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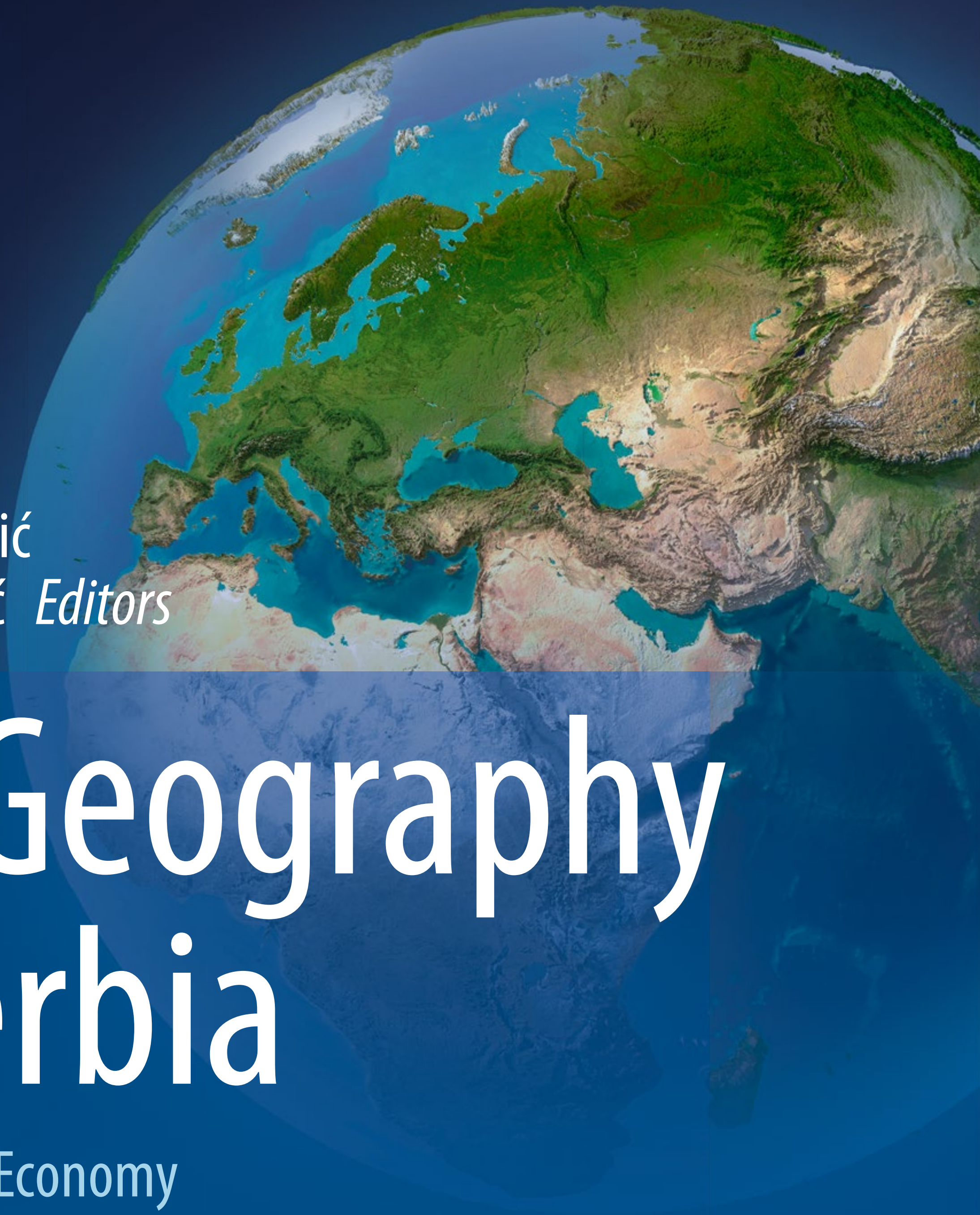

Emilija Manić
Vladimir Nikitović
Predrag Djurović *Editors*

# The Geography of Serbia

## Nature, People, Economy

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Editors

# The Geography of Serbia

## Nature, People, Economy

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*Serbia is a secret world*
*Where no day knows what the night brews;*
*And no night sees the dawn's gray child;*
*Where each bush in the brake defends its dream*
*as separate secret flame;*
*And no bird knows what waves and weaves*
*Those patterns in the rustling leaves.*

*Desanka Maksimović (1898–1993),*
*Famous Serbian poet*[1]

[1] From: Maksimović D (1998) Don't Fear: selected poems. Association of Writers of Serbia, Belgrade

# Preface

Serbia is a country in Southeast Europe that occupies southern parts of the Pannonian plain as well as the central parts of the Balkan Peninsula. As the area of an amazing variety of genetic relief types, with karst and aeolian formations as exceptional for their specificities, Serbia emerges from the low landing Pannonian plain to the highest mountainous regions in the Dinarides and mountains Prokletije, Šara, and Stara Planina. Different geological features, together with different climates and transit and specific domicile waters (karst springs and thermomineral waters), created various natural habitats with specific flora and fauna and numerous endemic and relict species. The area boasts plenty of traces of rich cultural heritage, since the central Balkans was the main migration corridor between southwest Asia on one side, and central and west Europe on the other.

The first geographic descriptions of the Balkans – that is, of the area of today's Serbia – appeared as late as the second half of the nineteenth century. Until then, the data about this "corner of Europe" could only be found in the descriptions of travelers passing through the Balkans. The earliest of such descriptions are related to pilgrims, and later also to Arabian travelogue writers. According to Radovanović in his book *Putopisi o Srbiji kroz vekove* (Travelogue about Serbia through the centuries), 2012, during the Ottoman rule, the imperial envoys on their way from Vienna to Constantinople were the only ones who recorded their observations about the landscapes they were passing through. They described these landscapes as "vast, immense areas of game-rich forests and uncultivated lands with traces of old civilization, inhabited with tall, fair skinned people who wore unusual garments." The oriental travelogue writers, such as the eminent Evliya Çelebi (seventeenth century), also confirmed these descriptions.

When Serbia regained sovereignty in the nineteenth century, it established an education system in which geography was, for the first time, included in the curriculum as a teaching course at Great School (1863). These were not yet scientifically founded information, but rather a sort of travelogues with geographic contents collected by travelogue and literary writers and culture workers: *Novejše zemljopisanije* (*New Land Description*, 1825) by Joakim Vujić, *Geografičesko-statističesko pisanije Srbije* (*Geographical-statistical Description of Serbia*, 1827) by Vuk Stefanović Karadžić, *Rečnik geografijsko-statistični Srbije* (*Geographical-statistical Vocabulary of Serbia*, 1846) by Jovan Gavrilović, *Prinos za geografiju Srbije* (*Contribution to Geography of Serbia*, 1873) by Jovan Dragašević, *Kneževina Srbija* (*Principality of Serbia*, 1876) and *Kraljevina Srbija* (*The Kingdom of Serbia*, 1884) by Milan Đ. Milićević, and *Srbija – opis zemlje, naroda i države* (*Serbia: Description of Land, People, and Country*, 1887) by Vladimir Karić.

The beginning of the development of geography as a scientific discipline in Serbia is related to the very end of the nineteenth century and the name of a distinguished Serbian geographer Jovan Cvijić, who founded the Geographical Institute within the History and Philosophy Department at the Great School in Belgrade in 1893. After completing his doctoral thesis in Vienna, Jovan Cvijić returns to Serbia as a follower of the famous Albrecht Penck, where he sets the foundations or karstology and karst terminology, thus marking a turning point in karst research (he was the one who introduced a new at the time, but now widely accepted term – karst). It was the beginning of the Serbian school of geography, and from then on began an intensive development of individual geomorphology disciplines (karstology and speleology) and hydrogeology, but also of socio-geographic disciplines, such as anthropogeography and ethnology. The Geographical Institute, headed by Jovan Cvijić, becomes a pioneer of organized scientific research in different parts of the Balkan Peninsula, especially in the fields of geomorphology, settlements, and population. In 1910, the first association of the Balkans' geographers was founded – Serbian Geographical Society – led also by Jovan Cvijić. This is why it is impossible to fully understand the Serbian school of geography and its position in the European science of geography without considering the work and accomplishments of this famous Serbian geographer.

Cvijić was researching the Dinarides mountain range in order to better understand karst and the processes occurring within it. According to numerous karstologists, such as, Roglić, Sweeting, Ford, and others, Cvijić's doctoral dissertation represents, even nowadays, the beginnings of the karst studies, and his understanding of karst hydrology is the precursor of modern scientific interpretations of this process. He was the first to identify traces of Pleistocene glaciation in the Balkans, thereby initiating a change in the thought on the scope of Pleistocene mountain glaciation of Europe. Modern climate research has confirmed that there are differences in the glaciation phases during the Pleistocene, which were first identified by Cvijić. Due to all this, the geomorphology public worldwide, headed by the esteemed geomorphologist Ford, considers Jovan Cvijić as "the father of karst geomorphology."

At the same time, Cvijić had been exploring the origin of the population in the Balkans. He established his own anthropogeographic school that transformed Serbian and Yugoslav social geography, including initiation of the scientific approach to studying migrations of the Yugoslav peoples. His key publication in this field is the book, *La péninsule balkanique: géographie humaine* (1918), originally written in French, and subsequently extended and translated into Serbian – *Balkansko poluostrvo i južnoslovenske zemlje: Osnove antropogeografije* (*Balkan Peninsula and South Slavic Lands: The Basics of Anthropogeography*) and published in two volumes – the first in 1922 and the second posthumously in 1931. In this capital work, he imperceptibly introduces human geography into political geography and deals with all important aspects of the relationship between the geographical environment and the spiritual and material culture in the Balkans. According to renowned Serbian geographer Mirko Grčić, the classic paradigm of Cvijić's anthropogeographic school is very close to the "modern" system paradigm that points out the scientific synthesis of causal dependence among ethnic, ethnodemographic, social, cultural-civilizing, and geopolitical processes within their geographic demonstration and historical continuity. Having to thank precisely to Jovan Cvijić, but also to his students – geomorphologist Petar Jovanović (1893–1957), anthropogeographer Rista Nikolić (1877–1917), and anthropogeographer Jevto Dedijer (1880–1918) – the Serbian school of geography became firmly recognized in both Serbia and the world in the period between the two world wars. This is also confirmed by the fact that Cvijić had an exceptional role in determining the borders of the first modern state of South Slavic peoples (the predecessor of the Kingdom of Yugoslavia) as the chief of the ethnographic section of the Serbian delegation at the Paris Peace Conference (1919).

After the Second World War, Serbian geography developed within the framework of Socialist Yugoslavia, mostly following Cvijić's school of thought, but without the impact it previously had on world geography. The last decades of the twentieth century were extremely harsh for the entire Serbian science, and thereby also for geography. The international isolation of Serbia after the breakup of Yugoslav state caused, among other things, an enormous emigration of students and perspective scientists, and it almost extinguished cooperation with researchers of foreign universities and institutes. Such atmosphere caused an even further decline in the importance and visibility of Serbian geographic science in international scientific publishing industry. Huge social changes in Serbia after the year 2000, including a new science policy oriented toward the incitement of international cooperation and projects and toward publishing the research results in the world-leading magazines and publications, have, to a certain degree, opened a possibility for Serbian geographic science to fight to regain its position on the European and world's map, by pursuing the most important heritages of Jovan Cvijić and his followers that withstood the test of time in the past 100 years. It seems that the work of geographers could be especially important in this respect, because many of today's complex social processes in Serbia and the Balkan Peninsula have been identified by Cvijić and his associates, also pointing to the possible direction of their far-reaching implications.

Many challenges concerning geohazard, demographic, and migration processes and regional geopolitical and geo-economic relations that Serbia faced in socialist, and especially in the post-socialist period, marked by the turbulent break-up of Yugoslavia and too slow transition of socio-economic order now represent research topics of contemporary geographers in Serbia, who are trying to make their contribution to solving and better understanding of the said challenges. Besides relying on the extremely rich scientific heritage of their predecessors, today's geographic research in Serbia is based on theoretical concepts, methodology apparatus, and technological achievements of contemporary geospatial science which imply a high degree of integration of geographic disciplines and related scientific fields. The editorial team of this monograph has based the concept of presenting the contemporary geography of Serbia precisely on this approach.

Analyzing the existing area of Serbia, it is impossible to neglect its specific natural environment, its history, the consequences of cohabitation in mutual Yugoslav state, the consequences of disintegration of that state, events at the end of the twentieth century and also the impact of the existing global and regional processes that are affecting the Balkans' territory. It seems that the issues from the human geography area are precisely the ones that are the most complex and that arouse great interest in the wider geographic public. By building "a house in the middle of the road," Serbia and its people have been permanently under different political, economic, and cultural influences. As a result, its cultural heritage became highly assorted, on the one hand, and its history was very dramatic on the other. It is almost impossible to find a nation in a world that, inhabiting the same territory, has changed four countries over the last 40 years! This is why it seemed to us that, by giving more room to human geography topics, the first encounter with Serbia will reveal to the reader of these pages just what kind of a "corner of Europe" Serbia is, who made it such, and how.

The most challenging demographic issues that contemporary Serbia is now facing are childbearing rates far below replacement level resulting in depopulation and intensive population aging, relatively high death rate and negative migration balance. The total population of Serbia has been declining since the dissolution of the former Yugoslavia in 1991 when the rate of natural change turned negative. The rising net emigration speeded up this trend at the turn of the millennium. In addition, Serbia is lagging behind most EU member states in terms of educational attainment of their working age population. Although Serbs are the dominant majority, the demographic profile of the country reveals rich ethnic heterogeneity, particularly in the Vojvodina region, resulting from the multifaceted interaction of historic, geographic, demographic and political factors.

At the same time, Serbia has still not completed its social and economic transitions, which last for more than thirty years now. Although the transition from centrally planned to market economy is a demanding process in itself, the political situation during the 1990s made it even more difficult for Serbia. The economic transition in the country, which started at the end of the previous century and continued at the beginning of this one, resulted in a transformed economy with still existing serious structural problems. Such demographic and economic circumstances have created several important issues that Serbia will continue to face in the future: environmental issues, rural and urban developments, and one of the most demanding regional disparities in Europe.

While deciding on the authorial concept of this monograph, we had the option of taking one of the two opposite approaches, each having its natural advantages and disadvantages. One implied a small team of authors, such as our three-member editorial team, giving their answer to the contemporary geographic issues in Serbia. This would, without a doubt, result in a scientifically homogenous concept of the monograph, which is an advantage that would be appreciated primarily by the readers interested in the entire content of the book. However, the price of this approach would reflect a higher degree of subjectivity and general representation of the (sub)disciplines expected to be contained in a publication of this kind. The other approach implied a wide specter of authors of various academic specialties, not only in geography, but also in related scientific fields, who have a common trait that they, in their research, take the phenomena and processes shaping the contemporary geographic image of Serbia as their research subject. Risking a lack of compactness in style, which would probably make the book even more readable as a whole, we chose the latter option.

Since the first book, *Serbia: Description of Ground, Nation and Country*, written by Professor Vladimir Karić in 1887, which presented the most important geographical features of that time on 935 pages, geography and related disciplines went a long way from a pioneering development phase to modern science disciplines that give a significant contribution to the general development of Serbia. Today, the book *Geography of Serbia* integrates the results of scientific research of as many as 44 researchers from the renowned scientific institutions of Serbia: University of Belgrade (the Faculty of Geography, the Faculty of Economics, the Faculty of Philosophy, the Faculty of Mechanical Engineering), University of Novi Sad – the Faculty of Science, Serbian Academy of Science and Art (SASA), the Geographical Institute "Jovan Cvijić" of SASA, the Institute of Social Sciences Belgrade, the Institute of Balkan Studies SASA, the Archeological Institute Belgrade, the Institute of International Politics and Economics, and the Institute of Architecture and Urban and Spatial Planning of Serbia.

By choosing this kind of approach in regional-geographic analysis, we believe that the reader of this book has been provided with a higher quality content, based on more detailed analyses of particular processes, with each section of the book being more autonomous in terms of content. *The Geography of Serbia* provides the readers with an opportunity to get to know Serbia from all aspects: its diversity and wealth, its population and economy, but also the challenges it faces. It consists of five major parts (historical and geopolitical context, physical geography, demography, economy, and regional development and specificities) and includes 23 chapters that lead the reader through the history and culture of this part of Europe and the Balkans, through the Serbian nature, population, and economy, striving to point out on scientifically based facts, not only the structure but also the dynamics of the space it analyzes. It was really challenging to unify so many different disciplines and researchers, with the desire to provide an in-depth analysis in a comprehensive geographical study at the points that are believed to be of special importance for understanding Serbia, and which – like cubes in a mosaic when combined and interconnect – create a complete and unique picture of a space.

Belgrade, Serbia

Emilija Manić
Vladimir Nikitović
Predrag Djurović

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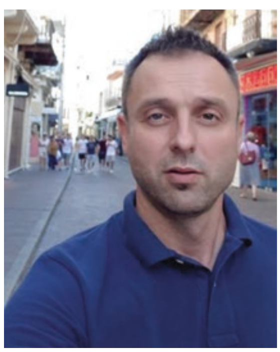
The book *Geography of Serbia* presents results gained from the researches taken more than a century as well as those obtained more recently by the authors of this book in a frame of a number of projects, including the results carried out within the 2020 Research Program supported by the Ministry of Education, Science, and Technological Development of the Republic of Serbia.

Above all, we gratefully acknowledge the authors of all the chapters for their time and efforts to make the interdisciplinary research findings in the field of geography of Serbia closer to a broad international audience.

# Contents

# About the Editors

**Emilija Manić** lectures the Economic Geography and Geography of Tourism at the University of Belgrade the Faculty of Economics. She graduated from the University of Belgrade the Faculty of Geography where she received her master's degree (2005) and PhD (2008). Her main fields of interest and research are spatial analysis of economic activities, socioeconomic analysis, GIS application in the business and local government, tourism destination, and tourism impact. She is an author of several books on economic geography, tourism, and GIS in economic planning. She has published numerous research papers in leading national as well as international journals.



**Vladimir Nikitović** works at the Demographic Research Centre of the Institute of Social Sciences, Belgrade, and serves as the editor in chief of *Stanovništvo (Population)*, one of the world's oldest demographic journals. He received his academic education at the University of Belgrade – holds BSc in Geography and MSc in Demography at the Faculty of Geography (2003), and PhD in Demography at the Faculty of Economics (2009). His publications include several books and edited volumes as well as numerous research papers related to demographic and migration processes, cited in leading scientific journals and strategic policy documents. He had been engaged as manager, thematic expert, and consultant in numerous national and international projects, including the creation of national public policy documents in the field of demography and spatial planning.

**Predrag Djurović** was born in 1962. He graduated from the University of Belgrade, Faculty of Geography, where he received a master's degree (1990). In the same institution, he received Ph.D. in geomorphology with the topic "Alpine Karst of Mt. Durmitor – Geomorphological Study" (1996). The main fields of research interests are physical geography, especially geomorphology (karstology, recent and paleo glaciology, speleology). He is the editor of the "Speleological Atlas of Serbia" and the author of thematic maps in geomorphology, karstology, and speleology. Until 2001, he was employed by the Geographical Institute "Jovan Cvijić" Serbian Academy of Sciences and Arts., is a full professor at the University of Belgrade, Faculty of Geography, where he lectures in Paleogeography, Dynamic Geomorphology, Speleology, and Mountain Tourism.

# Part I

# Historical and Geopolitical Context

Emilija Manić and Vladimir Nikitović

# 1 Geographical Position of Serbia

Milutin Tadić and Emilija Manić

**Abstract**

Serbia represents an excellent example of how the geographic position of a country is a complex and extremely dynamic category. Located at the Southeast Europe, as a medium-size country, Serbia occupies the central part of the Balkan Peninsula and the southern rim of Pannonian Basin. Being in such geographical position, Serbia and its people have been permanently under different political, economic and cultural influences.

Serbia is predominantly highland zone criss-crossed by river basins in the south, with highly fertile agricultural lands and navigable rivers and canals of the Pannonian Plain in the north. Being located in the North Temperate Zone characterized by normal day-and-night cycles, Serbia has mild continental climate that passes into mountain climate in the southern highland regions and continental climate in the Pannonia plain. It is a continental country but with favourable position for traffic and transportation. The political issues at the end of the last century and transition from centrally planned to market economy shaped Serbia as developing European country with a prominent depopulation and a high out-migration rate.

**Keywords**

Geographical midpoint · Borders · Continental country · Economic-geographical position

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By the size of its territory, Serbia is among the medium-size countries in Europe (88,499 km$^2$) (Statistical Yearbook 2019), with almost seven million inhabitants (not including southern province Kosovo and Metohija) (Statistical Office of the Republic of Serbia 2020). Serbia is located at the Eastern Hemisphere and also at the Northern Hemisphere, approximately half-way between the equator and the Geographic Northern Pole. Serbia is situated at the South-eastern part of the European continent, and it is in Central European Time zone (CET).

The extreme points of Serbia's territory are determined by the following geographic coordinates (Fig. 1.1):

N (46° 11′ 25″ N, 19° 40′ 00″ E),
S (41° 51′ 08″ N, 20° 37′ 33″ E),
W (45° 54′ 30″ N, 18° 49′ 16″ E),
E (43° 11′ 13″ N, 23° 00′ 47″ E).

The shortest distance of the territory of Serbia is 488 km, 'diagonally' between the northernmost and the southernmost points, and that between the easternmost and the westernmost points is 449 km. The midpoint of the geographic network field where Serbia is territorially located, that is, the *geographical midpoint of Serbia*, is defined by the coordinates of $\varphi_0$ = 44° N, $\lambda_0$ = 21° E, which correspond to Kragujevac (Tadić 2000) – the fourth largest city measured by the population of the country and one of the most important economy and educational centres in Serbia.

Serbia is located in the North Temperate Zone, and therefore characterized by normal day-and-night cycles: in the winter, solstice daytime lasts for 8 h and 53 min, while in the summer, solstice daytime lasts for 15 h and 30 min (Tadić 2010). These spatiotemporal mathematical-geographical determinants completely 'individualize' the geographical position of Serbia, significantly impacting its relative position and its physical characteristics.

Serbia is a *continental country*, one of the 44 landlocked countries in the world, which significantly decreases the


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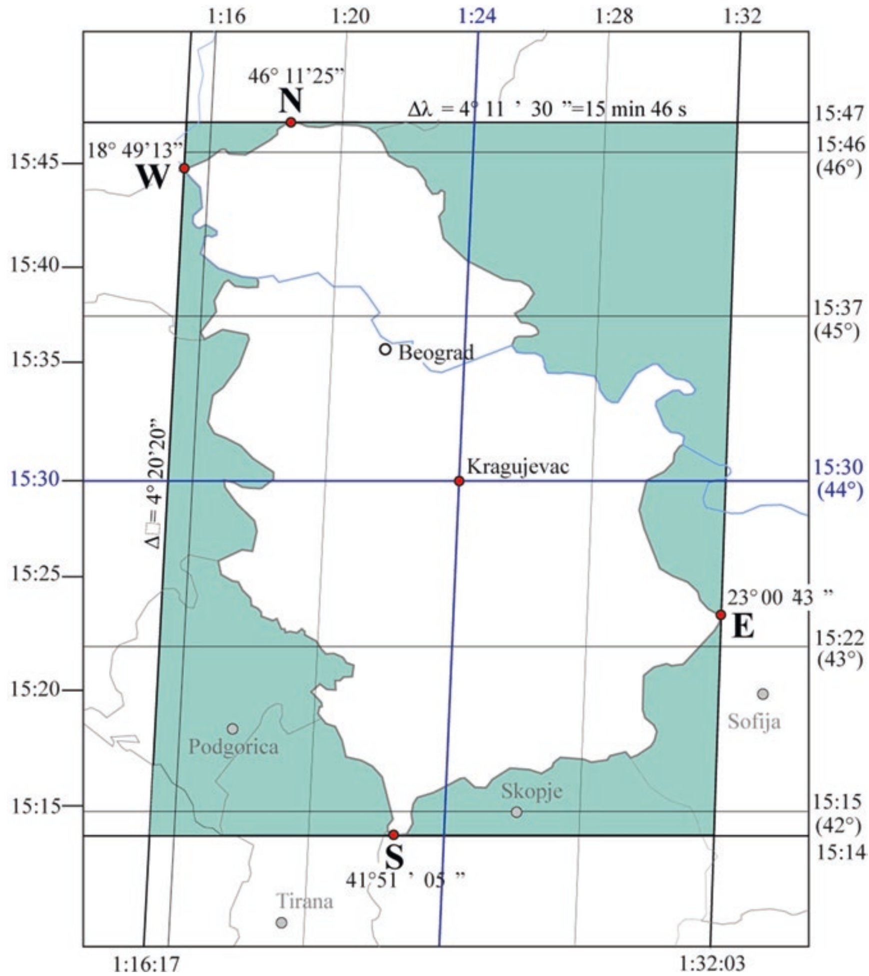


**Fig. 1.1** The geographic network field where Serbia is territorially located (*Source:* authors' calculations based on data from Tadić 2010)

favourability of its geographical position. It borders with eight counties. The *borders* with Hungary, Romania, Albania and Bulgaria had been established after the First World War, at the Paris Peace Conference in 1919, and they were confirmed by the United Nation decisions after the Second World War. The borders with three former Yugoslav republics (Bosnia and Herzegovina, Croatia and Northern Macedonia) were internationally recognized after the break-up of the Socialist Federal Republic of Yugoslavia (SFRY) in 1991. With Montenegro, the international border was established in 2006, after Montenegro declared independence. However, some disputable border issues remained unresolved and will be subjected to bilateral agreements or arbitration in the future:

- One hundred and forty-five kilometres of the borderline along the Danube river's flow is the object of dispute between Serbia and Croatia, and negotiations on this are ongoing since 2003. Croatia suggests that the areas be divided according to the cadastre documentation, while Serbia suggests the border to be set along the midline of the Danube river's flow which meandered in the meantime.
- Ninety-five percent of the border between Serbia and Bosnia and Herzegovina is determined and clearly defined, but four minor sectors are still disputable.
- The borders between Serbia and Montenegro and between Serbia and North Macedonia remain unresolved due to the issues concerning southern Serbian province of Kosovo and Metohija. Since 1999, Kosovo and Metohija (10,887 km$^2$) are under United Nations administration – UNMIK (United Nations Interim Administration Mission in Kosovo)[1] that operates there together with EULEX (the European Union Rule of Law Mission)[2] and KFOR (a peace support operation NATO forces).[3] The independence of this territory, declared by the political representatives of the Albanians, is not recognized by Serbia or the United

[1]The official website of The United Nations Interim Administration Mission in Kosovo. https://unmik.unmissions.org. Accessed 6 December 2020.

[2]The official website of The European Union Rule of Law Mission. https://www.eulex-kosovo.eu/. Accessed 6 December 2020.

[3]The official website of the peace support operation NATO forces. https://jfcnaples.nato.int/kfor. Accessed 6 December 2020.

Nations,[4] so the political status as well as the borders issue is still opened questions (see Chap. 4).

Situated at the central part of the Balkan Peninsula and the southern region of Pannonian Basin, Serbia is at the same time both a Balkan and also a Pannonian and Central-European country. The largest part of Serbia (about 75% of its territory) extends south of the rivers Sava and Danube, which are natural borders of the Balkan Peninsula. It is situated in a predominantly highland-mountain zone criss-crossed by river basins, with mild continental to mountain climate and with deposits of natural resources such as coal, copper ore, and non-metallic deposits (Fig. 1.2).

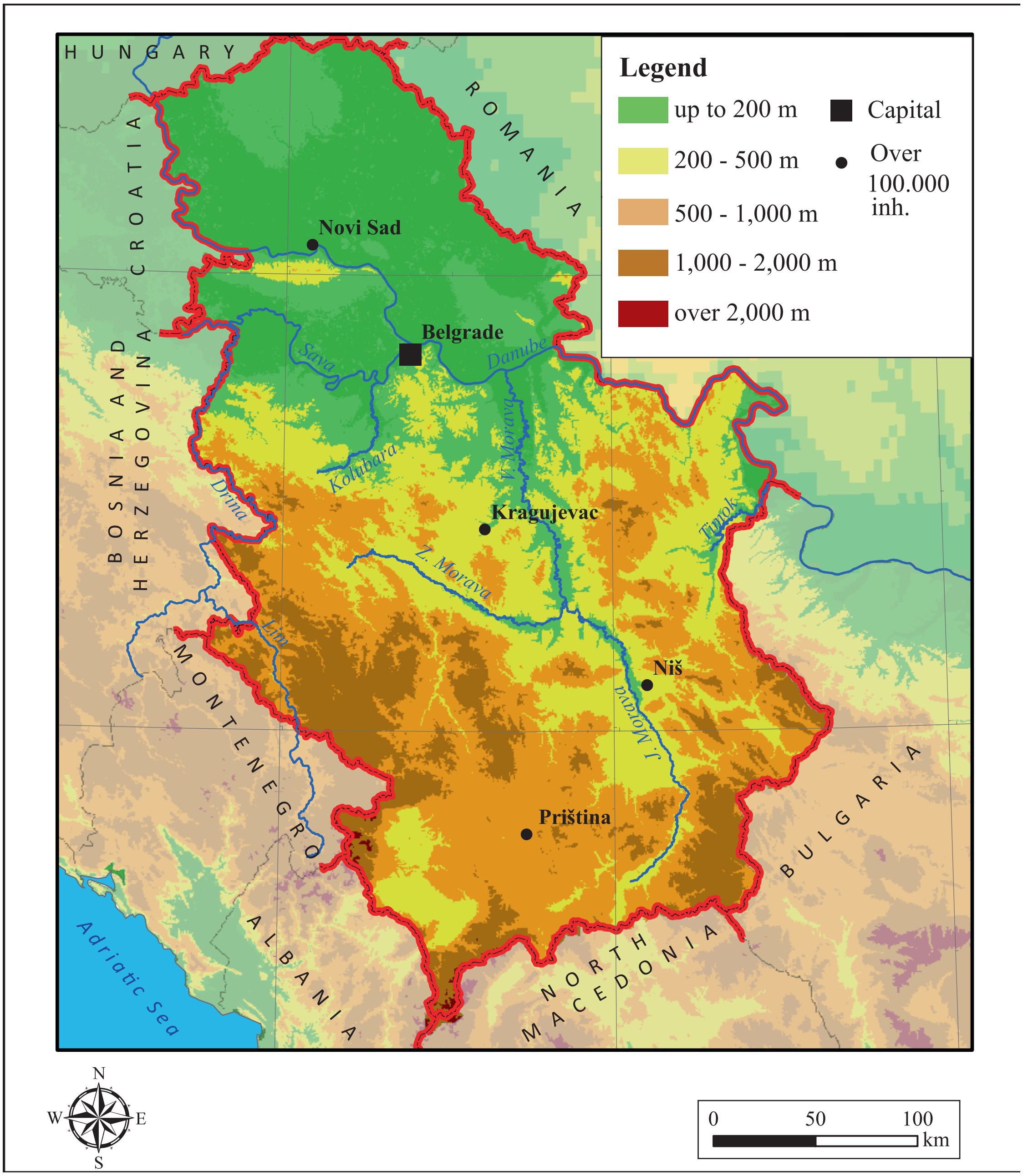


**Fig. 1.2** Location and borders of Serbia

[4]The official website of The United Nations. https://www.un.org/geospatial/content/serbia-0. Accessed 6 December 2020.

The area to the north of the Sava and Danube rivers is low-lying and is a part of the vast Pannonian Plain, with mild continental to continental climate and with highly fertile agricultural lands and navigable rivers and canals. Due to such relief and the central position at the Balkans, Serbia has a favourable position for traffic and transportation.

Two *pan-European corridors* run through Serbia: Corridor 7 and Corridor 10. Corridor 7 is actually the Danube river navigation route, which connects the North and the Black Sea via Rhine-Main-Danube System, whereby it 'opens' the access to the World Sea for Serbia. Corridor 10 basically connects the Western Europe with the south of the continent and the Southwest Asia (it runs between Salzburg and Thessalonica, and it has four branches). It enters Serbia from the west (Ljubljana–Zagreb–Belgrade and continues with Branch B: Budapest–Belgrade). It further runs southward along the valleys of the Velika and Južna Morava and the Vardar rivers (Belgrade–Thessalonica), and eastward along the valley of the river Nišava (Branch C via Sofia to Istanbul).

Concerning its *economic-geographical position*, Serbia belongs to developing countries. However, comparing to the other developing European countries, Serbia is one of the poorest, with a prominent depopulation and a high emigration rate – the Gross Domestic Product per capita in 2018 was 7234 current US dollars (World Bank 2019), while the 2018 natural increase rate was −5.5‰ in comparison to the previous year (SORS 2019). There are many reasons for such state of affairs, which should be observed in a wider context of global and regional socioeconomic processes at the entire Balkans.

The Balkans has always been a bridge between Europe and Asia, where different political, economic, cultural and military interests have met and intertwined for centuries. Both the events from the earlier (the relations with Byzantine and Ottoman Empires, reconstruction of modern Serbian state, two World Wars) and contemporary Serbian history (disintegration of SFR Yugoslavia and relations to the neighbouring countries) point to this fact. Serbia and the Balkans are an excellent example of how the geographic position of a country is a complex and extremely dynamic category.

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# 2 Prehistory of Serbia: A Brief Overview

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**Abstract**

Research has shown that the territory present-day Serbia was continuously inhabited from the earliest prehistoric to historic times. Covering most of what is Serbia today, the Central Balkans acted as an important migration corridor that connected Southwest Asia with Central and Western Europe. Moreover, the Central Balkans represented an important ecological and social refugium for European human communities during harsh glacial periods and other crises. The highest population densities throughout the region's prehistory were recorded in river valleys, as well as the lowland and low hilly areas at their peripheries, while occupations of hilly-mountainous areas were more frequent during Paleolithic and Metal Ages. Apart from historical and social circumstances, population densities and the occurrence of specific settlement patterns were also influenced by the distribution of mineral and food resources exploited during particular intervals. Prehistoric cultural and demographic links between the Balkans and Central Europe or Southwest Asia have been well documented. However, the Balkans also saw the rise of authentic cultural manifestations such as the Lepenski Vir culture which have not been documented in other parts of Europe.

**Keywords**

Prehistory · Serbia · Paleolithic · Mesolithic · Neolithic · Eneolithic · Bronze Age · Iron Age

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The role of the Central Balkans in European prehistory was largely determined by its geographical location and characteristics. In the past, the main migration corridors between Southwest Asia and Central and Western Europe passed through the Central Balkans, and the peninsula represented an important glacial refugium of Europe (Griffiths et al. 2004). Areas that provided optimal conditions for settlement (such as lowlands, river valleys, and basins) acted as the scenes of social and cultural interactions in different periods of prehistory. Cultural changes and population movements during these periods were undoubtedly greatly influenced by geographical factors. It is therefore not surprising that a multitude of evidence for demographic shifts and cultural and social contacts between different populations has been collected from the territory of Serbia. However, this territory also records some unique cultural manifestations, characteristic only of the Balkans.

## 2.1 Paleolithic

The evolution of hominins in the Balkans can be traced back to the late Miocene (Turolian) during which the Eastern Mediterranean experienced significant cooling and aridification. The discoveries of 7.2-million-year-old hominin fossils in Greece and Bulgaria (*Graecopithecus freybergi* and cf. *Graecopithecus* sp., respectively) indicate that major splits in the hominid family probably occurred outside Africa (Fuss et al. 2017). The oldest artifacts from the Central Balkans, dated to the early phase of the Middle Pleistocene, were discovered in the Balanica Cave Complex in Sićevo near Niš in the southeastern part of Serbia (Fig. 2.1).

The deepest layer of Mala Balanica, which was radiometrically dated to around 400 thousand years ago, yielded a fragment of a fossilized hominin mandible (Fig. 2.2). The fossil does not show Neanderthal-like morphological features and has thus been attributed to the species *Homo heidelbergensis* (Roksandic et al. 2018). The upper layers of


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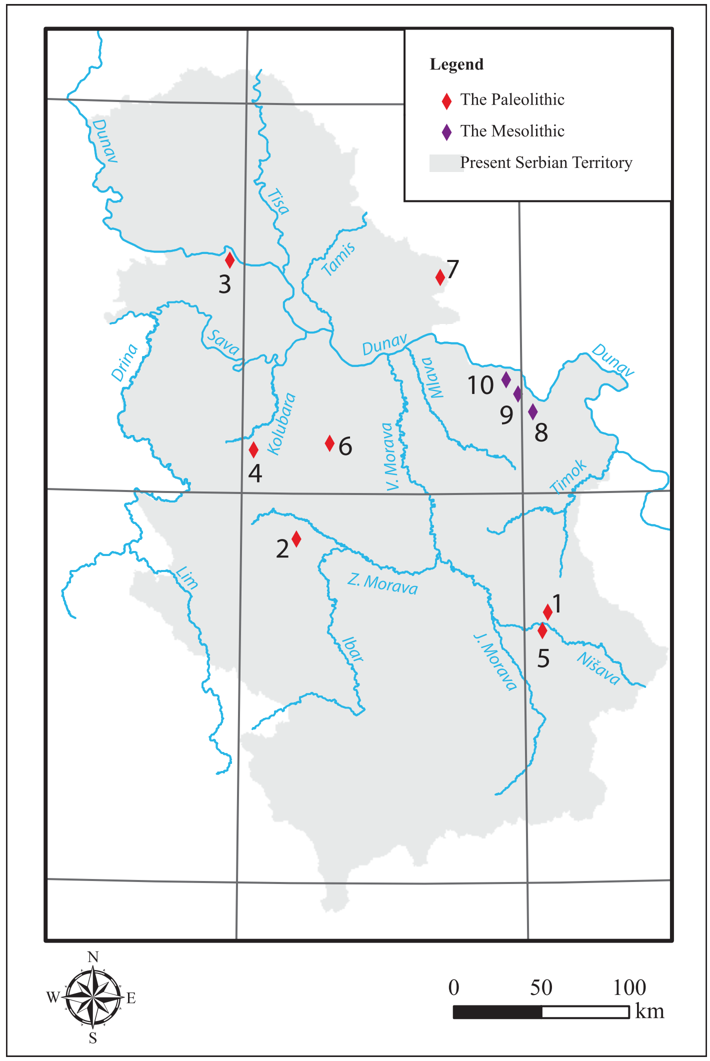


**Fig. 2.1** Paleolithic and Mesolithic sites in present-day Serbia. (Modified from Mihailović and Zorbić 2017) Paleolithic: 1. Balanica, 2. Kosovska kosa, 3. Petrovaradinska tvrđava, 4. Šalitrena pećina, 5. Pešturina, 6. Risovača, 7. Crvenka – At; Mesolithic: 8. Vlasac, 9. Lepenski Vir, 10. Padina


**Fig. 2.2** Fragmented mandible of *Homo heidelbergensis* from Mala Balanica. (Photo by M. Roksandić)

Mala Balanica (2a-2) and the lower layers of Velika Balanica (3a-3c) record numerous artifacts and faunal remains from the late Middle Pleistocene (400–200 thousand years ago), as well as traces of fireplaces. Balanica artifacts, including the typical Quina sidescrapers (Fig. 2.3), were found to have numerous parallels in the Yabrudian of the Levant, indicating that demographic shifts and/or cultural transmission occurred between the Middle East and Southeast Europe at the end of the Middle Pleistocene, during some of the interglacial periods (isotopic stages 9 or 7) (Mihailović and Bogićević 2016).

The Neanderthal economic activity was based on hunting different species of animals in the immediate vicinity of the habitation. For example, horses and bison were the most frequently hunted animals in the vicinity of Pešturina Cave (southeastern Serbia), which also records Neanderthal remains (Radović et al. 2019; Lindal et al. 2020) and remains of megafauna (Milošević 2016). At Hadži Prodanova Cave, the most numerous mammalian remains were those of ibex (Milošević 2016), while in the vicinity of Šalitrena Cave (western Serbia), Neanderthals mostly hunted for bovines, horses, and ibex, and less frequently for chamois and roe deer (Fig. 2.1).

