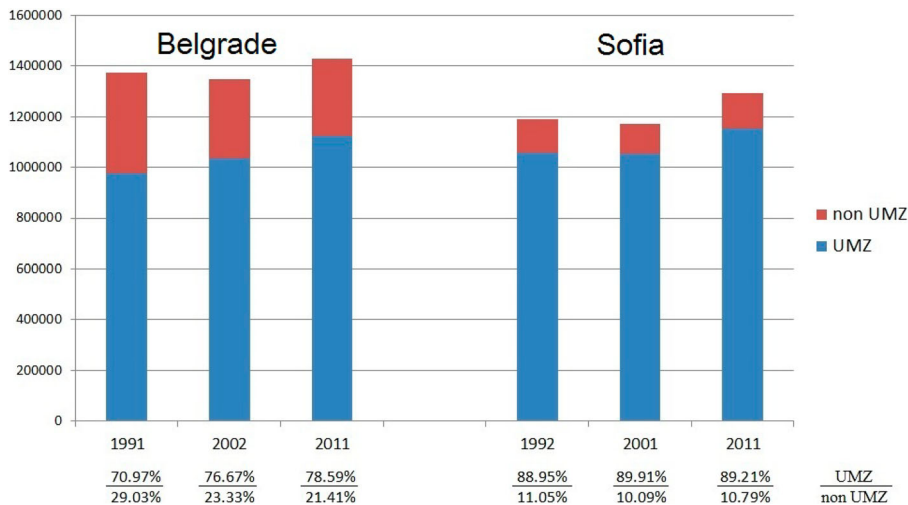


Figure 3. Changes in UMZ and non-UMZ population of Belgrade and Sofia.

Second, in the period 1990–2012, the area of the UMZ of Belgrade was enlarged by 49.83%, whereas the non-UMZ area diminished by 16.47% – as shown in Table 2. In the same period, both the area of the UMZ and the non-UMZ area of Sofia increased by 6.44% and .43%, respectively. Thus the share of the UMZ of the total urbanized area has increased in both cities.

The growth of the UMZ in both cities is depicted in Figures 4 and 5. These figures also illustrate the changes in the number of patches. In some periods, the number of UMZ patches increases (see also Table 3) as a result of the transformation of non-UMZ patches to UMZ patches. The number of suburban patches per square kilometre in the urban regions of the two cities is not dissimilar and in both cities, this number is diminishing. Also similar are the average sizes of the suburban patches.

Next, we examine the spatial features of the largest patches (LP) and suburban patches. In this regard, we observe substantial (although not major) differences between Belgrade and Sofia – as shown in Table 4. Belgrade's largest patch is obviously much more irregular than that of Sofia, as shown by the values of the Edge Density and the Compactness Index. However, it appears these differences are decreasing over time. The Mean Edge Density of the suburban patches of Belgrade is again slightly higher than that of Sofia. Yet in the period 1990–2012 this difference has grown.

Table 2. Total urbanized, UMZ and non-UMZ urbanized areas of Belgrade and Sofia.

City	Urbanized Area (UA)	1990 ha	2000 ha	2006 ha	2012 ha
Belgrade	Area of the UMZ	14762.55	18880.56	21475.96	22118.40
	Non-UMZ area	9685.41	8498.99	8032.09	8090.65
	Total Urbanized Area	24447.96	27379.55	29508.05	30209.05
	UMZ as share of the total UA	60.38%	68.96%	72.78%	73.22%
Sofia	Area of the UMZ	16362.63	16408.06	16986.58	17416.40
	Non-UMZ area	7751.32	7806.31	7717.7	7784.39
	Total Urbanized Area	24113.96	24214.37	24704.3	25200.79
	UMZ as share of the total UA	67.86%	67.76%	68.76%	69.11%

