

LINKS BETWEEN DEMOGRAPHIC CHANGES AND TRANSFORMATION OF CAPITAL'S URBAN SYSTEM

**DOI: <https://doi.org/10.18509/GBP22157f>
UDC: 314.116(497.11)**

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ABSTRACT

Extremely polarized space and demographic processes, as well as the most significant concentration of population and functions on the territory of the capital and its surroundings, are the characteristics of the most post-socialist countries. One of those cities is Belgrade, the capital of the Republic of Serbia, on the example of which this research was conducted. At the beginning of the 21st century, urban systems, as observed, are experiencing significant transformations, which represent new trends in their spatial and population development. This paper investigates and analyzes the links between certain spatial-functional and demographic changes within the daily urban system of Belgrade. The model of spatial manifestation of daily labor migration was used to determine the boundaries of the observed area, while census statistics were used as a basic source of data. Changes in the core of the urban system, as well as in the most important satellite settlements and secondary centers, were especially emphasized. Based on the analyzed phenomena, conclusions about the connections and interdependence of contemporary demographic processes and spatial-functional changes within the urban system of the capital, on the example of Belgrade, are presented.

Keywords: demographic changes, urban system, transformations, Capital, population

INTRODUCTION

The connections between demographic processes and the stage of development of a certain area are characterized by a cause-and-effect nature. In a complex system of relations and connections, the needs and possibilities of the population affect the development of space, while space, by itself, with its general and current functional characteristics influences the determination of the directions of demographic processes. Among modern demographic problems, one of the most prominent is the uneven spatial distribution of the population. In the process of demographic or other forms of polarization, the existence of one or more poles of concentration of population or functions is necessary. In most cases, the role of the leading pole in the development of the entire territory is connected to the capital of a country. Often the attractive function and strength of the capital exceeds the capabilities of the rest of the country, creating a significant population and functional imbalance. The resulting situation leads to further deepening of negative population processes, as well as the creation of new problems of economic or organizational nature.

As the influences of cities often exceed their own bounds, it is necessary to study the processes that take place in the entire system of settlements that are formed around the

prominent core. In the process of urbanization, the strength and demographic position of the city are reflected, not only through its individual characteristics, but also through the characteristics of the settlements that gravitate to it. The core, which in this case represents the city, together with functionally dependent settlements, form a whole that can be viewed as a separate system, and as a subsystem of one of the higher levels of the organization. Demographic processes that take place within the observed system are a direct or indirect manifestation of the transformations that take place, both within it and at a higher level of the organization.

As a case study, it served Belgrade, the capital and largest city of the Republic of Serbia, i.e. the system of settlements in which it represents the core. To determine the boundaries of the observed area, as a basic indicator, the daily mobility of the employed population was used. The basic time frame for the research of population alterations in the settlement system was the inter-census period between 2002 and 2011, taking into account previously initiated transformations, directly or indirectly related to the observed area.

URBAN SYSTEMS AND DEMOGRAPHIC PROCESSES

At the center of the relations and connections between demographic processes and the settlement system, is the city, as the core of the concentration of the population and the functional center, around which the said assembly is formed. Urban settlements can be said to be the product of a very complex combination of natural and socio-economic conditions. At a certain level of development of human society, they arise because of the appropriate division of work in it. From the moment of their creation, the cities themselves caused further diversification of economic activities and occupations. A common feature of modern urban settlements is that together with the surrounding they form one organic whole [1]. Movements of people, goods and information are a constant spatial phenomenon, and take place between cities, between cities and rural settlements and between individual economic activities. With these movements, cities and all settlements are connected into a spatial system in which they have the function of hubs. From that, complex urban systems of different characteristics are developing, which means that the network of centers is expanding, cities are growing, functionally they are more diverse and powerful, and the interactions between them are stronger [2]. Functional relations and connections between the city and its surroundings depend on many factors: geographical position, relief, natural resources, climate, population characteristics, economic conditions, development of non-economic activities, etc. The traffic-geographical position is of great importance for the development of functional relations, therefore the influences of the city will be felt more strongly along the main roads [1].