Within the early Middle Paleolithic lithic material (which generally belongs to the typical Mousterian), Quina artifacts

**Fig. 2.3** Stone tools from Mala Balanica. (Photo by D. Mihailović)

commonly occur with Levallois artifacts – indicating that Neanderthals planned their activities in advance (Hiscock et al. 2009). A technologically undifferentiated Typical Mousterian occurs in the interior of the Balkans during this period (Mihailović 2014). Mousterian with leaf-points, present in the Pannonian Basin and in the east of Balkans, has been confirmed so far only at two sites in Serbia: Risovača Cave (central Serbia) and the terrace in front of Šalitrena Cave (Mihailović and Zorbić 2017).

Although the Balkan Neanderthals likely died out 44–43 kya (as inferred by the available absolute dates in the region), this archaic group of hominins might have survived somewhat longer in the central and western parts of the peninsula (Mihailović 2017). So far, there is no conclusive evidence that their extinction was due to climate and environmental factors (Müller et al. 2011), nor by the effects of mega-eruption 40 kya (Lowe et al. 2012). The extinction of Neanderthals seems more likely to be linked to the emergence of modern humans, whose presence in the Balkans was confirmed at 43 kya (Tsanova 2008). In addition to archeological data, contact between the two populations is evidenced by the relatively high proportion of Neanderthal genes in the genome of the modern human from the Peştera cu Oase site in southwestern Romania (Fu et al. 2015).

The earliest evidence of the material culture of modern humans in Southeastern Europe comes from northern Bulgaria and southwestern Romania – where Paleolithic art has also been confirmed (Tsanova 2008; Géli et al. 2018). Most authors believe that modern humans settled Europe from southwest Asia and that this expansion occurred along the so-called Danube corridor (Chu 2018). This is supported by the Serbian Paleolithic record, which shows the majority of the early Upper Paleolithic (Proto-Aurignacian and Aurignacian) sites concentrated in the Danube and Sava River basins and peri-Pannonian lands, while there are none in the central and southern parts of the Balkans (Mihailović et al. 2011). However, it remains to be seen whether modern humans also used other routes for their migrations (Mihailović 2020).

Crvenka-At in eastern Vojvodina (Northern Serbian province) stands out among the Aurignacian sites in Serbia (Mihailović 1992) (Fig. 2.1). This multilayered site records an enormous quantity of lithic artifacts, which display characteristics seen in the Aurignacian sites of the Romanian Banat. While the simultaneity of these sites has not yet been confirmed, it can be assumed that this part of the Banat represented a unique social territory, that is, that the Aurignacian communities seasonally exploited the lowlands of the Banat and the low hilly zones of the Carpathian Massif (Hauck et al. 2018).

Several ephemeral settlements with a low number of lithic finds have been confirmed in eastern Serbia, suggesting that the Aurignacian communities seasonally inhabited hilly areas of this region too (Dogandžić et al. 2014). A significantly richer lithic assemblage was recovered from the Aurignacian layer at Šalitrena Cave in western Serbia, dated to 36–34 kya (Marin Arrojo and Mihailović 2017) (Fig. 2.1).

The majority of Upper Paleolithic sites in Serbia are those which record Gravettian and the early phase of Epigravettian. This is in accordance with the assumption that the Balkans represented one of the main European refugia during and just before the Last Glacial Maximum, not only for fauna and flora but for human populations as well. Moreover, the strong Central European affinity of the material culture of the northern Balkans (Šalitrena Cave, Bulgarian sites) indicates that contacts between the communities that inhabited the Carpathian Basin and the northern Balkans intensified at the beginning of the Last Glacial Maximum, perhaps due to demographic shifts (Mihailović et al. 2011).

The Gravettian is best known from layer 4 at Šalitrena Cave, which yielded numerous artifacts and remains of fauna (Mihailović 2008a) (Map 1). Unlike Šalitrena Cave, most sites in eastern Serbia (e.g., Bukovac, Velika Cave, Pešturina, Velika Vranovica – Lower Cave) cannot be classified as base camps, but only as temporary or specialized camps related to ibex hunting and the acquisition of additional resources (Kuhn et al. 2014; Dimitrijević et al. 2018). During this period, the settlement of gorges and canyons had begun, fully apparent only in the late Pleistocene and early Holocene.

Recolonization of the hilly-mountainous zone occurred during the Late Glacial. While the interior of Serbia saw no increase in the Epigravettian presence, the traces of frequent settlement (probably seasonal in character) were recorded in the coastal zone and the territory of northern Montenegro.

## 2.2 Mesolithic

As is the case with the final Paleolithic, Mesolithic sites have been recorded mostly in the coastal zone of the Balkans. In the interior of the peninsula, however, Mesolithic sites are generally lacking. The notable exception is the Iron Gates region of the Danube River, where a large number of Mesolithic settlements were discovered and examined in the 1960s and 1970s, thanks to the protective research undertaken due to the construction of hydroelectric power plants on the Danube (Radovanović 1996). Since later studies in Serbia did not reveal any additional Mesolithic sites, the question arose as to whether the Central Balkans had been inhabited in the early Holocene at all (Perlès 2003). However, we cannot exclude the possibility that the Mesolithic settlements were erected directly along the banks of rivers, lakes, and seas and that they are today flooded, eroded, or covered with thick layers of alluvial deposits.

The beginnings of the settlement of the Iron Gates gorge go back to the end of the Pleistocene and the beginning of the Holocene, with sites such as Climente and Cuina Turcului on the left bank of the Danube, as well as Vlasac, Padina and Lepenski Vir on the right bank of the river (Radovanović 1996; Jovanović 2008; Borić 2011) (Fig. 2.1). The archeological and isotopic analyses have demonstrated that fishing had a significant role in these settlements (Bonsall et al. 2016), while still seasonally exploiting the hilly-mountainous zone (Mihailović 2008b). Adaptation to the new conditions of life was gradual, as evidenced by the transformation of chipped stone artifacts and the appearance of bone, antler, or horn tools (Mihailović 2007). In most settlements dated to this period, graves were also noted. According to some interpretations, the graves could have played the role of territorial markers, as a means for a community to claim territory (Radovanović 1996).

Favorable ecological conditions have prevailed in the Iron Gates during the Boreal age, which led to a boom in the hunting and fishing economy, reflected in the intensification and specialization in catching big fish, such as sturgeons and catfish (Živaljević 2017). At this time, the process of sedentarization of the Iron Gates Mesolithic communities began (Dimitrijević et al. 2016), and a local domestication of the dog is recorded at Vlasac (Radovanović 1999; Dimitrijević and Vuković 2015). There are also indications that contacts with Neolithic communities of Anatolia (Turkey) were already established during this period (Cristiani et al. 2016).

Many riverbank sites in the Iron Gates were abandoned during the global climatic oscillation which occurred around 6200 years ago, with the notable exception of Lepenski Vir (Bonsall et al. 2002). The site of Lepenski Vir existed between 6300 and 5900 BC, as a unique phenomenon in the Mesolithic of Europe (Srejović 1969). More than 50 dwellings with trapezoidal bases and limestone plastered floors were discovered at the site, many of which contained figurative and ornamental stone sculptures with fish-like features (Fig. 2.4). Burials were carried out both within (below the floors) and outside of the dwellings (Borić 2016).

At Lepenski Vir, the phase with trapezoidal buildings (i.e., Lepenski vir I) is concurrent with the appearance of the Neolithic in the Central Balkans (Radovanović 2006; Borić

**Fig. 2.4** Stone sculpture from Lepenski Vir, the so-called Foremother. (Photo by National Museum, Belgrade)

2011). Interactions between the Mesolithic and Neolithic populations have been confirmed in the technological domain (e.g., the appearance of Neolithic elements in chipped and polished stone, bone and horn tool production), but also via molecular studies. Strontium and nitrogen isotope data have shown that there was contact between the local (hunter-gatherer) and newly arrived (farmer) populations (Borić and Price 2013). Furthermore, aDNA analyses of the Lepenski Vir hunter-gatherers have demonstrated a clear genetic affinity toward northwestern Anatolian Neolithic populations (Mathieson et al. 2017), confirming the Iron Gates as a region of interaction between different populations.

## 2.3 Neolithic and Eneolithic

The emergence of the Neolithic in the Balkans at the beginning of the sixth millennium BC was driven by the influx of cultivated cereals and domesticated animals from the Middle East and new technological developments such as the production of pottery, in favorable ecological conditions. This change was accompanied by dramatic demographic growth and the formation of communities much larger than those of Paleolithic and Mesolithic. The Neolithic Starčevo and Vinča cultures occupied territories much larger than present-day Serbia, encompassing the bordering parts of neighboring countries too, and, taken together, lasted for almost two millennia.

During the Neolithic, areas south of the Sava and Danube Rivers were more densely populated than those in the north (i.e., the present-day northern Serbian province of Vojvodina). The reason for this probably lies the fact that wetlands covered vast expanses of today's northern Serbia, from prehistory until the construction of the irrigation system in the eighteenth century. Prehistoric settlements were therefore positioned on elevated ground, not prone to flooding.

Two cultures dominated the Neolithic landscape of the Central Balkans: the Starčevo (older) and the Vinča (younger) cultures (Fig. 2.5). The northern part of present-day Vojvodina was inhabited by people of the Körös culture during the Early and Middle Neolithic and by those of the Tisza culture during the Late Neolithic. Continuous development

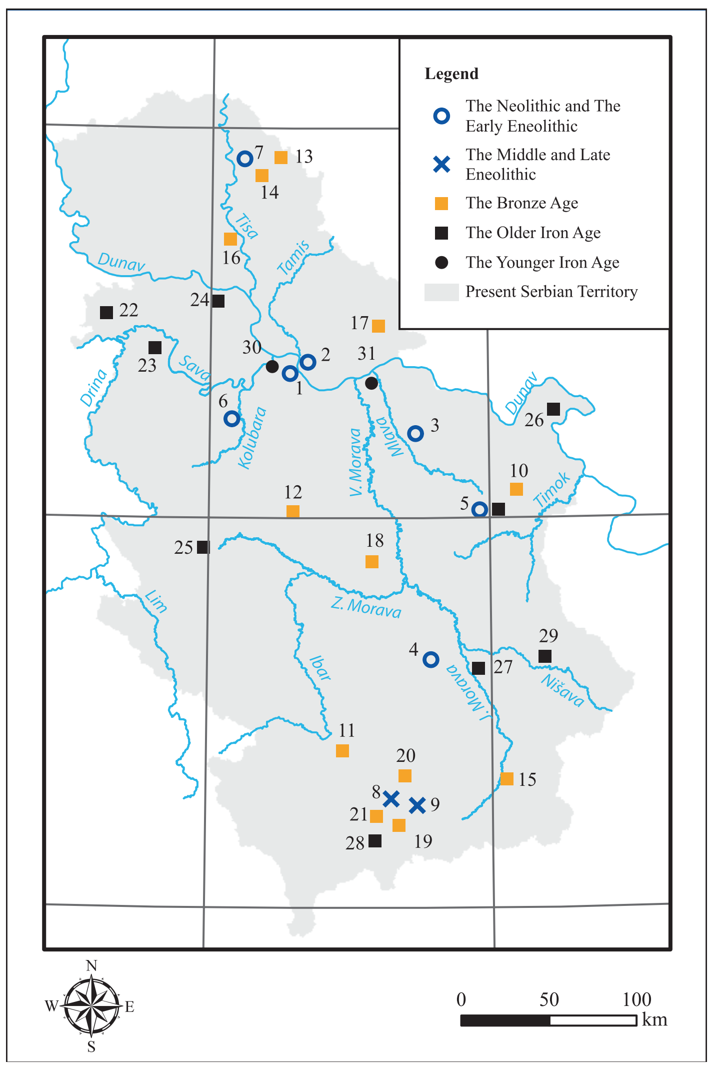


**Fig. 2.5** Neolithic, Eneolithic, Bronze Age, and Iron Age sites in present-day Serbia, all of which are mentioned in the text. (Modified Mihailović and Zorbić 2017)
*Neolithic and Early Eneolithic*: 1. Vinča, 2. Starčevo, 3. Belovode, 4. Pločnik, 5. Zlotska pećina, 6. Crkvine-Stubline, 7. Čoka; *Middle and Late Eneolithic*: 8. Gladnice, 9. Hisar-Suva Reka; *Bronze Age*: 10. Ružana, 11. Jarmovac, 12. Prljuša-Mali Šturac, 13. Mokrin, 14. Ostojićevo, 15. Meanište, 16. Feudvar, 17. Židovar, 18. Ljuljaci, 19. Iglarevo, 20. Graštica, 21. Karagač; *Early Iron Age*: 22. Gradina upon Bosut, 23. Gomolava, 24. Kalakača, 25. Mojsinje, 26. Vajuga-Pesak, 27. Vrtište, 28. Pećka Banja, 29. Sinjac Polje; *Late Iron Age: 30.* Karaburma, 31. Pećine

of Starčevo and Vinča cultures indicates that the same population inhabited these areas during a period of almost 2000 years.

The people of the Starčevo and Vinča cultures generally preferred their settlements to be located near rivers, and only quite rarely in mountainous areas. In the Early Eneolithic, however, the settlement pattern changed, as the proportion of settlements located at higher altitudes and caves increased, while river valleys were still densely populated. This was likely due to more frequent foreign invasions during this period, which forced the population to withdraw to better-protected areas.

There were two basic types of settlements in the Neolithic and Early Eneolithic: lowland and hillfort settlements (Ristić-Opačić 2005). However, no single settlement type was specific to a particular phase of the Neolithic and Early Eneolithic. Hillfort settlements were erected in the areas south of the Sava and Danube Rivers. Cave settlements begin to appear only in the Eneolithic, which can possibly be related to the climate catastrophe in the southeastern part of the Balkan Peninsula (Todorova 2007) and migration caused by it. Caves represented ideal locations for settlements as they provided coolness, moisture, and security.

Vinča culture settlements occupied between 0.5 and 200 ha (Chapman 1981), and the larger settlements (such as Crkvine-Stubline in Posavina, Fig. 2.5) supported at least 2000 and possibly up to 3500 inhabitants (Crnobrnja 2014). On the other hand, Starčevo culture settlements were probably inhabited by smaller communities, as inferred from the less dense spatial distribution of residential buildings.

Agriculture certainly represented the main subsistence strategy during Neolithic and Eneolithic. The most frequently cultivated plant species were einkorn wheat (*Triticum monococcum*) and emmer wheat (*Triticum dicoccum*), while other types of cereals were also widely represented: bread wheat (*Triticum aestivum/durum*), barley (*Hordeum vulgare*), and millet. Flax (*Linum usitatissimum*) was probably grown for the production of fiber and oil (Tasić and Filipović 2011). In addition to cultivated plants, Neolithic and Eneolithic communities also consumed wild plants, and collecting of wild fruits certainly represented an important subsistence practice during those times.

Livestock farming was limited to several species. The presence of domesticated animals such as cattle, sheep, goats, pigs, and dogs was confirmed in several Neolithic sites. The people of Starčevo culture predominantly herded cattle, in contrast to the Early Neolithic localities in Greece, Hungary, and the Carpathian region, where sheep and goats were prevalent. Adult cattle were represented in a much higher proportion than young animals (Stojanović and Bulatović 2013), so it is assumed that these bovines were raised primarily for milk and as draft animals.

**Fig. 2.6** Anthropomorphic figurine from Vinča. (Photo by N. Tasić)

Neolithic and Early Eneolithic communities had extensive craft production, as evidenced by the numerous and varied pottery, stone and bone tools, weapons, and ornamental and cult objects found at sites throughout Serbia (Figs. 2.6 and 2.7) (Antonović 2003; Šarić 2014; Vitezović 2011; Vuković and Miloglav 2018).

Wood was used extensively in the production of furniture and items for daily use, as evidenced by the numerous stone axes, adzes, and chisels, as well as by the prints of rectangular planks in daub fragments which represented parts of the walls of dwellings. The diversity of rock types used as raw materials for production of tools and ornamental and cult objects indicates that Neolithic inhabitants of the Central Balkans had extensive knowledge of the geological resources. Amorphous pieces of malachite, azurite, galenite, and cinnabarite, which were discovered at some sites of the Starčevo and early Vinča cultures (Antonović 2014), imply an early knowledge about different types of ores, which would eventually lead to the discovery of metallurgy around 5000 years BC. The technology of copper smelting and casting already reached an enviable level in the earlier phases of the Vinča culture and continued to develop during the Early Eneolithic, as evidenced by the production of massive copper tools. The extensive production of smaller tool types for daily use (e.g., awls, chisels) began only after the Vinča culture, during the Middle and Late Eneolithic, throughout the territory of Serbia.

**Fig. 2.7** Stone mortar from the site of Vinča-Belo Brdo. (Photo by N. Tasić)

Trade contacts are indirectly recorded in some Neolithic and Eneolithic settlements. Luxury goods such as obsidian (volcanic glass) and *Spondylus* bivalve shells were imported from geographically remote areas. On the other hand, decorative items characteristic of the Vinča culture were exported, as exemplified by the marble button-like items discovered at the Tisza culture site of Čoka in Vojvodina (Fig. 2.5). Salt (halite) was likely one of the central goods in prehistoric exchange networks since it has an important role in human nutrition (Tasić 2009). This pivotal resource could have been obtained from the mines in Tuzla (Bosnia) and Transylvania (Romania), but it could have also been obtained from saline soils found along the Danube, Tisza (Tisa), Maros (Moriš), and Temes (Tamiš) Rivers (Tasić and Filipović 2011).

Eneolithic period was marked by frequent cultural shifts, and the territory of today's Serbia never again displayed the cultural unity seen during the Neolithic. As the great Vinča culture came to an end around the mid-fifth millennium BC, the territory of Vojvodina was occupied by the southward expanding populations of the Tiszapolgár and Bodrogkeresztúr cultures, respectively. The communities of the Bubanj-Sălcuţa-Krivodol cultural complex began to settle in the territory of eastern and southern Serbia even before the end of the Vinča culture. At the beginning of the fourth millennium BC, after several centuries of peaceful and stable development, these cultures were replaced by the new ones, in the waves of migration and cultural change which characterize the Eneolithic period.

The Middle to Late Eneolithic settlement patterns on the territory of Serbia were strongly influenced by the climatic conditions that prevailed during the fourth and third millennium BC, as well as by the features of relief. The hilly-mountainous terrain and pastoral lifestyle led to a new way of organizing settlements south of the Sava and Danube Rivers, and the increased demand for copper during this period resulted in intensified colonization of the areas rich in this mineral resource (i.e., western and eastern Serbia).

Climatic changes (a noticeable temperature drop and a decrease in humidity) at the end of the fourth millennium BC led to the thinning of the forest cover and the expansion of the grasslands. As a result, many fertile soils have turned useless (Srejović 1981), which in turn forced the central Balkan populations to shift from sedentary agriculture to nomadic pastoralism, characterized by seasonal population movements from the highlands to the lowlands. Domestication of the horse by the nomadic tribes which inhabited the grasslands between the Volga River and the Ural Mountains represents a key point in this change of lifestyle. More waves of settlement followed, especially in the northern Pannonian regions of Serbia and in the valleys of large rivers in its central part. The Cernavodă III-Boleráz, Baden, and Kostolac cultures alternated successively, until the arrival of predominantly nomadic populations from the Pontic and Central Asian steppes (Gladnice and Hisar sites in southern Serbia, Fig. 2.5). These nomadic cultures constructed large tumuli (burial mounds), as exemplified by those of the so-called Pit Grave or Ochre Grave culture, about 1000 of which have been recorded in Serbia (Tasić 1983).

The Late Eneolithic period is characterized by (among other things) an increase in the production of copper items, especially cruciform axes (Jovanović 1971), the majority of which were discovered in the areas of the most intensive copper exploitation (northeastern Serbia). These items were also found in other regions of Serbia, where they probably arrived through the exchange, as valuable and luxury items. The economic transition to metallurgy also led to changes in the religion and treatment of the dead, which is best reflected in the abandonment of skeletal burial (inhumation) and the adoption of cremation (Jovanović 1971).

Settlements in the plains of the Pannonian Basin, as well as those on the terraces of large rivers in the Central Balkans, retained the form of the earlier Neolithic settlements but differed by having smaller numbers of residential buildings. At the same time, a new type of high-altitude settlement was emerging in the hilly-mountainous zones of northeastern Serbia. Groups of smaller residential buildings were constructed in inaccessible locations (e.g., above canyon entrances, at elevations above river mouths), and as a rule protected by a steep rocky cliff on one side (Kapuran 2014). It is assumed that these settlements represented landmarks in the landscape, occupied by the shepherds who were herding their animals in the surrounding territories during the summer months.

## 2.4 Bronze Age

The earliest Bronze Age in the territory of Serbia is documented by the sites of the Vinkovci and Maros cultures in the Pannonian Basin, Belotić-Bela Crkva in western Serbia, and Bubanj–Hum III culture in central and southern Serbia (Fig. 2.5). These cultures spanned almost the entire territory of present-day Serbia, although recent research in the field of archaeometallurgy has suggested that the copper-rich areas were the most densely populated ones. In addition to those located in eastern Serbia, there are indications that other copper mines had been also exploited during the Bronze Age, such as Prljuša-Mali Šturac on Rudnik Mt. in central Serbia (Antonović 2017) and Jarmovac-Majdan near Priboj in southwestern Serbia (Derikonjić 2010) (Fig. 2.5).

The Early Bronze Age in Serbia is characterized by a small number of recorded settlements, but a large number of explored necropolises. While only a single grave from the site of Surčin near Belgrade is attributed to the Vinkovci culture, a multitude of burial sites concentrated in the vicinity of Kikinda in Vojvodina are attributed to the Maros cultural group, with Mokrin and Ostojićevo (Girić 1971) necropolises probably being the best researched ones (Fig. 2.5). Hundreds of individuals were inhumated at these sites, along with grave goods such as pottery vessels and copper, bronze, or gold jewelry. The communities of the Belotić-Bela Crkva culture in western Serbia mostly inhumated their deceased, but cremations are also recorded; the burials were covered by stone or earth mounds of variable size (Fig. 2.5). At Meanište necropolis, located in the south of Serbia near Vranje (Fig. 2.5) and dated from the twenty-second century to the eighteenth century BC, only cremation burials are recorded, where the remains of the deceased were placed within circular stone structures (Bulatović et al. 2016). The material culture of the Early Bronze Age communities of southern Serbia displays strong influence of cultures located further south on the Balkan Peninsula.

During the Middle Bronze Age, the territory of today's Serbia was influenced by two large cultural complexes known as the Vatin and Bubanj-Hum IV. The contact between the territories of these two complexes was situated somewhere along the rivers of Zapadna Morava and Nišava (Fig. 2.5). In contrast to the previous period, several Middle Bronze Age settlements and burial sites were recorded in the plains of the Pannonian Basin; in the western part, however, no settlements dated to this period have been recorded. In addition to typical open-air settlements, the most important Vatin culture sites are the so-called tell-culture settlements such as Feudvar near Mošorin and Židovar near Vršac (Fig. 2.5). Feudvar was surrounded by powerful rampart defenses, reinforced with palisades and trenches, which enclosed houses of uniform size, organized in rows, with relief-decorated facades. A tell-type settlement of Židovar was formed on one of the hills on the outskirts of Deliblato Sands (Fig. 2.5). These sites likely represented the economic and political centers of the communities in the southern Pannonian Basin. Numerous other settlements were recorded in the vicinity of Vršac, Pančevo, Belgrade, Požarevac, and along the Danube (Fig. 2.8). Toward the end of this period, there was a strong influence of the so-called Transdanubian Encrusted Pottery culture.

Judging by the stylistic and typological characteristics of pottery, a distinct variant of the Vatin culture was present in the territories south of the Sava and the Danube. This culture was originally described based on the material from the site of Ljuljaci near Kragujevac (Bogdanović 1986), but is now known from a number of similar settlements thanks to new discoveries during the last few decades. The Middle Bronze Age is also marked by an increase in bronze production, thanks to the connections established with the mining areas in the Carpathians and Eastern Serbia.

During the Developed Bronze Age, the Vatin cultural complex collapsed. This was most likely due to the new climatic fluctuations of the mid-second millennium BC, and the resulting southward migratory waves of people from the Danube region.

The first migratory wave is marked by the influx of populations of the Transdanubian Encrusted Pottery culture, which originated in areas along the Danube where it persisted in enclaves until the very end of the Bronze Age (i.e., the cultural group Dubovac-Žuto Brdo-Grla Mare). The territories previously occupied by the populations of the Vatin complex (i.e., Vojvodina, Danube and Sava valleys, western Serbia) were now dominated by the Belegiš culture, well-known for its numerous necropolises (Gomolava, Karaburma, Feudvar) with cremated deceased (Fig. 2.5). Since its inception, the Belegiš culture had been under the influence of newly arrived populations from central Europe, associated with the Hügelgräber and Channeled Pottery cultures (Tasić 1972a). This interaction was rather gradual and peaceful in nature.

**Fig. 2.8** Votive cart from Dupljaja. (Photo by National Museum, Belgrade)

While the communities of the Tumulus (Hügelgräber) culture practiced biritual burials (i.e., both inhumations and cremations) under tumuli or flat graves – as exemplified by the necropolis of Velebit (Kapuran 2019), the Channeled Pottery culture is characterized by cremations under flat graves exclusively.

New cultures which almost exclusively practiced cremation burials were also emerging in the areas south of the Sava and Danube: the Paraćin culture in central Serbia; the Brnjica culture in southern Serbia, and in the present-day southern Serbian Autonomous Province of Kosovo and Metohija (with sites such as Graštica near Priština, Iglarevo at the Kosovo-Metohija border, and Karagač; Fig. 2.5) (Ljuci 1998). While Graštica represents a typical (cremations-only) Brnjica culture burial site, the two necropolises at Iglarevo also record inhumation burials (in addition to cremations). These sites yielded large numbers of bronze items, including weapons and jewelry (e.g., Mycenaean swords and long decorative needles).

The developed Bronze Age had seen a noticeable rise in the production of bronze, before reaching the peak during the next phase of the Bronze Age. Significantly, there was a resurgence of the production of anthropomorphic figurines related to religious rituals, with the artistically most elaborated objects occurring within the Dubovac-Žuto Brdo-Grla Mare cultural group.

The last two centuries of the second millennium BC are denoted in Serbian archeology by several terms, such as the Late Bronze Age-Early Hallstatt (Garašanin 1954), the Transitional period (Garašanin 1983, 1994; Vasić 1977), or the Iron Age I (Garašanin 1973, 1975). In the central European chronological scheme, this period is denoted as Hallstatt A (A1–A2). Today, it is clear that the first objects made of iron appear in the territory of present-day Serbia during the first millennium BC. Furthermore, since this period is marked by the largest number of recorded bronze objects during the entire prehistory, the appropriate term for it would be the “Bronze hoards horizon” (Tasić 1983). According to Garašanin (1983), the period can be divided into four phases, all of which except the first have the characteristics of the Gava group and the Urnfield (Urnenfelder) culture.

During the last two centuries of the second millennium BC, the Pannonian Basin was inhabited by populations that utilized black polished and channeled pottery of the Gava group and practiced a sedentary lifestyle, as inferred by the research of vast necropolises with cremated deceased found across Vojvodina. This cultural group is also well-known for finds of large accumulations of bronze objects (hoards) which included various types of weapons, tools, jewelry, and ingots, either stored in larger ceramic vessels or directly buried in the ground. Presumably, these hoards had a votive character, that is, they represented symbolic offerings to gods (i.e., the wealth bestowed by a community or individual upon the gods to pacify them).

Hoards of bronze objects are most prevalent in the Pannonian Basin, while being found in much smaller numbers in the region bounded by the Sava and Danube in the north and the Zapadna Morava and Nišava on the south (Fig. 2.9). There are no known bronze hoards in the territories further to the south.

At one point, there were significant cultural changes and demographic shifts in central and southern Serbia. Indigenous communities that inhabited the plains for centuries were beginning to retreat into the inaccessible mountainous zones, most likely due to the imminent threat posed by hostile pop-

**Fig. 2.9** Rudnik bronze hoard. (Photo by A. Đorđević)

ulations coming from the north. The scorched settlements of indigenous communities were thereafter occupied by the populations associated with the Channeled Pottery cultural group (Bulatović 2007), indicating that the population shift in the area had taken a violent turn. Therefore, the appearance of channeled pottery represents the clearest evidence of a new order, established after the destruction of indigenous settlements by the invaders from the north. These conquerors are, among other things, associated with the massive production of diverse bronze weapons.

## 2.5 Iron Age

According to Vasić (1990), the Early Iron Age can be divided into the Early Phase (tenth to eighth centuries BC; Hallstatt B), the Developed Phase (eighth to sixth centuries BC; Hallstatt C), and the Late Phase (sixth to fourth centuries BC; Hallstatt D), ending with the arrival of the Celts. Systematic archeological excavation of the settlement of Hisar in Leskovac (southern Serbia) has demonstrated that the earliest iron axes were used at the beginning of this epoch (Bulatović and Kapuran 2013). Another early record of an iron axe comes from the site of Gradina upon Bosut (Vojvodina), dated to the eighth century BC (Medović and Medović 2011, 65). This early stage is also documented at the necropolis of Mojsinje near Čačak (western Serbia), with a find of a single large-sized fibula with triangular foot (Vasić 2014). A number of iron objects were also recovered from the collective burial at Gomolava in Posavina (Tasić 1972b) (Fig. 2.5). All known settlements dated to this period (i.e., Gradina upon Bosut, Gomolava, Kalakača, Židovar, Titelski breg) are located in the territory of the northern Serbian province of Vojvodina (Fig. 2.5). These sites record numerous storage pits used to store cereals, marking the return to agriculture and a sedentary lifestyle (Vasić 1990; Jevtić 2011). There is also a change in funerary customs, as communities return to inhumation burial rites. At the group burial at Gomolava (Tasić 1972b) and the burial site of Mojsinje near Čačak (western Serbia), grave goods are usually represented only by a single ceramic vessel, while bronze grave goods are rare. In other cases, only individual burials were found.

During the eighth to sixth centuries BC (the Developed Phase of the Early Iron Age; Hallstatt C), elements related to the Basarabi culture dominated, first in eastern Serbia and later in its wider territory. With their origin in the east (Oltenia), these elements represent a reflection of the Thraco-Cimmerian or the Carpathian-Lower Danubian cultural complex. At the site of Vajuga-Pesak in the Iron Gates, the only known Serbian necropolis dated to this period, the individuals were buried with jewelry and weapons made of bronze and iron (Popović and Vukmanović 1998) (Fig. 2.5). The settlements recorded in the hilly-mountainous zones of eastern Serbia were ephemeral in character, and the subsistence strategy of these communities was oriented more toward animal husbandry (Kapuran 2014).

The first influence of the Glasinac culture can be observed during this period in western and southwestern Serbia, as exemplified by the aforementioned iron fibula from Mojsinje necropolis near Čačak. In the southern Serbian province of Kosovo and Metohija, this period is recorded in the earlier phase of Gradina in Belaćevac, with pottery which resembles Greek imports. The best known burial sites from this area are those of Vlaštica near Gnjilane (tumuli burials) and Kargač near Zvečan (Fig. 2.5). The numerous finds of weapons at the necropolises of Boka near Prčevo and Romaja near Prizren demonstrate a pronounced warriorhood element of the communities buried at these sites.

The Late Phase of the Early Iron Age (sixth to fourth centuries BC; Hallstatt D) is characterized by cultural influences coming from different directions: from the west (Glasinac and Donja Dolina in Bosnia and Herzegovina), from the southwest (Albania), from the east (Oltenia), and from the south (Pelagonia and Greece). In eastern Serbia, the so-called Zlot group appears, which displays influences coming from both the west and east of the Balkan Peninsula. In western and southwestern Serbia, there was a growing influence of the Glasinac culture, associated with the most powerful Illyrian tribe of Autariates, who are archeologically distinguished by burial sites consisting of tumuli with large number of weapons, jewelry, and pottery as burial gifts. At the same time, the territory of Vojvodina was under the influence of a group which used channeled pottery. In the south and southeast of Serbia, there was a simultaneous cultural influence from the territories of present-day Bulgaria and Greece.

The deceased were inhumated with jewelry and pottery items, which can be seen in the example of a tomb from the site of Vrtište near Niš in southern Serbia (Fig. 2.5). The stronger influence of the Glasinac culture and the growing number of imported goods from the territory of Greece resulted in the appearance of extremely rich graves with luxurious jewelry, amber, and warrior equipment. The best examples of this type of burials, known as the Mramorac type of graves, and the princely graves of Novi Pazar and Atenica in southwestern Serbia (Vasić 1997). In addition to the Mramorac-type jewelry, the imported Greek pottery represents a significant element present in these graves, such as the one discovered in Pećka Banja (showing a rectangular stone structure under the tumulus) (Fig. 2.5).

Toward the very end of the Early Iron Age, there was an even stronger influence on the material culture on the territory of present-day Serbia, coming from other parts of the Balkan Peninsula. The ancient tribe of Triballi (Vasić 1991), believed to be of Thracian origin, appeared in central and eastern Serbia, and lasted until the arrival of the Romans. The influences from Glasinac and Donja Dolina continued in the western regions of Serbia. The Illyrian tribe known by the name of Dardani settled in what is now southern Serbia (including Kosovo and Metohija) and northern Macedonia (Vasić 1991). The social interactions in this area are evidenced by the trade in luxury objects and biritual (skeletal and cremation) burials, as seen at the site of Sinjac Polje near Bela Palanka in southern Serbia (Kapuran et al. 2015).

The arrival of the Celts in the Central Balkans in the second half of the fourth century BC marks the beginning of the Late Iron Age. In the course of their southward migrations, the Celts occupied the Carpathian Basin, eastern Transylvania, and the Central Balkans, but without a clearly planned settlement pattern (Jovanović 2010). This event is best illustrated by necropolises located along the Danube River basin, such as those at Karaburma in Belgrade (Todorović 1972) and Pećine near Kostolac (Jovanović 2018) where we see the earliest Celtic burials in the territory of Serbia (Fig. 2.5). After the brief consolidation period, the Celts then attacked the regions to the south (i.e., Thrace and Greece), and this ended with the conquest of Delphi and the subsequent heavy defeat of the Celts in 279 BC (Jovanović 2018). After a series of defeats, the Celts were forced to retreat to the regions from which they started their invasion, and in the course of the third century BC, several tribes formed in the territory of present-day Serbia, most notably the Scordisci. Apart from Celtic, their material culture is also characterized by the Thracian-Scythian influences in the initial stages, as well as by the strong Dacian influence in the later stages, before the final conquest by the Romans.

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# Serbia: A Historical Survey

3

Radmila Pejić, Sofija Petković, and Dejan Radičević

**Abstract**

The Serbs settled in present-day Serbia and wider Balkans in the early seventh century and created their early medieval states there. From the twelfth to fifteenth century, Serbia prospered under the rule of the Nemanjić dynasty, expanding her territory to the south at the expense of the Byzantine Empire. Serbia became an Empire at the height of her power and the Serbian Orthodox Church rose to the rank of Patriarchate. In the fifteenth century, Serbia fell under the Ottoman yoke and it was not before the nineteenth century that the country regained her independency through insurgency against the Ottomans and diplomatic struggle against the background of the Great Eastern Crisis. Serbia then struggled to maintain her independent status as her mighty neighbor Austria-Hungary strove to reduce her to a client state. This conflict was resolved through the ordeal of the First World War in which Serbia lost a quarter of her population and suffered material destruction but emerged victorious. Serbia liberated the South Slav lands of the defunct Habsburg Empire and formed the Kingdom of Serbs, Croats, and Slovenes (renamed Yugoslavia after 1919). The Yugoslav Kingdom was dismembered during the Second World War and became a stage for the most brutal civil war under the occupation. The communists won power at the end of the war and established the "second" Yugoslavia which broke up in another civil war during the 1990s. After a short-lived union with Montenegro, Serbia again became an independent country in 2006.

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## 3.1 The Roman Empire in the Present-Day Serbia

The ancient population on the territory of present-day Serbia consisted of tribes belonging to three large ethnic groups (people) – Thracian, Illyrian, and Daco-Moesian, with the adstratum of the population inhabited during Roman domination from all parts of the Roman Empire. The territory of the present-day Serbia was divided between paleobalcanic tribes and tribal alliances (Papazoglu 1978; Mirković 2007). The Pannonian tribes were the first on impact by the Roman conquerors and their territories became part of the Roman province of *Pannonia* as late as the first century BC (Mirković 2006), while Roman conquests from the south, from the Roman province of *Macedonia*, lasted for several decades (Mirković 2007). Until then, the unique Roman province of Moesia, was divided into Upper (*Moesia Superior*) and Lower (*Moesia Inferior*). However, the greatest consequence for the Roman Empire, what will be shown later, was the division of the Empire in 394 AD by the Emperor Theodosius I. The border between the Eastern (*Pars Orientlis*) and the Western part of the Roman Empire (*Pars Occidentalis*) was most likely to extend from the mouth of the Kolubara River to the Sava and further to the south, descending to present-day Boka Kotorska (Montenegro), to the Mediterranean Sea. After this division, the territory of present-day Serbia was alternately under the rule of the Eastern and Western Empires, until 437 AD, when it finally became the Eastern Empire.

During the Roman period, the territory of present-day Serbia practically had three significant functions: (1) military-strategic, as a border area along the Danube limes, (2) mining-metallurgical, with extraterritorial status to provinces in the mining areas, and (3) communication, with sig-


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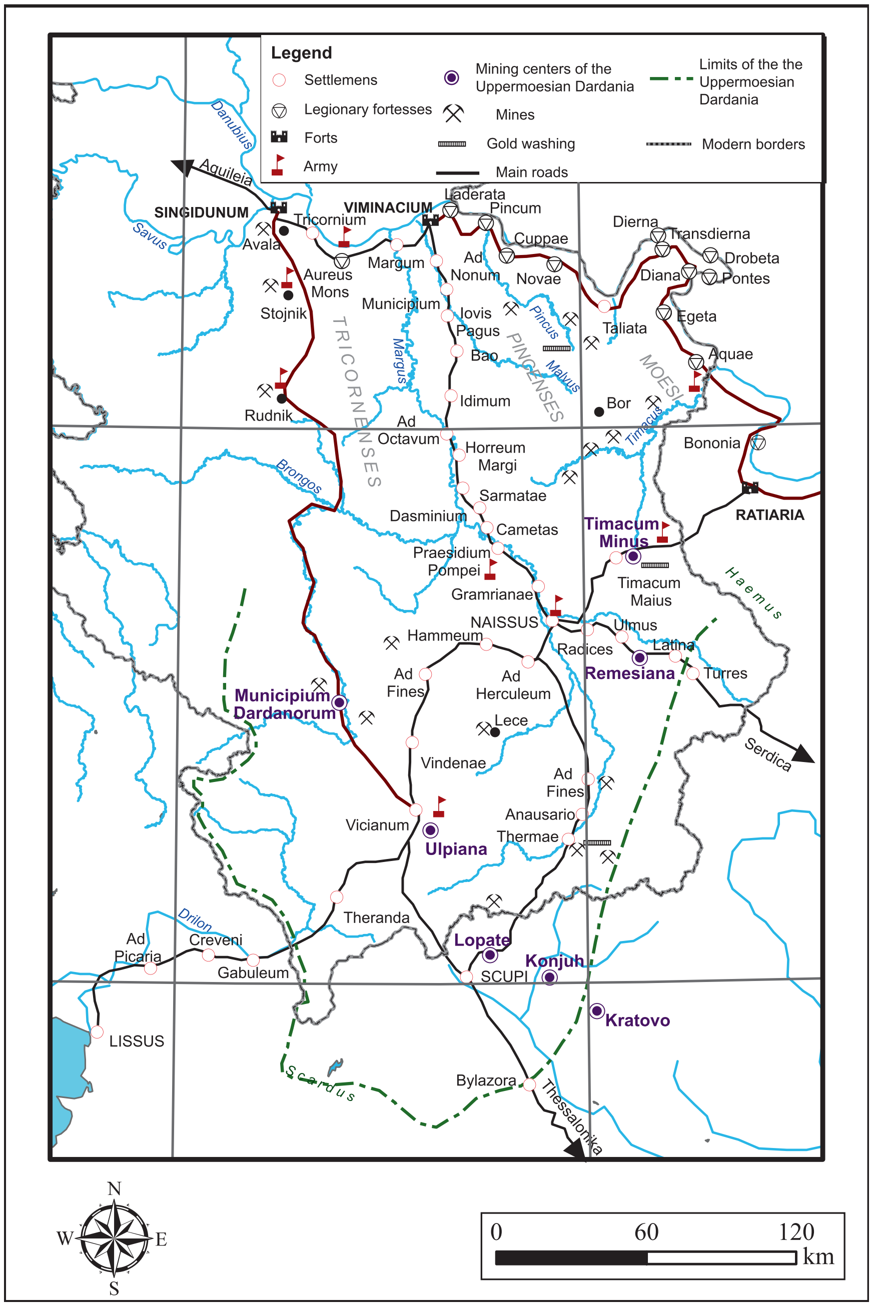


**Fig. 3.1** Upper Moesia. (Reproduced from Petrović 2007)

nificant waterways (Sava, Danube, Morava, and Timok) and land routes.