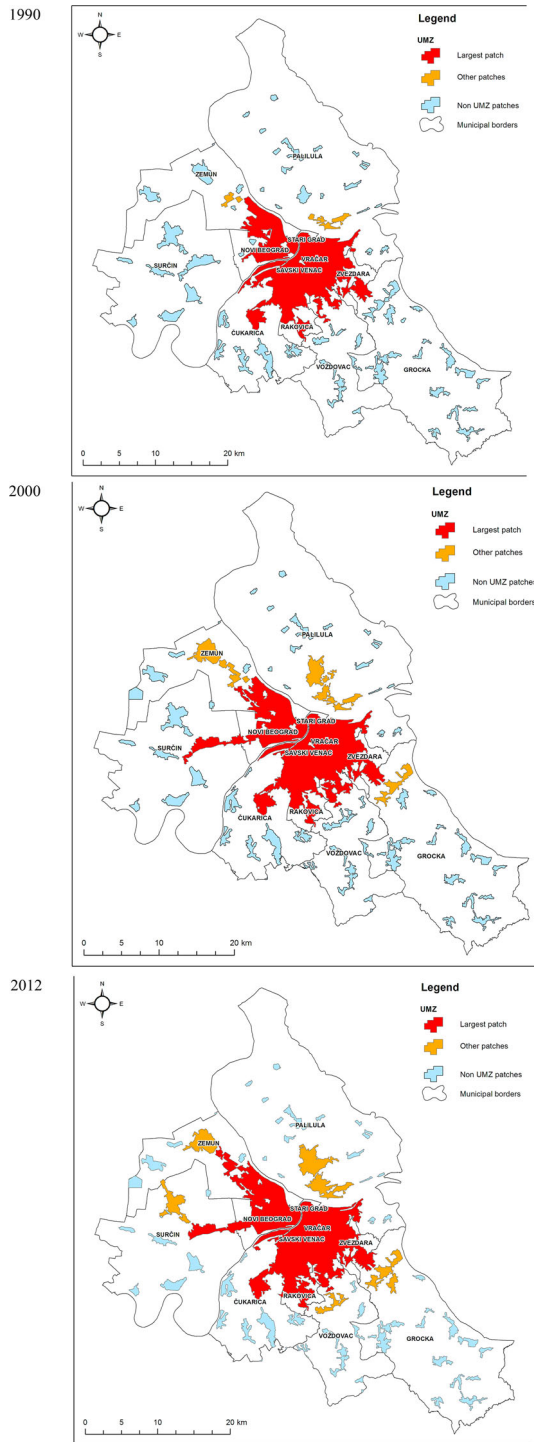


Figure 4. UMZ and non-UMZ patches of Belgrade in 1990, 2000 and 2012.