The types of manifestations of the city in the network of settlements, developed in a certain geospace, can have a dual role. The city can play the role of a center in the spatial organization of two systems of phenomena. On the one hand, they are the production, exchange and consumption of goods and the provision of services; and on the other, the organization of life and work, meeting the needs of the population living in the surrounding settlements. In addition, the city can be a center in which activities are concentrated, which have the characteristics of the poles of development, and such a city manifests itself as a factor in initiating, encouraging and directing the development of surrounding settlements [3]. Due to its properties of geographical gender, the city in the system of two-way connections is the driving force and carrier of connections and changes in the network of settlements, i.e. acts as a factor in the development of surrounding settlements, their socio-economic, and functional and built structures in its

surroundings [4]. It has been determined that the city is a factor in the development of the surrounding geospace, and its activities can be manifested in several ways: by attracting labor, population, raw materials and financial resources from the surrounding area; encouraging the development of oscillatory migrations of labor and many other users of various services from the surrounding area to the city; relocation from the city or creation of new production plants in the surrounding settlements, ie - encouraging, creating and strengthening secondary genders, services, work, connections and development in the network of surrounding settlements; by significantly expanding the built-up areas of the city and by growing and integrating the nearest suburban settlements into the physiognomic and functional-spatial structure of the city [5].

Starting from the definition of the system, it can be said that the urban system is a set of cities between which there is an interaction that takes place through the circulation of people, goods and information [6]. These movements are performed by traffic connections, such as railways, roads, air corridors, telephone connections, or some other form of communication [7]. With all its characteristics, urban systems are a reflection of the manner and degree of development of a space, its socio-political organization and economic position in the national and world economic system. From that, it can be concluded that for the geographical knowledge of a space, it is extremely important to know the features and levels of development of urban systems. Urban systems are social and spatial systems, and their characteristics should be viewed through three important dimensions: vertical (hierarchical), horizontal (spatial) and temporal. The basis for observing all dimensions of urban systems is their interdependence, since at a certain moment the vertical dimension of the centers also has a certain spatial dimension [8].

As opposed to the regular size distribution of cities [9], on the examples of some countries, irregularities in the size distribution of cities were noticed. In the hierarchical distribution, there was one large city, which was usually the capital, and all other cities were much smaller. The law of the primary city, i.e. the capital or the largest, as well as its exceptional importance in the development and organization of space and the state [10] explain this distribution of sizes. Numerous later studies have shown that the irregular size distribution of cities is maintained in a large number of countries, i.e. the distinct primacy of the capital in their urban systems [11].

DAILY MOBILITY AS A DEMOGRAPHIC INDICATOR FOR DETERMINING THE BOUNDARIES OF THE SYSTEM

The field of influence of the city on the surrounding can best be observed through the interaction with the population of dependent settlements. The mobility of the population between the city and the surrounding area is extremely pendular - turbulent, and can be compared to the movement of money. There is a centrifugal relationship between the city and its surroundings, in addition to the gravitational or centripetal one. At the same time, there is a two-way movement of people and goods. The rural settlement, as well as the city, has its attractive functions, taking into account that the city is the cause of turbulence, ie the cause of functional relations. The residential function represents the gravitational force of rural settlements, where a significant number of passengers live on the city-surroundings route. As the city could not exist without the surrounding and functional connections, so the accelerated urbanization causes great changes in the countryside [1]. To determine the limits of the impact of a certain settlement, through demographic indicators, the use of daily mobility of the employed population has become more frequent. Commuting creates an opportunity that did not exist in the past, to live at a

considerable distance from the place of work. The size of the city is one of the key determinants, so in the largest agglomerations, through this form of population movement, the effects are felt over long distances. In the city itself as well as in its surroundings, a significant flow of population is being created. Therefore, commuting causes numerous consequences, which are reflected in the already mentioned spheres [12]. Daily mobility of the population represent both population and socio-economic and cultural connections between the area of housing and the area of work of daily residents, with numerous causes, but also consequences in both areas. The process of commuting, especially of the economically active population, given that it is strongly linked to demographic development, economic development, transport, settlements, as well as labor and real estate markets, has broad implications in all spheres of life and work, as well as the population of labor settlements [13].