The administrative center of the Upper Moesia was also a legionary camp on the Danube Limes – *Viminacium* (on the right bank of the Danube), indicating the military-defensive character of this border province. *Limes Moesiae Superioris* – Roman border of Upper Moesia on the Danube, starting from the legionary camp in *Singidunum*, through fortifications along the Danube all the way to *Viminacium*, and then through the Iron Gate gorge (Kondić 1980, 1984, 1986, 1987; Mirković 2015) (Fig. 3.1). The most significant strategic points were the Singidunum Legionary Camp (present-day Belgrade), which received municipal status during the reign of Emperor *Marcus Aurelius* (Mirković 2007) and *Viminacium* town (*municipium*), which received the status of colony in 239 AD under Gordian III (*Colonia Aelia Viminacium*).

Numerous archeological sites testify to the economic function of the Roman provinces on the soil of present-day Serbia. The archaeological testimony is particularly contributed by large series of buried individuals from Roman cemeteries explored in Serbia, among which are the necropolises of *Sirmium* (Sremska Mitrovica, Vojvodina) (Miladinović-Radmilović 2011) and the Roman fort and the city of

*Timacum Minus* (Knjaževac, Eastern Serbia) (Petković et al. 2005; Petković and Miladinović-Radmilović 2014), but above all the necropolises of *Viminacium*, where over 14,000 graves from the period of second to fifth centuries were explored (Zotović and Jordović 1990; Korać and Golubović 2009).

The population of the Roman province of Upper Moesia (*Moesia Superior*) was mainly engaged in agriculture, mining, and metallurgy (Mócsy 1970; Mirković 2006, 2007). Livestock production was dominant (Miladinović-Radmilović et al. 2016), and in agriculture, besides wheat, viticulture was also significant (Medović 2008), whose cultivation was expanded by the Roman Emperor *Probus* (ruled 276–282) in the vineyards, which still exist in the present-day (Fruška Gora in present-day Vojvodina, Negotin Region and the Timok Basin in present-day Eastern Serbia). The most important activity in mining and metallurgy was the exploitation of precious metals, gold and silver, in the mining areas in present-day Upper Drina Valley (*Argentariae Pannonicae*), on the Kosmaj mountain (*Metalla Tricornenienses*), in present-day Eastern Serbia (the Bor Basin, the Timok Basin, and the Pek valley) (*Metalli Aureliani*, later *Territoriae Metallorum*), and in present-day Kosovo (*Metalla Dardanorum*) (Dušanić 1980; Kondić 1995; Dusanić 1991, 1995; Petrović 1995a; Tomović 1995, 2001). Metallurgy was also developed. There were two large imperial workshops for manufacturing items of precious metals, in the cities of *Sirmium* (present-day Sremska Mitrovica) and *Naissus* (present-day Niš) (Popović 1994, 1997), while metal production was also confirmed in *Singidunum* (Belgrade), *Viminacium* (coin mint), settlements in the Timok and the Bor basins (Jovanović 2004a, b; Petković 2009, 2010). In present-day Ćuprija, *municipium Horreum Margi*, an armor manufacturer, *scutaria*, was placed (Notitia Dignitatum, Pars Orientis). In Roman cities on the soil of present-day Serbia, ceramic vessels and lamps, glass, and other objects for daily use were made of metal, stone, and bone and antler (Brukner 1981; Bjelajac 1990; Ružić 1994; Petković 1995, 2010; Cvijetićanin 2001, 2006, 2016).

Present-day Serbia, along with its neighboring areas, had a particularly important transport function in the Upper Moesia area. The main land routes were built by the Romans in the valleys of the big rivers, following the ancient, prehistoric communications in the Danube and Morava Valley. The road along the right bank of the Danube, from the Black Sea to the mouth of the Sava (via *militaris*), was built as early as the first century AD, as evidenced by epigraphic inscriptions from the reigns of Emperors Tiberius and Claudius, erected on the most difficult section of this communication, in the Iron Gate gorge (Mirković 2015). In addition to military function, it was also significant for the further distribution of goods, linking northwestern and central Europe with the Black Sea region and further Asia, as well as supplying limes troops. It was reconstructed by Emperor Trajan, as an infrastructure for the conquest of Dacia, located on the left bank of the Danube (in the territory of present-day Romania). Another significant communication, which was primarily economic in nature, was the route leading from *Viminacium* to the Morava Valley and then further south, through the valley of the South Morava, to the Vardar Valley, all the way down to the Aegean Sea (via *nova* and via *Publica*). Although it was previously thought that this communication diverted at *Naissus* (Niš) toward present-day Prokuplje, and then passing through the territory of present-day Kosovo to the municipal territory of Scupi (present-day Skopje) (Jireček 1887; Vulić 1938; Mirković 1960), new archeological research has confirmed the Roman public road in the South Morava Valley (Petrović 2007; Petković 2012, 2016) (Fig. 3.1).

The main roads, along with developed settlements, were the routes and centers of the early Romanization of the area of present-day Serbia (Brukner et al. 1987; Petrović 1979, 1995a, b), with particular development of the cities on the Danube during the fourth century (Mirković 2007). Roman goods were produced and traded in them, and they became more significant as the centers of Roman culture transfer.

It is also interesting to note that as many as 18 Roman emperors from the late third and early fourth centuries were born in the territory of present-day Serbia (Jovanović 2006). This is due to the great influence of the border army in the Balkans, engaged in the selection of Roman emperors, who, most often, came from the ranks of legion officers from the Danube border. Among them stand out the so-called "Illyrian emperors": *Aurelianus* and *Probu*s, as well as almost all emperors from the time of the tetrarchy – *Galerius*, *Constantius Chlorus*, *Severus*, *Licinius*, *Maximinus Daza*, and Constantine the Great. Thus, in relatively small territory, as many as four Roman imperial palaces and residences were built: in present-day Sremska Mitrovica in Vojvodina (*Sirmium*) probably the residence of several emperors *Galerius*, Constantine I and Constantius II; in Gamzigrad near Zaječar in Eastern Serbia the residence of the tetrarch Galerius, *Felix Romuliana*; in present-day Niš (Southern Serbia) the imperial residence, maybe built by Constantine the Great, *Mediana*; and Vrelo – Šarkamen in Eastern Serbia, most likely the residence of tetrarch *Maximinus Daza* (Vasić and Tomović 2005). The Imperial Palace in *Sirmium* is only partially explored and presented, as it is mostly located below the modern city of Sremska Mitrovica. The tetrarchic residence of emperor Galerius, *Felix Romuliana*, has been almost completely explored, presented to the public, and listed on the UNESCO World Heritage List in 2007 (Fig. 3.2). Archaeological excavations and conservation and restoration works are underway at the tetrarchic residence in Šarkamen and the palace of *Mediana* in Niš, in order to present these monuments of Roman culture.

**Fig. 3.2** Imperial residence of the tetrarch Galerius. (Documentation center of the Institute of Archaeology, Belgrade)

Already in the middle of the fifth century, when the border of the Empire on the Danube fell, the Roman provinces on the soil of present-day Serbia were destroyed by the invasion of Attila's Huns. However, at the end of the same century, *Anastasius*, the emperor of the Eastern Roman Empire, restored the Danube limes and established Roman rule in these areas. During the renewal of the Roman Empire in the sixth century by the emperors Justin I and Justinian I, the territory of present-day Serbia was experiencing a great revival and flourishing. This was reflected in the large number of rebuilt cities, forts, churches, and Episcopal seats, as well as in the newly formed Archiepiscopacy of *Iustiniana Prima*, erected by Emperor Justinian in his hometown, present-day Caričin Grad near Lebane (Southern Serbia).

However, the prosperity of the Balkans did not last long. Though largely ravaged by Germanic tribes and Huns, the wealth of Roman provinces and cities attracted new conquerors. Together with the Avars and other barbaric peoples, the Slavic tribes devastated the entire Balkan Peninsula during the sixth century and at the end of the sixth century and beginning of the seventh century began to settle it permanently (Živković 2007).

## 3.2 The Middle Ages: The Rise of Serbian States

The outset of the Middle Ages on the Serbian soil was marked by the demise of the Roman-Byzantine system of rule and permanent settlement of the Slavic tribes, including the Serbs. The first mention of the Serbs in the Western sources is found in the Royal Frankish Annals (882). They are called *Sorabi*: "of whom it is said that they hold a large portion of [Roman] Dalmatia," which meant the western part of the Balkan Peninsula, between the Adriatic Sea and the Danube River (Bataković 2005). The written records and archeological findings are meagre with regard to the early period of the Serb settlement in the territory where they remained. In the northern part of Serbia, north of the Sava and Danube rivers (present-day Vojvodina), there are a few known settlements from this period. The oldest ones in the area of northern Bačka and the Banat have been dated back to the sixth century (Janković 1998; Trifunović 1997a, b; Radičević 2015), whereas the oldest Slav graves from no earlier than the eighth century with the burned remains of the buried had been discovered on the right bank of the Danube in Novi Slankamen (Janković 2003). The Slavs were accustomed to living on the riverbanks and sailing, since the largest part of Vojvodina, nowadays a fertile plain with the exception of the Fruška Gora and Vršac mountains, was covered in marshes (Bugarski 2008). This environment started to change gradually from the eighteenth century onward with a large-scale land reclamation. The Slavs inhabited villages with scattered houses, half-dugouts, and dugouts, while houses aboveground were few (Trifunović 1997a, b).

Among the objects found, pottery is the most frequent finding (Trifunović 1997a, b; Stojić 2002). In addition to pottery, the most commonly used objects were made of wood (Mrgić 2004). Economics of these settlements, which was mostly based on agriculture (cereals, millet, and wheat are detected on the preserved fragments of vessels) and cattle breeding, the latter was more developed. Given the geographic prominence of rivers, fishery was another important source of food, which is shown by the remaining fish bones and clay wights for fishing nets (Trifunović 1997a). There is also evidence that people were skilled in the metallurgy of iron.

The land south of the Sava and Danube was much different: it was hilly with forests, river valleys, and dales. In settling this area, the Slav tribes followed not only the natural routes (river valleys and passes) but also the routes along the existing Roman roads. It was exactly in river valleys and dales that the majority of settlements were formed (Kovačević 1981; Trifunović 1993; Radičević 2005) and later grouped into *župas*, smaller and larger geographic, economic, and administrative units (Blagojević 1981; Tomović 1999). In time, many of these would in time get new Slav names, usually after the rivers around which they gethered. As far as we know, the Slavs did not settle initially in the captured and devastated towns, but rather lived in the open space where they tilled the land.

Although the later sources speak of a dense network of medieval roads across the territory of present-day Serbia which linked all the important settlements, administrative, economic, and religious centers (Škrivanić 1974), this was far from the famous construction of Roman roads. Decrepit and without regular maintenance, Roman roads became indistinguishable from their surroundings and it is doubtful if their traces were recognizable at all. Even in places where they could be recognized, such as sections of the old Military Road (via *Militaris*) leading from Belgrade to Niš and then to Constantinople, the road looked nothing like the admirable roads from the Roman era (Porčić 2004). The sailing was common on the largest rivers and the points of intersection with important land routes. The permanent river crossings and bridges, were of special strategic and economic significance (Mišić 2007).

The Serbs had formed several states by the ninth century and most of them covered the territory beyond the present-day Serbia (Fig. 3.3). The Narentine region, also called Pagania, was on the Adriatic coast, between the Cetina and Neretva rivers. The Zachlumia region was between the Neretva River and Ragusa (present-day Dubrovnik in Croatia). Between Dubrovnik and the Bay of Kotor (in present-day Montenegro) lay Travunia and Konavli, while the Dioklea region, the oldest Serb state, was situated between the Bay of Kotor and the Bojana River (also in present-day Montenegro). Rascia, later named Serbia, covered the territory in the hinterland, between the Sava River in the north, the Vrbas River in the west (present-day Bosnia), and the Ibar River in the east. Rascia and Dioklea would prove to be two of the more enduring Serbian medieval states. In his book *De administrando imperio*, the Byzantine Emperor, Constantine VII Porphyrogennetos, made it clear that part of Bosnia between the Drina and Bosna rivers was an inseparable part of Serbia. One of the most important centers in that region was Salines or Soli (the present-day city of Tuzla).

The first known Serb ruler in all the abovementioned areas was *Prince Višeslav*, who is believed to have ruled over Serbia in the last decades of the eighth century. Prince Višeslav was a contemporary of Carlo the Great, King of the Francs, and Emperor of the Romans (768–814). Višeslav's successors struggled to maintain independence over the next 150 years threatened by two mighty neighbors – the Byzantine Empire and Bulgaria.

The last ruler of the first Serbian dynasty known as the Višeslavićs or Vlastimirovićs was Prince *Časlav Klonimirović* (927/8–950), who managed to escape from captivity in Bulgaria, with Byzantine assistance, and restore the Serbian state. At that point Serbia encompassed Travunia and Bosnia – it stretched to the Pliva River in the west, to the Sava in the north and to the Zapadna Morava in the east (Fig. 3.3).

At the time of formation of this fairly large state, the first fortified settlements emerged in the abandoned, and partly destroyed, fortresses of the early Byzantine era (Bulić 2013; Špehar 2017). In the western parts of present-day Serbia, fortresses were built in the highlands because of Bulgarian expansion, whereas the eastern and central areas fell under the Bulgarian rule (Ćirković 1981a, b). On the other side, along the Danube, in central Serbia (in what used to be the old Roman limes), the emergence of fortresses had to do with Hungarian conquests in the former Roman province of Pannonia and the necessity to defend the right bank of the Danube from Hungarian raids (Janković 1981; Janković and Janković 1978; Radičević 2013). Although these were the first military and administrative, later also religious centers, their structure was such that they cannot be regarded as urban ones (Popović 2016).

Intensive *Christianization* also took place during the reign of the first Serbian dynasty (from the second half of the ninth century onward). It is known that the conversion to Christianity in these areas started under Emperor Heraclius and lasted several centuries (Ostrogorski 1970). After the attempts from Rome had ended in failure, Christianization


**Fig. 3.3** Serbian lands in the mid-tenth century. (Author N. Šuletić)

was completed by Byzantine missionaries in the mid-ninth century. Nevertheless, Roman influence was important as *King Mihailo of Diokleia* (Duklja) became the first Serb king in the second half of the eleventh century, after having received his crown from the Pope. The first Christian saint from the ranks of Serb rulers was Jovan Vladimir of Diokleia in the tenth century. Canonization of subsequent rulers became customary, forming an essential feature of state ideology. Apart from written records, there are archeological findings which indicate the changes in funeral ritual and the building of the first churches. A switch to inhumation in keeping with Christian rites, the development of church building, and the widespread use of objects associated with religion and personal piety reflect the definite entrenchment of a new religion (Špehar 2015, 2017).

After immense efforts of Byzantine Emperors, John I Tzimiskes (971–976) и Basil II (976–1025), to subdue Bulgaria and establish their rule in the Balkans in the second half of the tenth and early eleventh century, the Byzantine Empire and Hungary became conterminous along the Danube. The interests of these two mighty states clashed across the Balkans, especially in the late eleventh and early twelfth century. It was no wonder that the border area on the Danube saw the brunt of the fighting (Kalić 1967). For that reason, the border defenses were increasingly developed on both sides: Hungary continued to use earth palisades, while the Byzantines built new fortresses made of stone – they also made fortifications in the western parts of present-day Serbia for protection against the Serbs (Popović 1999).

The situation in the Balkans changed substantially following the death of the Emperor Manuel I Comnenus (1143–1180). Hungary and the restored Bulgaria fought wars of Byzantine succession in the Danube area, while the Serbian state was firmly established in central and southern parts of present-day Serbia. It gained its independence and acquired large territories under the rule of the Grand *Župan* (Prince), Stefan Nemanja (1166–1196). He was the founder of the *Nemanjić dynasty*, which ruled Serbia for two centuries. His domain included Dioklea, under the name Zeta, which comprised the Serb-populated parts of present-day Herzegovina, Bosnia, Macedonia, and Albania. This was the beginning of Serbia's expansion to the north, east, and south, which would make her one of the most powerful European states in the fourteenth century (Fig. 3.4).


**Fig. 3.4** Serbia in fourteenth century (from 1320 to 1355). (Author N. Šuletić)

**Fig. 3.5** Saint Sava, Mileseva monastery. (Reproduced from Popović and Vojvodić 2016)

Serbia became a kingdom in 1217 under Nemanja's son, *Stefan the First Crowned*. In parallel, the Serbian church gained autocephaly, that is, church independence in 1219, with the rank of archbishopric, through the efforts of Nemanja's middle son, *Sava Nemanjić (St. Sava)*, the first archbishop of Serbia (Fig. 3.5).

Through marriages to members of the ruling families and prominent nobles in the Byzantine Empire, Serbia not only increasingly adopted the standards of Byzantine tradition but also absorbed other Mediterranean and Central European influences. Resulting from this mixture, Serbia developed her own culture and art, which was evident in a large number of monasteries and churches decorated with fresco paintings, particularly in the provinces of Kosovo and Metohija (see Chap. 18).

The rise of Serbia was based on the opening of new silver and gold mines, especially under *King Milutin* (1282–1321) who doubled the territory he ruled over. *Stefan Dušan* (1331–1355) assumed the title of Emperor in Skoplje in 1346 and created the largest state in south-eastern Europe with the ambition to replace the declining Byzantine Empire. As a corollary, the status of the Serbian church was elevated to the rank of Patriarchy, with the seat in the town of Peć.

It was no coincidence that Serbia's territorial expansion under the Nemanjić dynasty ran parallel with the rapid economic and cultural development from the mid-twelfth century to the Ottoman conquests in the fifteenth century (Blagojević 1981). In the early days, almost the entire population was rural and tilled their land, while cattle breeding was something of an auxiliary economic activity and mostly important in the mountainous regions (Blagojević 1973, 1983; Katić 1978). In the central Serbian lands, there were no urban settlements before the mid-thirteenth century. It was the *growing mining industry* that provided impetus for the emergence of the earliest urban centers (Popović and Bjelić 2018). The expansion of mining after the mid-thirteenth century, which resulted from the arrival of the highly skilled Saxon miners, also brought about the growth of arts and trading. The mining products rapidly became the chief Serbian export commodities and the mining settlements turned into the principal trading centers (Đuk 2003). *Novo Brdo* presented the best example of how an urban center of medieval Serbia grew out of the thriving mining, commerce, and trades (Fig. 3.6).

It was an outstanding place, a testament to economic prosperity, known far beyond Serbia for the finest and highly acclaimed silver. A cosmopolitan spirit of the city stemmed from the ethnic mixture of population, which, in addition to Serbs, consisted of the Saxon (German) miners and merchants from the Republic of Dubrovnik. It is estimated that during the time of its greatest prosperity, some 10,000 people lived in Novo Brdo. As Constantine the Philosopher, the writer of a biography of the Serbian Despot Stefan Lazarević, recorded, Novo Brdo was "a silver and, indeed, golden city," while the Byzantine historian Ducas called it "a mother of cities" (Popović and Bjelić 2018).

The rule of the last Nemanjić, *Emperor Uroš*, Stefan Dušan's son, saw the disintegration of the Serbian Empire into a number of almost independent feudal statelets controlled by local notables (King Vukašin, Despot Uglješa, Despot Oliver, Prince Lazar, Nikola Altomanović, Djuradj Stracimirović Balšić being among the most prominent ones). The demise of the Empire started with the defeat of the powerful brothers Vukašin and Uglješa Mrnjavčević at the hands of the Turks on the Maritsa River in 1371. Shortly afterward, as a descendant of the Nemanjićs on his paternal grandmother's side, *Ban* Tvrtko of Bosnia crowned himself with the

**Fig. 3.6** The Medieval Fortress of Novo Brdo. (Photo by M. Popović)

double royal wreath of Serbia and Bosnia (1377). Prince *Lazar Hrebeljanović*, the strongest of the remaining Serbian feudal lords, willingly accepted Tvrtko's coronation with a view to securing an important ally against the invading Turks. Aided by Trvrtko's troops, Prince Lazar confronted the Ottoman army in *the Battle of Kosovo* on 28 June 1389. This epic battle brought death to both Lazar and the Ottoman Sultan, Murad I, but its outcome is not quite clear. What is certain, however, is that Serbia's losses were such that Lazar's son, *Prince Stefan Lazarević* (1389–1427), was forced to become an Ottoman vassal. In time, Prince Stefan managed to consolidate and strengthen his state, showing considerable political skill in balancing between the Ottoman Empire and Hungary (Fig. 3.7). He was even accorded the title of *Despot* from Constantinople. He moved his capital from Kruševac to Belgrade, which he received from friendly Hungary and turned into a prosperous city. His successors, Despots from the Branković dynasty, had to face the renewed Ottoman pressure and thus moved capital once again to Smederevo, building an impressive fortress there (Fig. 3.8). *Djuradj Branković* (1427–1456) maintained the precarious position of Serbia, being a vassal to both Hungarian kings and Ottoman sultans.

The Ottomans captured Smederevo in 1459, which marked the collapse of the medieval Serbia. Four years later, the Ottomans conquered Bosnia and then Herzegovina (named after Stefan Vukčić Kosača, the Herzog of St. Sava) in 1481. Zeta survived until 1499.

The Ottoman invasion also brought about considerable ethnographic changes across the Balkans and in Hungary. Fleeing from the Turkish raids and conquest, a large number of Serbs moved to the north after the battle of Kosovo. They crossed the Sava and Danube rivers into Hungary and continued to fight the Turks together with their titular rulers.

The resettlements to the north, which were instigated by the Battle of Kosovo, increased in both occurrence and size. Being pushed to the north, under the despots the Serbs moved across the Sava River into Hungary. In 1471, Despot Vuk Grgurević (Vuk the Fiery Dragon), the grandson of Djuradj Branković, was the first one to settle in Hungary. He was noted for his successes in fighting the Ottomans not just in southern Hungary, but also in Bosnia and Wallachia (present-day Romania). The Serb-manned towns of Šabac and Belgrade, now under Hungarian rule, resisted the Ottoman attacks until 1521.


**Fig. 3.7** Territories under the rule of the Despotate of Serbia. (Author N. Šuletić)

**Fig. 3.8** The Fortress of Smederevo with the remnants of Despot Djuradj Branković's palace built in 1428–1430. (Photo by D. Radičević)

## 3.3 Under the Ottoman Rule

The Ottomans established military, administrative, and judicial order in the conquered lands, with Islam permeating all aspects of social life. The Muslims were privileged subjects of the state, who were given opportunities for climbing the social ladder. On the other hand, the Christians (and Jews) were reduced to second-class subjects, with limited opportunities for developing trade and prosperity. In addition, the Ottoman authorities imposed certain exceptionally difficult taxes on the population in the newly conquered lands. The most insufferable one was the *devshirme*, or tribute in blood, whereby Christian boys aged usually 7–12 years were taken from their families and sent to Constantinople (Matkovski 1969). They would be first converted to Islam and then work for Turkish peasants in Anatolia in order to learn the language and customs. They were then trained for military service as members of the Janissaries, elite infantry units, and the first standing army in Europe (Ménage 1991; Imber 2002). After years of careful selection, the ablest ones would reach the most senior positions – for example, Grand Vezier, Mehmed Pasha Sokolović, was a Serb born in Bosnia.

During the centuries of the Ottoman rule, it was largely the Orthodox Christian Church that preserved the identity and tradition of the Serb people which were scattered across the borders of the empires (from Dalmatia to Macedonia). The church succeeded to revive its organization when Mehmed Pasha Sokolović restored the *Serbian Patriarchate of Peć* and appointed his brother, *Makarije Sokolović*, as Patriarch Makarije I (Veinstein 1997) (Figs. 3.9 and 3.10).

Nevertheless, the *Islamization* of the Serb people carried on. It proceeded in waves and lasted until the end of the eighteenth century, though it varied in intensity in different areas, depending on geographic conditions, historical circumstances, and various social and economic factors (Minkov 2004; Zirojević 2012).

The Serb people expected liberation from the Ottoman rule from the Habsburg Monarchy, which waged a series of wars against the Turks until the late eighteenth century. The Serbs sided with the Austrian army in the Great Turkish War (1683–1699) only to experience disappointment after the Austrian defeat. Fearing reprisals from the Ottoman troops, a *large-scale migration of Serbs* followed in 1690 under Patriarch Arsenije III Čarnojević from the southern regions of Serbia. According to some estimates, around 360 villages in Kosovo and Metohija were emptied and 37,000 families, or approximately 185,000 people, settled in present-day Vojvodina (Serbia) and Slavonia (Croatia) in what is known as the First Great Migration of the Serbs. The Second Migration took place in 1739 under Patriarch Arsenije IV Jovanović Šakabenta (Popović 1954).

**Fig. 3.9** *The Patriarchate of Peć Monastery.* (Reproduced from Popović and Vojvodić 2016)

**Fig. 3.10** Makarije Sokolović. (Reproduced from Popović and Vojvodić 2016)

## 3.4 From the Serbian Revolution to Yugoslavia

In the early nineteenth century, the Serbian people were exposed to the increasing terror from the rogue Ottoman janissaries (*Dahiyas*) in the Pashalik of Belgrade. This virtually forced the Serbian elders to rise to arms to escape summary executions. They secretly met in Orašac, on Candlemas, 14 February 1804, and elected *Djordje Petrović* (*Karadjordje* – the founder of the Karadjordjević dynasty) to be their leader. This was the beginning of what the famous German historian, Leopold von Ranke, termed the Serbian Revolution (Von Ranke 1829, p. 9). It grew into the struggle for national liberation, but it was also a social revolution as the insurgents did away with the feudal norms and became the owners of the land they liberated from the Turkish beys and agas – *The First Serbian Uprising*, as it is known in Serbian historiography. The success of the uprising was facilitated by the outbreak of the Russo-Turkish war (1806–1812). The insurgents declared independence from the Ottoman Empire in 1807, at which time the *Foundations of the Serbian Administration*, something of a constitution of the renewed Serbian state, was adopted (Đorđević 1995). Having acquired freedom, Karadjordje's insurgents refused the autonomous status for Serbia stipulated by the 1812 Treaty of Bucharest between the Russian and the Ottomans. The latter then turned to Serbia in full strength and crushed the uprising in 1813. Karadjordje and other leaders fled to Austria, while the masses of people suffered large-scale reprisals. Serbia rose to arms again in


**Fig. 3.11** Serbia as a sovereign and internationally recognized country (1878). (Author K. Vranić)

1815 under *Miloš Obrenović* (*The Second Serbian Uprising*). Through combination of armed resistance and astute diplomacy, he managed to attain autonomy guaranteed by Russia in 1830 (Petrovich 1976) (Fig. 3.11). The Sultan's special edict confirmed Miloš as hereditary prince of Serbia (he thus founded the second Serbian dynasty – Obrenović dynasty).

In the next four decades, the Serbian autonomy grew and two dynasties, Obrenović and Kradjordjević, alternately ruled Serbia. The rule of the autocratic Obrenovićs was ended in 1842, when Karadjorde's son Alexander took the power (1842–1858), during whose reign the oligarchy of the national magnates was established (the so-called *Defenders of the Constitution*). Under their rule, and due to the influx of many educated Serb bureaucrats from the neighboring Austria, Serbia modernized its nascent institutions. In foreign policy, Serbia supported the Serbs in southern Hungary, who sided with the Habsburgs against the Hungarians, in the 1848 revolution. This led to the temporary reward – the creation of the *Voivodeship of Serbia* (1849–1860), a separate crown land of the Austrian Empire. By the terms of the 1856 Treaty of Paris, Serbia's autonomy, which had hitherto been under exclusive Russian protection, was guaranteed by a concert of Great Powers, and Serbia became a member of the European Commission of the Danube (Bataković 2014a, b).

However, the unpopularity of the Karadjordjevićs reign brought back again Obrenović dynasty to the throne – old Prince Miloš ruled only for 2 years and was succeeded by his son Mihailo (1860–1868). The old Prince Miloš and his hair Mihailo returned to Serbia in 1858. Miloš lived and ruled autocratically for another 2 years just as he had been used to. Prince Mihailo (1861–1868) endeavored in the manner of enlightened rulers from the eighteenth century to strengthen Serbia and further undermine Ottoman sovereignty through top-down reforms (law-making and formation of the army). His Prime Minister, Ilija Garašanin, spared no effort to forge the *First Balkan Alliance*: he liaised with Montenegro (whose prince was willing to give up his throne in favor of Mihailo), Greece, Bosnian Serb rebels, Bulgarian revolutionaries, Croatian politicians, and Albanian tribal leaders. The aim was to start the general uprising of all the Balkan Christians and create a Serbian-Bulgarian Empire. However, Prince Mihailo was assassinated in 1868 and his death put an end, for nearly half a century, to attempts at establishing political and military cooperation among the Balkan nations. His successor Prince Milan Obrenović (1868–1888) led Serbia through two wars against the Ottoman Empire. The first war (1876) was not successful, but the second one (1877–78) coincided with another Russo-Turkish war and ended in victory which allowed further expansion to the south (the towns of Niš, Leskovac, and Vranje were incorporated). The *Berlin Congress of 1878* confirmed not just the territorial gains of Serbia, but also the status of a sovereign and internationally recognized country (Fig. 3.11).

Although Serbia owed much to Russian political and military support for its success, it was disappointed by Russia's championing of Greater Bulgaria even at the expense of ethnically Serbian lands. For that reason, Prince Milan turned to Austria-Hungary for protection and, with its support, declared Serbia Kingdom in March 1882. This came with the price: by the terms of the 1881 Secret Convention Milan renounced Serbia's claim to Bosnia-Herzegovina, in which the Serbs constituted nearly a half of the population, and consented to strictly limited expansion to the Ottoman territory in the south. As a self-willed autocrat, Milan clashed with both the political parties of that time (People's Radical Party and Liberal Party) (Đorđević 2017) and abdicated in favor of his son Alexander Obrenović (1888–1903).

King Alexander continued unpopular Austrophile foreign policy as well as the personal regime of his father, despite the adoption of the liberal constitution in 1888. This dissatisfaction led to the brutal murder of Alexander and his Queen in 1903 (this was the work of a group of conspiring officers and politicians). Having no heirs, the Obrenovićs dynasty came to an end. The Karadjordjević dynasty returned to the throne in the person of Peter I (Karadjordje's grandson) and the new era in modern Serbian history had become because of the profound change in both internal and external policies. A soldier and Russophile, a democrat and a translator of John Stewart Mill's works, King Peter embraced a slightly altered version of the 1888 Constitution. His reign is often considered the "golden age" of political liberties, cultural development (the Great School was transformed into the *University of Belgrade* in 1905), and national enthusiasm. For the most part of this period, central political figure was Nikola Pašić, Prime Minister and leader of the Radicals. In foreign affairs, Serbia emancipated itself from the tutelage of Austria-Hungary, resisting heel Vienna's attempt to bring Serbia to heal through economic pressure in what was known as the *customs, or the pigs, war* (1906–1911). Serbia had to endure the annexation of Bosnia-Herzegovina in 1908 as it found itself isolated and presented with an accomplished fact. But major successes and the doubling of its territory were to follow in the two *Balkan wars* of 1912–1913 (Fig. 3.11).

In the First Balkan War (1912), Serbia joined forces with Montenegro, Bulgaria, and Greece to expel the Turks from most of the Balkans. After the famous victories at Kumanovo and Bitola, the Serbian army liberated Old Serbia (the Ottoman Kosovo vilayet: the Raška region or the Sanjak of Novi Pazar, Kosovo, Metohija, Northern Macedonia). This war was very popular among Serbian people of the time, because it was regarded as "avenging of Kosovo," that is, redressing the 1389 defeat and the centuries of servitude. The strategic goal of acquiring an outlet to the Adriatic Sea on the Albanian coast was not accomplished because of Austria-Hungary's opposition (Bled and Deschodt 2014; Vojvodić 2015). Vienna championed the creation of Albania as a means to that end. The distribution of the spoils of war in Macedonia led to the Second Balkan War, as Serbia and Greece stood together against Bulgaria. The victory over Bulgarians at Bregalnica in 1913 further increased Serbia's prestige among the South Slavs (Yugoslavs) in Austria-Hungary. It was not just the Serbs, but also a large number of Croats and Slovenes, especially liberal ones, in Bosnia-Herzegovina, Croatia, Slavonia, Dalmatia, Vojvodina, and Carniola who looked to Serbia as something of a Piedmont of Yugoslav unification (Šepić 1970; Janković and Krizman 1964). The Balkan Wars were characterized by ethnic violence on all sides, including Serbian, and they pushed the Ottoman Empire back from most of the Balkans (Stamatópoulos 2015).

The major successes in the Balkan Wars exhausted Serbia in terms of both human and financial resources, so it was not ready to enter a new conflict. But the fateful assassination of Crown Prince, Franz Ferdinand, in Sarajevo on 28 June 1914 led to the First World War. This was an act committed by *Young Bosnians*, the local youth enraged with the colonial rule of Austria-Hungary over their homeland. The nationalist Unification or Death organization (better known as the *Black Hand*) comprised largely of Serbian officers provided them with logistical support against the intentions of the Serbian government (Ćorović 2018). Austria-Hungary used the long-awaited pretext to embark on military annihilation of Serbia. However, the Serbian army defeated the invading Austro-Hungarians twice in 1914 – at the Cer Mountain and on the Kolubara River (West Serbia). During the *Kolubara battle*, Serbia proclaimed that its war goal was the creation of a single state which would encompass all the Serbs, Croats, and Slovenes. The Pašić government assisted the Yugoslav émigrés from the Habsburg Monarchy who shared that vision (Šepić 1970; Stanković 1985; Pavlović 2016). However, in the fall of 1915, a combined offensive of much superior German, Austro-Hungarian, and Bulgarian troops overwhelmed and occupied Serbia. But part of the Serbian army retreated through Montenegro (which was made possible by the Montenegrin resistance to Austro-Hungarian troops at Mojkovac) and Albania. Those units which went across the Albanian mountains, together with a number of civilians, the government, King Peter and Regent Alexander (who had taken over royal prerogatives from his old father shortly before the war) suffered considerable casualties on account of winter and hostile local population. This was termed in collective memory as the "Albanian Golgotha," with more than 200,000 people disappeared (Boope 1917; Mourelos and Papadakis 2005; Mitrović 2007). The Serbian troops were evacuated from the Albanian coast to the Greek island of Corfu on the Allied, mostly French, and shipping. Having been recuperated and reorganized in Corfu (where tens of thousands of exhausted and sick soldiers also died), the Serbian army was deployed on the Macedonian Front. In the fall of 1918, it played a central role in breaking through the enemy lines (*Battle of Kajmakčalan*) and forcing Bulgaria to capitulate (Opačić 1980). On 1 November 1918, Serbian soldiers triumphantly entered Belgrade. Later that month, the national assemblies of Vojvodina and Montenegro declared their unification with Serbia. At that time, the Serbian army crossed into the territory of the collapsing Austria-Hungary (south Hungary, Bosnia-Herzegovina, Croatia, Dalmatia, and Slovenia) on the invitation of the peoples' councils which had taken over administration of their provinces. For the Croats and Slovenes, the Serbian troops were the sole protection from Italy's imperialism based on the London Treaty of 1915 concluded with the Entente Powers (Mitrović 2007).

On 1 December 1918, a delegation of the People's Council of the Slovenes, Croats, and Serbs from Austria-Hungary addressed Regent Alexander with their plea for unification with Serbia under the Karadjordjević dynasty. With his affirmative reply, *the Kingdom of Serbs, Croats, and Slovenes (SCS)* came into existence (Fig. 3.12).

After having realized the Yugoslav unification and protected from Italy most of the Yugoslav lands, regarded as enemy territory by its allies, Serbia embedded its statehood and tradition into the new state (Pavlović 2016). This was achieved at the price of tremendous, comparatively largest, demographic losses among all the belligerents in the Great War. It is estimated that Serbia lost around a quarter of its population – more than half of the males aged between 18 and 55 perished (Mitrović 2007).

The newly created Kingdom of SCS was not just a Balkan, but also a Central European and Mediterranean country, and represented a regional power in south-east Europe. The menace of the country was dissent over its constitutional arrangement. While the Serbs saw it as a natural continuation of the Kingdom of Serbia and took its centralist administration on the French model for granted, the Croats aspired to have their own autonomous status which would transform the SCS Kingdom along (con)federal lines. Disagreements between the constituent peoples in the common state became more and more serious, which is why King Alexander tried to impose the ideology of integral Yugoslavism – an attempt to suppress the Serb, Croat, and Slovene identity in favor of a common Yugoslav one. Consequently, the name of the country was officially changed to *Yugoslavia* in 1929 (Pavlowitch 2002). But this exercise in nation building ended in failure and aggravated dissatisfaction of the Croats. It was over with the assassination of King Alexander in Marseilles in 1934, committed by Bulgarian Vlado Chernozemski, member of terrorist organization *IMRO* (Internal Macedonian Revolutionary Organization), and helped by *Ustasha*, fascist Croat organization based in Mussolini's Italy. Alexander's murder was described as the first shots of the Second World War (Eden 1962). Prince Paul took over the royal prerogatives as a Regent of Yugoslavia and his reign was marked by the effective, if not formal, dropping of integral Yugoslavism (see Chap. 4, Fig. 4.2).

In early 1941, Yugoslavia's position became increasingly difficult as Germany and Britain were about to clash in the neighboring Greece. An Anglophile and democratically minded Prince Paul tried to keep Yugoslavia out of the war, but Yugoslav government joined the Tripartite Pact). His


**Fig. 3.12** The Kingdom of Serbs, Croats, and Slovenes (SCS). (Author N. Šuletić)

solutions were not accepted by the army, and a group of officers carried out a British-sponsored coup, overthrew Paul, and handed the crown to Alexander's underage son Peter II. Seeing the coup as a personal affront, Hitler immediately ordered the destruction of Yugoslavia. The Axis invasion started with the aerial bombardment of Belgrade on 6 April with thousands of killed civilians and huge demolition of the city (the National Library was burnt to the ground). By 17 April Yugoslavia had been conquered. The whole country was conquered in only 10 days.

Hitler dismembered Yugoslav territory among the Axis allies, reducing Serbia to its 1912 borders and, uniquely among the Yugoslav provinces, placed under the German military regime and burdened with the payment of contributions for the costs of German administration. The most of Vojvodina went to Hungary, the German-populated Banat had a special status within Serbia, southern Serbia and Macedonia went to Bulgaria, Kosovo to Greater Albania under Italy's patronage, and Srem (together with Croatia, Bosnia-Herzegovina) was a part of newly formed the Independent State of Croatia (NDH) under the Ustasha regime. During the war, this regime within the NDH territory committed terrible genocide against the Serb, Jewish, and Roma population in the territory under its control (Trifkovic 1998; Yeomans 2013; Bartulin 2014; McCormick 2018; Cingolan and Adriano 2019).