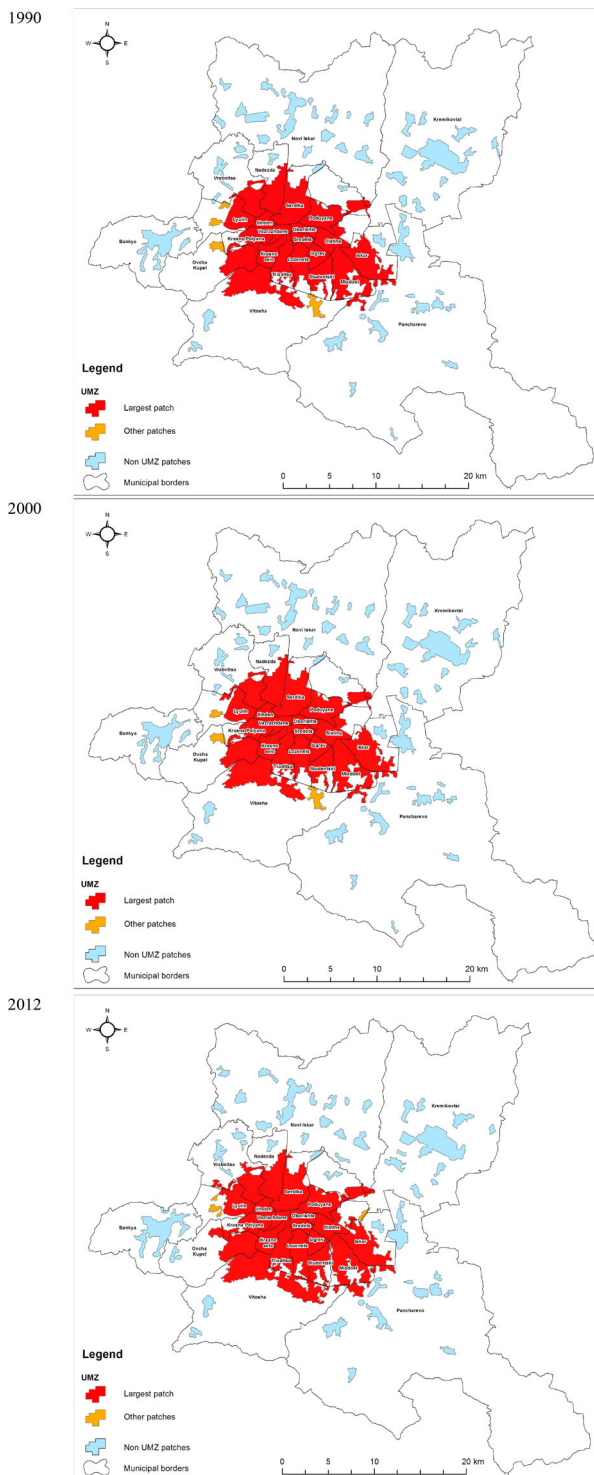


Figure 5. UMZ and non-UMZ patches of Sofia in 1990, 2000 and 2012.

Table 3. Urban (UMZ) and suburban (non-UMZ) patches.

Belgrade	Urban region 161,736.36 ha	1990	2000	2006	2012
UA of the UMZ, ha		14,763	18,881	21,476	22,118
Number of UMZ patches		4	9	8	8
Non-UMZ UA, ha		9685	8499	8032	8091
Number of non-UMZ patches		66	60	61	61
Number of non-UMZ patches per km²		0.041	0.037	0.038	0.038
Mean Size of non-UMZ patches, ha		146.75	141.65	131.67	132.63
Sofia	Urban region 133,977.00 ha	1990	2000	2006	2012
UA of the UMZ, ha		16,363	16,408	16,987	17,416
Number of UMZ patches		5	4	6	4
Non-UMZ UA, ha		7751	7806	7718	7784
Number of non-UMZ patches		57	57	54	54
Number of non-UMZ patches per km²		0.035	0.035	0.033	0.033
Mean Size of non-UMZ patches, ha		135.99	136.95	142.92	144.16

Table 4. Measures of Belgrade's and Sofia's largest patches (LP) and suburban patches.

	Belgrade	1990	2000	2006	2012
Largest Patch	Perimeter of the LP, km	255.1	291.4	302.7	303.4
	Surface area of the LP, km ²	14138	15796	16873	17311
	Edge Density of the LP, m/ha	18.04	18.45	17.94	17.53
	Compactness Index of the LP	1.65	1.53	1.52	1.54
	Suburban Patches	Sum of non-UMZ urbanized areas	9685	8499	8032
	Sum of non-UMZ edge lengths	521.1	483.5	470.7	473.7
	Mean Suburban Edge Density	53.80	56.88	58.60	58.55
	Sofia	1990	2000	2006	2012
Largest Patch	Perimeter of the LP, km	192.6	198.2	226.7	241.1
	Surface area of the LP, km ²	15877	15972	16791	17234
	Edge Density of the LP, m/ha	12.13	12.41	13.50	13.99
	Compactness Index of the LP	2.32	2.26	2.03	1.93
Suburban Patches	Sum of non-UMZ urbanized areas	7751	7806	7718	7784
	Sum of non-UMZ edge lengths	363.85	374.44	358.48	361.93
	Mean Suburban Edge Density	46.94	47.97	46.45	46.49

Figures 6 and 7 depict the changes in the patches of Sofia and Belgrade in the studied period. They illustrate the transformation of non-UMZ into UMZ patches.