The daily urban system consists of commuters and a regional entity that includes a space that unites the origins of daily mobility of the population [14]. The concept of the daily urban system was introduced into the scientific literature as a new form of spatial organization of metropolitan regions separated on the basis of daily population movements in the second half of the 20th century [15], [16]. Based on the experience in researching the demographic, spatial and functional components of the daily urban system, the model of spatial manifestation of daily labor migration was applied [17]. Within the model, by grouping settlements with a similar volume of daily labor migration, ie the share of commuters in the labor center in the total number of employees, according to place of residence, the fields of influence of the center are singled out. The daily urban system consists of commuters and regional goals. Based on the intensity of daily interaction, the following zones are determined within the field: zone of intensive influence (from which more than 70% of employees migrate to the work center daily), zone of strong influence between 50 and 70% of employees migrate daily), medium impact zone (from which between 30 and 50% of employees migrate to the labor center daily), low impact zone (from which less than 30% of employees migrate to the labor center daily), as well as the periphery of the daily urban system (from whose settlements less than 5% of employees migrate to the labor center daily). The categorized values of the share of commuters, who travel to the labor center every day in the total number of workers, according to the place of residence, are qualified by an appropriate name that suggests their dependence on the function of work. The model has been successfully applied within various types of research, covering most of the territory of the Republic of Serbia [18], [19], [20], [21], [22], [23], [24], [25].

SERBIA AND BELGRADE IN CONTEMPORARY DEMOGRAPHIC PROCESSES AND FUNCTIONAL TRANSFORMATION OF THE URBAN SYSTEM

Urban centers, urban and rural areas which compose urban systems in Serbia represent heterogeneous set of settlements which differs in demographic size, economic development and functional capacity. This is a consequence of different development predispositions in geographical and socio-historical context. Similarly, to the most of Southeast Europe, Serbia is not sufficiently urbanized compared to the most developed part of the continent [26]. During the second half of the twentieth century, the most intensive socio-geographical, socio-economic and demographic changes took place on the territory of Serbia, which influenced significant changes in the manner and organization of space. The main causes of these changes are the pronounced planned

industrialization of the then state, and then, politically initiated deagrarianization and urbanization, whose action, the socio-economic structure of the total population, was fundamentally changed [21]. The last decade of the twentieth century is associated with negative processes initiated, primarily, by non-economic factors.

Regional and subregional differences, and especially the growing gap between the largest urban centers and the rest of the country, in the level of economic development, diversification and job offer, housing, health care, overall quality of life, but also subjective experience of opportunities to achieve life goals, determine directions and the intensity of internal migration. In such a system, Belgrade and Novi Sad stand out, above all, as the main poles of attracting internal migrants [27]. The effect of migration on demographic development is of different intensity and scope regionally. The spontaneous relocation of the population over a long period resulted in the depopulation of a large part of the territory of the Republic, which was also contributed to by emigration from the country, especially the young population. The mentioned processes conditioned the polarization of demographic development [28]. Over last decades, in Serbia are living about half millions of refugees from the ex SFRY. During that time, they fit less or more into new environment, with different level of adaptation that depends on factors such as education, profession etc., and the type of settlement in that refugee settled (urban or rural, collective centers). The largest part of refugees in overall population is enumerated in Belgrade, especially in municipalities, such as Zemun, Barajevo, Čukarica etc. [29]. The combination of natural and migratory components caused depopulation in rural areas, and polarization in urban centers or immediate surroundings. The concentration of functions and population in urban areas, and the depopulation of rural areas, have led to changes in the demographic size of settlements, especially to the fragmentation of villages [19]. In that way, social and demographic changes were faster, i.e. they were not in line with economic changes.