Two resistance movements soon emerged in Serbia which initially joined the forces (Roberts 1973; Williams 2003). The reprisals against the Serbian civilians were unique in occupied Europe: the German army shot 100 civilians for each killed German soldier and 50 for each wounded one. In total, during the period from 1 September to 21 December

1941, around 35,000 civilians in Serbia were killed, while the Germans suffered very few casualties (Schramm 1965).

However, during the period of war, the initial cooperation of those two resistance movements was terminated and turned into a civil war on account of their irreconcilable ideological differences (Nikolić 2014; Pavlowitch 2008). It could be said that the history of the Second World War in Yugoslavia, as well as on the territory of Serbia, was, to a large extent, the chronicle of a complex civil war in a country divided along ethnic, religious, and ideological lines. At the end, in a certain degree, the international politics of the great powers shaped the outcome. The partisans with Josip Broz Tito got the upper hand and paved the way to the social revolution and the abolishment of monarchy (Petranović 1992; Pavlović 1998; Williams 2003). The Soviet troops in Serbia drove the Germans out of Belgrade in October 1944 and installed Tito in power, who established a Soviet-style dictatorship of proletariat. The "second" Yugoslavia was born, and it was based on the revolutionary principles adopted in 1943 (Pavlowitch 1988).

The Federal People's Republic of Yugoslavia (1945–1963) consisted of six republics: Serbia, Bosnia-Hezegovina, Croatia, Slovenia, Macedonia, and Montenegro (Vojvodina and Kosovo-Metohija were two autonomous provinces within Serbia) (see Chap. 4). The communist regime nationalized the property of the "bourgeois" classes, along with the forced agrarian collectivization, and established a Soviet-style, state-sponsored planned economy (see Chap. 14). In foreign policy, Yugoslavia was initially a Soviet satellite, but Tito's ambitions to play an important regional role led to his rift with Stalin. With considerable Western material support, Tito endeavored to establish Yugoslavia as an alternative model of a communist society. This was the motivation behind Yugoslavia's branding of workers self-management at home and the formation and promotion of the nonalignment movement abroad (see Chap. 14). The country was renamed the *Socialist Federal Republic of Yugoslavia* in 1963 (see Chap. 4, Fig. 4.3). Ten years later (1974), as a result of the growing nationalism of the local communist leaderships, particularly in Croatia, Yugoslavia was constitutionally rearranged as something of a loose confederation (see Chaps. 4 and 14). It was only the aging Tito that held the country together. With his death (1980), but also under the global geopolitical changes, Yugoslavia was facing bigger and bigger economic and political challenges (see Chap. 14). The beginning of the last decade of the twentieth century was the final breakdown of Yugoslav state and it perished in a bloody *civil war* (1992–1995), which was in many ways a continuation of the 1941–1945 bloodshed.

Because of the terrible crimes that took place during the conflicts on the territory of former Yugoslavia in the 1990s, the United Nations established The International Criminal Tribunal for the former Yugoslavia (ICTY). These wars produced a huge number of permanently displaced people from the war-affected areas and settled in the third countries, including Serbia (see Chap. 12). During that period, having huge inflows of refugees, Serbia was facing very hard times under the UN economic sanctions, which, with some modifications, particularly were in force until the political changes in 2000 (see Chap. 14). At the same time, demands for the secession of ethnical Albanians in its province, Kosovo and Metohija, were stronger by each day (see Chap. 4). The conflicts culminated with the NATO air strikes against the Federal Republic of Yugoslavia (1992–2003) (it included republics Serbia and Montenegro) which caused significant emigration from Kosovo and Metohija. The internal displaced people from Kosovo and Metohija is estimated to 201,047 persons (Commissariat for Refugees and Migration – Republic of Serbia 2020). However, there are no reliable data about emigration to third countries. Some analysis showed that the population decrease in Kosovo and Metohija during the period 1990–2015 was between 90 and 185 thousand people depending on data source (Josipovič 2016). Such a broad range of the estimated decrease has been induced by various factors – political (boycotts of the official statistical institutions for collecting data population data during the period of Yugoslavia), socio-cultural, institutional (slow capacity building of new institutions), economic, etc. (Nikitović 2018). But the real exodus from the Kosovo and Metohija territory has been taking place during the last several years according to the official statistics – a net emigration of almost 100,000 people was observed in only a 2-year period (2014–2015) (Kosovo Agency of Statistics 2018: 18).

Serbia and Montenegro remained together in the *Federal Republic of Yugoslavia*, which was also called a "third Yugoslavia" and soon after political changes in Serbia in 2000, it redefined itself into the *State Union of Serbia and Montenegro* (2003–2006). After the Montenegrin independence referendum in 2006, both Serbia and Montenegro became fully independent states. However, it was not the end of political challenges for Serbia. Since 1999, its southern province, Kosovo and Metohija, has been under the UNMNIK administration. The political representatives of the Albanian majority from this province unilaterally declared Kosovo's independence in 2008, which has been recognized by certain number of countries, but not Serbia or United Nations (Bataković 2014a, b). This controversy remains one of the most troubled questions in international relations (see Chap. 4).

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# Political Geography of Serbia: Territorial Organization and Government

4

Nebojša Vuković

## Abstract

The territorial development of the modern Serbian state started from 1804, and it lasted through the second half of the nineteenth century and the Balkan Wars of 1912–1913. In that context, Serbia's political-geographical status during the existence of the "three Yugoslavias" (1918–1941, 1945–1992 and 1992–2003), the State Union of Serbia and Montenegro, and also after its gaining independence anew in 2006, was especially interesting. In parallel with its territorial development, the administrative structure of Serbia was developing too, together with the development of local self-government, and the competences of cities and municipalities, as well as the autonomous provinces. These changes were accompanied with the changes of the Serbian political system as well as the electoral system. After a very turbulent history and territorial changes, one of the biggest contemporary political challenges for Serbia is the problem of Kosovo and Metohija, its southern province, which Serbia currently has no control of. This situation as well as the relation to the significant world and regional countries, the European Union and NATO, must be analysed through the geostrategic position of Serbia.

**Keywords**

Serbia · Political-geographical position · Balkans · Kosovo and Metohija · Yugoslavia

> The Republic of Serbia is the state of Serbian people and all citizens who live in it, based on the rule of law and social justice, the principles of civil democracy, human and minority rights and freedoms, and commitment to the European principles and value (Constitution of the Republic of Serbia 2006, Article 1).

Serbia is a parliamentary republic spreading on a territory of 88,449 km$^2$ and the capital city of Belgrade. It is a republic consisting of Central Serbia and the two autonomous provinces – Vojvodina, and Kosovo and Metohija. However, since 1999 and the NATO air strikes against the Federal Republic of Yugoslavia (with which Serbia is a continuity state), Serbian institutions have lost their control over its southern province, Kosovo and Metohija (10,887 km$^2$). The political representatives of the Albanian majority in the province unilaterally declared its independence in 2008. That act has been recognized by a certain number of countries, but not Serbia or the United Nations (for details on the current status of the province, see Sect. 4.2.1). The United Nations Security Council resolution 1244, adopted on 10 June 1999, confirms the commitment of all Member States to the sovereignty and territorial integrity of the Federal Republic of Yugoslavia, with which a continuity state was the State Union of Serbia and Montenegro (2003–2006), and since 2006 with which a continuity state was Serbia. Therefore, it may be interpreted that the international community's commitment to the preservation of sovereignty and integrity also refers to the Republic of Serbia.

After the Montenegrin independence referendum in 2006 and the abolishment of the State Union of Serbia and Montenegro (2003–2006), Serbia became a continuity state, after having been part of different states during the period 1918–2006: the "first" Yugoslavia (1918–1941; namely Kingdom of Serbs, Croats and Slovenes 1918–1929), the second Yugoslavia (1945–1992) and the third Yugoslavia (1992–2003) (see Chap. 3). Nowadays it is a member of the United Nations (UN) and a large number of international organizations, bodies and conventions. It is also a candidate

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country for the European Union membership and adheres to the policy of military neutrality.

## 4.1 Modern Serbian Borders – Territorial Change

The modern Serbian state is the heritage of the two big national uprisings against the Ottoman Empire at the beginning of the nineteenth century (1804 and 1815) (see Chap. 3). Being on the periphery of the Ottoman Empire, a significant part of today's Serbia known as Sanjak of Smederevo, was twice under the Austrian occupation (1718–1739 and 1788–1791) and officially called Serbia, where the Austrian tsar represented the king of Serbia (1718–1739) (Pavlović 2004). By some researches, at the end of the eighteenth century, it was the territory of about 23,700 km$^2$, and it is estimated that a total of 400 thousand people lived there (Zavod za statistiku 1955). However, Serbia was granted the status of an autonomous principality within the borders of the Ottoman Empire only just 15 years after the Second uprising (1830–1833).

It is interesting that both Serbian Uprisings started in the central part of Serbia, that is, in Šumadija. *Šumadija* is Serbia's core geographical region, spreading between the rivers Danube, Sava, Velika Morava, Zapadna Morava and Kolubara. In a broader sense, it also encompassed the area of Belgrade, covering about 6000 km$^2$. This region was the main axis of the emerging Serbian principality within the Ottoman Empire. In the beginning, during the Serbian Uprisings, Serbia was a state that mainly belonged to the regions around the rivers Sava and Danube, and as was observed by Jovan Cvijić, a famous Serbian geographer, it had "a truly unstable geographic position" being a barrier to Central Europe because it spreads over the main entrance to the Balkan Peninsula (Cvijić 1991).

Regardless of territorial expansion under the rule of knyaz (prince) Miloš Obrenović in 1833 (Serbia so expanded that it covered an area of almost 38,000 km$^2$), the geographic position of Serbia remained same. Serbia expanded its territory by less then 11,000 km$^2$ and gain formal independence after the wars with Ottoman Empire (1876–1878), but its geographic position remained unstable. In Cvijić's opinion, in this period, Serbia was a state that belonged to the Morava River basin – *Moravian State*, which spread deeply towards the south, towards the central part of the Balkan Peninsula (Cvijić 1991). Its position in the Balkans was central, whereas its tendency to expand towards the south was strengthened by the proximity of the Balkan core, where the longitudinal and transverse lines of the Balkan Peninsula communications intertwined (see Chap. 17).

Serbia retained the same borders for over three decades. After the Balkan Wars (the First 1912 and the Second 1913) it territorially expanded to the south, while the administrative and territorial organization of the country did not significantly change (see Chap. 3, Fig. 3.11). It liberated the areas of its "historical heart" (Kosovo and Metohija, the Region of Novi Pazar, and Vardar Macedonia – territory of today's Republic of North Macedonia). Its position on the Balkan Peninsula became completely central, because it spread from the Danube River to the outskirts of Thessaloniki, generally speaking. Beside the Morava River basin, it almost covered the entire basin of the Vardar River, so it could be defined as the *Moravian-Vardar State* (Cvijić 1991). Prior to the First World War, Serbia's new territory was in total 87,800 km$^2$, but it was still a landlocked state.

After the First World War, Serbia formed a large state of South Slavs – The Kingdom of Serbs, Croats and Slovenes (1918) with the Karadjordjević dynasty and got an access to the sea (see Chap. 3). After the Second World War and the change of form of government, the Federal People's Republic of Yugoslavia (later the Socialist Federal Republic of Yugoslavia – SFRY) was organized using the USSR model, with six socialist republics – Serbia, Croatia, Slovenia, Bosnia-Herzegovina, Montenegro and Macedonia. Serbia also had an autonomous province – Vojvodina, and an autonomous region – Kosovo and Metohija (Ćirković 2004).

Compared to the territory of the Kingdom of Serbia, the Socialist Republic of Serbia was significantly redesigned. Vardar Macedonia was excluded from it, and the Socialist Republic of Macedonia was created. On the other hand, Serbia spread onto the regions northward from the rivers Sava and Danube: the southern parts of the Austro-Hungarian Monarchy, which were included in the Kingdom of Serbs, Croats and Slovenes after the First World War, now became a part of Socialist Republic of Serbia – the Socialist Autonomous Province of Vojvodina. The part of the region of Metohija, which had belonged to the Kingdom of Montenegro before the First World War, was included in Serbia's territory as well – the Autonomous Region of Kosovo and Metohija. Also, after the First World War, by the peace treaty of 1919, Bulgaria relinquished certain territories to the Kingdom of Serbs, Croats and Slovenes, which today belong to the Republic of Serbia (about 1500 km$^2$) and the Republic of North Macedonia (about 1000 km$^2$). In total, the Socialist Republic of Serbia occupied a territory slightly larger in size than the territory of the Kingdom of Serbia before the First World War (88,449 km$^2$).

The Socialist Republic of Serbia within Yugoslavia was no longer the Moravian-Vardar state, but it largely remains a state of the Danube region due to Vojvodina's position in Serbia (the Danube passes through the Republic of Serbia in a substantial length of 588 km). Besides, due to this fact, Serbia became a Central European country as well, not only a Balkan country.

## 4.2 Administrative Territorial Structure – Historical Overview

At the beginning of the nineteenth century, a specific autonomy and the self-government of the local Christian population (Serbs) functioned within the borders of the Ottoman Empire. Every village was governed by the village aldermen (*kmetovi*) who represented their villages before the Turks, defending them from Turkish violence, and judging in minor disputes between villagers themselves (Milosavljević 2015). The tax collection levied by the Ottoman Empire was carried out by another local village ruler (*seoski knez*). Apart from this micro-level, the Serbian population had yet another level of self-government manifesting through the existence of smaller territorial areas called *knežine*, which were ruled by their *knez* (ruler of *knežina*, with broad range of competences) (Svirčević 2011).

The Constitution adopted in 1835 was one of the most progressive constitutions in Europe in that time (the government was divided into three independent branches, granting civil rights). Serbia was administratively divided into counties (*okruzi*), districts (*srezovi*) and municipalities (*opštine*). The new constitution changes (1838–1839) divided Serbia into 17 counties, which consisted of several districts, while districts included several villages or municipalities (Svirčević 2011). During the period of political regime of the Defenders of the Constitution (see Chap. 3), the first Municipality Law was adopted, classifying the municipalities into three classes according to their size, economic and demographic structures (Milosavljević 2015). For the first time in 1866, a new law which classified municipalities into urban and rural was created. Every municipality had its own territory, and its own institutions (Svirčević 2011).

A decade after acquiring full independence, in 1888, a new quite liberal constitution was adopted, confirming the administrative division of the country into counties, districts and municipalities. Within the counties and municipalities, there were elected institutions (assemblies, boards), whereas the counties, districts and municipalities received quite a broad range of competences. At the end of 1900, Serbia had 16 counties divided into 81 districts, and the city of Belgrade with separate administration; within the districts, there were 796 municipalities. There was a total of 4302 inhabited places – cities, towns, villages and hamlets (Zavod za statistiku 1955).

After the First World War, in the Kingdom of Serbs, Croats and Slovenes (later the Kingdom of Yugoslavia), Serbia represented a geographic and historical term and the four levels of administrative units were defined by the new constitution in 1921 – areas, counties, districts and municipalities. The areas (*oblasti*) represented a level of regional self-government, while the districts and the municipalities represented a local self-government (Milosavljević 2015). The areas were not allowed to have in excess of 800 thousand citizens and there were 33 of them in the Kingdom of Serbs, Croats and Slovenes.

However, the struggle among political parties and especially the strained relations between Serbs and Croats as two major nations forced the king Aleksandar Karadjordjević in 1929 to centralize its power by abolishing the areas and producing nine subdivisions (*banovinas*) with the independent administrative unit of the City of Belgrade (see Chap. 3). Also, the country name was changed – the Kingdom of Yugoslavia was "born". Each banovina was headed by a ban (governor), who was appointed by the king. *Banovinas* had self-government institutions, but they did not take into account historical and geographic realities. They were named by the rivers, for example, Danube (Dunav) – Dunavska Banovina, Sava – Savska Banovina, and so forth, except for Dalmatia, which was called the Coastal banovina (Primorska banovina) (Ćirković 2004) (Fig. 4.1).

The established *banovinas* were supposed to be nationally mixed and reaffirm the unitary state (Stepić 2001). Five of them were completely or partly located in the Serbian territory. With this new territorial organization, the municipalities became the main self-governmental units while the districts lost their self-government characteristics (Milosavljević 2015).

After the Second World War, in the new socialist and federal Yugoslavia, Serbia was one of the six socialist republics, with two autonomous provinces – Vojvodina, and Kosovo and Metohija (Fig. 4.2).

Each republic had their own government, assembly and constitution. During the next two to three decades, the legislation on local government frequently changed (Milosavljević 2015). A greater jurisdiction was given to the municipalities so that now their authority was extended to the issues of political, economic, cultural and social life. The regional level of governance (districts) was left only as an administrative unit, while the Constitution of 1974 greatly increased the power of autonomous provinces. Apart from the Parliament and the Government, they had the Constitutional Court and the Presidency, and were almost equal to the Republics according to their rights. This way, the Socialist Republic of Serbia became asymmetrically organized: Central Serbia was directly governed from Belgrade as the capital of the Republic, whereas the territories of the provinces were foremost governed from their administrative centres – Novi Sad (Vojvodina) and Priština (Kosovo and Metohija), and only indirectly from Belgrade. Serbia had become federalized at a time when all other republics of socialist Yugoslavia were completing their sovereignty (Ćirković 2004).


**Fig. 4.1** The territorial organization of the Kingdom of Yugoslavia, 1929

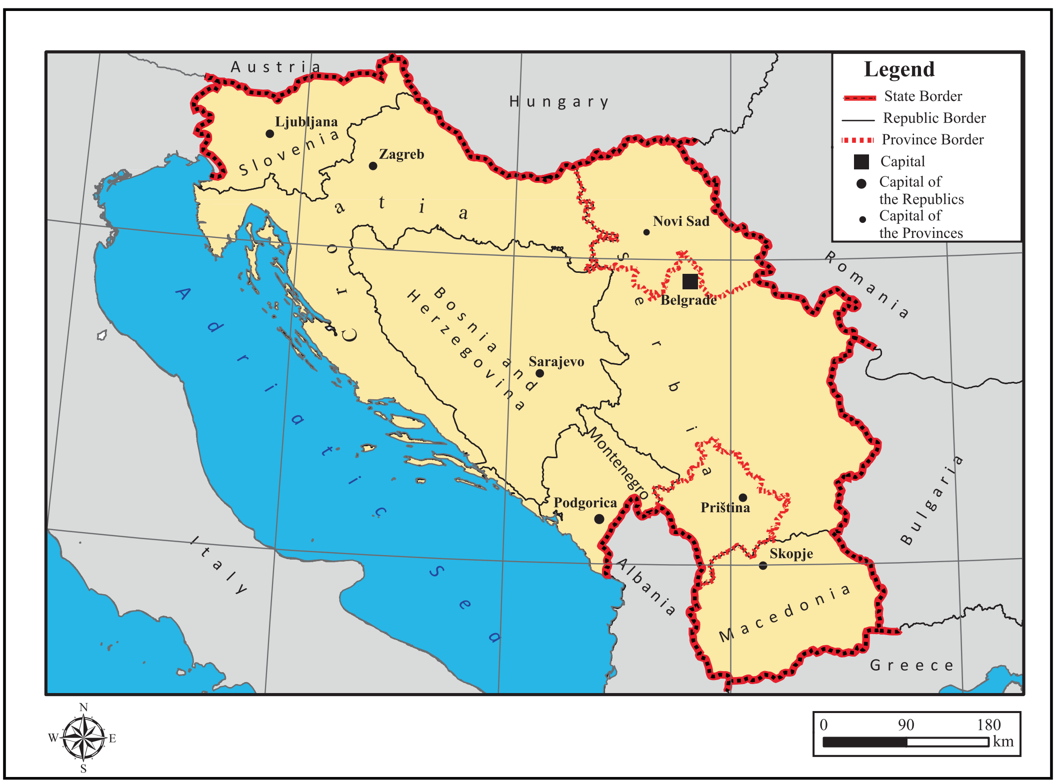


**Fig. 4.2** Socialist Federal Republic of Yugoslavia


**Fig. 4.3** Federal Republic of Yugoslavia (1992–2003) and the State Union of Serbia and Montenegro (2003–2006)

After the SFRY broke up in 1991, and the Federal Republic of Yugoslavia was established in 1992, the new state took over the existing territorial organization and the governance (Fig. 4.3). The capital Belgrade and another four biggest cities got self-governance (Kragujevac, Novi Sad, Niš and Priština). However, during the 1990s, there was a reduction in the municipalities' jurisdiction, while the municipal property started being owned by the state (Milosavljević 2015). After the year 2000 and significant political turnovers, several laws regulating local self-government were adopted. The municipalities were given back certain jurisdictions, and the means of their financing were defined.

### 4.2.1 The Kosovo and Metohija Issue

Considering the fact that the majority of Kosovo's population after the Second World War were mainly Albanians, the autonomy of Kosovo and Metohija de facto became the autonomy for the Albanian minority in Serbia and Yugoslavia. This was an especially sensitive issue taking into account the relationships between the Albanians and the non-Albanian people living there. It rooted long in history, during the centuries of the Ottoman Empire rule, when the Albanian ethnic majority in Kosovo and Metohija had been created. The Albanian people, being Islamized, were privileged in relation to the Serbian Christian population. Through the pressures, privileges and violence against Serbs, they were inhabiting the territory that had previously been inhabited by the Serbian population especially after two big migrations of Serbs to the north and west in the seventeenth and eighteenth centuries (Boganović 1985) (see Chap. 3).

Between the two world wars, the authorities of the Kingdom of Yugoslavia gave an agricultural land in Kosovo and Metohija as a reward to individuals (families) for their contributions in the Great War and in this way tried to encourage the immigration; the majority of them were Serbs, although there were members of other nations, too. During the Second World War, however, the local Albanian population expelled almost all colonists. After the War, the communist authorities made it impossible for the expelled to return under the pretext of their not having personally farmed the land they had received (Pavlović 2014). While the majority of them were Serbs, in spite the later partly revision of this decision, its consequences were detrimental to the ethnic balance in Kosovo and Metohija.

The period of socialist Yugoslavia brought further dislocation of the remaining Serbs and other non-Albanians from Kosovo and Metohija, while the Albanian ethnic majority became additionally consolidated and continued to strengthen through exceptionally high birth rates. In the decades following the World War II, the birth rate of Kosovo population with the Albanians as the majority was unusually high not only for the socialist Yugoslavia, but for Europe as well. "The total fertility rate of the ethnic Albanian population in Serbia was much higher in Kosovo than in other regions of the country, but also in relation to Albania (on average one child)" (Nikitović 2018, p 302). In 1961, for example, the total fertility rate in Central Serbia was 2.1, in Vojvodina 2.2, and in Kosovo and Metohija 6.2 (Nikitović et al. 2016). In comparison with the other parts of Serbia, the population in Kosovo and Metohija was increasing faster. Between 1961 and 2010, the increase in the total population of Kosovo and Metohija was almost 8 and 14 times the increase observed in Central Serbia and Vojvodina, respectively (Nikitović et al. 2016). The increase in the percentage share of the Albanians in the total population of Kosovo and Metohija carried with itself visible political consequences – requests for full autonomy, even for the right to secession from Yugoslavia (Nikitović 2018). This was increasingly more pronounced, given the fact that, from an ethnic point of view, the territory of the province was becoming progressively more Albanian. It is interesting that after 1999, since when the Republic of Serbia has no effective rule in Kosovo and Metohija, the birth rate in the province has abruptly been falling. Thus, the total fertility rate in 2010 was 1.4 in Central Serbia, 1.4 in Vojvodina, and 2.0 in Kosovo and Metohija (Nikitović et al. 2016).

Even though the Albanian minority was enjoying an exceptionally high level of rights from constitutional reforms in 1974, and even though the Autonomous Province of Kosovo had almost equal rights and competences as the other republics of the Socialist Yugoslavia, the Albanian mass protests broke out in 1981 (Pavlović and Marković 2006). These protests had the elements of an armed rebellion and were accompanied by the demands that Kosovo should gain the status of the socialist republic, which would give it the right to secede and join Albania. Actually, according to the 1974 Constitution of the SFRY, the right to self-determination was literally given to the peoples (nations) of Yugoslavia, not to the republics, and especially not so to the national minorities; apart from that, according to the same Constitution, the Yugoslav borders could not have been changed without the consent of all the republics and both provinces. Legally observed, Albanian demonstrators were wrong.

The political struggle between the Albanians and the SFRY (later the Federal Republic of Yugoslavia, and afterwards the Republic of Serbia) practically has started in 1981 (the first mass protests of Albanians with similar demands were in 1968). The Socialist Republic of Serbia tried to strengthen its central power and limit the autonomy to its provinces conducting a considerable reduction in their rights in 1989. At the same time, the relations between the Yugoslav republics worsened and in 1991 the Yugoslavia broke up. Its two republics – Serbia and Montenegro – formed the so-called "Third Yugoslavia" in 1992. In Kosovo and Metohija, the struggle between Albanians and official government has escalated to an armed conflict with the elements of terrorism. Numerous murders of policemen, soldiers, civilians of both the Serbian and the Albanian nationalities (who had been employed in Serbian state institutions) were perpetrated by the so-called Kosovo Liberation Army during the second half of the 1990s, so that, as early as in 1998, the American State Department included this "army" in the list of terrorist organizations (Ćirić 2008). Assuming that the human rights of the Albanian community in Kosovo and Metohija were endangered, NATO (without the UN's authorization) conducted air strikes against the Federal Republic of Yugoslavia (FRY) in 1999, which lasted for 78 days. There are no precise data about the number of the killed during the NATO bombing. Immediately after the bombing had ended, Human Rights Watch (HRW) concluded that as few as 489 and as many as 528 Yugoslav civilians had been killed in the 90 separate incidents in the Operation Allied Force (the NATO air war). The post-conflict casualty reports by the Yugoslav Government vary, but they coincide in estimating a civilian death toll of at least some 1200 and as many as 5700 civilians. After the bombing had ended, American general Joseph W. Ralston, the vice chairman of the Joint Chiefs of Staff of the United States Armed Forces, said that Serbian civilian casualties were estimated at fewer than 1500 dead (HRW 2000). The Serbian media quote that, according to the estimates, from 24 March to 10 June 1999, a total of 1500 to 2500 people were killed (at least 79 children, and 754 members of Yugoslav armed forces and Serbian police), and 6000 were wounded (RTV 2020).

Due to the devastation of the infrastructure, as well as the numerous civilian casualties, the FRY's authorities withdrew the military and police forces from the territory of Kosovo and Metohija. The United Nations Security Council Resolution 1244 imposed UNMIK (United Nations Interim Administration Mission in Kosovo) to perform the basic civilian administrative functions, maintain civil law and order and promote human rights. After 2008, EULEX (European Union Rule of Law Mission in Kosovo) took over many duties from UNMIK. The international peacekeeping force, Kosovo Force (KFOR) with substantial NATO participation, was responsible for the establishment of a safe and secure environment and the freedom of movement in Kosovo and Metohija – both working under the authority of the UN.

The situation in the territory of Kosovo and Metohija worsen by the proclamation of independence by the political representatives of the Albanian majority in 2008, which was recognized by less than 100 countries (the exact number remains unknown since some countries have withdrawn their recognition in recent years and some has never sent written recognition). Serbia did not agree upon that act and it still considers Kosovo and Metohija as its territory even though it has no control over it. The status still defines the UN Security Council Resolution 1244, but Serbia accepted that this territory could be represented officially as Kosovo* (with an asterisk) is due to the normalization of life for the population living there. This territory still cannot reach the UN membership due to the political support given to Serbia by the Russian Federation and China, permanent members of the UN Security Council, and its status remains uncertain.

Even the name of this territory indicates the complexity of the problem. The Constitutional name of the southern Serbian province is Kosovo and Metohija. The name Kosovo originates from the Serbian word "*kos*" (eng. *blackbird*) (a small black bird), whereas the name Metohija originates from the word "*metoh*" (a monastery estate) (Pavlović and Marković 2006; Radovanović 2006). Actually, the very names Kosovo and Metohija originate from the medieval times. Metohija is the biggest basin in the territory of the South Slavic countries (Radovanović 2006).

Originating from the Greek language, μετόχιον [metókhion] – metohion in the medieval Serbia referred to a *monastery estate*, whereas the word Metohija would, therefore, signify the land of monastery estates in a free translation (see Chap. 3, Fig. 3.5 and Fig. 3.8). It testifies to a proportionally large number of the Orthodox monasteries in that region and to the prevailing presence of the Serbian-Orthodox population in it, too. However, after the Second World War in the context of power relations in Yugoslavia (Serbia), this region changes its name several times. In 1963, it was declared within the SFRY (Serbia) as the Autonomous Kosovo-Metohija province. But the amendments to the 1968 Constitution left out the word Metohija from the name, which was confirmed by the 1974 Constitution. The 1990 Constitution put back the word Metohija in the name of the province and in a symbolic way indicated the start of the period in which the Serbs reacquired the political power over the province. After the NATO's air strikes against the FRY in 1999, the international organizations that were, and still are, present in Kosovo and Metohija only used, and are still using only the word Kosovo, just like the Albanians (Radovanović 2006). It can be said that leaving out the word Metohija from the name of the province is an act of the same sense as if the determinant Herzegovina were left out from the name of the state of Bosnia and Herzegovina.

## 4.3 The Constitution – Basic Principles and Concepts

After an independence referendum in Montenegro in 2006 which ended the State Union of Serbia and Montenegro, both countries continue to exist as sovereign states. Today's Republic of Serbia inherited the area of the Socialist Republic of Serbia (Fig. 4.4). According to the valid Serbian Constitution of 2006, municipalities, cities and the City of Belgrade (capital) remain the units of local self-government; their highest institution is the Assembly, which consists of the councillors elected for the 4 years' term. The Assembly


**Fig. 4.4** Territorial organizations of the Republic of Serbia

adopts the municipality's budget and its statute, adopts development plans and elects executive authorities. During the period after 2000, the territorial organization of Serbia adopted several changes (Milosavljević 2015). The system of local self-government is arranged into 174 local self-government units and based on the monotypic model of municipality. There are 29 settlements with the status of a city, including Belgrade (Ministarstvo državne uprave i lokalne samouprave, 2019b), 29 administrative districts, and two autonomous provinces.

An administrative district is formed to carry out state administration tasks outside the headquarters of a state administration authority, but it does not represent an additional level of regional self-government. In accordance with the Constitution, municipalities are responsible for the local administrating and local management as well as for public services (Constitution of the Republic of Serbia 2006, Article 190), and the autonomous provinces have their own assemblies and governments.

In the Republic of Serbia, the government system is based on the division of power into legislative, executive and judicial. The relationship between the three branches of power is based on balance and mutual control. Judicial power is independent.

The National Assembly is the supreme representative body, which, inter alia, performs the highest legislative authority in the country. It consists of 250 members, elected for a period of 4 years. The President of the Republic (without executive power although he/she is elected through elections) represents the Republic of Serbia in the country and abroad, promulgates laws upon his/her own decree in accordance with the Constitution, proposes to the National Assembly a candidate for the Prime Minister, appoints and dismisses, upon his/her own decree, the ambassadors of the Republic of Serbia and so on. The President of the Republic also commands the Army and appoints, promotes and relieves the officers of the Army of Serbia. The Government is the holder of executive power in the country (Constitution of the Republic of Serbia 2006, Article 122) with changeable organization and the numbers of the ministries. The Government establishes and pursues policy, executes laws, proposes to the National Assembly laws, directs and adjusts the work of public administration bodies. Judicial power is unique throughout the Republic of Serbia, and courts are separated and independent in their work (Constitution of the Republic of Serbia 2006, Article 142). Judicial power in the Republic of Serbia belongs to the courts of general and special jurisdiction.

According to the current Constitution, the Republic of Serbia is a secular state, and the freedom of thought, conscience, beliefs and religion is guaranteed.

## 4.4 The Political System

The multiparty system in Serbia has a certain tradition since the first organized political parties of the West European type appeared in the second half of the nineteenth century (Svirčević 2011). The oldest political parties in Serbia of that time were Liberal Party, Progressive Party (primarily conservative and moderate) and the People's Radical Party (whose foothold was amongst peasants with strong elements of the socialist ideology) – all three formally formed around 1881 (Ćirković 2004). Apart from these parties, there was also the Independent Radical Party formed in 1902 (the ideas of liberal democracy), and the Serbian Social-Democratic Party (represented the interests of workers and poorer layers of society) (Svirčević 2011). Between the two world wars, the other mentioned parties (except for the People s Radical Party) stopped existing under their names in the new state, and their members were becoming members of new political organizations (Democratic Party, Communist Party, and others). However, after the Second World War a new political system had been launched – a one-party system led by the Communist Party of Yugoslavia.

After a few decades of the rule of the Communist Party of Yugoslavia (1945–1990), the first multiparty elections, as well as the elections for the President of the Republic of Serbia, were held in 1990. On these elections, the Socialist Party of Serbia, as well as its candidate for the President – Slobodan Milošević, convincingly won. In the period from 1990 to 2000, Serbia was being dominated by the Socialist Party of Serbia. Its program was based on the preservation of the *status quo* in the society, politics and economy that had been inherited from the period of socialism. After the political changes of 2000, during the next decade (2000–2012) Serbia was being dominated by the two political parties which have the adjective "democratic" in their names – the Democratic Party of Serbia and the Democratic Party. Since the year 2012, Serbia has been dominated by the Serbian Progressive Party. After 2000 and the political changes, Serbia went through a process of the ownership transformation in the economy (the so-called transition, or privatization), which had been a usual process in East Europe after 1990, with state-owned enterprises and enterprises in social ownership simultaneously falling into the hands of new owners – domestic and foreign companies (see Chap. 14). The share of the service sector in Serbia's economy increased to the detriment of the industry. Additional democratization in society and the strengthening of the role of non-government organizations and the civil sector in general took place in the political life of Serbia. In its foreign policy, Serbia declared joining the European Union and the development of partner relationships with NATO as a priority, simultaneously preserving its military neutrality and good relations with the Russian Federation and China. When speaking about administration, local self-government, and the education, science and culture sectors, many solutions applied in the practice of the European Union countries have been either partially or fully applied in Serbia as well.

Currently, there are 113 parties registered in Serbia (Ministarstvo državne uprave i lokalne samouprave 2019a). A political party may be established by a minimum of 10,000 legal adults with the capacity to contract who are nationals of the Republic of Serbia (or 1000 in case of a political party of a national minority).

The multiparty system in Serbia is characteristic for several details (weaknesses) that arise from the law on the election of members of parliament (MPs). The two-round majority system was applied in the first multiparty elections and since 1992, the proportional system with the threshold of 5% until 2020 (it has been changed into a threshold of 3%) and D'Hondt formula. Due to the fear that small parties cannot reach the electoral threshold, small parties shelter to pre-electoral coalitions or appear on larger parties' lists. The consequence is a fragmented Parliament. For example, after the parliamentary elections of 2012, about 44 parties, trade unions and other organizations reached the parliament (Orlović 2015).

The Republic of Serbia is a single electoral unit and MPs are elected on the basis of the lists of political parties, coalitions of parties, other political organizations and the lists submitted by groups of citizens. Every citizen of the Republic of Serbia with the domicile on the territory of the country, who is over 18 years of age and, with legal capacity has the right to elect MPs or to be elected as an MP. Often, many municipalities in Serbia are not represented through members of Parliament. Thus, for example, "in the four convocations of the National Assembly from 2000 to 2014, about 100 municipalities on average were without their representatives. At the same time, 39.2% of the MPs came from the territory of Belgrade and Novi Sad [the only metropolitan area in the country – see Chapter 21] although 26.9% of the voters are from these two cities" (Orlović 2015, pp. 100–101).

On the other hand, the electoral system in Serbia enables parties of national minorities to acquire their representatives in the National Assembly irrespective of the small number of their voters. Since 2003, the electoral threshold for minority parties has been modified. The so-called natural threshold (or the so-called positive discrimination) has been introduced. For example, "if the number of the voters on the elections is 3,750,000, and that number is divided by the number of the seats in the parliament (250), the result obtained is 15,000, meaning that one parliamentary seat bears this number of votes. If a minority party wins 30,000 votes, this is divided by 15,000, and this party attains two seats in the Assembly" (Orlović 2015, pp. 99–100).

## 4.5 Political-Geographical Position

The geographical position of Serbia has a significant impact on its geopolitical position. It is located relatively close to the world's most developed countries and regions, that is, Western Europe, and at the same time to the southwestern Asian countries. Its geopolitical position is highly influenced by its central position on the Balkan Peninsula. Serbia is being mainly surrounded by the countries smaller or similar in size of their territory and total population, which are considerably less developed than the Western Europe countries. Additionally, the position of Serbia is also impacted by its relatively short distance from important communications and strategic traffic points. For example, the distance from Serbia (i.e. from its southern border with North Macedonia) to the Suez Canal rectilinearly barely exceeds 1500 km, and to the Bosporus it is less than 600 km, whereas the important port of Thessaloniki (Greece) is several hours away by car (from the interior of Serbia).

Serbia is surrounded by either the EU member countries or the countries that aspire to join the EU. At the same time, some EU member countries, that is, Germany and Italy, represent its largest trading partners, so it is understandable Serbia's orientation towards the full EU membership (see Chap. 19). However, Serbian path towards the EU is far more complicated than the paths of other countries.

After the political representatives of the Albanian majority in Kosovo unilaterally declared the independence of the province in 2008, the great majority of the EU member countries have recognized Kosovo as an independent state, except for Spain, Slovakia, Romania, Greece and Cyprus. Also, the EU membership requires that Serbia should reach a legally binding treaty by which the Kosovo status would be permanently defined (a kind of the implicit or explicit recognition of Kosovo's independence by Serbia). From Serbian point of view, it is very difficult and unjust requirement (condition) for membership in EU.

The geopolitical position of Serbia could conditionally be observed from an inter-perspective – the Balkan/European perspective. Namely, in the media and in academic discourse, a syntagma *the Western Balkans* has often been used in recent years. This term is a construct resulting from the three processes: European integration streams that have reached the Balkan borders, the consequences of the breakup of the SFRY and the formation of the new internationally recognized states by the republics from SFRY (Stepić 2004). When this concept was initially put to use, *the Western Balkans* implied all the former Yugoslav republics, except Slovenia, which were not members of the EU, including Albania. Afterwards, by Croatia's joining the EU in 2013, counting it into the region of *the Western Balkans* became redundant, whereas Kosovo and Metohija were, however, additionally included by the EU management bodies. In the geo-economic context, the term *the Western Balkans* is represented by CEFTA (Central European Free Trade Agreement), the trade agreement which defines the unified free trade zone in Southeast Europe even though it initially predominantly related to the Central European countries.

Apart from Serbia, it includes Albania, Bosnia and Herzegovina, North Macedonia, Moldova, Montenegro, and Kosovo and Metohija. In the political and academic circles, participation in CEFTA is considered as a prerequisite for the EU membership, within which Serbia participate since 2007 (see Chap. 19).

Analysing the geopolitical position of Serbia, it must be underlined that the Balkan Peninsula synchronously represents a "bridge" from Europe towards Asia, and vice versa, but also a barrier between the Eastern/Central European regions and the Mediterranean Sea (foremost the Adriatic and the Aegean seas) as well. This means that the area of the Balkan Peninsula, as well as Serbia itself, is in the focus of the political and economic interests of not only the EU, but also of the other great or regional powers.

Also, Serbia is the geopolitical core of the Balkan Peninsula considering the main pan – European transport corridors (Sekulović and Gigović 2008) as well as the air traffic corridors which pass through Serbian air space (Grčić and Ratkaj 2004) (see Chap. 17). Within this context, Belgrade (the capital) has special geopolitical significance – it is the crossroad of the strategic European transportation lines that connect West and North Europe to the southeast parts of the continent and further with Southwest Asia (connecting West and North Europe with the Aegean coast via the Belgrade-Skopje-Thessaloniki railway line, and also with the Adriatic coast via the Belgrade-Bar railway line) and the crossroads of the European airways (Proroković 2012).