Finally, Table 5 presents our findings on the densities in the UMZ and non-UMZ areas of Belgrade and Sofia. To be able to draw meaningful comparisons to values from other cities, we calculate two values – one based on what is usually meant by urbanized area, i.e. including urban green areas (CLC classes 1.4.1. and 1.4.2.) and the other one based only on urban built-up area, i.e. excluding classes 1.4.1 and 1.4.2. Whereas both capital cities are already densely populated (for comparisons see the next section), a substantial difference is that the densities in Belgrade are falling, while the densities in Sofia are growing.

4.4. Summary of findings

To investigate suburbanization and sprawl we start with trends of urban growth and expansion, that is, with the observation that both cities are growing (Belgrade – by 3.87% in the years 1991–2011 and Sofia – by 8.52% in the years 1992–2011) and expanding (in the years 1990–2012 Belgrade – by 23.56% and Sofia – by 4.51%). But furthermore, the analysis of the indicators that we have employed shows that some changes are typical of sprawl, while other changes are in fact atypical. Table 6 outlines the changes of both types.

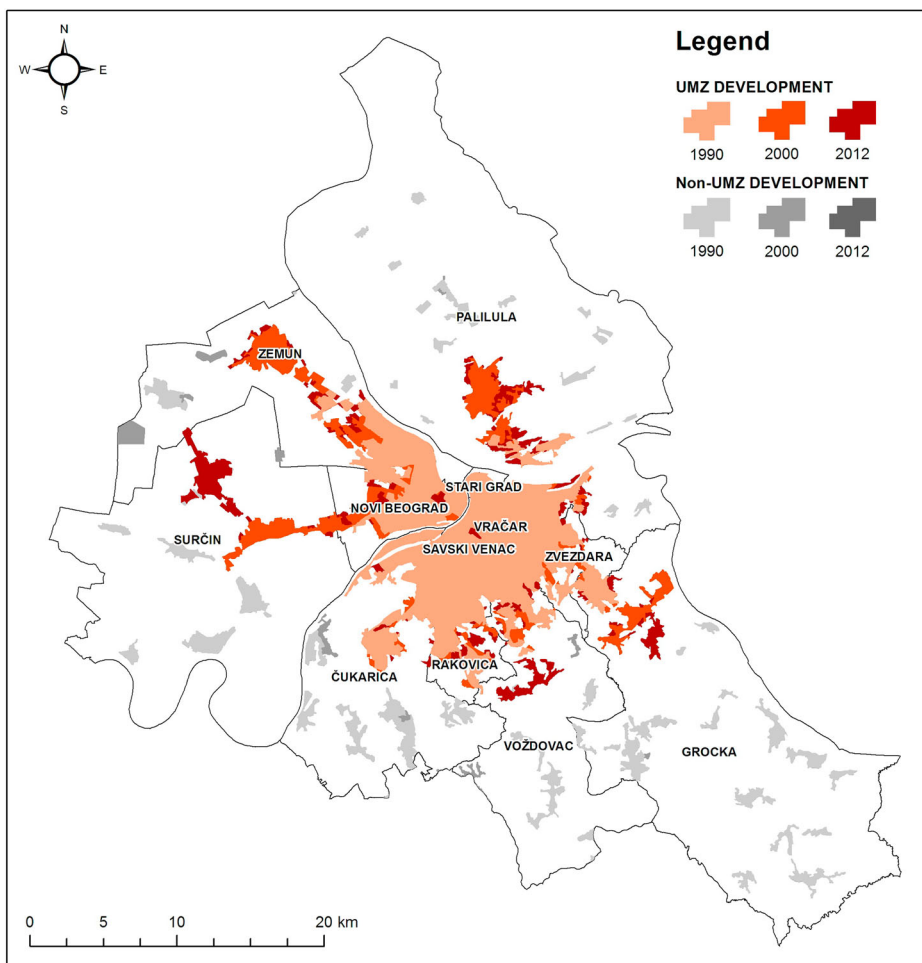


Figure 6. Changes of the patches of Belgrade, 1990–2012.