Within the presentation of modern intensive spatial-functional changes in urban regions, and due to the end of the demographic transition, spatial-demographic indicators have a more significant role. Some of them are indicators of changes in the concentration, ie population density and relocation of the population, as well as changes in the characteristics of daily migration and in the structure of activities. There are connections between economic and demographic development, which are reflected in the spatial redistribution of population, as well as in the redistribution of population by activity, where the concentration of population in urban settlements, around the center of industrial activity, represents changes in spatial structure. Such a pronounced migration dynamics in the horizontal and vertical sense, conditioned by human activities, is a significant indicator of spatial-functional connections that are established in the region and between regions [30]. As the geospace of Serbia is differently economically developed and unevenly populated, all phases, types and levels of urbanization of settlements are found in certain regional units. The most important is the Belgrade agglomeration, i.e. a complex system of urban settlements with a high degree of morphological and functional connection, with a multi-layered hierarchy and a large gravitational influence [31].

Half a century ago, the gravitational area of Belgrade was defined as an area with almost five million inhabitants, with its indirect influence felt in Serbia, Bosnia and Herzegovina and Macedonia, while direct influence was present in several neighboring and close regions [32]. The process of transformation of the surrounding settlements has advanced the most and is most widespread around Belgrade, with it being marked as the basic center of development in the network of settlements in Serbia. A wide zone of neural settlements

developed around it, some of which had already grown into continuously built tissue, while others, in addition to being spatially separated, were already included in the city in the early 1980s [3]. In terms of concentration of population and activities, the achieved development of Belgrade was considered the result of a process that took place over a long period. The capital is also called the super-concentration of population and activities in the Republic of Serbia and beyond, and this is a problem in regional development because Belgrade also appears as a factor in discouraging the development of these territories. The complex of factors of internal, intra-city concentration of functions in Belgrade is placed in the same context, which is considered a consequence of its monocentric structure, and this again has numerous consequences on the functioning of the city, both internally and within the structure of Belgrade's regional space [33].

The end of the XX and the beginning of the XXI century is considered a period of developmental stagnation of the Belgrade metropolitan region. The goal is to move from a classic monocentric agglomeration with a strong core and relatively poorly developed periphery centers to a modern polycentric agglomeration in which peripheral settlements will take over part of the spatial and functional competencies of the core. The current relations in the region are characterized by a pronounced polarization and dichotomy of center-periphery, where the settlement of Belgrade, in relation to the total population of sub centers that should take over the role of regional development centers (Lazarevac, Mladenovac and Obrenovac), has twelve times more inhabitants. [34]. Due to all that, as one of the primary tasks of our urban geography, the definition and exact limitation of the Belgrade metropolitan area, whose administrative area deviates from the metropolitan one, was emphasized. The terms Belgrade and its urban system, gravitational zone, sphere of influence, functional area, city region, nodal region, metropolitan area implies only one process, and that is the functional action of the capital of Serbia. In addition, the Belgrade hinterland is considered an important agricultural, production, entrepreneurial, transport and vital resource [35].

The directions and dynamics of spatial-demographic changes during the last decades outline the stages of urbanization that Belgrade has gone through and clearly point to the directions and effects of transformations of spatial-economic and spatial-functional structure. The strengthening of political-administrative, economic and cultural-educational functions and the role of Belgrade in the regional development of Serbia and the wider surrounding, i.e. their strong influence on population growth, territorial expansion and growth of the former town into a metropolitan wide field of influence [36]. Belgrade is also considered to have grown into a powerful pole of concentration of population and activity in a short period of time, as well as a factor in channeling demographic and economic flows in the wider area. Changes in territorial distribution, spatial displacement and structural features within the agglomeration were in close interaction with the development and expansion of the urban region [37].