Apart from the USA, which is interested in the Balkans and in Serbia mostly for military-strategic reasons (an important American military base, Bondsteel, is located on Kosovo and Metohija's territory, (in)directly on the territory of Serbia), there are also the other powers, that is, the Russian Federation, China and Turkey, which are interested in this area for the same reasons, as well as for the broader economic and political reasons. The Russian Federation has been presented in Serbia mainly through the energy sector as the main provider of gas and oil within Southeast Europe (see Chap. 16). By importing gas from Russia, Serbia satisfies approximately 80% of its needs (Breban 2018). The Russian Federation is Serbia's third foreign trade partner. On the other hand, Turkey also attempts to establish itself as a strong economic factor in the Balkans, as well as an important regional political power. Recently, China has been increasingly more present in the Balkan region through the *One Belt, One Road* initiative and the project *New Silk Road*. Due to its attractive geographic (and political) position, Serbia has got an exceptional place in this initiative. At the same time, China is a significant investor in Serbia, that is, creditor (owner) in the reconstruction or traffic infrastructure (railways, highways, bridges), as well as in the sectors of energy, the steel industry and telecommunications (Dimitrijević and Jokanović 2017) (see Chaps. 16 and 17).

The most significant area from the point of view of geostrategy is the *Morava-Vardar valley*, which spreads from Danube, via the rivers of Velika Morava, Južna Morava and Vardar (in North Macedonia), all the way to Thessaloniki. The Morava-Vardar valley, specifically the traffic corridor spreading throughout its length, is considered as the fastest way to reach the Aegean Sea from the Pannonian Plain and Central Europe in general. The so-called central part of the Balkans, which covers the area amongst the cities of Kraljevo, Priština, Skopje, Sofia and Niš, is an exceptionally attractive strategic object. It is "the central manoeuvring area of the Balkans with significant communication junctions" (Pavlović 1999, p 45). Its biggest part is located in Serbia and the communications and naturally passable zones radially diverge towards all the parts of the Peninsula (Fig. 4.5). This part of the Balkans had "an exceptional role in expanding power and the influence" (Pavlović 1999, p 45). The territory of Serbia is, more or less, intersected by several strategic routes from which, military wise, the Asia Minor – Pannonian strategic route could have special significance in the future.

Serbia shares about 85% of its borders with the NATO member states – Croatia, Hungary, Romania, Bulgaria, Montenegro, Albania and North Macedonia (Fig. 4.5). In this context, its geostrategic position as a military neutral country could be evaluated as unfavourable. Even though Serbia maintains constructive relations with NATO (it is a signatory state of SOFA, IPAP and NSPO agreements, and it participates in the Partnership for Peace program), its position in the Alliance's encirclement surely significantly deteriorates its geostrategic position. On the other hand, Serbia's membership is not of vital importance to NATO, which has moved its borders far to the east, even though the shortest communication routes, for example, that from Albania to Romania, from Greece to Hungary, or from Bulgaria to Croatia (all of them are members of the Alliance) pass through Serbia (Vuković 2016). Serbia has been an observer country in the Collective Security Treaty Organization (CSTO). For the largest part, it imports military equipment from the Russian Federation.

The fact that Serbia holds the central position in the Balkans with its important roads and travel routes has been proven by the 2015–2016 migration crisis, when a big refugee wave from the Middle East and North Africa arrived in Europe. On the so-called *Balkan Route,* on the road from Turkey and Greece towards the EU, West and North European countries, more than one million migrants passed through Serbia by the end of 2019 (Komesarijat za izbeglice i migracije 2019) (see Chap. 12). The reason for that is sim-

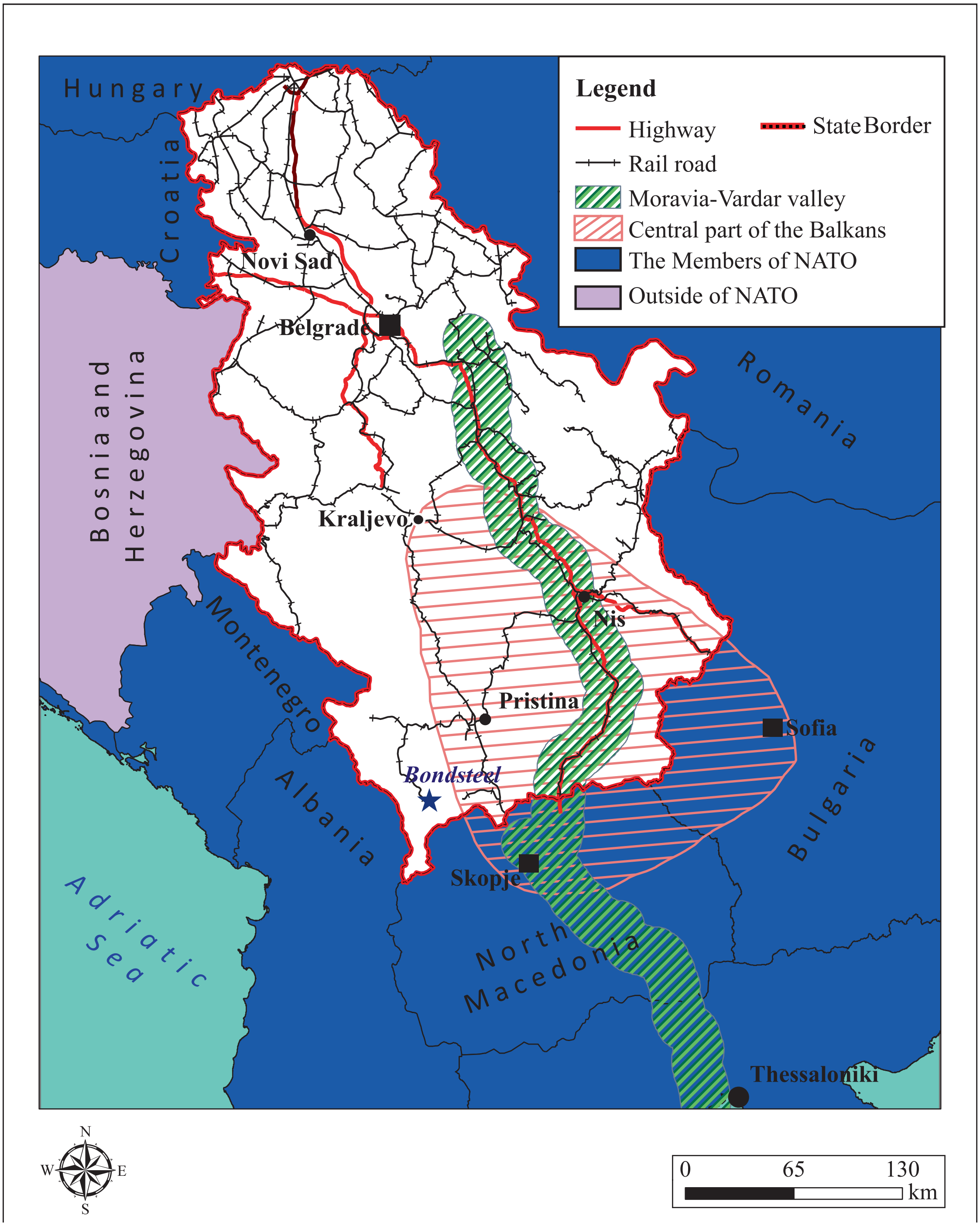


**Fig. 4.5** Geopolitical position of Serbia: The most important geostrategic objects

ple – the shortest land route from Asia Minor and Greece to the leading European countries in the West passes through the Serbian territory. Despite the de-facto closure of *the Balkan route* in early March 2016, a constant stream of migrants continues to arrive in the Republic of Serbia – mainly from Bulgaria and North Macedonia – with strong support from cross-border smuggling and trafficking networks. Throughout 2018, the monthly number of stranded migrants in Serbia fluctuated around 4000 (UNICEF 2018).

Being a relatively small area country with long borders and the encirclement by the NATO member, its geostrategic position in the current political circumstances is very sensitive and unfavourable (Vuković 2016).

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# Part II

# Physical Geography

Predrag Djurović

# Climate of Serbia

5

Boško Milovanović, Gorica Stanojević, and Milan Radovanović


**Abstract**

There are three types (with several subtypes) of climate in Serbia. According to the Köppen climate classification, the most parts of Serbia have moderately warm and humid climate; on higher altitudes, there is moderately cold and humid climate, whereas only in the parts with the highest mountains, cold and humid climate is represented. As the result of the urban heat island effect, the highest average annual air temperature is in Belgrade the capital of Serbia where it exceeds 12 °C. On the highest peaks of the mountains in the southwest and southeast of the country average annual air temperatures are below 2 °C. Range of absolute minimum and absolute maximum air temperatures is between −39.5 and 44.9 °C. Precipitation amount varies from 550 to 600 mm (mainly in the northern part of the country) to over 1100 mm on the highest mountains in the southwest. In the period from 1961 to 2010, the largest part of Serbia became warmer, but without the statistically significant trend in the received precipitation quantity. Snowfalls are a frequent occurrence in the winter part of the year and vary from 30 to 40 days on the northern lowland to cca 100 days on the highest mountains. On the annual level, the lowest value of insolation (1534.8 h) and the highest cloudiness (6.4) is at the station Požega (western Serbia). The distribution of values of relative humidity during a year is opposite to the distribution of air temperatures in Serbia (Belgrade has the lowest value of 68.6% on an annual scale). The most significant wind on the territory of Serbia is košava which can reach a speed up to 48 m/s.



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**Keywords**

Air temperatures · Precipitation · Snowfalls · Isolation · Cloudiness · Humidity · Wind · Serbia


## 5.1 The Factors Which Determine the Climate

The values of the climatic elements on the territory of Serbia are the results of the impacts of numerous climatic factors. Geographically, Serbia is located in the moderate mid-latitude zone of the northern hemisphere, in the southeastern Europe, on the Balkan Peninsula. Large land and water surfaces (Euro-Asian land, the Atlantic Ocean, the Arctic Ocean, the region of the Sahara) influence the formation and movement of air masses, dominantly determining the weather and climatic conditions in Serbia. The relief features, hydrological and bio-geographical factors, and in the last decades, the human impact (the most evident in urban areas) on the regional and local level affect the existence of various types of climates. The analysis of temporal series of climatic elements on the seasonal and annual level enables more detailed insight into the climatic features on the territory of Serbia.

The factors which dominantly determine the climate on the territory of Serbia are its mathematical-geographical position and the circulation of atmosphere, that is, its exposure to the air masses of various geographical origin and physical characteristics. On a relatively small territory, various climates are noticed, and, locally, numerous specificities as well, under the influence of mutual activity of orographic, hydrological, bio-geographical and anthropogenic factors.

Continental and maritime air masses of different geographical origins cause different weather conditions in Serbia. It is under the constant influence of the Azores anticyclone and Icelandic cyclone, whereas it is affected by the Siberian anticyclone in the winter period, and the Karachi (or Arabian) depression in summer. On the east of the Euro-




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Asian continent, in the colder half of the year, forms a field of high pressure, Siberian anticyclone. Its ridge includes parts of eastern and central Europe, enabling a breakthrough of polar and Arctic air from the north and the east. In the same time, the mountains on the Balkan Peninsula have relatively high air pressure, whereas the region of the Mediterranean Sea is characterised by baric depressions (Ducić and Radovanović 2005). The stability of such synoptic conditions leads to the occurrence of cold waves and air temperatures below the average on the territory of Serbia.

During summer, due to the movement of the thermal equator and moderate mid-latitude front towards the north, parts of central and south Europe are under the influence of the ridges of Azores anticyclone and they are characterised by calm and stable weather. Then, in the east, above the Arabian Peninsula, the Karachi depression is formed. Intensive advection of hot air from the north of Africa leads to the appearance of heat waves and air temperatures significantly above the average.

For precipitation events, the impact of the Icelandic cyclone is also significant, as well as the movement of humid air masses from the Atlantic Ocean which come to the territory of Serbia from the northwest. This is especially characteristic for the warmer part of the year, when the cold air of maritime origin reaches the territory of Serbia, where it is "quickly heated from the ground, becomes unstable, and results in short showery precipitations" (Bilić 1978). According to Tošić and Unkašević (2013) 74.5% of precipitation in Belgrade falls during the warmer half of the year and due to the intensive convection of colder and more humid maritime air. Also, the Bay of Genoa and the Adriatic basin represent cyclogenic regions where the cyclone paths gravitate towards the east. In April and May, in most of the regions in Serbia, the Mediterranean cyclones represent the main form of circulation which ensures the spring maximum of precipitation, as well as the secondary maximum in the fall (Bilić 1978). In certain cases, with the inflow of colder air from the north, the system of low pressure moves towards the east, becoming more powerful on the territory of the Balkan Peninsula, which causes heavy precipitation (in May 2014, the daily precipitation quantity in certain stations in the west of Serbia exceeded 100 mm) (Tošić et al. 2017). Also, the cyclogenic activity in the eastern Mediterranean and the inflow of humid air masses from the southeast and east often cause sums of precipitation above the average on the territory of Serbia (Unkašević and Radinović 2000; Tošić and Unkašević 2013).

## 5.2 Spatial Distribution of Climatic Elements

The latitude and relief are the most significant factors which affect the spatial distribution of air temperatures in Serbia (Vujević 1953; Ducić and Radovanović 2005; Milovanović et al. 2018). The northern, lowland part of Serbia, the edges of the Pannonian plain, lower parts along river valleys, and hilly terrains of the western, central and eastern Serbia, and then the valleys and ravines in the south of Serbia, are characterised by the mean annual air temperatures between 10 and 12 °C. A larger part of this region is included in the isotherm of 11 °C[1] (Fig. 5.1).

In the region of Belgrade, the mean air temperature is about 12 °C. The mean annual air temperature in the meteorological station Belgrade (located in a wider centre of the city) in the period 1961–2010 was 12.3 °C, which was the result of the urban heat island effect (Anđelković 2005; Milovanović et al. 2017a).

Besides Belgrade, the station with the highest average annual temperature of 12.1 °C is Prizren (Kosovo and Metohija) on the furthest south (the result of the Mediterranean influence due to the openness of this region with river valleys to the south). With the rise of altitude, the mean annual air temperature decreases. In the highest parts of mountains in southeastern Serbia, it ranges from 2 to 4 °C, whereas it is below 2 °C in the mountains in the southwest and south (above 1800 m a.s.l.) (Fig. 5.1). During the summer, in Vojvodina and Pomoravlje region, the mean air temperature is about 21 °C, and in the regions of Belgrade, Negotin frontier area on the furthest east of Serbia and around Prizren (Kosovo and Metohija) reaches up to 22 °C. According to Milovanović et al. (2017a), the mean summer temperatures at the altitude of 1000–1250 m a.s.l. are in the range from 14.3 to 16.3 °C, at about 1500 m a. s. l. they are lower than 12 °C, and the position of isotherm of 10 °C is at the altitudes of about 2000 m a.s.l.

The dominant feature of the spatial distribution of precipitation in Serbia is the decrease of precipitation quantity from west to east (Fig. 5.2). It is a direct consequence of the exposure of the Serbian territory to the humid air masses from the northwest and the southwest. Also, the mountain ranges on the west intensify this distribution. According to Dukić (1978) and Rakićević (1979), the places with the same altitudes and nearly equal circle of latitude get 1.11 mm less precipitation annually per each kilometre of distance when moving from west to east. The northeastern part of Serbia, as well as some smaller regions in the valleys of the Velika and Južna Morava rivers and in the east of Serbia, are characterised by the lowest annual precipitation of 550–600 mm. With the rise of altitude, the annual precipitation quantity also increases (from 800 to 900 mm in the mountains of eastern and southern Serbia, and 1000–1100 mm in the most western and the most southern parts of Serbia). The highest parts of mountains in the southwestern part of Serbia get more than 1100 mm of precipitation a year.

According to the annual distribution of precipitation, there are three distinguishable pluviometric regimes. In the largest part of Serbia, the Danube variant of the continental pluvio-

[1]This isotherm is additionally highlighted on the map because of the detailed insight into the spatial distribution of air temperatures.

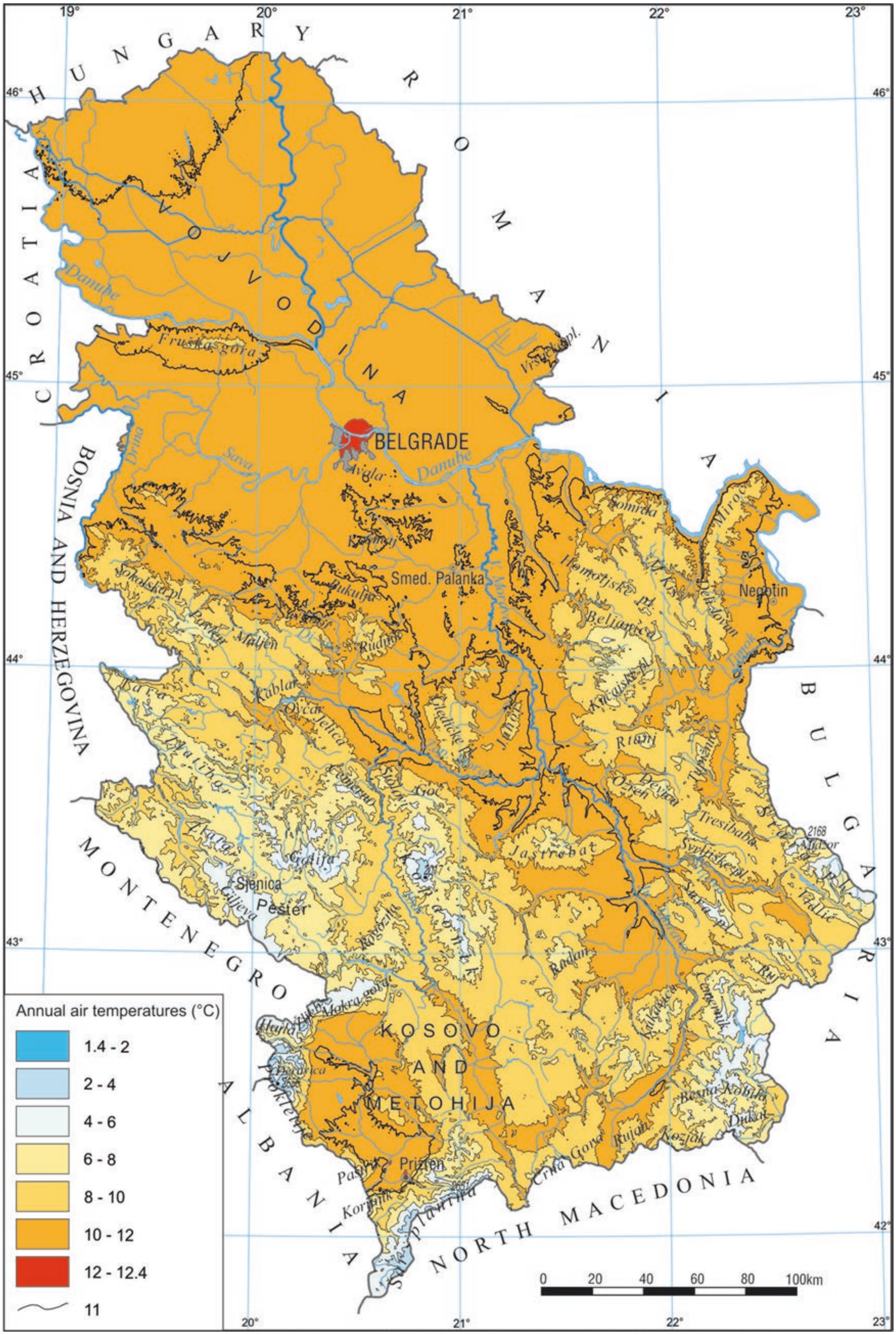


**Fig. 5.1** The mean annual air temperatures (1961–2010). (Milovanović et al. 2018)

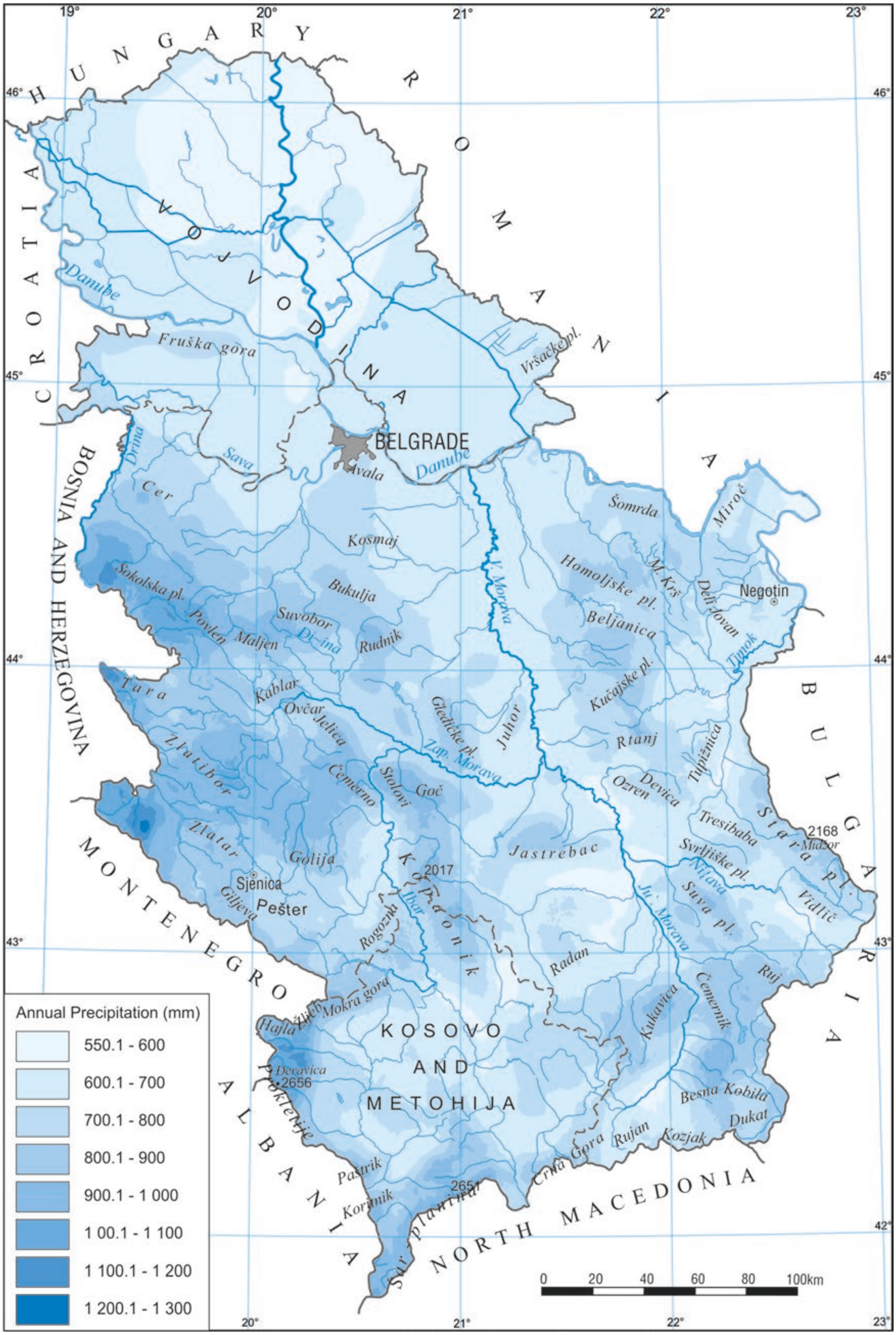


**Fig. 5.2** The mean annual precipitation in Serbia in the period 1961–2010. (Milovanović et al. 2017b)

**Table 5.1** Absolute maximum and minimum air temperatures (°C) with the date of the occurrence in meteorological stations in Serbia in the period 1961–2010

| Stations | Absolute maximum of air temperature | | Absolute minimum of air temperature | |
|---|---|---|---|---|
| | (°C) | Date | (°C) | Date |
| Banatski Karlovac[a] | 41.6 | July 24th 2007 | −23.7 | January 31st 1987 |
| Belgrade | 43.6 | July 24th 2007 | −21.0 | January 24th 1963 |
| Veliko Gradište | 43.6 | July 24th 2007 | −26.4 | January 25th 1963 |
| Valjevo | 42.4 | July 24th 2007 | −28.4 | January 24th 1963 |
| Vranje | 41.6 | July 24th 2007 | −25.0 | January 13th 1985 |
| Vršac | 42.2 | July 24th 2007 | −32.6 | January 24th 1963 |
| Dimitrovgrad | 41.4 | July 24th 2007 | −29.3 | January 25th 1963 |
| Zaječar | 44.7 | July 24th 2007 | −29.0 | January 13th 1985 |
| Zlatibor | 35.8 | July 24th 2007 | −22.8 | January 23rd 1963 |
| Zrenjanin | 42.9 | July 24th 2007 | −30.4 | January 24th 1963 |
| Kikinda | 40.0 | July 24th 2007 | −29.8 | January 23rd 1963 |
| Kopaonik[b] | 30.0 | July 24th 2007 | −24.8 | January 13th 1968 |
| Kragujevac | 43.9 | July 24th 2007 | −27.6 | January 24th 1963 |
| Kraljevo | 43.6 | July 24th 2007 | −24.0 | January 11th 1967 |
| Kruševac | 43.7 | July 24th 2007 | −28.1 | January 25th 1963 |
| Leskovac | 43.7 | July 24th 2007 | −30.5 | January 25th 1963 |
| Loznica | 42.3 | July 24th 2007 | −25.4 | January 24th 1963 |
| Negotin | 42.6 | July 24th 2007 | −28.5 | January 24th 1963 |
| Niš | 44.2 | July 24th 2007 | −23.7 | January 25th 1963 |
| Novi Sad | 41.6 | July 24th 2007 | −30.7 | January 24th 1963 |
| Palić | 38.2 | July 19th 2007 | −25.2 | January 24th 1963 |
| Požega | 41.0 | July 24th 2007 | −30.7 | January 13th 1985 |
| Sremska Mitrovica | 40.7 | July 24th 2007 | −29.5 | January 31st 1987 |
| Smederevska Palanka | 44.9 | July 24th 2007 | −30.5 | January 23rd 1963 |
| Sjenica | 36.2 | August 23rd 2007 | −35.6 | January 13th 1985 |
| Sombor | 40.3 | July 20th 2007 | −27.2 | January 24th 1963 |
| Ćuprija | 44.6 | July 24th 2007 | −27.1 | January 31st 1987 |
| Crni Vrh[c] | 36.5 | July 24th 2007 | −23.2 | January 24th 2006 |

[a]Period 1986–2010; [b]Period 1967–1973 and 1980–2010; [c]Period 1982–2010 – Republic Hydrometeorological Service of Serbia

metric regime is represented, and it is characterised by two maximum and two minimum values of precipitation. The primary maximum is at the end of spring and at the beginning of summer, and the secondary maximum is at the end of fall and the beginning of winter, whereas the primary minimum of precipitation is at the end of summer and the beginning of fall, and the secondary one is in some of the winter months (most frequently in February). At the farthest southwest of Serbia and in the south (in the region of Metohija), the maritime pluviometric regime is represented (precipitation maximum in late fall, that is, the winter precipitation maximum). The transitional pluviometric regime, between the continental and maritime (with approximately equal primary and secondary precipitation maximum), is represented on the territory of Kosovo, as well as in eastern Serbia (Milosavljević and Milosavljević 1962), from where it continues to the Vidin region of Bulgaria (Mateeva 2002).

The hottest parts of Serbia in the winter have the mean temperature of about 2 °C (in Belgrade 2.1 °C, in Prizren 1.9 °C). Winters are the coldest on high mountains (the mean winter temperature on Kopaonik is −4.6 °C), but in parts with ravines (e.g. Požega at 310 m a.s.l., has the same winter temperature as Rudnik at 700 m a.s.l.) in the lower terrains where the temperature inversions are frequent in winter.

The absolute minimum temperature in Serbia of −39.5 °C was measured in Karajukića Bunari on Pešter plateau (southwest of Serbia) on 13 January 1985. Such a low temperature is caused by specific relief in this part of Serbia (Rakićević 1971).The absolute maximum air temperature was measured at the station Smederevska Palanka and it was 44.9 °C (24 July 2007) (Table 5.1). In last decades, the extreme temperature events have increased frequencies with a particularly negative impact on urban populations. Stanojević et al. (2014a, b) showed the negative impact of heat waves on health and mortality in Belgrade for the period 2000–2010.

Snowfalls are a frequent occurrence in the winter part of the year on the territory of Serbia. The intensity of snowfall and the formation of snow cover is significantly influenced by relief. In the lower areas, the first snowfalls occur in the first half of December, whereas with the increase of the altitude, snow occurs from the first half of November, and in the highest terrains even in the second half of October. Snowfalls are most frequent in January, then in February and December.

The northern lowland part of Serbia is characterised by the smallest number of days under snow (on average, 30–40 days a year, period 1981–2010). On the terrains at higher altitudes, snow falls for more than 60 days a year. In the region of Pešter plateau (southwestern Serbia), in Sjenica, snow falls for 61 days a year on average, whereas on the mountains of the western and southwestern Serbia it lasts longer (on the mountain of Zlatibor 66 days, on Kopaonik for 94 days). In the eastern Serbia, snow falls for more than 60 days (Crni Vrh 67 days). The snow cover remains of these terrains for more than 100 days a year (Sjenica 103 days, Zlatibor 114 days, Crni Vrh 123 days, Kopaonik 162 days). The insolation is primarily influenced by the latitude, but it also depends on the configuration of the terrain, cloudiness, and other local conditions. It represents an important climatic element whose annual values on the territory of Serbia change in dependence of the season, with the highest values in summer and with the lowest in winter. On the annual level, the total number of hours of the Sun radiation ranges from 1534.8 h in the station Požega (western Serbia) to 2142.6 h in the station Kikinda (Vojvodina). Požega (western Serbia) is characterised by a specific ravine position (in the western part of Serbia), which affects the values of insolation and cloudiness. The highest values in Kikinda (western part of Serbia) are the results of the openness of the terrain (lowland part of Serbia) with no influence of orography. During a year, the highest values of insolation are in July, from 227.8 h in Požega to 309.5 h in Vranje (the south of Serbia). The lowest values are in December, from 32.4 h in Požega, to 82 h on Kopaonik (higher values on higher altitudes during winter are the results of inversive cloudiness). Contrary to insolation, the lowest values of cloudiness are in summer, and the highest are in winter. Observed on a monthly level, the greatest cloudiness is in December, and then in January, whereas the lowest values are in August and July. Generally, cloudiness has a regular yearly path: it decreases from December to August, and then increases again. In December, in most of the stations, the cloudiness has relatively higher values (more than 7.0), with the maximum value of 8.0 in Požega. The specificity of the geographical position of Požega reflects in the values of other parameters as well. According to Milovanović et al. (2017a), the average annual number of days with fog in this place is 127 (1981–2010), the average number of cloudy days in a year (the average daily cloudiness above eight tenths) is 129 (1981–2010), and the average number of clear-sky days (the average daily cloudiness below two tenths) is 34 (1981–2010). For the comparison sake, on the majority of synoptical stations in Serbia, the number of days with fog is between 20 and 30, annually (period 1981–2010). The average annual cloudiness is from 4.7 in Novi Pazar (the southwest of Serbia) to 6.4 in Požega. With the rise of altitude, the annual values of cloudiness also rise (the average annual cloudiness in Sjenica is 6.0, on Crni Vrh 6.1, and on Kopaonik 5.8). The distribution of values of relative humidity during a year is opposite to the distribution of air temperatures in Serbia. In the winter part of the year, December and January are characterised by the highest values of relative humidity. In December, they range from 79.9% in Belgrade to 88.2% in the station in Senta (Vojvodina). During summer, the relative humidity has a value of 61.9% in Negotin (eastern Serbia) to 76.4% in Žagubica basin (also in eastern Serbia). On the annual level, on average, the values of relative humidity range from 68.6% in Belgrade to 80.5% in Žagubica.

The most significant winds on the territory of Serbia are *košava* and etesian winds. The consequence is the distribution of air pressure and air flows in this part of Europe. The movement of colder air from the region of the Eastern Europe towards the warmer Mediterranean is accompanied by the occurrence of *košava*. It most often happens in the colder part of the year, and less frequently in summer. On average, *košava* blows at the speed of 5–10 m/s, where strong and weak blows interchange in the period of 2–3 days, and sometimes even longer (Milosavljević 1953). The literature also describes events when *košava* lasted for more than 20 or 30 consecutive days (Milosavljević 1953; Milosavljević 1972). Northern, eastern and central parts of Serbia are most exposed to the effects of *košava*, and its greatest power is in the valley of the Danube, downstream from Belgrade to the entrance into the Djerdap gorge at the speed of 25–30 m/s. Describing the events from February 1896, Vujević (1953) states that the blows of *košava* were so strong that in certain parts of Serbia the wind blows threw trains out of rails, and the sand from Deliblatska peščara sands spread over a wide surrounding area. Plazinić (1985) describes events in Belgrade when the speed of *košava* reached over 35 m/s. The strongest recorded blow of *košava* in Belgrade had the speed of 35.9 m/s (October 17th 1976), while the greatest speed of *košava* (on the territory of Serbia) was measured in Vršac (the northeast of Serbia, the district of Banat) on 11 January 1987 and it was 48 m/s (Zarić 2014).

Contrary to *košava*, in the warmer half of a year, a large part of Serbia is under the influence of etesian winds. These winds form as a result of high pressure above Central Europe and the low pressure above the eastern Mediterranean, so the northern part of Serbia, that is, the territory of Vojvodina is the most exposed to the impact of these winds. Towards the south, the impact of etesian winds is felt the most in the valleys open to the north. These winds blow in the direction of northwest in most of the places in Serbia, except where their movement is changed under the influence of the relief. During etesian winds, the weather is clear, warm and without precipitation.

## 5.3 Changes of Air Temperature and Precipitation

For almost the whole territory of Serbia, a positive trend of the mean annual air temperature of 0.021–0.034 °C/year has been determined on the confidence level of 95% (Milovanović et al. 2018). The greatest increase in the trend values of 0.04 °C/year (confidence level of 95%) has been determined for smaller regions in the north of Serbia, the furthest west, southwestern Serbia, as well as in the furthest east (in the lower course of the river Timok). The negative trend of the mean annual temperatures has been determined for a small region in the south-southeast of Serbia, but without statistical significance (Fig. 5.3). Such values are in accordance with the changes in this part of the European continent (EEA 2017).

The trend of the mean annual precipitation on the territory of Serbia in the period 1961–2010 was analysed by Milovanović et al. (2017b). Similar to the spatial distribution model of the mean annual precipitation quantities in Serbia, the trend of this variable shows the change from positive values (>30 mm/decade) in the furthest west, into the negative values (<−30 mm/decade) in the furthest east (Fig. 5.4). In the largest part of Serbia, the trend values are from −5 to 5 mm/decade and 5 to 15 mm/decade, while the statistically significant trend (confidence level of 95%) has been determined only for the stations with the highest positive trend values (Fig. 5.4).

According to the EEA (2017), the border between positive and negative precipitation trends (±0–20 mm/decade, period 1960–2015) on the territory of southeastern and central Europe is at about 22° of the east longitude and goes through the territory of Serbia. In the period from 1961 to 2010, the largest part of Serbia became warmer, but without distinct changes in the received precipitation quantity. The same counts for springs, summers and winters, while falls became wetter and warmer, or colder, depending on the observed region (Milovanović et al. 2017a).

## 5.4 Climate Regionalization

The regionalization of the climate in Serbia is shown as a part of the analysis of a larger territory (SFR Yugoslavia) in the works by Obuljen (1955, 1979), Gams (1976), Milutunović (1974), Savić (1979), and Radinović (1981), whereas in the works by Rakićević (1980), and Ducić and Radovanović (2005), only the climate regionalisation of Serbia was shown.

In Serbia, in most of its parts, a moderately warm and humid climate is represented; on higher altitudes, it is a moderately cold and humid climate, whereas only in the parts with the highest mountain, cold and humid climate is represented.

One of the best known and most frequently used systems for the climate classification is the Köppen climate classification system (Köppen 1918; Kotteki et al. 2006) (Table 5.2).