The results of the empirical study confirm the thesis that the nature of suburbanization and sprawl in Belgrade and Sofia is unique. Our observations confirm a strong trend towards suburbanization, as massive tracts of non-urban (rural) land on the urban fringe have been transformed into urban. Regarding sprawl, the results are more ambiguous. While five of the measures calculated for Belgrade indicate, or are typical of sprawl, four are atypical. In Sofia, only two of the measures are typical of sprawl and seven are atypical. In both cities, changes in spatial patterns on the urban fringe indicate trends towards increasing irregularity and proliferation (irregular growth) of urban form, indicating sprawl. A high degree of monocentricity and densities are prevalent features, atypical of sprawl.

In the studied period, the share of the population living in Belgrade's core city has increased from 70.97 to 78.59%. In Sofia, this share has also increased, from 88.95 to 89.12%. Furthermore, the UMZ has grown as a share of the UA in both cases, comprising about 70% of the UA in both cities in 2012. What is more, the increasing dominance of the core urban areas is to a certain extent at the expense of peri-urban areas, a trend which is in direct contrast to the premises that define suburbanization as growth in peri-urban areas

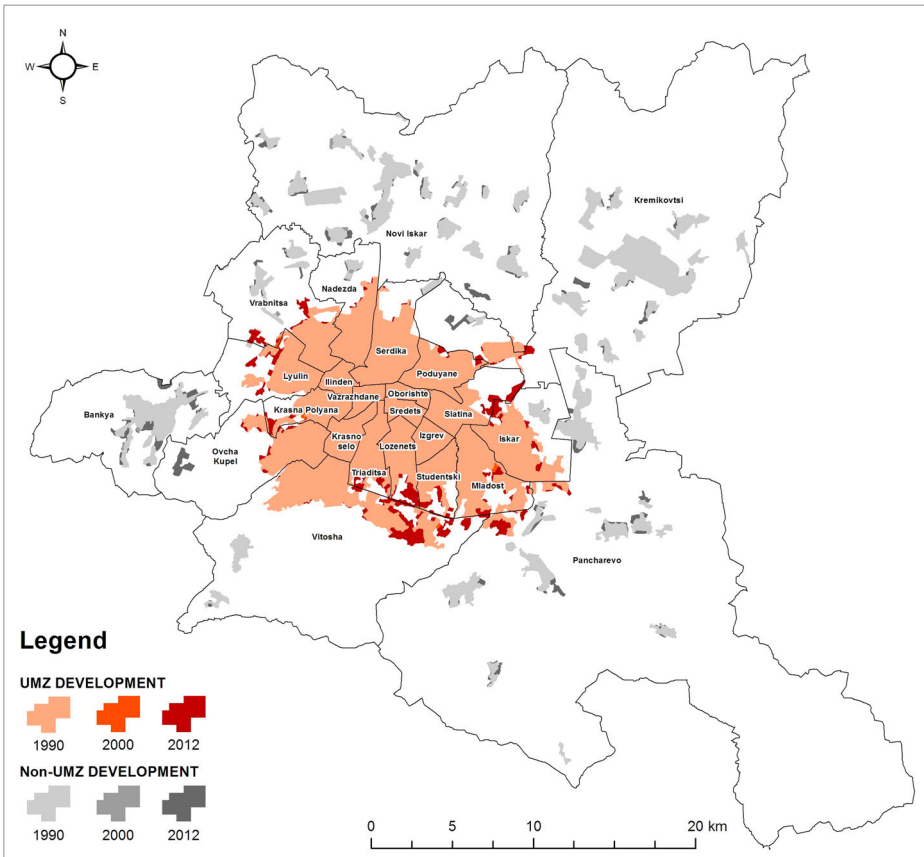


Figure 7. Changes of the patches of Sofia, 1990–2012.