The economic structure of Belgrade is dominated by the activities of the tertiary sector, while the industry is also being modernized, which determines the important place of Belgrade, as an industrial center, in the wider regional framework. Apart from the fact that today it is not a dominant activity, industry, as a city-building function, was a factor in the development of centers within the Belgrade region, primarily Lazarevac, Mladenovac and Obrenovac, while they stimulated the development of industry with agglomeration forms and content [38]. As in other parts of the country, the period of economic stagnation, and even the negative tendencies in production caused by a series of unfavorable circumstances (bombing, economic sanctions, the collapse of industrial

systems, recession, and entering the transitional phase) reflected on the changes in economic structure and population development [39]. The change in the spatial model of economic development during the last decades is a reflection of the scope, pace and success of implemented reforms, the existing economic network and spatial, positional, infrastructural, institutional, personnel and other possibilities of spatial forms development. The processes of deindustrialization, tertiaryization and reindustrialization intertwine from the angle of spatial-structural development of the economy, whose spatial organization in Belgrade represents a mosaic picture of various forms created in different epochs of urban development [40]. New development poles are being formed, taking into account the general tendency to move production from the city center to the periphery, as well as locating new production and service capacities in the peripheral zone of the City of Belgrade. In addition, it was estimated that the lack of adjustment to European policies of development, industry, spatial development, as well as environmental protection in the future territorial development of economic activities in the metropolitan area of Belgrade could have consequences in further processes [41].

POPULATION CHANGE IN BELGRADE DUS 2002 - 2011

During the analysis of demographic processes on the territory of the daily urban system of Belgrade, the basic indicators were singled out: absolute population change and the index of population change. Both indicators were analyzed in order to show the importance of transformation for each settlement of the system, and taking into account the different population size of these settlements. These indicators are presented for the last inter-census period, ie between the 2002 and 2011 censuses.

The change in all settlements belonging to the system was analyzed, with special emphasis on settlements located in the zones of stronger influence of the core itself. Within the core, parts of the settlements of Belgrade were analyzed separately, ie they were treated as separate settlements, in order to have an insight into significant changes within the very center of the system.

A total of 371 statistical units (separate settlements and parts of the settlements of Belgrade) were observed, of which an increase in the number of inhabitants was observed in 113 (Figure 1). The increase was of different intensity according to the types of settlements, their location and role in the observed system.

If we look at the periphery of the daily urban system of Belgrade, in the observed period, the largest absolute increase in population was in Novi Sad (40,142). It also represents the second most important center on the territory of the Republic and, together with Belgrade, forms the zone of the most intensive daily migration. Borča should be singled out as the most important satellite settlement in its immediate vicinity, which had an increase in population of more than 10,000. A significant group consists of settlements with an increase of 1,000 to 5,000 inhabitants, which included a large number of administrative centers of Belgrade municipalities. In the mentioned group, the most important was Kludjerica with an increase of 4,656 inhabitants, followed by the municipal center Surcin (3,913), Ugrinovci (3,608), Lazarevac (3,274), Sremcica (2,551), Leštane (1,981), Obrenovac (1,500) and Mladenovac (1,495). It is interesting that in the group of settlements whose number of inhabitants decreased by more than 1,000 in the observed period, there were mainly municipal and larger centers located on the periphery of the daily urban system of Belgrade.