Moderately warm and humid climate with warm summer (Cfb climate) and continental pluviometric regime is represented in the largest part of Serbia. Within this climate, some smaller regions with maritime and transitional pluviometric regime can be distinguished (east from the mountains of Deli

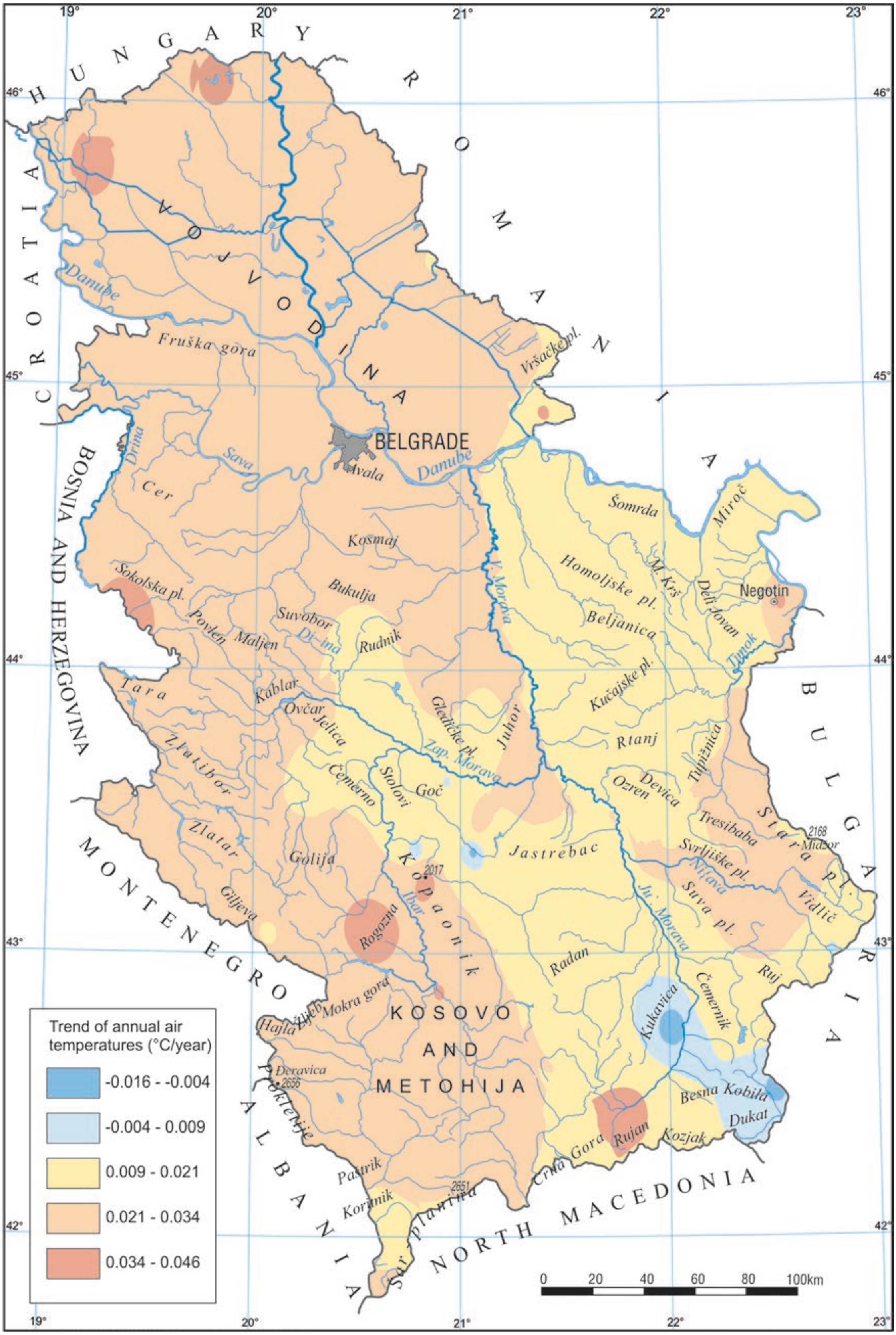


**Fig. 5.3** The trend of the mean annual air temperatures (1961–2010). (Milovanović et al. 2018)

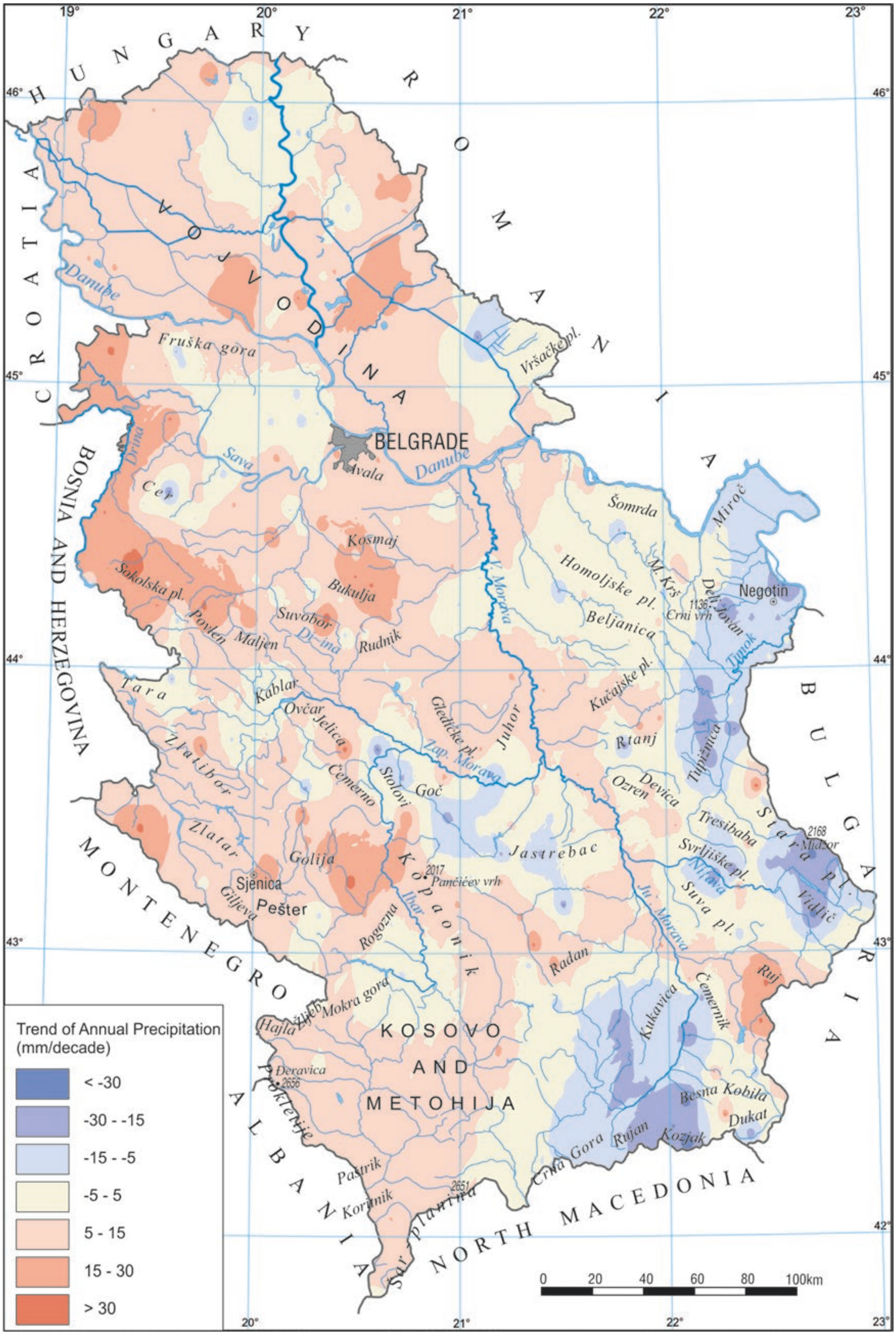


**Fig. 5.4** The trend of the mean annual precipitation in the period 1961–2010. (Milovanović et al. 2017b)

**Table 5.2** The Köppen climate classification (Köppen 1918)

| Climate | Name | Characteristics |
|---|---|---|
| A | Tropical hum`id climate | The lowest Tm > 18 °C |
| B | Dry climate | Dry border (border towards forests) is:<br>For precipitation period in winter: R < 2Tg<br>For inexpressive precipitation period: R < 2Tg + 14<br>For precipitation period in summer: R < 2Tg + 28 |
| C | Moderately warm climate | The lowest Tm between 18 and −3 °C |
| D | Moderately cold climate | The highest Tm > 10 °C, and the lowest Tm < −3 °C |
| E | Cold climate | The highest Tm < 10 °C |
| **Type** | **Name** | **Characteristics** |
| S | Steppe climate | The border between steppes and deserts is:<br>For precipitation period in winter: R = Tg<br>For inexpressive precipitation period: R = Tg + 7<br>For precipitation period in summer: R = Tg + 14 |
| W | Desert climate | |
| f | Humid climate | Without dry period |
| M | Monsoon climate | The rainy period compensates the lack in a dry period |
| S | Dry summer | The driest period in summer |
| W | Dry winter | The driest period in winter |
| T | Tundra climate | The highest Tm between 0 and 10 °C |
| F | Permafrost climate | The highest Tm below 0 °C |
| **Subtype** | **Name** | **Characteristics** |
| h | Hot climate | Tg > 18 °C |
| k | Cold climate | Tg < 18 °C, and the highest Tm > 18 °C |
| a | Hot summer | The highest Tm > 22 °C |
| b | Warm summer | The highest Tm < 22 °C, and at least 4 Tm > 10 °C |
| c | Cool summer | Less than 4 Tm > 10 °C, and the lowest Tm > −38 °C |
| d | Very cold winter | The lowest Tm < −38 °C |

*Tm* mean monthly temperature, *Tg* mean annual temperature, *R* precipitation quantity

Jovan and Miroč, the region of Metohija, the mountain of Crnoljeva, a part on the north and northeast of Priština, as well as the region around the source part of the Južna Morava river) (Cfb climate).

Moderately cold and humid climate, but with cool summer and continental pluviometric regime (Dfc climate) is represented in the mountainous regions above 1200 m a.s.l. in the southwest, south and southeast of Serbia. The higher parts of Šar planina Mt. and Prokletije mountain range (up to ≈ 2250 m a.s. l.) have the maritime variant of this type of climate. Parts of these mountain range above 2250 m a.s.l. are characterised by cold and humid climate with cool summer (Efc climate). Milovanović et al. (2017c) have made the climatic regionalization of Serbia (Fig. 5.5) applying the criteria from this system and using the maps of the mean monthly and annual values of air temperatures and precipitation for the period 1961–2010.

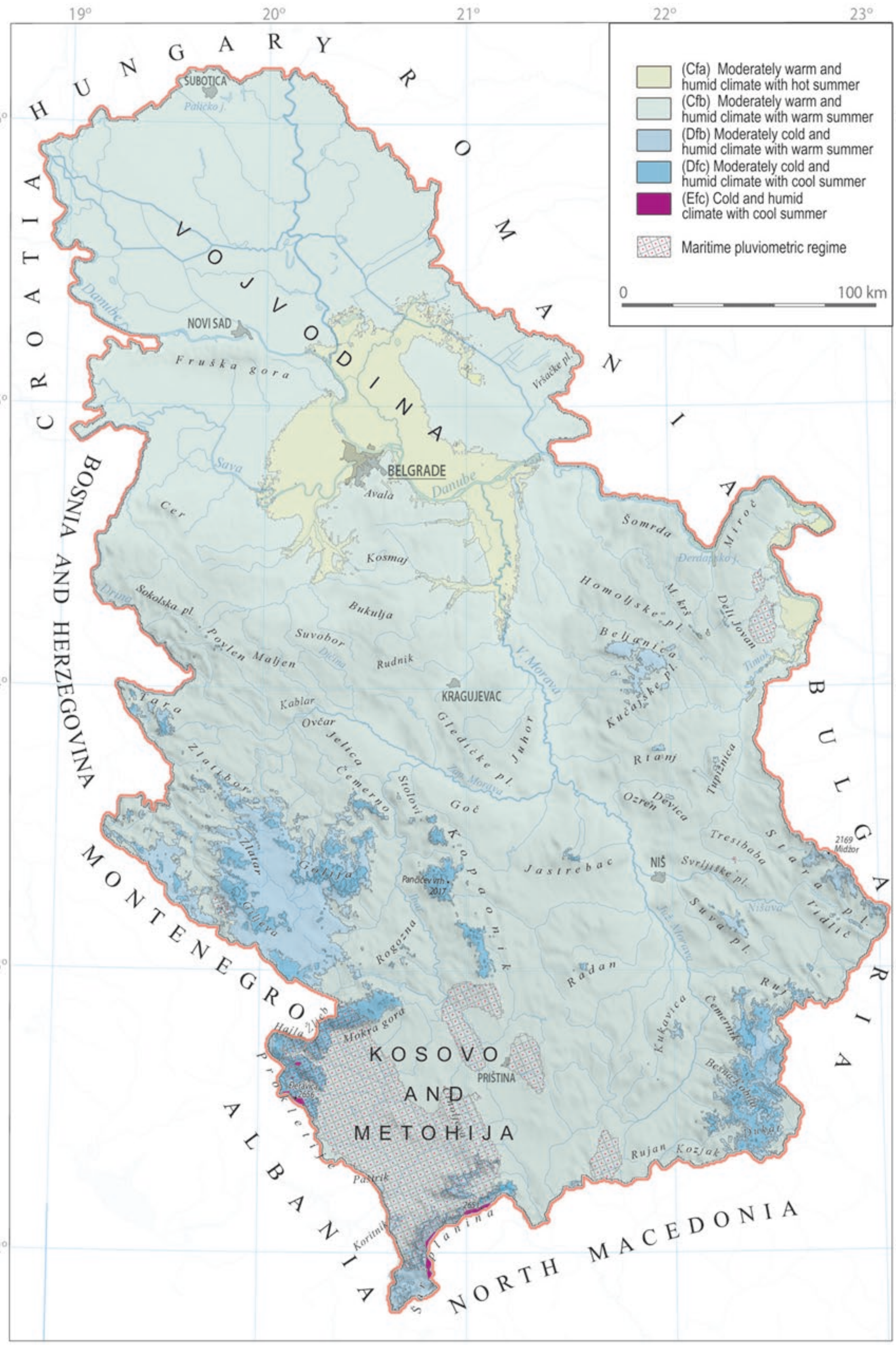


**Fig. 5.5** Climatic regionalization of Serbia according to Köppen. (Milovanović et al. 2017c)

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# Hydrological Characteristics of Serbia

# 6

Marko Urošev, Ana Milanović Pešić, Jelena Kovačević–Majkić, and Dragoljub Štrbac

**Abstract**

Most of the waters in Serbia are drained to the Black Sea drainage basin (92.6% of its territory), while only a few percentages belong to the Adriatic and Aegean basins. The largest rivers in Serbia are international rivers such as Danube, Sava, Drina, Tisza which have water discharge of 5084 $m^3/s$ and the domestic waters contribute with only 481 $m^3/s$. Spatial and temporal distribution of runoff is unequal due to different pluviometric and temperature regimes. The average specific runoff is about 6 $l/s/km^2$ and vary from <1 $l/s/km^2$ (northern parts of Serbia) to 40 $l/s/km^2$ (Prokletije Mt., Šar-planina Mt.). High waters occur in spring, and low waters appear during summer-autumn period. The floods in large river valleys threaten about 18% of the territory of Serbia, while torrential floods occur in small drainage basins with great terrain slopes and erosion on the territory south of the Sava and the Danube. In Serbia, there are a relatively small number of natural lakes. Reservoirs have greater importance for water management. There are also various types of aquifers which are mostly used for the water supply system, while the thermal-mineral water has a recreational-therapeutic purpose.

**Keywords**

Hydrological characteristics · Groundwater · River regimes · Floods · Hydrological droughts · Lakes and reservoirs · Serbia

Hydrological characteristics of Serbia are presented using the analysis of groundwater, rivers, canals and lakes. All the waters belong to the Black Sea (92.6%), Adriatic (5.2%) and Aegean (2.2%) drainage basins (Fig. 6.1). Within these sea drainage basins, there are 11 larger river drainage basins. Within the Black Sea drainage basin, distinctive are the drainage basins of the rivers Danube, Tisa, Sava, Drina, Kolubara, Velika Morava and Timok. The Adriatic drainage basin comprises the drainage basin of the river Beli Drim, and the Aegean one consists of the drainage basins of the rivers Lepenac, Pčinja and Dragovištica (Fig. 6.1). In the mountainous region of Serbia, a large number of watercourses is formed and more than 1000 mm are drained there (see Chap. 5). Except for this factor, geological, pedological, geomorphological, biological and, from the middle of the twentieth century, anthropogenic factors are also significant.

Groundwater is the most important source of the population's water supply. For this purpose, karst aquifers are used. Various and numerous springs of thermal mineral waters are significant for the development of spa centres and tourism (see Chap. 18). Different factors have affected the formation of the river network, its density and hydrological regime of water bodies (Jevđević 1956; Dukić 1978; Živković 1995; Dukić and Gavrilović 2006; Živković 2009). On magmatic and metamorphic rocks (26.6% of the territory), 41.7% of the surface water quantity is formed (Manojlović and Živković 1997). The average density of the river network in Serbia is 323 $m/km^2$, and about 2000 $m/km^2$ in the regions where water impermeable rocks prevail (Kovačević-Majkić et al. 2016). In Serbia, about 9% of the territory is formed of carbonate rocks (Gavrilović 1976), and such terrains are characterised by a sparse river network or its absence. The human impact on the waters in Serbia is reflected in the runoff regulation (building of embankments, dams, retentions, riverbed regulation). People also have influence on the length and the density of a river network (meander cutoff, digging canals) and on the intra-annual water distribution (water transfers from one basin to another).

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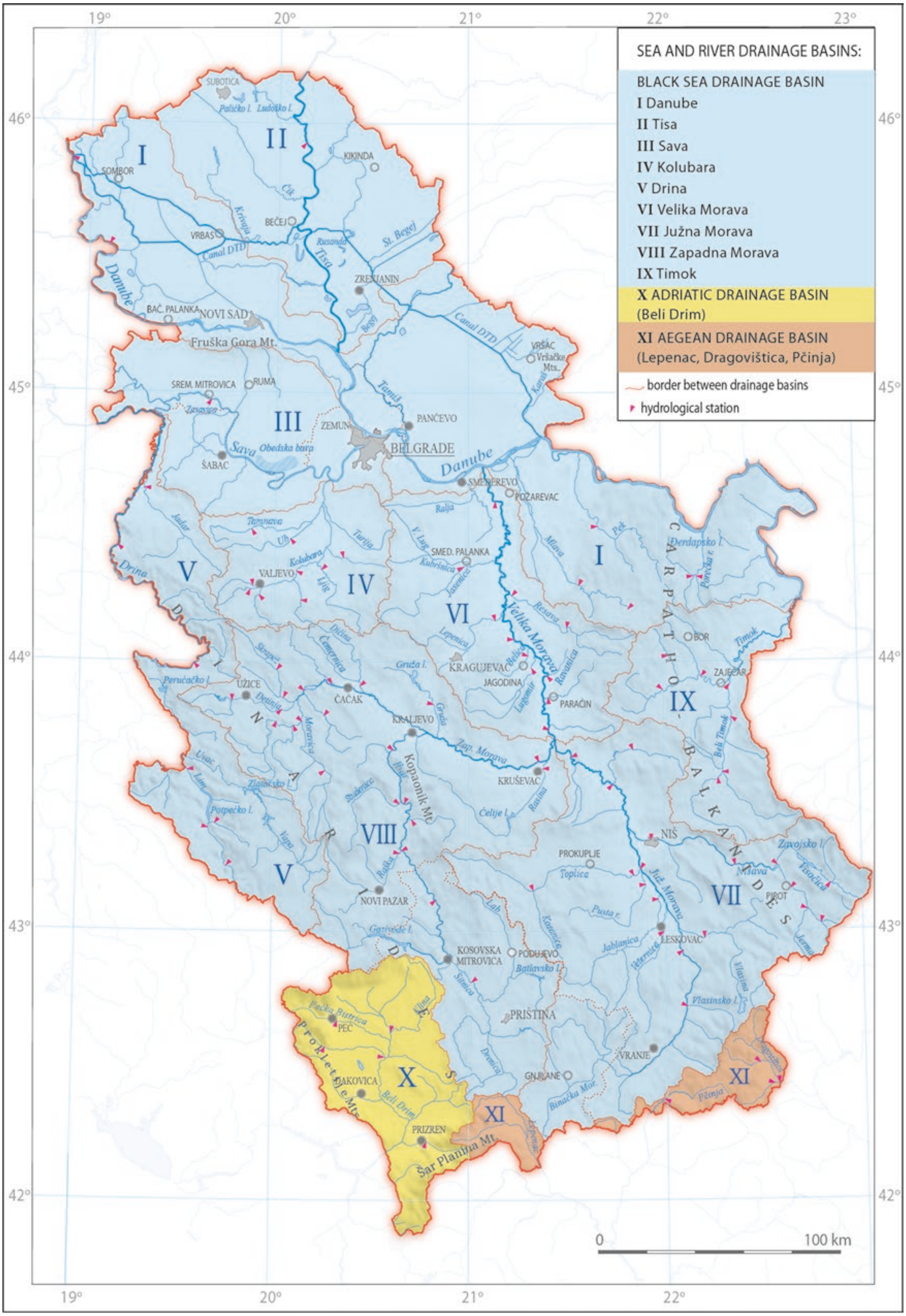


**Fig. 6.1** Sea and river drainage basins. (Modified from Uroševet al. 2017)

A larger part of the territory of Serbia has the continental pluviometric regime (maximum in spring), and a smaller part has the maritime regime (the greatest water inflow at the end of fall and the beginning of winter). Extreme precipitation may cause a quick inflow of water in the riverbeds and the occurrence of floods, which, if involve the territories with a high level of the base erodibility, can also have torrential character. Extremely small precipitation quantities or the absence of precipitation lead to the drying up of a certain number of watercourses during a year. Such pluviometric and river regimes cause material damages and human casualties and thus get the character of natural disasters (Kovačević-Majkić et al. 2014).

The canal network in Serbia has a multiple purpose, and the most significant canal system is the Danube-Tisa-Danube hydrosystem. The canals are partly navigable, and a part of them has reduced functionality due to not being maintained.

There are numerous reservoirs in Serbia, and they have multiple purposes, whereas the natural lakes are smaller in area and they are mostly used for fishing, tourism and recreation.

## 6.1 Groundwater

In Serbia, *three main types of groundwater* are represented. The most represented type is a *phreatic aquifer* which is shallow and appears in the valleys of large rivers such as the Danube, Sava, Tisa and Velika Morava. *Artesian* and *subartesian aquifer subtype* is found in great depths, and is present in the largest part of Vojvodina and in ravines. In the eastern, western and southwestern parts of Serbia where limestone prevails, *karst type of aquifer* is formed. The abundance of karst aquifers range from several centilitres to several cubic metres a second, and the most significant ones that stand out are the aquifer of the river Mlava (0.22–16.5 $m^3/s$) and of the Beli Drim river (0.9–21 $m^3/s$) (Lazarević 1991; Gavrilović 1993; Stevanović 1995; Petrović 2002; Ristić 2007; Dragišić 2014).

In Serbia, for water supply, groundwater is most often used (Institut za vodoprivredu "Jaroslav Černi" 2001). The total estimated capacity of the existing springs of groundwater in Serbia is about $700 \cdot 10^6$ $m^3$ a year (Ministry of Environment and Spatial Planning 2010; Environmental protection Agency 2019). The quality of groundwater is the worst in the alluvial aquifers of large watercourses. The water of karst aquifers are of the best quality, but their use is not significant. There are certain problems in the exploitation of the artesian and subartesian groundwater, due to their depth (about 120 to 250 m).

There are a large number of different thermal mineral springs in Serbia. The first researches started in the middle of the nineteenth century (Lindenmayer 1856), and at the beginning of the twentieth century the first systematisation and classification of thermal mineral waters were given (Leko et al. 1922). In Serbia, there are about 370 springs of mineral waters (Dukić and Gavrilović 2006). The average abundance of thermal mineral springs in Serbia is 1800 l/s (Milivojević 1985). Due to their characteristics, these waters are mostly used for healing purposes (59 spas) (Dukić and Gavrilović 2006). The thermal mineral waters are used for drinking, for heating and in agriculture. According to the temperature of the water, they are divided into three categories. The most important cold springs are Palanački kiseljak, Bukovička banja and Prilički kiseljak. The springs which belong to the hypothermal type are in Sokobanja, Banja Koviljača and Zvonačka banja. The homeothermal springs are in Niška banja, Sijarinska banja and Lukovska banja. The hyperthermal springs are in Vranjska banja, Jošanička banja, Sijarinska banja and Kuršumlijska banja (Dukić 1978; Filipović and Krunić 1995; Dukić and Gavrilović 2006). Thermal mineral waters are formed in volcanogenic massifs, in karst regions, in the areas of metamorphic rocks and in hydrogeological basins (Protić 1995).

## 6.2 Rivers

Several large international rivers flow through Serbia: Danube, Sava, Tisa and Drina, which have a larger quantity of water than the watercourses formed on the territory of Serbia. The transited waters (5084 $m^3/s$) comprise 91.4%, while the domestic waters (481 $m^3/s$) participate with 8.6% in the total runoff (5565 $m^3/s$) (1961–2010) (Urošev et al. 2017).

According to various authors and for different periods, the annual volume of domestic waters is $15.2 \cdot 10^9$ $m^3$ for the period 1961–2010 (Urošev et al. 2017), $18.8 \cdot 10^9$ $m^3$ for the period 1951–1985 (Ocokoljić 1993/94) and $16.7 \cdot 10^9$ $m^3$ for the period 1946–1978 (Vujnović 1995). According to the runoff and the area of the drainage basins, the largest river of Serbia is Velika Morava (sub-drainage basins VI, VII and VIII in Fig. 6.1). It makes up the largest part of domestic runoff (about 40%), and it comprises 41% of the territory of Serbia (Vlahović et al. 2006; Ocokoljić 1987; Urošev et al. 2017).

### 6.2.1 The River Regime

The average specific runoff is about 6 $l/s/km^2$ (6.73 $l/s/km^2$ Ocokoljić 1993/94; 7.06 $l/s/km^2$ Manojlović and Živković 1997; 5.75 $l/s/km^2$ Prohaska 2003; 5.44 $l/s/km^2$ Urošev et al. 2017). The values of the specific runoff in Serbia (1961–2010) (Fig. 6.2) vary from <1 $l/s/km^2$ to 40 $l/s/km^2$ (Urošev et al. 2017).

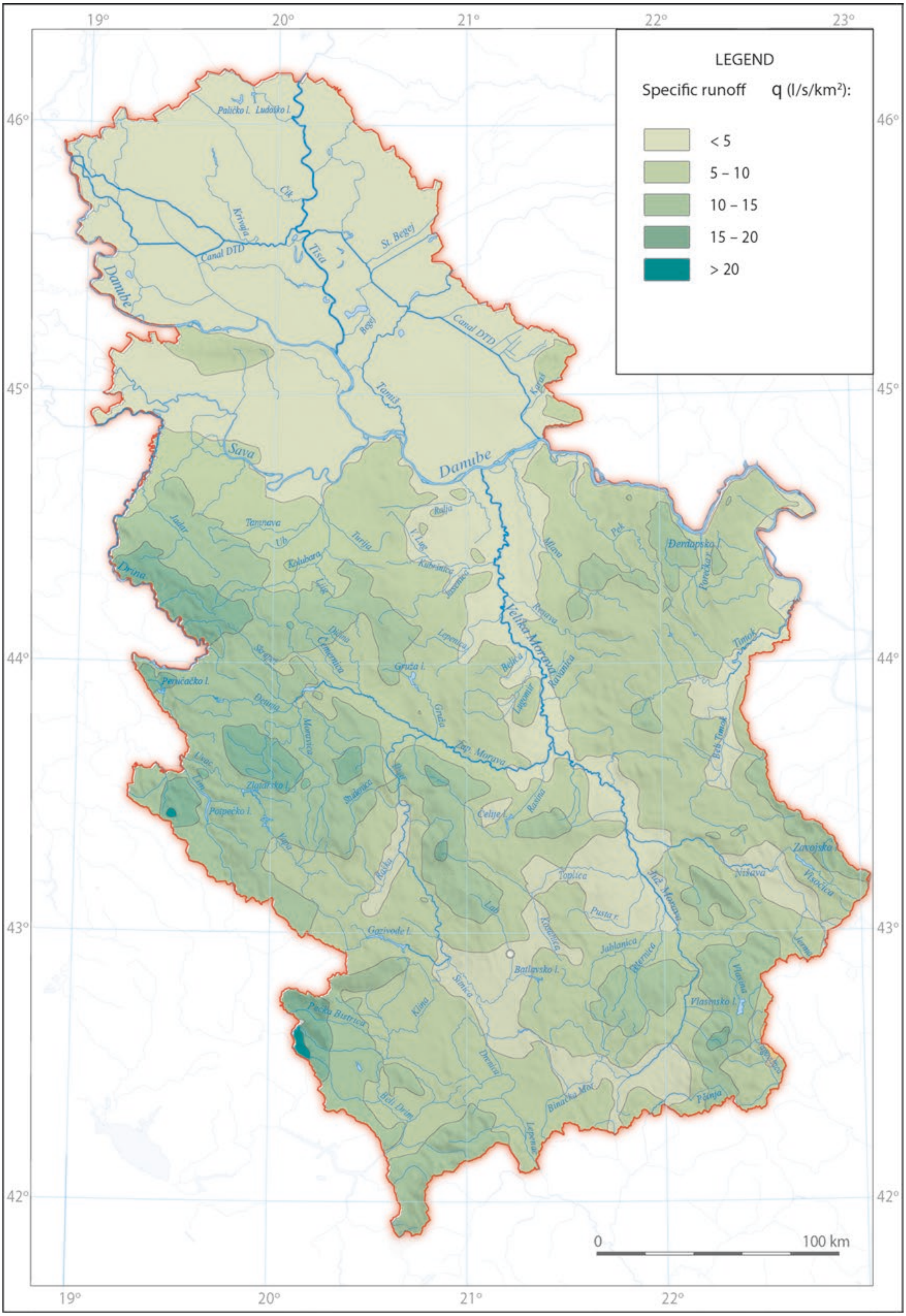


**Fig. 6.2** The mean annual specific runoff in Serbia for the period 1961–2010. (Modified from Urošev et al. 2017)

The largest specific runoffs are found in the mountainous regions of the southwestern and western Serbia. They are the regions of the Prokletije Mt. and Šar-planina Mt., the upper parts of the drainage basin of the Drina and the source parts of Zapadna Morava river. With the decrease of the precipitation quantities, in the direction of east and northeast, the values of the specific runoffs also decrease. Thus, the smallest values of the specific runoff are of the immediate drainage basin of the Danube, lower parts of the drainage basins of the rivers Tisa, Velika Morava, Kolubara, Južna Morava, Zapadna Morava and Timok. The regions above 500 m a.s.l. are the most abundant with water, and they comprise 39% of the territory of Serbia (Ocokoljić 1993/94). Between 400 and 700 m a.s.l., that is, on 22% of the territory of Serbia, 34.5% of the runoff is formed (Manojlović and Živković 1997).

According to the coefficient of variation of annual discharges, rivers are classified into five classes, from those with very low oscillation, those with small, then moderate oscillation, to the rivers with high oscillation and those with very high oscillation of discharge ($C_v \geq 0.56$). The discharge oscillation is low and moderate (86% of stations) on the Danube, Sava, Drina and in certain stations in the drainage basin of Zapadna Morava. High and very high oscillation of discharge is registered on 13.8% of stations (mostly in the drainage basins of the rivers Kolubara, Velika Morava and Južna Morava). In case of some of the rivers (Ravanica, Belica), a high coefficient of the discharge variation is the consequence of frequent drying off in summer. The highest oscillation is registered on the river Gruža in the central part of Serbia, and the lowest is at the entrance of the Danube into Serbia (Urošev et al. 2017).

On 27% of the stations, a statistically significant trend of the changes in the mean annual discharge has been registered, and that trend on all those stations is negative, except on one of them, where it is positive (Fig. 6.3). Analysed by seasons, negative trends are more significant in summer and in spring, and they are positive in fall (14–24% of stations) (Kovačević-Majkić and Urošev 2014). In winter, on 6.4% of stations, the trend is positive, and on 8.5% of the station it is negative. In a certain number of cases, the trends occur as a consequence of the impact of anthropogenic factors (building of reservoirs). According to the analysis of trends in mean annual discharges on 35 stations in the Serbian part of the Danube drainage basin, it has been concluded that there are no significant trends, and where they exist, they are negative and under the anthropogenic impact (Kapor et al. 2011).

Based on the analysis of the mean monthly discharge, the discharge variations during a year were interpreted. They are most influenced by the pluviometric regime and the air temperature. High waters occur in spring, and low waters appear during summer-fall period due to the lack of precipitation and the increased evapotranspiration. In winter, in higher parts of Serbia, the snow cover alternately accumulates and melts, whereas in lower regions, due to the rise in air temperature in this period of the year, precipitation in the form of rainfall occurs more often. The rivers that form on the territory of Serbia (the drainage basins of the Velika Morava, Kolubara, and Timok) mainly belong to the pluvio-nival regime (Fig. 6.4).

The Danube, in its most upstream part in Serbia, has the most water in the period April–June, with the maximum in June and the least in the period October–November, with the minimum in October. After it receives the water from the Tisa and the Sava, the Danube, under the influence of their regimes, has the most water in the period April–May, with the maximum in May, and the least in the period September–October, with the minimum in October (Institut za vodoprivredu "Jaroslav Černi" 2001). The river Tisa has a pluvio-nival regime with the maximum mean monthly discharges in April, and with the lowest in the period September–October (Fig. 6.4) (Urošev et al. 2017). The river Sava mostly has a nival-pluvial regime with large quantities of water in spring (April) and with the expressed minimum in August and September (Fig. 6.4). The rivers of central and eastern Serbia also have pluvio-nival water regimes, but their maximum occurs at the end of winter and in spring in the period February–May, while the minimum is in the period August–September. The rivers in the drainage basins of the rivers Zapadna Morava and Kolubara are with the largest quantities of water in March, and the ones in the basins of the rivers Južna Morava, Timok and Nišava are in April, and they are the driest in August and September. The maximum mean monthly discharges on the rivers Dragovištica and Pčinja (the Aegean drainage basin) also occur in April, and the minimum ones are in August. The Beli Drim river and its right tributaries have large quantities of water in the period from December to May under the influence of the maritime regime of precipitation. The left tributaries of the Beli Drim river are under the influence of the modified continental regime (Urošev et al. 2017).

The maximum specific runoffs (about 1000 l/s/km$^2$) are related to small watercourses whose drainage basins cover the areas from 100 to 200 km$^2$ (in the drainage basins of the rivers Kolubara, Beli Drim and Velika Morava). In most of the rivers, the values of the maximum specific runoffs which have a return period[1] of one hundred year ($q_{max1\%}$) are determined for the rivers Beli Drim, Drina, Lim, Kolubara (about 300–400 l/s/km$^2$), and the smallest ones for the rivers Tisa, Danube, Sava and Velika Morava (<80 l/s/km$^2$). The highest values of low waters, expressed in terms of minimum specific runoff of 95% probability of occurrence ($q_{min95\%}$), are

[1]The return period represents the probability of the reoccurrence of a critical event expressed in years.

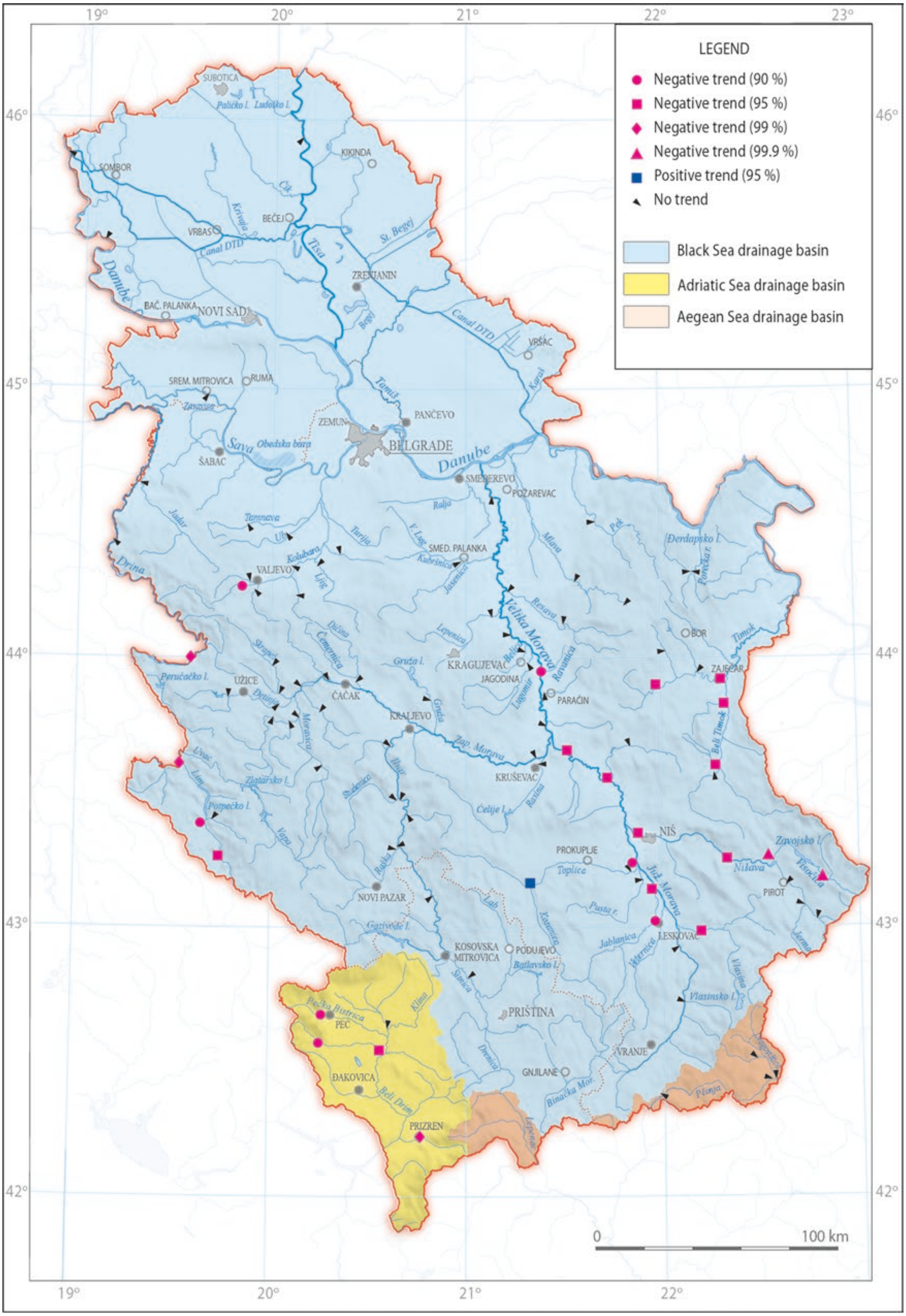


**Fig. 6.3** The trends of annual discharges in Serbia for the period 1961–2010. (Modified from Urošev et al. 2017)

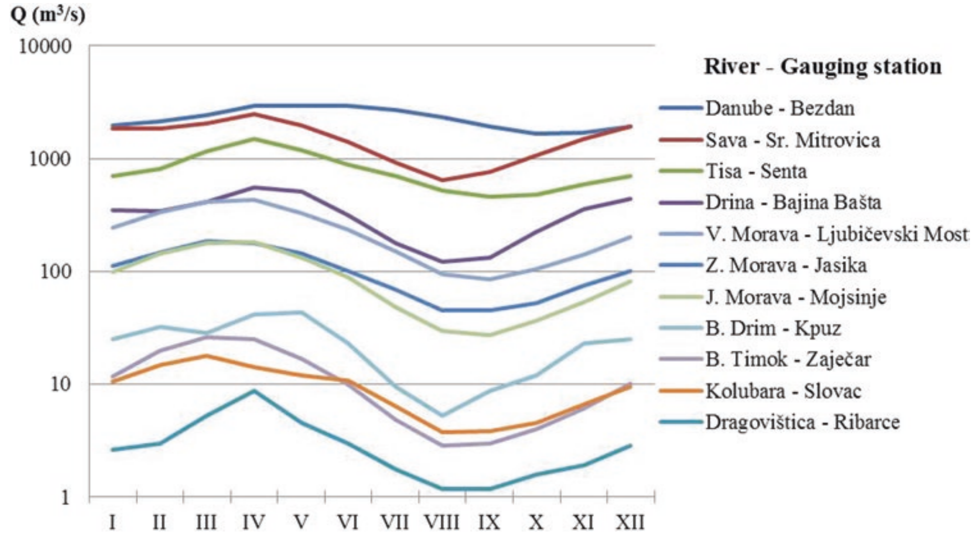


**Fig. 6.4** The comparative overview of the mean monthly discharges on the representative profiles for the period 1961–2010. (Modified from Urošev et al. 2017)

registered on the Danube upstream of Novi Sad, and then on the rivers Sava, Drina, Lim and the tributaries of the Beli Drim. Their values are a bit higher than 2.0 l/s/km$^2$. The lowest values of the minimum specific runoff have been determined for the drainage basins of the rivers Kolubara, Timok, Velika Morava and Južna Morava, and they range from 0.3 to 0.4 l/s/km$^2$ ($q_{min95\%}$) (Urošev et al. 2017).

### 6.2.2 Floods

The floods with the 100-year return period potentially threaten about 16,000 km$^2$ or 18% of the territory of Serbia (Ministry of Environment and Spatial Planning 2010), and the largest potentially flooded areas are in the northern part of Serbia and in the alluvial plains of the rivers Sava and Velika Morava. Analysed by the drainage basins, the largest flood-prone areas are in the valley of the rivers Tisa (26.8% of the area of the drainage basin on the territory of Serbia, or 2070 km$^2$), Sava (14.3% of the area of the drainage basin on the territory of Serbia, or 2243 km$^2$), Velika Morava (5.9% of the drainage basin area, or 2240 km$^2$) (Gavrilović and Dukić 2014).

In Serbia, floods most often occur at the end of spring and at the beginning of summer. In that period, large precipitation quantities drain with the coincidence of snow cover melting in the upstream parts of the drainage basins of the international rivers Danube, Tisa, Sava, Tamiš (on the Alps, Dinarides, and Carpathians). Besides the pluviometric regime, erosion processes also affect the formation of a flood wave by causing showering riverbeds, which reduces their water-flowing capacity. The formation of flood waves is also caused by anthropogenic factors (deforestation, illegal building of infrastructure, inadequate maintenance of embankments and canals, inadequate ways of land usage, etc.). In Serbia, according to the main cause, there are six distinctive types of floods: 1) floods caused by rainfall and snow melting; 2) floods due to the coincidence of high waters; 3) ice floods; 4) torrential floods; 5) floods caused by land sliding and 6) floods caused by dam breaking (Gavrilović 1981).