at the expense of central areas. Yet, these local specifics do not necessarily negate suburbanization entirely, especially when the phenomenon is understood as a phase of urban expansion (Fee & Hartley, 2011). The point is that suburbanization is occurring in areas that are directly adjacent to the compact city and thus, the proliferation of UA leads to almost immediate enlargement of the UMZ. For instance, the intensive population flow to the popular southern suburban areas in Sofia resulted in the rapid densification of developments near the city and almost instantaneously enlarged the UMZ. In Belgrade, this trend has been even stronger. While the total UA increased by 23.5% (1990–2012), the UMZ UA grew by circa 50% and the non-UMZ UA shrank by 16.47%. The transformation of suburban patches into urban, or the growth of the compact city, can be observed in Figures 4 and 5.

We conclude the study by reviewing urban densities and must reiterate the high values in both cities at the start of the transition. In 1990, the overall *gross* density (urban green areas included) in Belgrade was 56.3 p/ha and the *net* density (green areas excluded) was 73.3, while the density of the UMZ was 65.7 *gross*/99.5 *net* p/ha. In Sofia, these values were respectively 49.5 *gross*/74.4 *net* and 64.8 *gross*/96.9 *net* p/ha for the UMZ. These figures are very high, when compared to the gross densities of London (42.3), Paris (46.6) and Amsterdam (48.8) p/ha (Kenworthy et al., 1999). The net UMZ densities may be compared

Table 5. Population densities in Belgrade and Sofia.

Belgrade	1990	2000	2012	Change 2012/1990
Urbanized area of the UMZ, ha	14763	18881	22118	149.83%
'Gross' UMZ Density (urbanized area), p/ha	65.7	54.2	51.2	77.86%
Built-up area of the UMZ, ha	9752	13958	16602	170.24%
'Net' UMZ Density (built-up area), p/ha	99.5	73.3	68.2	68.52%
Non-UMZ urbanized area, ha	9685	8499	8091	83.53%
Non-UMZ Density (UA), p/ha	42.0	38.8	37.7	89.68%
Non-UMZ built-up area, ha	9044	7845	7179	79.38%
Non-UMZ density (built-up area), p/ha	45.0	42.1	42.4	94.37%
Total urbanized area, ha	24448	27380	30209	123.56%
Overall pop. density (UA), p/ha	56.3	49.4	47.6	84.43%
Total built-up area, ha	18797	21803	23782	126.52%
Overall pop. density (built-up area), p/ha	73.3	62.1	60.4	82.46%
SOFIA	1990	2000	2012	Change 2012/1990
Urbanized area of the UMZ, ha	16363	16408	17416	106.44%
UMZ Density (urbanized area), p/ha	64.8	64.2	66.7	103.02%
Built-up area of the UMZ, ha	10941	10957	10574	96.65%
UMZ Density (built-up area)	96.9	96.1	109.9	113.45%
Non-UMZ urbanized area, ha	7751	7806	7784	100.43%
Non-UMZ Density (UA), p/ha	17.3	15.3	18.2	104.73%
Non-UMZ built-up area, ha	5104	5143	5417	106.13%
Non-UMZ density (built-up area), p/ha	26.3	23.2	26.1	99.10%
Total urbanized area, ha	24114	24214	25208	104.51%
Overall pop. density (UA), p/ha	49.5	48.4	51.7	104.44%
Total built-up area, ha	16045	16100	15992	99.66%
Overall pop. density (built-up area), p/ha	74.4	72.8	81.5	109.51%

Table 6. Assessment of the changes in Belgrade and Sofia.