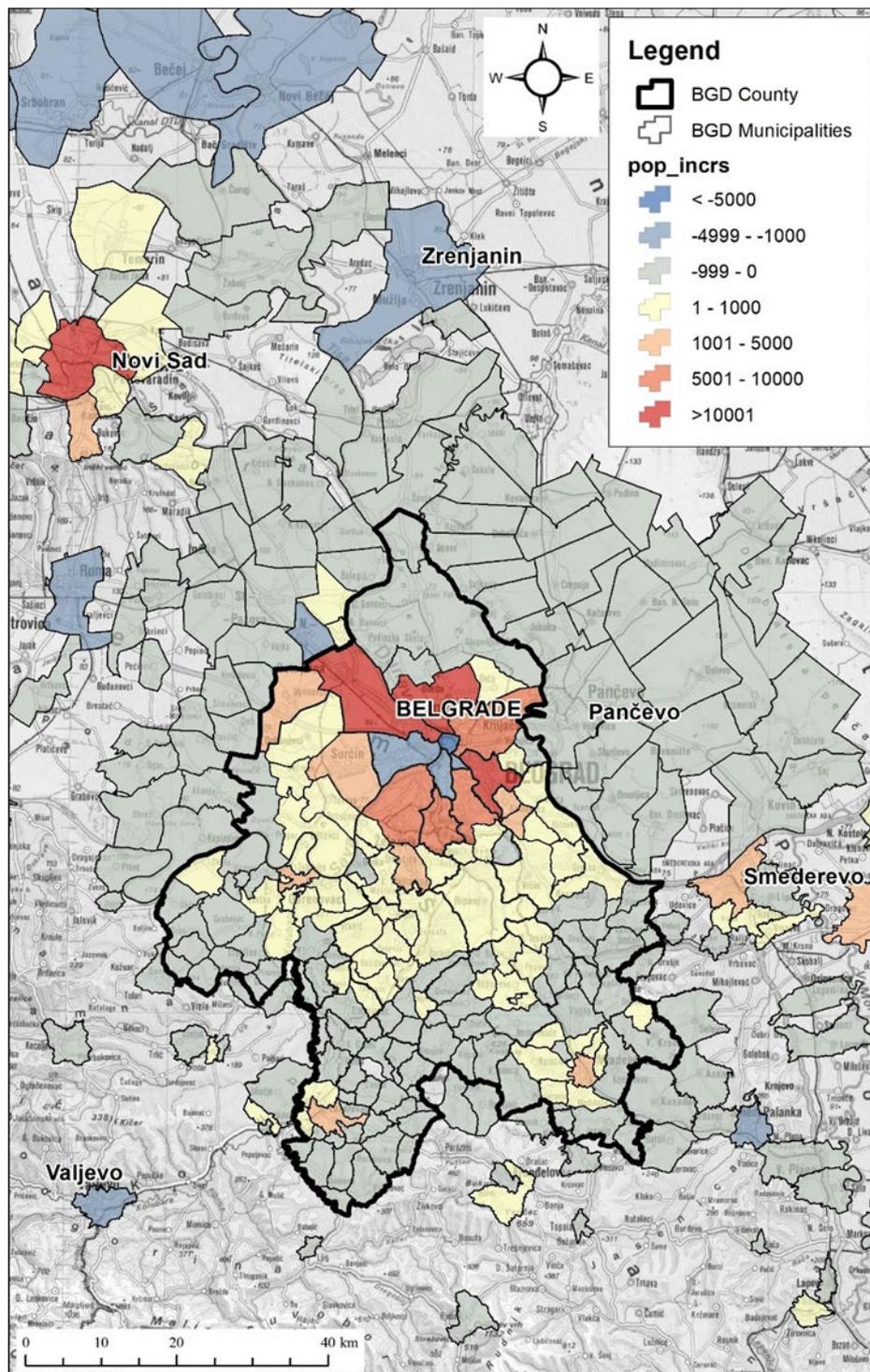


Figure 1. Absolute population change of Belgrade DUS 2002-2011.

The absolute population change within the parts of the core itself had significant differences. The most significant increase of almost 20,000 inhabitants was observed near Zvezdara. In addition to that, the part of Belgrade that belongs to the municipality of Zemun had an increase of more than 10,000 inhabitants. Rakovica was very close to this category, as well as the part of Belgrade that belongs to the municipality of Čukarica. Parts of Belgrade belonging to the municipalities of Palilula and Voždovac also had an increase of more than 5,000 inhabitants.