The most frequent causes of floods in Serbia are intensive rainfalls, often accompanied by snow melting and high waters coincidence (Gavrilović et al. 2012). Ice floods have been quite frequent phenomena in Serbia until the 1970s. They especially threatened the immediate drainage basin of the Danube, in the sector of Djerdap gorge (in 1938, 1966) (Gavrilović 1981), as well as the drainage basin of the river Velika Morava because of its numerous meanders (in 1914, 1937, 1956, 1963) (Petković 1963; Lazarević 1965; Zeremski 1969; Gavrilović 1981). These phenomena are caused by morphological characteristics of the drainage basins, which have enabled the formation of ice barriers and the occurrence of floods upstream from where they are formed. After the construction of Djerdap reservoir and the regulation (straightening) of the course of Velika Morava by cutting the meander, such floods have not been recorded in the present period. The floods caused by landslides are less frequent in Serbia. The flood happened on the river Veliki Rzav (in 1954), when the sliding mass blocked the river near the village of Visoki. The flood happened on the river Visočica (in 1963), when the sliding mass blocked the river and formed a lake near the village of Zavoj. In the drainage basin of the Jovačka reka river (in 1977), the flood occurred due to blocking the river, when a lake was formed near the village of Jovac (Gavrilović 1981). The floods caused by the dam break are rare, and such examples were recorded at the occasion of the failure of a dam of the flotation tailings pond Valja Fundata near Majdanpek and the overflowing of polluted water from the tailings pond into the river Veliki Pek in 1974 (Gavrilović 1981), and the dam failure on the flotation tailings pond Šaški potok near Majdanpek and the overflowing of polluted water and tailings into the rivers Šaška reka and Porečka reka in 1996 (Milanović Pešić 2015b).

The greatest floods in Serbia occurred in 1965, 2006 and 2014, when a lot of large rivers reached their absolute maximum of water level and discharge. The greatest flood in Serbia in the twentieth century occurred in May–June 1965. Due to the melting of large quantities of snow in the drainage basins of the Danube's tributaries and heavy precipitation in Serbia, on the Danube and numerous tributaries, the maximum values of water level and discharge were recorded. The total flooded area was over 2500 km$^2$, as well as about 16,000 houses and 214 km of roads (Milovanov 1965; Alasov 1969; Petković 1970; Gavrilović 1981; Gavrilović and Dukić 2014), and the most severe damages were in the north of Serbia. On the Danube, at Bezdan, the recorded discharge was 8360 m$^3$/s (the return period of 64 years), and in Bogojevo the discharge was 9290 m$^3$/s (the return period of 66 years) (Fig. 6.5). At that time, on the Velika Morava at Varvarin, the discharge was 3080 m$^3$/s (the return period of 205 years), at Bagrdan it was 2840 m$^3$/s (the return period of 119 years) and at the Ljubičevski Most it was 2390 m$^3$/s (the return period of 124 years) (Urošev et al. 2017).

Due to heavy precipitation and snow melting in March and April 2006, on the Danube (downstream from the mouth of the Tisa), on certain hydrological stations on the Tisa and on the Sava in Belgrade, the values of water level and discharge exceeded their historical maximum. On the Danube in Zemun (Fig. 6.6a), the flooding wave had the return period of 52 years, and in Veliko Gradište the return period was 108 years. On the Tisa at Senta, the discharge reached 3720 m$^3$/s (the return period of 98 years), and on the Sava, the discharge reached the value of the return period of 47 years (Milanović et al. 2010).

In mid-May 2014, in central Serbia, the greatest floods in the twenty-first century were recorded. The main cause of these floods was the heavy precipitation in the second half of April, at the beginning and in the middle of May, which, in some locations, exceeded one third of the total annual quantity (e.g. in the western part of Serbia, on the territory of Valjevske Mts., etc.). At certain hydrological stations, the absolute maximum water levels were reached since the beginning of measuring. These floods spread over the territory of 9 towns and 31 municipalities. The greatest floods were registered in the drainage basins of the rivers Kolubara, Jadar, Sava, Zapadna Morava, Jasenica, Belica, Lugomir, Resava, Crnica and Mlava. According to the hydrological model *HEC–HMS* (Institut za vodoprivredu "Jaroslav Černi" 2016), the maximum discharge on the Kolubara in Valjevo was 397 m$^3$/s (the return period of 120 years), at Slovac 1117 m$^3$/s (the return period of 480 years), at Beli Brod 1458 m$^3$/s (the return period of 520 years) and at Draževac, upstream from Obrenovac (with the condition that there was no overflowing into the excavation sites of Kolubara mines) 2767 m$^3$/s (the return period of 650 years). High waters which can occur once in 200 years were also recorded at that time on the tributaries of the Kolubara (the rivers of Ljig, Tamnava and Ub). The absolute maximum values were also recorded on the Sava (Sremska Mitrovica station, 6600 m$^3$/s, the return period of 79 years), on the Crnica (Paraćin station, 185 m$^3$/s, the return period of 73 years), on the Resava (Svilajnac station 239 m$^3$/s, the return period of 123 years) (Fig. 6.5) (Urošev et al. 2017). During this flood, 51 people died, about 32,000 people were evacuated, 2260 buildings collapsed (the buildings in Obrenovac, Paraćin and Svilajnac were not taken into account) and the largest number of them was damaged. The most severe consequences were recorded in Obrenovac, in the Kolubara lignite basin and in Nikola Tesla thermal power plant. The total estimated damage of this flood was 1.5–1.7 billion euros (Government of the Republic of Serbia 2014).

Torrential floods in Serbia most frequently occur in the areas threatened by erosion, in small drainage basins (areas up to 1500 km$^2$) with greater terrain slopes on the territory south of the Sava and the Danube (Čolić et al. 1977; Petrović et al. 2014), after intensive rainfall episodes. According to the Inventory of torrential floods in Serbia, the most impacted was the drainage basin of the Kolubara, where 121 torrential floods were registered in the period 1929–2010 (Petrović et al. 2015). One of the greatest torrential floods occurred in the drainage basin of the river Vlasina in June 1988. The recorded precipitation quantity was 220 mm in 3 h (Gavrilović 1991), and the measured discharge was 780 m$^3$/s (the return period of 187 years) (Urošev et al. 2017). Four people died, several thousand of buildings were damaged, 26 bridges collapsed and dozens of kilometres of roads were damaged, as well as large areas of arable land (Petković et al. 1989). In July 1999, the torrential floods affected the drainage basins of the Velika Morava with its tributaries, of Zapadna Morava and of the Topčiderska reka. In that flood, 8 people died, several thousands of residential buildings and several hundreds of office buildings were damaged, and 30 bridges collapsed (Milanović Pešić 2015a). At that time, the recorded water discharge on the Lepenica river at Batočina was 193 m$^3$/s (the return period of 184 years) (Urošev et al. 2017), and on the Topčiderska reka river in Belgrade, it was 91.4 m$^3$/s (the return period of 71 years) (Milanović Pešić 2015a). In May 2010, a torrential flood occurred on the river Pčinja near Trgovište in the southeastern Serbia (Fig. 6.6b), with the discharge of 344 m$^3$/s (the return period of 129 years) (Urošev et al. 2017).

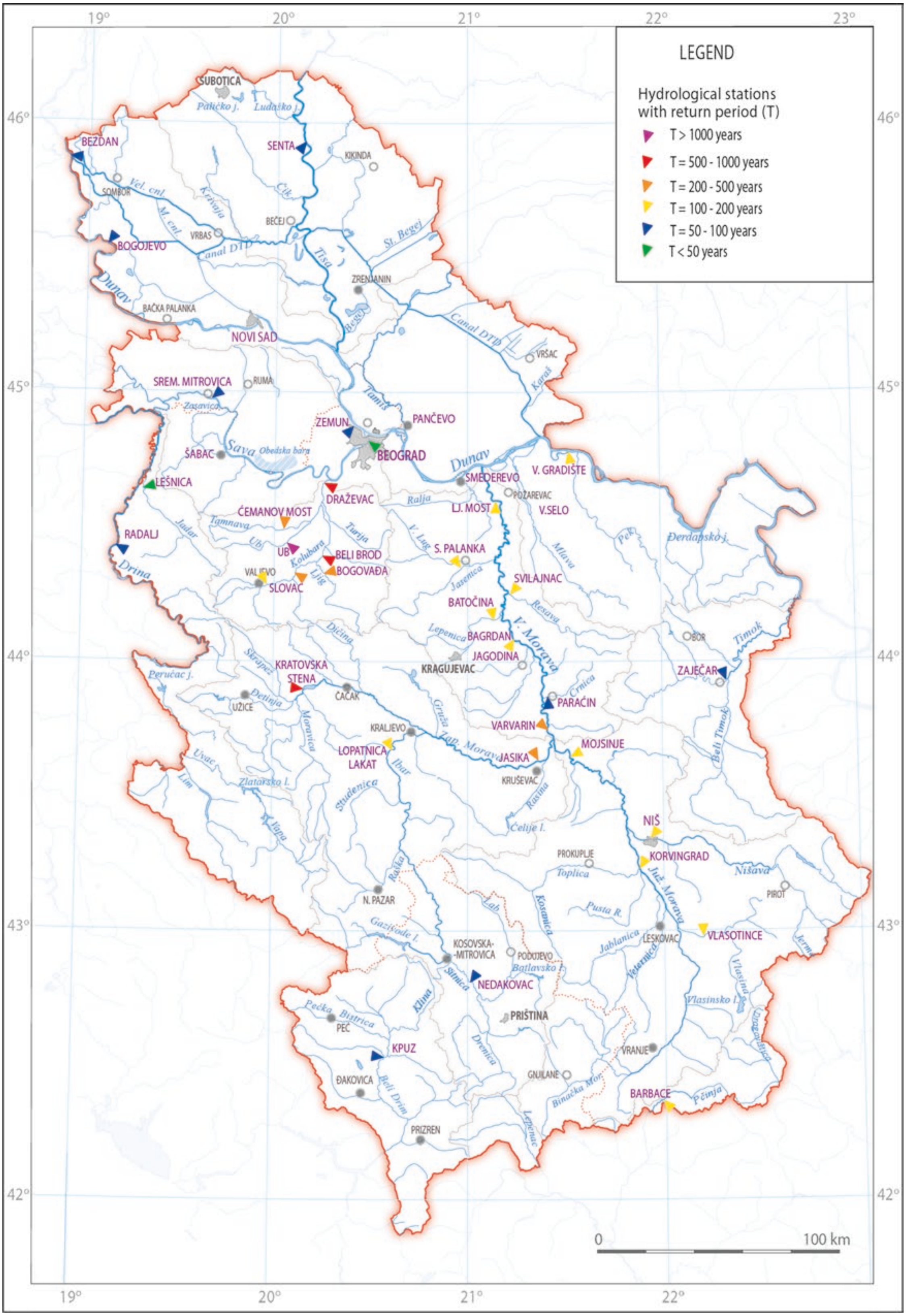


**Fig. 6.5** The return periods of the greatest floods for the period 1961–2014. (Source: authors' calculation based on the Republic Hydrometeorological Service of Serbia data)

**Fig. 6.6** (**a**) The absolute maximum water level of the Danube in Zemun in the instrumental period (photo by M. Urošev, 4/14/2006). (**b**) The consequences of the torrential flood of the river Pčinja in Trgovište (photo by M. Milivojević, 5/28/2010)

### 6.2.3 Hydrological Droughts

The frequency analysis of hydrological droughts is shown for 39 stations in the drainage basin of the river Velika Morava (Fig. 6.7) for the period 1961–2014 (Urošev 2016). For the distinction of hydrological droughts on hydrological stations, the threshold method was used (Zelenhasić and Salvai 1987; Urošev et al. 2016a), and for the statistical analysis of drought deficits and drought durations, the partial duration series method was used (Urošev et al. 2016b).

The longest average duration of a hydrological drought is in the immediate drainage basin of the river Velika Morava (43 days), followed by the one in the drainage basin of the Južna Morava (38 days) and the smallest in the drainage basin of the Zapadna Morava (36 days). Distinguishable are three zones with the longest duration of hydrological droughts. The first zone, the river Velika Morava with its tributaries Belica and Lugomir, has the average drought duration from 45 to 50 days. The second zone with long drought durations is a part of the middle course of the river Zapadna Morava, from Čačak to Kraljevo, whereas the third zone, with a bit lower values (about 40 days), is related to the middle course of the Južna Morava and its left tributaries (Jablanica, Pusta reka and Toplica). From the analyses, it can be noticed that the dominating ones are the droughts that last from 31 to 45 days (Urošev 2016).

In the drainage basin of the river Velika Morava, hydrological droughts occur in the period from July to November, and they are most frequent in August and September, when they affect the largest areas (> 60% of the basin area). The greatest regional droughts in the drainage basin were recorded in September 1994, in August 1990, as well as in 1962, 1993 and in 2012.

### 6.2.4 Water Balance

About three-fourth of the total precipitation quantity in the territory of Serbia evaporates (Table 6.1). The most unfavourable relation of the runoff and evapotranspiration is in the immediate drainage basin of the Danube, and the most balanced one is in the drainage basin of the Drina. According to the quantity of domestic waters, Serbia belongs to the countries very poor in water (1542 $m^3$/inhabitant a year), but if the transited waters are taken into account, it is classified among the countries very rich in water (17,809 $m^3$/inhabitant a year) (Urošev et al. 2017).

## 6.3 Canals

Canals in Serbia usually are built in the lowland regions of Vojvodina. The intense canal building started in the nineteenth century, although the first canals were built in the times of Roman reign. Basically, they are intended for drainage, irrigation and navigation. Before they were built, the land was saturated with water, it was moorland and it represented an obstacle, both for moving and for life and usage.

The total length of the canal network is 22,643 km (Institut za vodoprivredu "Jaroslav Černi" 2001). The most important system of canals is the canal network of the Danube-Tisa-Danube hydrosystem, whose length, together with the lower course of the river Tamiš, is 960 km, of which 386 km are navigable for the ships under 1000 t of loading capacity, 259 km are navigable for the ships up to 500 t of loading capacity and 28 km are navigable for the ships under 200 t of loading capacity (Statistical office of the Republic of Serbia 2014).

The main obstacle in the functioning of the canals is insufficient maintenance, which causes overgrowth and non-functionality.

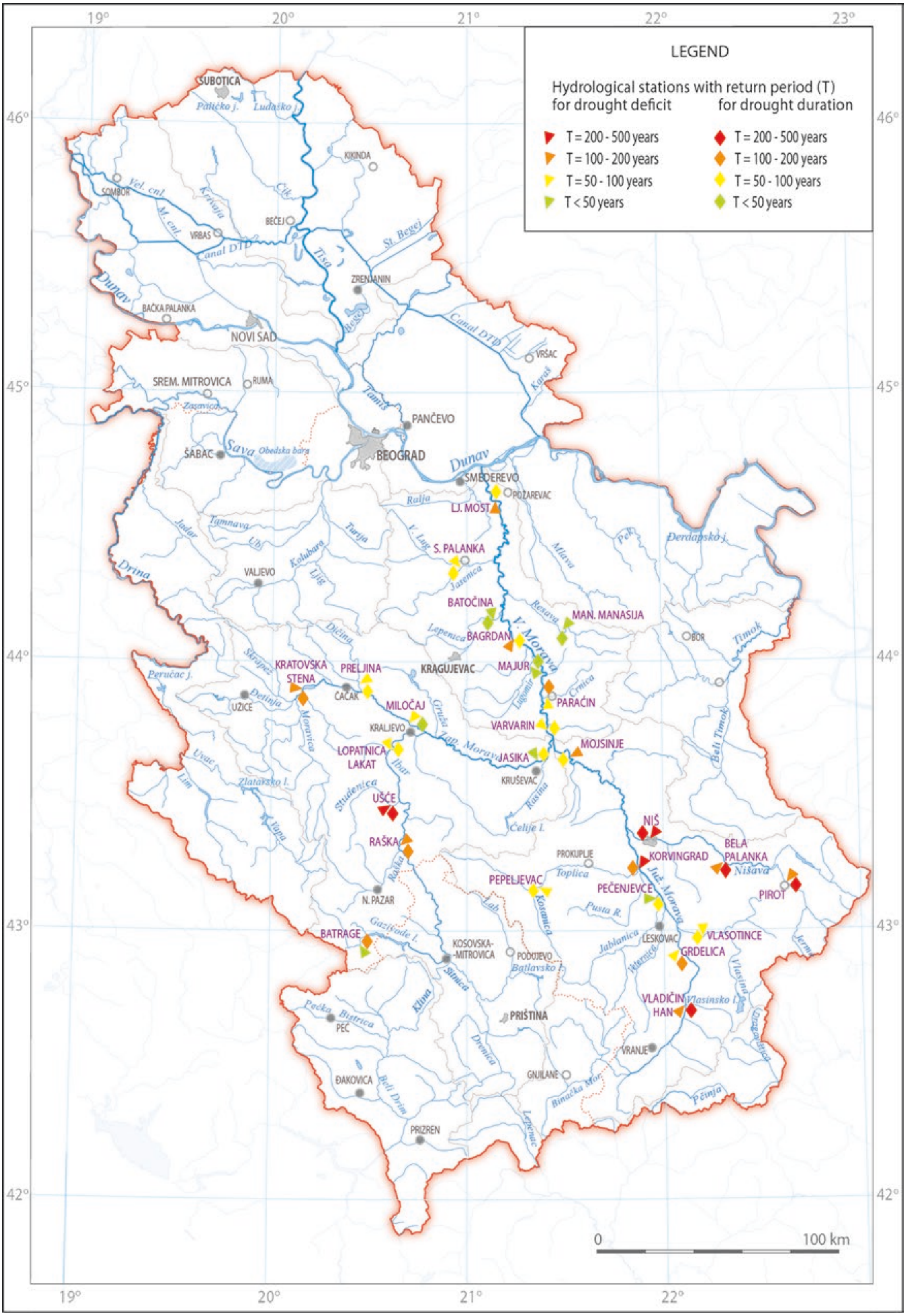


**Fig. 6.7** The return period of the maximum recorded deficits and durations of hydrological droughts in the drainage basin of the river Velika Morava for the period 1961–2014. (Source: authors' calculation based on the Republic Hydrometeorological Service of Serbia data)

**Table 6.1** The water balance of Serbia for the period 1961–2010 (Urošev et al. 2017)

| Sea drainage basin | River drainage basin | F ($km^2$) | F (%) | P (mm) | Y (mm) | E (mm) | Co (%) | Ce (%) |
|---|---|---|---|---|---|---|---|---|
| Black Sea | Danube | 17,877 | 20.2 | 640 | 35 | 605 | 5.5 | 94.5 |
| | Tisa | 7611 | 8.6 | 549 | 103 | 446 | 18.7 | 81.2 |
| | Sava | 5575 | 6.3 | 642 | 169 | 473 | 26.3 | 73.7 |
| | Drina | 6018 | 6.8 | 863 | 416 | 447 | 48.2 | 51.8 |
| | Kolubara | 3628 | 4.1 | 777 | 139 | 638 | 17.8 | 82.2 |
| | Velika Morava | 6814 | 7.7 | 659 | 214 | 445 | 32.5 | 67.5 |
| | Zapadna Morava | 15,310 | 17.3 | 752 | 210 | 542 | 27.9 | 72.1 |
| | Južna Morava | 14,514 | 16.4 | 699 | 178 | 521 | 25.4 | 74.5 |
| | Timok | 4513 | 5.1 | 691 | 175 | 516 | 25.3 | 74.7 |
| Adriatic | Beli Drim | 4602 | 5.2 | 806 | 388 | 418 | 48.1 | 51.9 |
| Aegean | Lepenac / Dragovištica / Pčinja | 1947 | 2.2 | 730 | 249 | 481 | 34.1 | 65.9 |
| Total | Serbia | 88,499 | 100.0 | 756 | 171 | 585 | 22.7 | 77.3 |

*F* drainage basin area, *P* precipitation, *Y* runoff, *E* evapotranspiration, *Co* runoff coefficient, *Ce* evapotranspiration coefficient


**Fig. 6.8** Natural and artificial lakes in Serbia. (**a**) Palić lake (photo by M. Urošev, 05/06/2012); (**b**) Jažinačko lake (photo by M. Milivojević, 07/17/2007); (**c**) Djerdap lake (photo by M. Urošev, 11/10/2018); (**d**) Perućac lake (photo by M. Urošev, 08/22/2013)

## 6.4 Lakes and Reservoirs

In Serbia, there are a relatively small number of natural lakes, different in genesis and with relatively small cover areas. Lake basins are formed by the action of winds, rivers, karst or glacial erosion and land sliding.

The best-known *aeolian lakes*, formed by the action of winds, are on the north of Serbia. They are Palić Lake, the largest natural lake in Serbia (5.6 $km^2$) (Fig. 6.8a) (Đurić 1949; Bukurov 1954; Mihajlović-Matić 1956; Seleši 1973; Dugonjić 1974; Stanković 1980; Tomić 1985; Dožić 2006; Milošević 2012), as well as smaller lakes in its surroundings such as Ludaško Lake (Dugonjić 1956), Slano, Krvavo and Kelebijsko lakes (Bukurov 1954).

*Fluvial lakes,* the remains of the abandoned river beds, are characteristic of the middle and lower courses of large rivers. Along the river Sava, the best-known lakes are Zasavica (Dukić 1957; Grčić 2004; Milanović Pešić and Matijević 2005; Drašković 2013; Janković 2014) and Obedska Bara (Grozdanić 1950; Dukić 1957; Marčetić 1965; Janković 1993/94; Markićević 2002). Along the river Begej, there is Carska Bara (Kovačev and Budakov 1996; Branković and Budakov 1993/94; Tomić and Romelić 1998; Drašković 2013), whereas the lake Rusanda represents the abandoned river bed of the Tisa (Bajić 1964; Obradović 2005) (Fig. 6.1).

*Karst lakes* have relatively small cover areas and they are formed by filling sinkholes with water. The examples of such lakes are Vrmdžansko lake near Sokobanja (eastern Serbia) (Gavrilović and Gavrilović 2005), as well as the lake in Sremčica near Belgrade (Petrović and Gavrilović 1960).

*Glacial lakes* have small cover areas and they are located in the highest mountain regions. On the Prokletije Mt. and on Šar-planina Mt., they were formed in the Pleistocene cirques. The lakes on the Prokletije Mt. are Malo Djeravičko and Veliko Djeravičko, Jezero bez dna, Travno and Crveno (Knežević 1989; Menković 1994), and on Šar-planina Mt., Livadičko (Štrbačko) lake (Krivokapić 1959; Radulović 1996), Veliko and Malo Jažinačko (Fig. 6.8b) (Đukić 1989; Matić 1996; Đukić 1999), Gornje Bukorovačko (the highest natural lake in Serbia – 2410 m a.s.l.), etc.

*Landslide lakes* appear suddenly, but they are mostly smaller in size and, due to eutrophication, their life span is shorter. They are formed by blocking a river course by a sliding mass (landslide) or by the formation of lake basins in the sliding mass. The first group comprises the lakes Balta ala Šontu (Rakićević and Stanković 1967) and the lake on the Kazan stream near Donji Milanovac in eastern Serbia, as well as Jovačko jezero lake on the Jovačka reka river near Vladičin Han in southeastern Serbia (Petrović and Stanković 1981; Jevremović and Kostić 2011). A well-known example is Zavojsko jezero lake on the river Visočica in southeastern Serbia which was formed in 1963. The original lake was drained, and then, on the spot of the landslide, an artificial dam was erected (Zeremski 1964; Minčić 1989; Đorđević 1990; Stanković 1993; Mustafić et al. 2008). The second group comprises lakes Semeteško jezero, Gornje and Donje jezero on Kopaonik, near Jošanička banja, as well as Oblačinsko jezero lake near Prokuplje (Rakićević 1967).

By their size, of much greater importance are artificial lakes – reservoirs, created by damming large rivers. Their purpose is multiple, with the focus on energy production, but they are also used for water supply, protection against floods, fishing and for tourism purposes. In Serbia, about 60 reservoirs with high dams have been built and over 100 small reservoirs in Serbia without autonomous regions. Of 60 large reservoirs, 28 reservoirs are of individual volumes greater than 10 million $m^3$ (Institut za vodoprivredu "Jaroslav Černi" 2015) (Table 6.2).

The best-known example of a multi-purpose reservoir is *Djerdap lake* on the Danube (Fig. 6.8c), which represents the largest lake in Serbia. Its surface at the high water level is 253 $km^2$ (163 $km^2$ on the Serbian side and 90 $km^2$ on the

**Table 6.2** The largest reservoirs in Serbia and their main purpose

| Reservoir | River | Year of construction | Dam height (m) | Dam length (m) | Reservoir volume ($10^6$ $m^3$) | Purpose[a] |
|---|---|---|---|---|---|---|
| Đerdap I | Danube | 1972 | 61 | 1278 | 2550 | E,N |
| Đerdap II | Danube | 1987 | 52 | 899 | 868 | E,N |
| Gazivode | Ibar | 1977 | 108 | 520 | 370 | E, W, I, FP |
| Bajina Bašta | Drina | 1966 | 90 | 461 | 340 | E |
| Kokin Brod | Uvac | 1962 | 82 | 1227 | 273 | E |
| Uvac | Uvac | 1979 | 110 | 307 | 213 | E |
| Vlasina | Vlasina | 1949 | 34 | 239 | 176 | W, E |
| Lazići | Beli Rzav | 1984 | 131 | 218 | 170 | E |
| Zavoj | Visočica | 1989 | 86 | 262 | 170 | E |
| Tisa | Tisa | 1978 | 25 | 341 | 160 | I, FP |
| Zvornik | Drina | 1955 | 42 | 269 | 89 | E |
| Gruža | Gruža | 1984 | 52 | 288 | 65 | W, FP |
| Ćelije | Rasina | 1978 | 52 | 220 | 60 | W, FP |
| Bovan | Sokobanjska Moravica | 1978 | 52 | 151 | 59 | W, FP |
| Vrutci | Đetinja | 1984 | 77 | 241 | 54 | W |
| Rovni | Jablanica | 2015 | 75 | 450 | 52 | W, FP |
| Potpeć | Lim | 1967 | 46 | 212 | 44 | E |
| Barje | Veternica | 1991 | 75 | 326 | 41 | W, FP |
| Batlava | Batlava | 1966 | 46 | 302 | 39 | W |
| Gračanka | Gračanka | 1965 | 54 | 270 | 32 | W |
| Prvonek | Banjska r. | 2005 | 88 | 250 | 20 | W |

[a]The reservoir's main purpose: *E* energy production, *W* water supply, *I* irrigation, *N* navigation, *FP* protection against floods. Data source: Institut za vodoprivredu "Jaroslav Černi" 2015

Romanian side), and its volume at the average water level reaches the value of $5 \cdot 10^9$ $m^3$ of water. At high water levels, it is up to 264 km long, and at low water levels its length is 132 km. Its width is the smallest in Mali Kazan gorge (about 180 m), and the biggest is in the basin of Donji Milanovac (about 2200 m). The maximum depth of the lake is 82 m (Dukić 1964; Đorđević and Neimarević 1972; Savić 1994). The nominal power of the hydropower plant Djerdap 1 is 1083 MW (Electric power industry of Serbia 2019). Numerous problems have been noticed regarding reservoirs, and among the most significant are the sediment deposition and the loss of the reservoir useful volume (Ovčar lake, lake Parmenac, Zvornik lake) and the deterioration of water quality in certain reservoirs whose main purpose is water supply (Vrutci, Gruža, Ćelije, Bovan).

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# Geomorphological Characteristics of Serbia

7

Predrag Djurović

**Abstract**

The main morphological feature in the relief of Serbia is its gradual rise from the Pannonian Plain in the north to the highest parts of the Šar-Prokletije Mountains in the south and southeast. The central part of the territory encompasses the valleys of the Morava and Southern Morava Rivers, which flow from south to north. West of them lies a mountainous region with the Dinaric Mountains as the most exceptional range. The Carpathian-Balkan mountain range in the east undergoes a gradual decrease of elevation, transiting into marginal parts of the Vlaško-Pontian Plain. The relief base is made up of rocks of different age and different origin (sedimentary rocks with Quaternary alluvial and aeolian products as the most widespread and very abundant carbonate rocks), igneous rocks and diverse metamorphic rocks. The relief was formed over a long period of time with significant climate changes that led to alternation of geomorphological processes (aeolian, periglacial and glacial). In the relief of Serbia, depending on the role of geomorphological processes, it is possible to distinguish different genetic morphostructural types of relief that arose under the influence of endogenic forces (tectonic and volcanic) and exogenic processes (recent fluvial-denudation, karstic colluvial and periglacial). Preserved palaeorelief forms that arose during earlier stages of relief formation have been overprinted by recent geomorphological processes (palaeoabrasional, palaeokarstic, palaeoglacial and palaeoaeolian). Anthropogenic influence on relief (active for several centuries) was occasionally high enough to result in complete conversion of natural relief features and appearance of a new category – anthropogenic relief. Diverse lithology, a different tectonic fabric, neotectonic activity and former and recent climate changes are the major factors that have led to the formation of genetically diverse relief types, from different morphostructural relief elements to genetically various exogenic landscapes.

**Keywords**

Genetic types · Geomorphological processes · Relief forms · Morphostructural relief · Recent relief · Palaeorelief · Serbia

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With respect to geomorphological features, several macro-relief entities can be distinguished on the territory of Serbia:

- The Pannonian Plain of lowland relief and domination of fluvial-denudation and aeolian relief forms
- The peri-Pannonian area of hilly-mountainous relief at lower and moderately high elevations with domination of fluvial-denudation, colluvial and sporadically karst relief and elements of palaeofluvial and palaeoabrasion relief
- A valley-basin region of limited elevation (lowland area) and prevalence of fluvial relief, whereas colluvial processes (landslides) prevail in valleys and on basin slopes
- A mountainous region containing moderately high and high mountains, where the prevalence of fluvial or karst processes with elements of periglacial relief is dependent on lithology, and where palaeoglacial forms occur on summits.

The relief of Serbia is characterized by significant altitudinal zonation. Of the country's total area, 36.83% is in the altitude belt up to 200 m a.s.l., 24.7% is between 200 and 500 m a.s.l., 27.28% is between 500 and 1000 m a.s.l., 9.59% is between 1000 and 1500 m a.s.l., 1.37% is between 1500 and 2000 m a.s.l. and 0.59% is above 2000 m a.s.l. (Mladenović 1983). The lowest relief is in the easternmost part of the country at 28 m a.s.l. (at the confluence of the



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Timok and the Danube Rivers), and the highest is at 2656 m a.s.l. (the Djeravica peak in the Prokletije Mountains).

## 7.1 Factors Dictating the Emergence of Recent Geomorphological Processes

The geological background and climate are the two main factors governing recent geomorphological processes in Serbia. In addition to these natural factors, various human activities (changes in the ecosystem, hydrotechnic activities, pit mines, etc.) appear as important factors that control and to a significant extent affect the intensity of a number of recent geomorphic processes.

Geological composition is recognized as the key factor in controlling dominant geomorphological processes. Geological products in Serbia include different rocks and sediments that were formed as far back as before pre-Palaeozoic to Quaternary times.

Different types of clastic and metamorphic rocks, as well as igneous ones, are the most abundant. These rocks frequently alternate with each other and have the widest distribution in western, southern and eastern Serbia. Tertiary solidified, weakly consolidated or even loose lacustrine sediments occur in the peri-Pannonian region and in the valley-basin region (the broader area around the Morava and Western Morava Rivers), as well as in a number of smaller or larger basins. The same sediments build the largest part of the Pannonian Plain's basement, being covered by different unconsolidated Quaternary clastic sediments. Thus, in regard to geology, deluvial, fluvial and colluvial processes (landslides) prevail in these regions.

Areas in eastern and western Serbia built by different carbonate rocks (Mesozoic and, to a lesser extent, Palaeozoic limestones and marbles, including Miocene limestones) display karst relief. Pseudokarst (clastokarst) relief built by various aeolian sediments (sands and loess plateaus) evolved in the Pannonian, peri-Pannonian and easternmost parts of Serbia.

With its two main elements (precipitation and temperature), the country's climate determines the dominant geomorphological processes in Serbia (see Chap. 5). The amount and kind of annual precipitation and temperature oscillations created conditions suitable for fluvial processes throughout the whole of Serbian territory. Longer retention of snow and the influence of negative temperatures, that is, the influence of cryo-nivation processes, occur only at altitudes exceeding 1500–1600 m a.s.l. The small percentage of such areas diminishes the effects of these processes in regard to both their duration and their spatial distribution. However, climate changes during the Pleistocene had a significant impact on relief formation. The sudden drop of temperature on high mountains in the Pleistocene caused domination of glacial processes, while periglacial ones like recent cryo-nivation processes affected lower altitudes on much broader areas than today. Climate changes also had an impact on the erosion force of long rivers, as well as on the deposition of aeolian sediments in the Pannonian and peri-Pannonian regions.

## 7.2 Genetic Types of Relief

Two main genetic types of relief can be distinguished in Serbia (Fig. 7.1). The morphostructural relief owes its development to the influence of endogenic forces (tectonic and volcanic processes), while exogenic forces led to the creation of recent fluvial-denudation, karstic and colluvial and cryo-nivation relief (Menković et al. 2003).

Triggering of the forementioned processes in space and time resulted in the creation of polygenetic forms. Distinct forms remain preserved in relief like relics of past processes that were active during former stages of relief creation (palaeorelief).

### 7.2.1 Morphostructural Relief

Morphostructural relief forms belong to a group that includes the largest relief forms in Serbia (Zeremski 1990; Menković et al. 2018). Two main groups, viz., tectonic and volcanic relief forms, are distinguished.

The major shapes of tectonic relief were developed by faulting, folding, subsiding or uplifting of blocks. Uplifted blocks (horsts) subsequently exposed to erosion occur in recent relief as noteworthy mountains, for example, Fruška Gora (Milić 1973), Vršački Breg (Bukurov 1950), Cer (Marković 1963), Juhor, Jastrebac, and Kukavica. Subsiding blocks (graben) created tectonic depressions that underwent different stages during their evolution, from marine and lacustrine basins to recent ones. Retreat of Pliocene lakes allowed river courses to form inside former basins and their subsequent transformation into the present basins (the Pannonian Plain and the Morava, Leskovac, Čačak, Kraljevo, Žagubica, Soko Banja, Kosovo, Metohija and other basins) (Milojević 1924; Marković 1964; Ćalić et al. 2012). The youngest tectonic events resulted in formation of neotectonic morphostructures, such as neotectonic depressions on the Pannonian Plain: near Alibunar, in Srem and next to Ruski Krstur (Zeremski 1967; 1973).

Horizontal tectonic movements, expressed as folding or thrusting, led to formation of a number of mountains in eastern Serbia within the Carpathian-Balkan mountain range (the mountains Tresibaba and Tupižnica; the Svrljiške Planine, Suva Planina and Stara Planina Mountains; etc.) (Zeremski 1994, 2004, 2008). Mountains in western Serbia

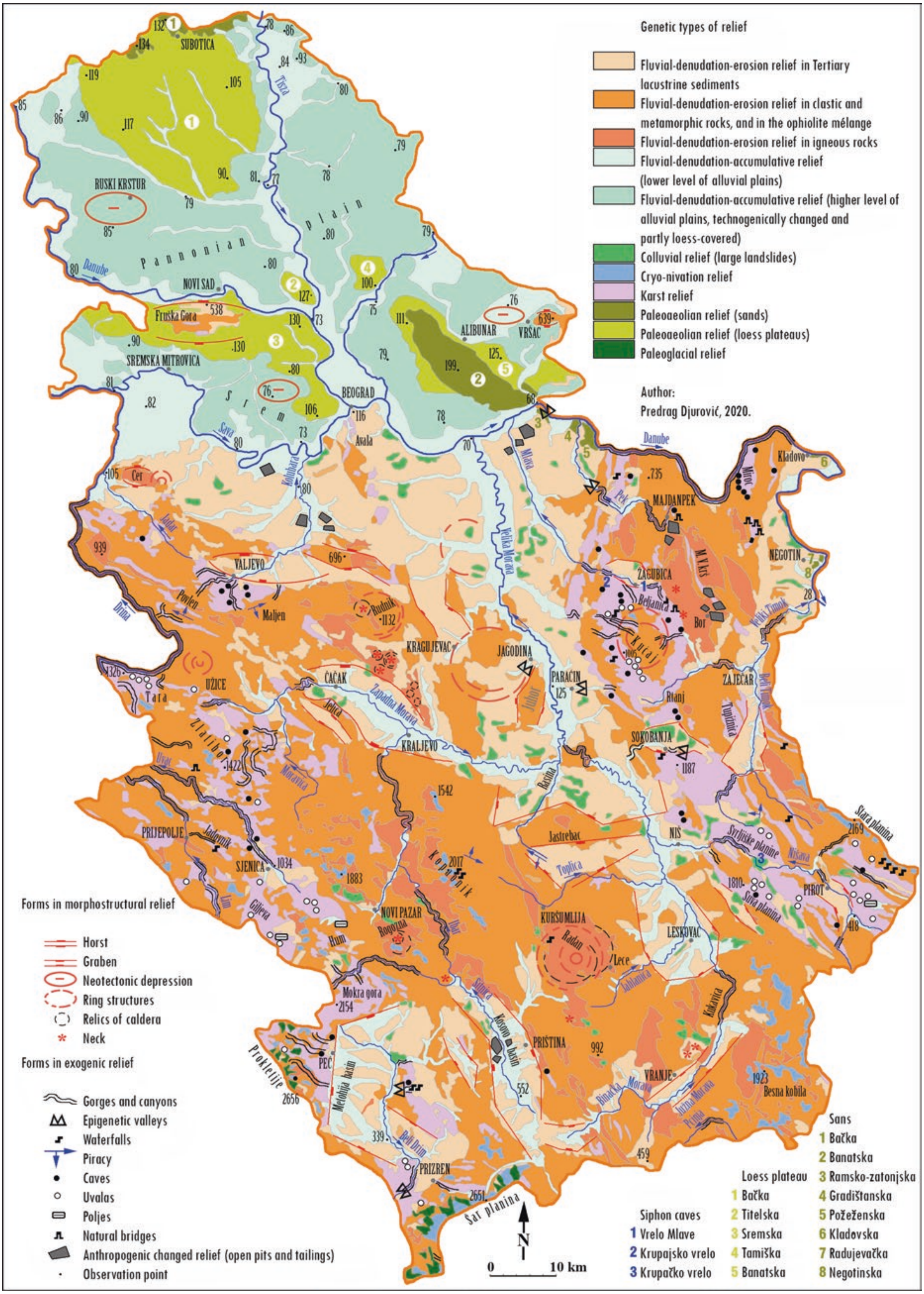


**Fig. 7.1** Geomorphological map

within the Dinaric mountain range (Tara, Jelica, Jadovnik, etc.) evolved similarly (Grubić 1972; Zeremski 1956).

Ring structures occur in the guise of circular or semicircular mountain ranges as a consequence of intrusion of igneous bodies in the Earth's crust (Manzalović 1978). Ring structures are identified at the mountains Rudnik, Kopaonik, Radan and Beljanica, as well as near Jagodina, Leskovac, etc. (Menković et al. 2018). Other distinct morphostructural relief elements include elbow curvature, transverse topographic asymmetry of valleys, half-elliptical forms related to neotectonic subsidence, etc. (Zeremski 1974, 1983, 1984, 1988, 1990).

Volcanic relief is represented only by palaeovolcanic forms (Cvijić 1924), due to the lack of active volcanism in Serbia. The majority of these forms are linked with Oligo-Miocene and Pliocene volcanic activity. Primary volcanic shapes have been exposed to erosion for a fairly long time and thereby been considerably modified. Volcanic relief is recorded at few places in Serbia. The best preserved are caldera and neck parts, while the presence of volcanic cones in eastern Serbia is still under discussion (Petrović 1967, 1976a, b, c). A neck and partly preserved caldera occur in the vicinity of Mt. Rudnik. Several volcanic centres with numerous caldera and neck relics are recognized in the central part of Serbia, in the area of the Borač-Kotlenik volcanic complex (SW of Kragujevac) (Marković and Pavlović 1967). Caldera and neck remains in the wider Ibar-Kopaonik region are another result of past volcanic activity. The earlier volcanic phase on Mt. Rogozna occurred, during the Middle Miocene, while the younger phase was in the Pliocene (Zeremski 1959). Among the number of reconstructed calderas within the Lece volcanic complex in southern Serbia, there are some reaching 15 km in diameter (Jovanović et al. 1973). Volcanic necks have also been recognized in the drainage basin of the Binačka Morava River (Pavić 1969). Similar phenomena are present in the Vranjska River's basin (Stanić et al.1995–97).