	Belgrade		Sofia	
	typical of sprawl	atypical of sprawl	typical of sprawl	atypical of sprawl
1) Share of the population living in the UMZ		increase		increase
2) Total UA v/s total population	23.56% UA increase v/s 4.33% pop. increase			4.51% UA increase v/s 9.15% pop. increase
3) Total UMZ area v/s non-UMZ area		increase		increase
4) Number of suburban (non-UMZ) patches per km ² .		decrease		decrease
5) Mean suburban (non-UMZ) patch size (MSPS)	decrease			increase
6) Compactness index of the largest patch (CILP)	decrease		decrease ^a	
7) Edge density of the largest patch (EDLP)		slight decrease	some increase	
8) Mean suburban edged density (MSED)	increase			no change
9) UMZ and non-UMZ population densities	decrease in UMZ and non-UMZ densities			increase in UMZ and no change in non-UMZ densities

^aThe CILP of Sofia is decreasing but it is still higher than that of Belgrade.

to Chicago's -16 p/ha, San Francisco's -19 p/ha, Prague's -71 p/ha and Paris's -88 p/ha, as calculated by Bertaud (2004b). However, based on the findings of our analysis during the transition period, we observe that Belgrade's densities have decreased substantially; by 16/18% (*gross/net*) in overall values and by 22/32% in the UMZ. In contrast, Sofia's densities have increased by 4/10% in overall values and by 3/13% in the UMZ.

5. Conclusion

Our goal in this paper has been to answer whether and to what extent urban trends in Belgrade and Sofia can be considered suburbanization and/or sprawl and what the influence of local factors may have been on these trends. We have identified several factors that are typical drivers of suburbanization and sprawl as well as others, which are atypical. The higher rates of car ownership and incomes of certain social strata which accompanied the transition are the only local economic factors that we found to correspond with the typical, global drivers of suburbanization and sprawl. The atypical factors, on the other hand, are attributable to drivers and conditions specific to SEE. Cultural traditions and housing preferences are probably the most important factor contributing to urban density. Despite the stark differences in historical and cultural backgrounds in Sofia and Belgrade, we have found grounds to maintain that attitudes of local residents in the socialist period were similar to those in Southern Europe, – characterized by ‘friendliness to the city’ and preferences for higher urban densities.

Our empirical research confirms that population growth in the two cities is leading to urban expansion and suburbanization, whereby the rates in Belgrade are higher. However, in both cities, trends of sprawl are weak with strong local specifics. New developments are usually compact, with relatively high densities and in close proximity to the city, which quickly become part of the UMZ. Almost no new development occurs far from established urban territories. Yet while these specifics refer to both cities, two measures in Sofia are so atypical, that we challenge any assessment that sprawl is occurring. Namely, the rate of population growth in Sofia is higher than the rate of urban expansion and overall population densities have grown. Furthermore, suburban densities are virtually unchanged (less than one percent decrease in 22 years).

Our findings present some important considerations for local planners and policies. Urban expansion (including low-density expansion, although not identified as sprawl) has been a fundamental concept in both the current Master Urban Plan of Belgrade and the General Urban Development Plan of Sofia, as outlined in section 3.2. These planning policies were prepared and adopted more than 15 years ago, a time when Bulgarian and Serbian planners were ostensibly less well-versed in the negatives of low-density and dispersed development. Today’s planners should adopt a more cautious approach to sprawl, based on the extensive global research critical of the subject. Rather than keeping with the outdated strategies that advocate sprawl, we would encourage local planners to consider the many associated negative impacts on communities and the environment. Furthermore, we would encourage local planners to acknowledge that low densities are not traditional in Serbia and Bulgaria, as this and other research has shown. Fostering such development would contradict local culture and therefore it would disturb social cohesion and cause even greater threats to sustainability.

Another concern that needs to be addressed by planners is the development of infrastructure. Serbian and Bulgarian planners are aware of the need to develop infrastructure to promote economic development, yet they must strike a balance between centre and periphery, growth and excessive expansion. Planners can find a balance when they are unified by an intent to encourage sustainable development and mitigate what is typically wasteful sprawl. As Serbia and Bulgaria are among the poorest countries in Europe, it is of great importance that urban development is both efficient and effective. An understanding of

the relationships between growth and expansion, suburbanization and sprawl and the implications of each is needed to steer urban development in the direction of sustainability. We hope that the present work can help future planners to isolate the positive urban development trends in SEE from negative ones, so as to foster urban sustainability with the tools at their disposal.

Disclosure statement

No potential conflict of interest was reported by the authors.

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