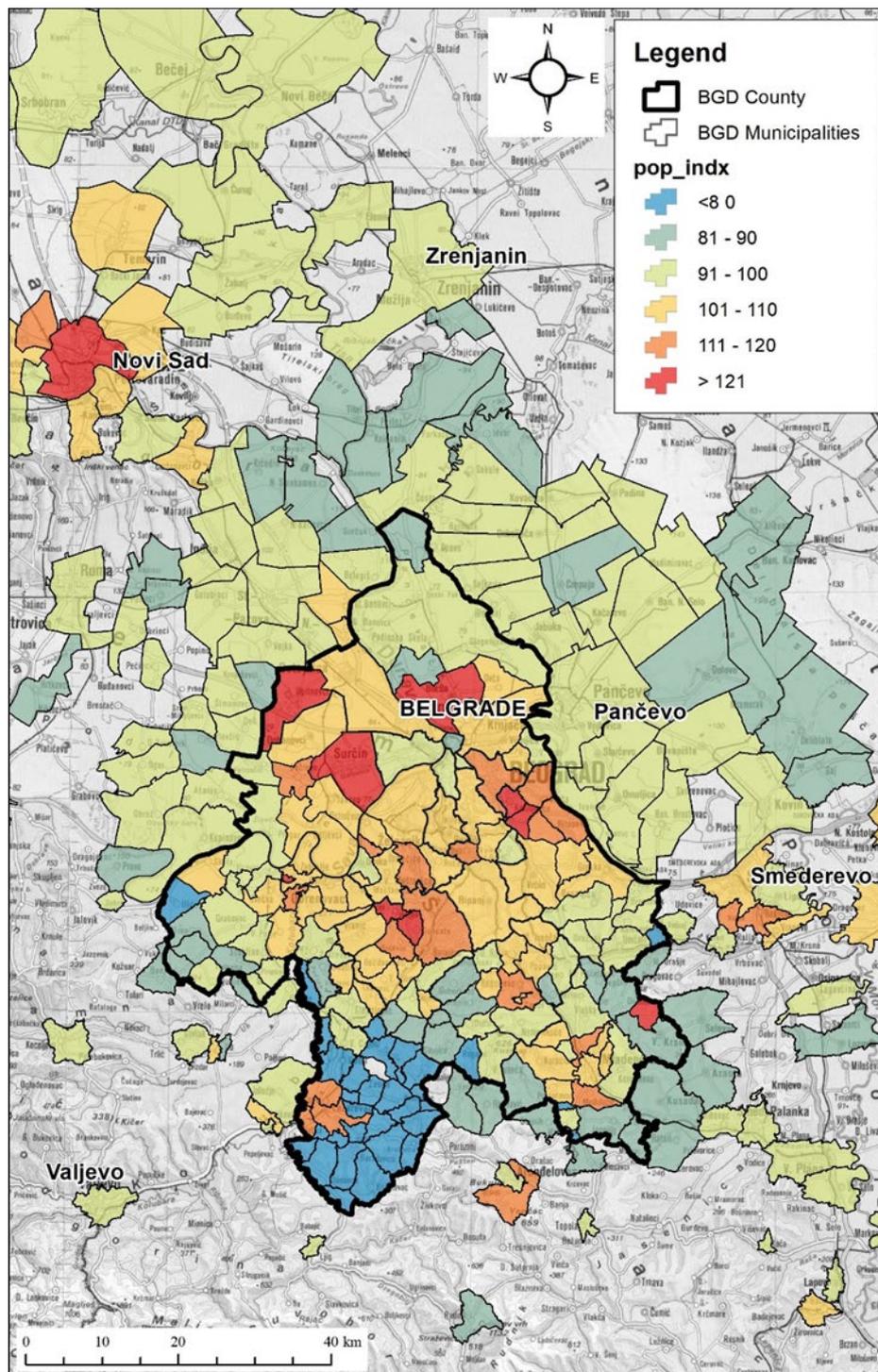


Figure 2. Population change index of Belgrade DUS 2002-2011

On the other hand, in the observed period, and according to the census, the number of inhabitants decreased in the municipalities of Vračar, New Belgrade, Savski venac and Stari grad. The municipality of Stari grad stands out as the only part of the settlement of Belgrade whose decline in population was more than 5,000, and at the same time a statistical unit with the most significant reduction in population in the entire system (7,093).

The percentage increase in the number of inhabitants among the settlements of the daily urban system of Belgrade had a slightly different schedule (Figure 2). Special mention should be made of the settlement of Ugrinovac in the municipality of Zemun, whose population increased by half in the observed period. Besides him, we should also point out the settlements whose population has increased by more than 30%, and they are: the settlement of Rvati in the municipality of Obrenovac, Borča in the municipality of Palilula and the settlement of Guncati in the municipality of Barajevo. A significant increase, with more than 20% in the observed period was also observed at the municipal center Surčin, then Meljak, Leštane and Kaludjerica. On the other hand, the population of Ušće in the municipality of Obrenovac and Vreoci in the municipality of Lazarevac had a population reduction of more than 20%. Other settlements where such a significant population decline was observed were parts of the periphery of the daily urban system of Belgrade. Observed according to the parts of the core of the system, the relative changes had different dynamics. The most significant increase was observed in the municipality of Zvezdara, whose population increased by 14.5% in the observed period. Rakovica (9.7%) and parts of the settlements of Belgrade belonging to the municipalities of Zemun (8.1), Čukarica (7.2) and Palilula (7.1) had an increase of between 5 and 10%. In contrast, the central city municipality of Stari grad had the most intensive decline in the number of inhabitants of 12.8%.

CONCLUSION

According to the evolutionary phases of the urban systems development and theoretical starting points of the urbanization processes spatial manifestation, city centers are the main initiators of socio-economic transformations of their surroundings. Belgrade, as a central settlement in the geospace of Serbia, directly and indirectly has a noticeable impact on the demographic, spatial and socio-economic transformation of settlements in its immediate and distant surroundings. The belated social and economic transition on the territory of Serbia had a significant impact on the role of Belgrade, and thus the transformation of its daily migration system. The distinctly polarized space of Serbia determined its position as the primary concentration of both the function of work and the function of housing within the borders of the state and beyond. Difficult conditions of development on the territory of the entire country were reflected in the intensification of deindustrialization and increasingly pronounced tertiaryization, in which Belgrade was in the forefront, as a social and political center. After the population growth of the urban core, and then the peripheral settlements, caused, above all, by the migratory influx of population, the attractive function of Belgrade was manifested by increasing the spatial coverage of its daily urban system.

On the whole, the territory covered by the boundaries of Belgrade's daily urban system represents a significant concentration of population. Unlike the rest of the Republic of Serbia, where depopulation trends have been going on for decades, the observed territory is characterized by positive population changes. In the last inter-census period, the number of inhabitants of all settlements belonging to the system, together with the core, increased by more than 60,000. Within the system, there are noticeable differences in population processes, which were significantly influenced by the functional transformations of certain settlements. The growth of the population is especially notable in the settlements that have physiognomically merged with the core, then in the municipal centers in development and in parts of the settlements of Belgrade where, instead of the traditional industrial orientation, the housing function is getting stronger. On the other

hand, depopulation processes are expressed in rural parts of the suburban area, mostly within municipalities that have traditionally had an industrial character. Special emphasis should be placed on the central parts of the system core, which represented the main depopulation zones in the observed period. Taking into account the continuation of the transformation of the center itself, as well as numerous settlements in its immediate surroundings, new trends in population movements can be expected, which once again confirms the dynamism of the capital urban system.

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