### 7.2.2 Recent Exogenic Geomorphological Processes and Relief Forms

#### 7.2.2.1 Fluvial-Denudation Processes and Forms

The fluvial-denudation process is the most widespread geomorphological process in Serbia due to suitable climate and geological conditions. About 86% of the territory is affected by the process of erosion. The least intensive denudation appears on limestone terrains in eastern and western Serbia, as well as on the Pannonian Plain (sands and loess plateaus). The most intensive denudation is recorded in southeastern Serbia, in watersheds of the Banjska (3075 $m^3/km^2$/year), Pčinja (2382 $m^3/km^2$/year) and Ljubatska (1619 $m^3/km^2$/year) Rivers (Lazarević 1983). However, notable depopulation and changing of the purpose of lands, along with natural expansion of vegetation and artificial forestation, etc., over the last 50 years (Manojlović et al. 2017) has led to a significant decrease in intensity of the denudation process (Kostadinov et al. 2014). The total extent of the denudation process in Serbia (for the period of 1966–1971) was about 37.250000 $m^3$/year, but it shrank subsequently (in 2009 it was estimated to be about 21,572,000 $m^3$/year) (Lazarević 2009). A similar situation was recorded in the watershed of the Nišava River, where the total extent of denudation was 2220455.1 $m^3$/year in 1970 and 1547002.8 $m^3$/year in 2010, that is, 765.3 $m^3/km^2$/year and 533.3 $m^3/km^2$/year per square unit (Mustafić 2012).

River courses transport about 25% of the total amount of alluvium from Serbian territory or approximately 9, 350 000 $m^3$ annually. The Black Sea receives about 78% of it, the Aegean about 13% and the Adriatic Sea the remaining 9% (Lazarević 1983). Differences in the erosion rate are related to geological, climatic, pedological and vegetational factors, as well as to different physico-geographical characteristics. The total amount of silt carried off from the watershed of the Jerma River during the period from 1964 to 1984 exceeded 825,000 tons (Manojlović et al. 2003), whereas 2,840,000 tons of suspended load was discharged from the watershed of the Beli Timok over the course of 12 years (Manojlović and Gavrilović 1991). Meandering of lowland rivers (the Kolubara) resulted in shoreline displacement at a rate of from 1.34 m/year (1930–1959) to 1.46 m/year (1959–1981) (Dragićević et al. 2015).

Accumulation processes take place on the alluvial plains of long rivers (Danube, Sava, Tisza, Morava, Southern Morava, Western Morava, Kolubara, etc.), which encompass about 14% of the territory of Serbia (Lazarević 1983). The Sava River (sector from Sremska Mitrovica to Beograd) on average accumulates 510,000 t of load annually (2000–2012) (Livija 2015).

The alluvial plains of long lowland rivers are the most important morphological element in the fluvial process. The plains of the Danube, Sava, Tisza and Morava Rivers measure up to 10 km in width. A number of river islands appear in the riverbeds, whereas a number of abandoned channels, meanders, etc. are found on the alluvial plains. During flooding, water overflows the riverbanks and inundates the adjacent alluvial plain. Afterwards, the retained water creates vast swamp areas. Intensive aeolian processes on the Pannonian Plain left behind loess accumulations on the alluvial plains. Part of this material was carried by rivers and sporadically settled out in places with a decreasing erosion rate. This has led to de-nivelation of parts of alluvial plains. The need to reduce the extent of flooding has brought intensive technogenic changes to alluvial plains recently, that is, long levees have been constructed along riverbeds, cut-offs have been created at meander loops, etc. Flooding of alluvial plains has in that way been largely prevented (Dukić 1978).

Numerous and long channel systems were built for taking away a high discharge. These technical solutions have interrupted natural sporadic floods on a majority of alluvial plains, which has proved to be beneficial as a way of supporting intensive settlement and adding nourishment to agricultural fields.

The drainage network in Serbia was formed after lacustrine basins, that is, the Pannonian Lake, and the Vlaško-Pontian basin and peripheral basins remained waterless, but the development of fluvial forms has lasted from the Early Miocene until the present day. The most outstanding forms in fluvial-denudation topography are peneplains. They are located at different altitudes, from the lowest Pannonian and peri-Pannonian regions to the highest mountainous regions. The highest pen plains, ones at 1600–1800 m a.s.l., were formed in the Lower Miocene, those at 310–350 m a.s.l. arose at the Pliocene/Pleistocene boundary, while the lowest, ones at 140–160 m a.s.l., were created in the Middle Pleistocene (Milić 1982). The valley of the Crni Timok River was incised about 100 m during the Quaternary, about 70–80 m in the Pleistocene and the remaining 15–20 m in the Holocene (Petrović 1970). Incision of the Sava River started at an elevation of 110 m a.s.l. and has increased by about 40 m until the present time (Marković 1967; 1967a).

Deepening of valleys was a multistage process, as can be inferred by the existence of river terraces sculptured in the Quaternary. The Danube River has incised four series of terraces in Vojvodina (Cvijić 1921; Bukurov 1954; Milojević 1960; Milić 1977, 1982). The same number has been identified in the valley of the Morava River (Jovanović 1969; Milić 1977, 1982). Incision of the Sava River took place in five phases (Milojević 1951a, b), starting from an elevation of 110 m a.s.l. (Marković 1967) as a consequence of different tectonic movements (Milić 1977).

Tectonic movements, intensive fluvial processes and general evolution of relief led to the appearance of river piracy and changes in the drainage pattern of Serbian rivers. In central Serbia, the watershed of the Black Sea increased in size at the expense of marginal parts of the Aegean Sea's watershed (Milić 1967). River piracy has been identified in the watersheds of the Rasina (Cvijić 1909), Ibar (Cvijić 1926), Binačka Moravica (Milojević 1951a, b) and Toplica (Djurović and Menković 2008) Rivers, as well as those of the Ljubovidja (W of Mt. Povlen) (Zeremski 1980), Uvac (Zeremski 1962), Povlen (Gavrilović 1983), Trgoviški Timok (Dinić 1967), etc.

Valleys in Serbia display an epigenetic pattern represented by common gorges and short canyons. Such forms were created by incision of valleys in lacustrine sediments (usually Pliocene in age) that themselves overlie former palaeorelief. The aforementioned forms were the main evidence used by geomorphologists to identify the boundary between the influence of abrasion and that of fluvial-denudation processes involved in creation of the relief of Serbia (Cvijić 1909; Jovanović 1951, 1953; Jovičić 1957; Marković 1964, 1966, 1985; Petrović 1963, 1966; Zeremski 1957). They can be found at the entrances or exits of almost all basins in Serbia. According to the mode of incision and their shape, they can be highly diverse.

The most emphatic morphological manifestations of fluvial erosion are gorges and canyons. Frequent oscillations in the erosion rate and the presence of thick limestone accumulations led to incision of the more resistant parts into steep, nearly vertical-walled valleys. The length of noteworthy narrows ranges from a few hundred metres to several kilometres. The average depth of valleys ranges from 200 to 300 m, and only in particular cases does their depth exceed 500 m. There are about 300 such valleys in Serbia.

Significant wearing a way of riverbeds created a number of cascades and waterfalls. Approximately 200 such occurrences are registered in Serbia (Stojadinović 2013). Their height is not impressive and averages from 10 to 20 m. They are higher than this in limited cases of staircase waterfalls overflowed by rivers of significantly fluctuating annual discharge. The majority of waterfalls occur in the Stara Planina Mountains (Veselinović 2013), where several cascade waterfalls reach heights of from 100 to 200 m. Cliffs are commonly formed by erosion and created by selective erosion. A number of waterfalls in Serbia are located in tufa accumulations (Djurović 1996/97) on karst terrains in eastern and western Serbia.

#### 7.2.2.2 Karst Process and Forms

Limestone covers about 8414 km$^2$ or 9.5% of the territory of Serbia (Gavrilović 1975, 1982). Limestones are distributed at altitudes of from 120 to over 2300 m a.s.l. Although chemical weathering affects the whole territory of Serbia, limestones are most readily attacked by this process. The amount of chemically dissolved matter carried away by rivers in eastern Serbia ranges from a maximum of 88.1 t/km$^{-2}$/year$^{-1}$ (watershed of the Crnica River) to as little as 33.8 t/km$^{-2}$/year$^{-1}$ (watershed of the Crnajka River), that is, 57 t/km$^{-2}$/year$^{-1}$ on average (Manojlović 1992). Experimentally obtained data about chemical weathering (standard tablets) on limestone terrains indicate that a quantity of 2.3 m$^3$/km$^2$ of limestone dissolves annually on average (Gavrilović 1984a, b). The ratio between chemical weathering on the surface and underground varies from 1:10 to 1:17. About 20,000 m$^3$ of limestone is dissolved from the entire karst terrain in Serbia. Chemical erosion is more than 200 times weaker than the denudation process and contributes to alluvium production with 0.05% (Gavrilović 1984a, b). Karst relief is found in limestones varying in age from Precambrian to Miocene, but is most abundant in limestones of Mesozoic age. Weathering attack commonly occurs in relatively thin limestone masses, although thicker limestone masses affected by this process are also recorded, for example, in the Miroč (over 700 m) and Suva Planina (about 800 m) Mountains and elsewhere. Limestone masses in some cases were broken by Neogene sediments or other rocks into smaller and separated pieces. Larger areas of continually distributed limestones are linked with mountainous regions that are under the influence of cry-nivation processes (high-mountain karst). Limestone masses are commonly cut by river courses, enabling a number of canyons and gorges to be formed and allowing fluvial karst to dominate. Disappearing rivers with short underground segments are common, and there are also a number of gravitational and siphon springs. Vast flattened limestone surfaces can be found on wide mountain saddles and karst plateaus.

Dolines are the most abundant forms of karst relief. They occur most frequently in the Valjevo karst area, on high karst plateaus in mountainous regions (Miroč, Suva Planina, Zlatibor, Giljeva and Beljanica), where they are as frequent as more than 50 per square kilometre (Gavrilović 1982). More than 100 dolines per square kilometre are present in the Mokra Gora Mountains (Menković 1995). Dolines come in many sizes and shapes. They can be alluvial, rocky and covered either by sediments or by plants. In high-mountain karst, dolines due to nivation (long–lasting snow) are asymmetrically-sided and much higher on the north side than on the south side (Suva Planina, Mokra Gora) (Gavrilović 1970, 1975; Menković 1995).

Karst dolinas are abundant and represent relics of fluvial relief that has been to a certain degree modified by recent karst processes (Petrović 1965). In the eastern Serbian karst, there are recognized over 900 dolinas with different degrees of morphological-hydrological transformation and permanent, temporary or intermittent flows, from blind and hanging dolinas to ones that are linearly oriented at their bottoms (Petrović 2015).

About 50 uvalas located at altitudes ranging from 240 to 1440 m a.s.l. altitude have been identified in Serbia (Djurović 2018). Their genesis is commonly linked with the post-fluvial phase in the evolution of karst dolinas, that is., they represent re-modified parts of former dolinas incised into the limestone basement.

The existence of karst poljes in Serbia is still an open question. The Sjeničko and Koštan poljes (Rakić 1982/83) in western Serbia, along with the Odorovačko polje in eastern Serbia, represent vast widened dolinas at places where rivers run beneath the ground surface. As they are built in non-carbonaceous rocks, they can be considered poljes of the contact type.

Microkarst forms (kamenitzas and karrens) are not very frequent, owing to more or less extensive covering of the limestone by either vegetation or soil.

Besides the aforementioned surface forms derived by dissolution of limestone, the karst topography of Serbia also includes more than 50 tufa accumulations of significant scale (Gavrilović 1992; Djurović 1998, 2018; Djurović and Djurović 2012). These accumulations commonly form around gravitation springs (Djurović and Djurović 2012) in the form of successive cascades and flats from 10 to 20 m high. The tufa on the southern slope of Mt. Beljanica is more than 40,000 years old (the effective dating range of the $C^{14}$ method) (Gavrilović 1992).

Speleological research has been carried out since the end of the nineteenth century (Cvijić 1895, 1893) and has proceeded without breaks until the present day (Petrović 1976a, b, c). The morphology, hydrology and evolution of more than a thousand caves were examined during this period. Their classification has also been done (Gavrilović et al. 1981/82). Speleogenetical processes were controlled by the same factors as those that exerted influence on the formation and evolution of karst. The majority of caves are morphologically simple, short, shallow and frequently without any hydrological function.

About 80 in number, the group of the largest caves in Serbia includes both those more than 500 m long and ones deeper than 100 m. Sixteen caves have a length of 1–5 kilometres three are from 5 to 6 km long and only two caves exceed 10 km in length, namely the cave Lazareva Pećina in the Carpatho-Balkanides (about 12 km long) and the cave Velika Klisura in the Prokletije Mountains (about 13 km).

Among the 80 largest caves, 15 of them have a vertical channel denivelation of more than 100 m, while depths of from 200 to 300 m are noted in 8 caves. In this group of the largest caves, three fourths of them have various hydrological phenomena (disappearing rivers, springs, interior flows, lakes, etc.) (Djurović 1998).

Within basins composed of deeply down-dropped limestones overlain by thick beds of Neogene and Quaternary sediments, the underground flows descend deep below the water table and reappear on the surface across channels of siphon caves that exceed 100 m in depth (Vrelo Mlave, Krupajsko Vrelo, Krupačko Vrelo) [Djurović (ed.) 1998].

Caves were formed in different periods of time. The oldest belong to palaeokarst forms (see Sect. 3.3.2). Some caves are of fairly long evolution. Located in the valley of the river Zlotska Reka, the Vemjikica Cave belongs to caves whose entrance is at the highest relative altitude (150 m a. s. l.). Comparative analyses and genetic correlation suggest that the Vernjikica Cave began to develop as a ponor cave at the end of the Upper Pliocene (Petrović 1964), which makes it one of the oldest caves in Serbia.

Signs of dolina infill in some Serbian caves serve as evidence indicating the occurrence of three extensive and several less extensive, that is, local, infill events at the end of the Pleistocene and in the Holocene (Gavrilović 1990a, b).

The youngest caves are those through which flow disappearing streams. Although their lowest channels are still hydrologically active, higher levels in the cave were formed much earlier. Calcite accumulations in the highest part of the cave Petnička Pećina are more than 40,000 years old (the effective dating range of the $C^{14}$ method).

#### 7.2.2.3 Aeolian Process and Forms

The aeolian process is still active over the entire surface of Serbia, but it is by far the most intensive on the Pannonian Plain. The reasons for this can be found in the limited area of it under forest (6.4%); the presence of vast agricultural fields lacking vegetation for longer periods of time, two sandy terrains and broad areas covered by loess; and occurrence of lengthy droughts accompanied by strong wind.

Aeolian erosion from the Subotičko-Horgoška Sands was estimated (during the period of period 1980–1999) to be on average 20 times stronger on unprotected agricultural fields (with a mean value of 6.9 kg/m$^{-1}$/year) than at localities under forest (with a mean value of 0.36 kg/m$^{-1}$/year), reaching a monthly maximum in April (1.82 kg/m$^{-1}$) and March (1.76 kg/m$^{-1}$) and having a predominantly NW direction (Letić 1989; Letić et al. 2001). An average of 2.5 kg/m$^{-1}$/year is carried away by aeolian erosion from agricultural loess soil in the vicinity of Bečej, and about 1.15 kg/m$^{2}$/year at Rimski Šančevi (Savić et al. 2002a, b; Savić and Letić 2009). In the case of the Delibatska Peščara Sands during the period of 2006–2009, aeolian erosion carried away about 4.48 kg m$^{-1}$/year on average from arable and unprotected lands and had a predominantly southward and southeastward direction (Velojić 2016). The geomorphological impact of aeolian erosion is most strongly manifested in infilling of natural and artificial aquatoriums (the Danube-Tisza-Danube Canal and the network of melioration canals). Assuming that about 2.35 t/year will accumulate over a length of 1 km in an aquatorium, riverbeds with a low mean slope will respond with reduction of flow velocity, increased accumulation and constant infill (Savić et al. 2000, 2002a, b).

Two particularly abundant aeolian features in the relief in Serbia are sandy terrains and loess plateaus. Sandy terrains are of the widest distribution on the Pannonian Plain (the Banat sandy terrain is 40 km long and 17 km wide, and dunes are present on an area of 360 km$^{2}$, while the Bačka sandy terrain covers an area of 250 km$^{2}$). Three sandy terrains in NE Serbia (the Ram-Zatonje, Gradište and Požega sandy terrains) form a belt 30 km long and 1–5.5 km wide that covers an area of 80 km$^{2}$. Smaller sandy terrains occur in the easternmost part of the country, along the banks of the Danube: the Kladovo (7 km$^{2}$), Radujevac (4.5–5.5 km in length) and Negotin (6 km$^{2}$) sandy terrains (Petrović 1976a, b, c). Five loess plateaus are recognized in the Pannonian realm: the Banat loess plateau (with loess 25–40 m thick), the Tamiš loess plateau (with loess 10–25 m in thickness), the Titel loess plateau (whose loess exceeds 50 m in thickness), the Bačka loess plateau (with loess accumulation about 10 m thick) and the Srem loess plateau (with loess about 30 m thick).

Prominent aeolian relief forms on sandy terrains are dunes several hundreds of metres in length and over 1 km and 32 m in height, with troughs exceeding 100 m in width separating one from another. Dune migration was stopped by using appropriate agrotechnical measures at the beginning of the nineteenth century. Loess dunes (up to 3 km long, 5–8 m high and about 50 m wide) are recorded on loess plateaus (Bukurov 1953; Petrović 1979, 1982).

On sandy terrains and loess plateaus, in addition to the aeolian forms (dunes and troughs between them), pseudokarst forms are present in the guise of clastokarst phenomena, viz., dolines. Loess sinkholes vary in outline and range in diameter from 300 to 800 m, appearing with a density as high as 50 per square kilometre (Bukurov 1953; Petrović 1979, 1982). Occasionally noted dolinas reflect climatic differences, as well as differences in loess composition (apart from aeolian sediments, fluvial ones may also occur).

Conspicuous features that need to be mentioned in aeolian landscapes are loess cliffs up to 50 m tall formed by streams down cutting a loess plateau. Numerous gullies occur in places where loess plateaus meet alluvial plains. These elongated forms with steep almost vertical sides and depths ranging from 20 to 30 m were created by anthropogenic activity, sometimes abetted by denudation processes.

Dolinas, loess cliffs and gullies are the youngest relief forms, younger than dunes and the troughs between them. The latter represents primary shapes of aeolian relief in sands and on loess plateaus, and they can therefore be referred to as forms of aeolian palaeorelief.

#### 7.2.2.4 Colluvial Process and Forms

The colluvial process in Serbia encompasses two main processes: landslides and rock falls. About 30% of the total area of Serbia is prone to landslides. There are about 3600 landslides in the country, and 750 of them are on the territory of Belgrade (Vujanić and Rakić 2013). Constantly moving landslides have a monthly velocity of about 2 cm a day (6 cm a day in the case of the Duboka landslide during May–June of 2005) (Mitrović and Jelisavac 2006), while in extreme cases the monthly velocity reaches 70–200 m a day (the Jovac landslide) (Jevremović et al. 2011). Maximal thickness and volume of the slumping mass range from 24 m and 4,000,000 m$^{3}$ (data referable to the Visočica landslide) (Gojić et al. 1964/65), respectively, to more than 26 m and 14,000,000 m$^{3}$ (the Duboka landslide) (Mitrović and Jelisavac 2006) and even values as great as 150 000000 m$^{3}$ (the Jelovac landslide) (Jevremović et al. 2011).

Rock falls commonly occur on steep sides of river valleys, for example, those of the rivers Drina, Danube (in the Djerdap Gorge), Ibar, Western Morava, Jerma, etc. (Jevremović et al. 2011). They are also common in mountainous regions where talus forms (in the Šar and Prokletije Mountains, as well as in the Suva Planina Mountains and the mountains Tupižnica, Mali Krš, Veliki Krš, etc., in eastern Serbia). Large rock falls often lead to disruption of road and rail traffic and less frequently to the formation of dams across river courses (those of the rivers Jerma and Western Morava).

#### 7.2.2.5 Cryo-nivation Process and Forms

Cryo-nivation processes take place in Serbia in its high-mountainous parts, more precisely above the forest treeline, whose natural boundary in the Prokletije Mountains, in the Šar Mountains and on Mt. Kopaonik is between 1800 and 1900 m a.s.l. (Gavrilović 1990a, b), whereas in the Stara Planina Mountains, it is at 1900–2000 m a.s.l. (Belij et al. 2007). This area has a high-mountain climate characterized by average annual air temperatures between 0 and 2 °C, with 90–120 freezing days and about 1200 mm of annual precipitation in the Stara Planina Mountains (Belij et al. 2007). On the Pešter plateau (about 1000 m a.s.l.), the average annual air temperature is 6.1 °C, and the lowest ever measured was -38 °C (Rakićević 1971, Belij et al. 2004). However, deforestation (anthropogenic lowering of the upper forest treeline) (Gavrilović 1970) and certain local occurrences (e.g. frost in karst uvalas) allow the cryo-nivation process to take place at much lower elevations. Cryo-nivation forms on the Pešter plateau (Belij et al. 2004) and on Mt. Beljanica (Belij et al. 1997) appear already at 1000 m a.s.l., while in the Stara Planina Mountains they can be seen at 1600 m a.s.l. (Gavrilović 1970). On average, 46 days of repeated cycles of freezing and thawing of soil without snow cover are recorded annually on the Pešter plateau, 40 on Mt. Tara and 13 on Mt. Zlatibor (Belij et al. 2004).

Earth hummocks are prominent features that need to be mentioned. They have been studied on the Pešter plateau (Belij et al. 2004), on Mt. Beljanica (Gavrilović 1968; Belij et al. 1997), in the Stara Planina Mountains (Gavrilović 1990a, b), on Mt. Zlatibor (Ducić et al. 2006), in the Šar Mountains (Belij 1992) and in the broader vicinity of the lake Vlasinsko Jezero (Milivojević 2015; Milošević et al. 2007). Additionally, sliding blocks and numerous cases of solifluction were discovered in the Šar Mountains (Belij 1992).

#### 7.2.2.6 Anthropogenic Process and Forms

Particularly important anthropogenic activities, in terms of geomorphological processes, include the following technical-construction works: surface mining (in the Kolubara, Kostelac, Kosovo and other basins); construction of hydro accumulations (on the rivers Drina, Vlasina and Western Morava and in the Djerdap Gorge of the Danube); digging of shipping canals (the Danube-Tisza-Danube hydrosystem); creation of melioration channels (with a total length of about 20,000 km in Vojvodina): cut-off of meander loops and shortening of water courses flows (along the Morava and Tisza Rivers); riverbed displacement (in the case of the Kolubara River); road and railway construction, etc.

As a result of hydro-technical activities, the natural pattern of the Morava River has been significantly disturbed. Its length, from what was originally 245 km, has been reduced to about 180 km since 1966 by cutting off 23 meanders from a total of 66. During periods of high water levels, the adjoining alluvial plains were flooded over distances of 4–5.5 km before levees were constructed, but only 1–1.5 km afterwards. Similar measures were carried out on the Tamiš River, which was shortened as much as 140 km by cutting off 77 meanders (Dukić 1978).

The exploitation of different ores by surface mining has resulted in complete alteration of the primary landscape (Gajić 2005; Djeković and Gvozdenović Dinić 1967). The "South Revir" open pit near Majdanpek (eastern Serbia) is elliptically shaped, 2450 m long, 1600 m wide and about 470 m deep. Since 1958, more than 1.1 billion tons of material has been mined. The "North Revir" pit is of similar shape, 1900 m long, 1100 m wide and 315 m deep.

Significant geomorphological changes have been produced by displacement of water courses. Removal of water from the bed of the Kolubara River into the bed of the much smaller adjacent Peštan River led to enhanced fluvial erosion, including erosion of the riverbanks and development of meanders (Djeković and Gajić 2006; Dragićević et al. 2015).

### 7.2.3 Palaeorelief Forms

On the territory of Serbia, besides recent forms, ones that were sculptured in previous phases of relief formation have been preserved and are properly referred to as palaeoforms. They have been more or less modified by recent processes. Four categories are distinguished among them: abrasional, karstic, aeolian and glacial.

#### 7.2.3.1 Palaeoabrasion Relief Forms

In the Serbian relief, from south of the Pannonian Plain to Mt. Zlatibor, there is a series of seven plateaus located at altitudes ranging from 120–140 m a.s.l. to 850 m a.s.l. These plateaus represent the largest macro relief forms in the relief of Serbia. The plateaus are horizontal, northward dipping, situated one beneath another and partly dismembered by shallow valleys formed by erosion that allow the entire geological column to be observed. At the time of the earliest geomorphological research, the plateaus in question were attributed to abrasion by the Pannonian Lake. The higher-placed plateaus were formed during the Pontian, the lower ones during the late Pliocene (Cvijić 1909). Their doubtful abrasional origin was a subject of much research in the middle of the last century (Jovanović 1951, 1953; Marković 1966, 1967). The obtained results indicated that their origin can be attributed to fluvial-denudation processes after retreat of the Pannonian Lake.

Only the lowest-lying terraces that arise immediately above the southern part of the Pannonian basin's bottom, as well as in some Neogene basins (the Soko Banja and Svrljig basins), can be considered palaeoabrasion forms.

#### 7.2.3.2 Palaeokarst Forms

Carbonate rocks in Serbia range in age from pre-Proterozoic marbles (vicinity of Prokuplje), Permian limestones (vicinity of Valjevo) and thick carbonate accumulations from the Mesozoic Era in eastern and western Serbia to Miocene marly-clayey limestones in the vicinity of Belgrade. Significant evidence of palaeokarst, preserved in the form of surface and underground relief features, has been found at a number of places in Serbia (Gavrilović 1985).

Surface forms include relics of cone karst on the mountains Beljanica and Kučaj, as well as on the Tepoš plateau in the southeastern part of Serbia (Gavrilović 1969, 1970a, b). These cone-shaped surfaces are 40–100 m high and range from 0.4 to 1 km in diameter. They are found at elevations between 680 and 900 m a.s.l. Vertical channels filled by sediments occur on the summits of some of them. Excavation of sediments (digging of mine shafts) revealed layers of brown coal up to 1.5 m thick. According to fossil flora remains, the coal is estimated to be of Middle and Late Miocene age (Pantić 1956,) and its formation judged to have occurred under conditions of sub-tropical to tropical humid climate. Loess-filled fossil sinkholes of Pliocene and Late Pleistocene age were discovered in the vicinity of Belgrade (Gavrilović 1985).

Mining activities in Serbia have contributed significantly to the discovery and exploration of underground palaeokarst forms. Exploratory boreholes and coal exploitation on western slopes of the mountains Beljanica and Kučaj revealed the presence of Palaeogene karst features (sinkholes, dolinas and uvalas about 1 km in width and 100 m in depth) in Cretaceous limestones overlain by Miocene sediments more than 400 m thick (Maksimović 1956). Exploitation of coal of Lower Miocene age in the vicinity of Krepoljin (western slopes of Mt. Beljanica) revealed sinkholes and uvalas about 0.5 km$^2$ in area built in Jurassic limestones (Miljković 1986). The exploitation of antimony (in the vicinity of Krupanj) led to discovery of a shaft about 30 m deep in Upper Carboniferous-Lower Permian limestones, while mineralization took place in the Oligo-Miocene (Djuričković 1982). The excavation of marble in Venčac (near the town of Arandjelovac) led to discovery of several caves that are almost completely filled-up by terra rossa (Janković 1997). The recrystallization of limestones into marbles took place in the Miocene, although these caves could have been sculptured in the Upper Miocene and Pliocene (Gavrilović 1996). The exploitation of lead-zinc ore in the Stari Trg mine (on the southern slopes of Mt. Kopaonik) made possible the excavation of a shaft system within marbleized limestones. The shaft extends from 730 to 135 m a.s.l. and was formed during the Early Paleogene (Petrović 1969).

#### 7.2.3.3 Palaeoglacial and Palaeo cryo-nivation Relief Forms

Records of Pleistocene glaciation are found in the highest mountainous parts of Serbia. Glaciation embraced the highest levels of the Šar and Prokletije Mountains (Cvijić 1913; Menković 1971/1972, 1994), where the appearance of cirques, valleys and moraines was ascertained. The cirque and valley types of glaciers prevailed, whereas plateau glaciers were recorded on flatten surfaces in the Šar Mountains.

In the Šar Mountains (2748 m a.s.l.), glaciers formed moraines at the end of cirque valleys (the oldest), down cirques and in cirques themselves (Menković 1977/78, 1990). The total area covered by glaciers was from 30 to 35 km$^2$ (Menković et al. 2004). The ELA value varied between 1900 and 2000 m a.s.l. on NW and NE exposures, but ranged from 2100 to 2300 m a.s.l. on southern ones (Kuhlemann et al. 2009).

Older and younger moraines, as well as ones formed inside cirques during the youngest glaciation phase, were found in the Prokletije Mountains (2656 m a. s. l.) (some of them are in Kosovo-Metohija) (Menković 1994). The ELA was at 1900 m a.s.l. on the north side, and at about 2200 m a.s.l. on the south side (Menković et al. 2004).

Impacts of low temperatures and enduring snow during former cold periods in the Quaternary are evident at many places in the relief of Serbia.

Examples of patterned ground (circles and stripes) are found on Mt. Beljanica. Their formation is linked with the last colder phase of the Pleistocene, when the mean annual temperature ranged between 0.7 and − 0.8 °C (Gavrilović 1968). Based on it, as well as on the presence of stone stripes in the Stara Planina Mountains, it was possible to determine the lower boundary of frost sorting during cold Pleistocene periods.

During the last glacial phase, regions above 1600 m a.s.l. in the Suva Planina were constantly exposed to conditions resulting in the formation of permafrost, while seasonal frost appeared up to 1200 m a.s.l. (Milić 1970). Records of two or three solifluction phases from the last glacial episode were noted by investigators in eastern Serbia, on the terrace of Lepenski Vir above the Danube (Milić 1972). Similar clues from the same period were found in the valley of the river Tumanska Reka, in the vicinity of Kučaj, on SW slopes of the Suva Planina Mountains and in the vicinity of Niš (Zeremski 1990).

#### 7.2.3.4 Palaeoaeolian Relief Forms

The formation of sandy terrains and loess plateaus through deposition of aeolian sediments in higher regions of the Pannonian Plain started over a million years ago (Marković et al. 2011), whereas in lower regions their formation began 600–700 thousand years ago (Jovanović et al. 2010). Climate changes in the Pleistocene accelerated loess deposition during glacial stages and their stages (under moderate steppe conditions on the Pannonian Plain) and slowed it down during interglacial and interstadial periods (pedogenetic processes). Aeolian forms that can be recognized at the surface on sandy terrains and loess plateaus were formed during the last phase, when the aeolian process was considered to be the dominant geomorphological process. Afterwards, not so long ago, under conditions of natural changes and increasing anthropogenic activity, this process lost its role and was replaced in importance by chemical erosion, denudation, suffosion, etc. For that reason, sandy terrains and loess plateaus as the most prominent macro features produced by the aeolian process, including typical aeolian relief forms such as dunes and the troughs between them, are considered to be palaeoforms in the relief of Serbia.

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Geomorphological processes were driven by factors such as complex geological composition, the tectonic fabric and diverse climate, which fluctuated significantly during the Quaternary. The evolution of relief was subjected to changes in the intensity of geomorphological processes, as well to their alternations. Accordingly, both recent and palaeorelief forms appear in the relief of Serbia. The latter include palaeoabrasion, palaeoglacial, Palaeo cryo-nivation, palaeoaeolian and palaeokarst forms. Recent forms developed under the influence of contemporary morphogenetic processes and significant anthropogenic impact. Fluvial-denudation relief is the dominant form, but karst and colluvial relief are of considerable distribution as well. Among colluvial forms, the most conspicuous in terms of distribution, frequency and consequences are landslides. The highest mountainous parts are exposed to cryo-nivation processes. Both spontaneous and planned activities of humans have in significant measure altered recent geomorphological processes. A situation that has yielded some positive results, but that in many cases has had negative effects as well, not only on nature but also on humans beings themselves (Fig. 7.2 and Fig. 7.3).


**Fig. 7.2** (**a**) Calcareous tufa deposits on the river Sopotnica, Jadovnik Mt., western Serbia. (**b**) Vernjikica Cave, Carpathian-Balkan mountains, eastern Serbia (photo by Dragan Smiljković). (**c**) Rimstone dams, Stopića pećina cave, western Serbia. (**d**) Siphon cave, Krupajsko vrelo spring, deep 123 m, eastern Serbia (photos by Predrag Djurović)


**Fig. 7.3** (**a**) – Recent cryo-nivation and Pleistocene glacial relief, Prokletije Mountains. (**b**) Anthropogenic relief, coal mine Kostolac. (**c**) Alluvial plain technogenic changed (Vršac, Pannonian Plain). (**d**) High fluvial-denudation plateau on Mt. Kopaonik (at 1600–1800 m a.s.l.) (photos by Predrag Djurović)

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# Biogeographical Characteristics of the Territory of Serbia: Richness and Spatial Distribution of Biodiversity, Endemism and Biogeographical Regionalization

8

Vladimir B. Stevanović

**Abstract**

The central Balkan position of Serbia accounts for its considerably rich biogeographic diversity. Owing to its climatic, orographic and pedologic features, the territory of Serbia is well suited for existence of different geo and migrant elements of plants and animals, and unique spatial and temporal structuring of its ecosystems. Here, many species originating from different European regions came close and made their home on this "crossroads" territory in contact with local living world, thus creating together biota that are complex or exceptional in composition. The succession of major geotectonic and climatic perturbations and changes unfolding through time and space across the country's territory preserved, in its turn, richness of Balkan endemic species and significant centres of speciation and divergence for many plant aggregates and complex species of vascular flora, and for animal groups of cryptobionts (in karstic caves) and phanerobionts (arthropods, gastropods and vertebrates); thus, giving rise to manifold ecological relations and influences. In consequence, the biogeographical regionalization of Serbia is truly complex. In horizontal zonation, the territory of Serbia is characterized by three biogeographical regions outlined by specific zonal ecosystems spreading from lowlands to the foothill zone: Mediterranean-sub-Mediterranean, Central European and Pontic-South Siberian regions. The altitudinal zonation of ecosystems shows two biogeographical entities: South European montane-subalpine region and Central-South European subalpine-Alpine region.

**Keywords**

Biogeographical characteristics · Biodiversity · Vascular flora · Vertebrate fauna · Endemism · Biogeographical regionalization · Serbia

Serbia spreads across the central part of the Balkan Peninsula and south-eastern expanses of the Pannonian Plain, and this geographical position accounts for the outstanding diversity of its biogeography. Historically, the principal events in the region took place during the Tertiary and Quaternary, when profound geotectonic and climatic changes shaped its relief and geology, and changed forever its biota. In the course of time, the appearance of the region's features underwent modifications through centuries-long anthropogenic influences, and the sum of effects brought about by those major determinants is now clearly evident in the current distribution of all existing plants, animals and fungi and is also reflected in different aspects of its ecosystems. The complexity of Serbia's biogeography is mainly due to its highly diverse orographic characteristics with many variants of the basic climate types. To be specific, Serbia's relief varies from lowlands stretching along big rivers, loess plateaus, sandy areas and hills in the province of Vojvodina in the north to the mountainous areas in the country's southern parts. In terms of geology, the southern part, that is, the entire area south of the Sava and Danube Rivers, is also very diverse, with riverbeds and valleys cutting through its relief and fragmenting it. Four mountain ranges meet on the country's territory: (a) the Carpathian-Balkan Mountains in northeast and eastern Serbia; (b) the Rhodopes in southern and central Serbia; (c) the Dinaric Alps (Mt. Tara in western Serbia, Mts. Golija and Jadovnik in southwest Serbia and the Prokletije Mountains in Metohija); and (d) the Scardo-Pindic Mountains in the south of Metohija and Kosovo (the Šar Mountain massif).

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Altitudinal zonation of ecosystems and biomes is evident on all of the mountains higher than 1000 m, particularly on those higher than 2000 m. It varies depending on the mountain's geographical position, the direction of its axis, its massiveness and height and its geological composition, as well as on the existing complex of other environmental conditions.

In short, owing to its specific climatic, orographic, petrographic and pedological features, the territory of Serbia is well suited to sustain the existence of a large number of different geo and migrant elements of flora, fauna and fungi, thus, determining unique spatial and temporal structuring of each ecosystem. It is important to note that biogeographical characteristics may often be entirely different from one end to another within a relatively small area, so that the distribution of the living world and ecosystems in Serbia is most often mosaic like and overlapping, which in the final analysis makes biogeographical division and regionalization quite intricate. Also adding to the complexity is the presence of a large number of plants and animals which, spreading from neighbouring territories, reach the farthest boundaries of their respective ranges on the territory of Serbia: their northern boundaries if they originate from the Mediterranean region, their southern boundaries if they are spreading from the Boreal and central parts of Europe, their westernmost extent for taxa coming from the Pontic-Caspian and Turanian regions, or their eastern boundaries for representatives from the Atlantic parts of Europe.

## 8.1 Assessment of Biodiversity

The accumulated knowledge about the living world of Serbia varies from one group of plants, animals and fungi to another, both in scope and in sufficiency. Certain groups of organisms have been very well researched, and while there is a wealth of information for some groups, a scarcity of data is still evident for others. In keeping with that state of affairs, estimates made so far regarding the distribution and extent of biodiversity, on both global and regional levels, have relied mostly on well-researched groups of organisms, as well as on the specific features of vegetation, that is, on ecosystems. Much along the same line of reasoning, it seems most appropriate that in the present survey, the biodiversity of the Serbia's territory is presented mainly based on available data about its vascular flora and vertebrate fauna, as those are the most thoroughly researched groups, and data on the characteristic ecosystems of this territory.

However, it is important to be aware of vigorous ongoing research, which is constantly filling gaps and broadening the overall knowledge about different groups of plant and animal organisms; and it is certain that with accruing information, the general understanding of Serbia's biodiversity is becoming clearer and more comprehensive.

The following quick look into some segments of the country's living world will illustrate its wealth and the intensity of relevant research, and may help to clarify why similar valuable data will have to be left out of the general estimate of biodiversity. For example, years of research have confirmed the existence of 797 taxa of bryophytes (661 mosses, 135 liverworts and 1 hornwort) (Sabovljević and Natcheva 2006; Sabovljević et al. 2008; Pantović and Sabovljević 2017), but these data are still incomplete, since the bryoflora remains insufficiently explored in many parts of Serbia (Bačka, eastern Banat, Mačva, Pomoravlje, Kosovo and southern Serbia). Similarly, in the case of macromycetes, which are known to abound in Serbia, the best explored are macromycetes of the phylum Basidiomycota (the subphylum of Agaricomycotina) and the phylum of Ascomycota (the subphylum of Pezizomycotina). Of these phyla, 625 species of macromycetes, classified into 253 genera and 53 families, have been found to grow in Serbia (Ivančević 1995).

Regarding the invertebrates in Serbia, the existing data vary greatly from one group to another: while some groups have been studied in great detail, only scanty information, mainly taxonomic, is available for others. So far, investigations have confirmed the existence of about 39.000 species of invertebrates: 200 species of protists, 310 of rotifers and cnidarians, 90 of flatworms (platyhelminthes), 30 of thorny-headed worms (acanthocephalans), 160 of roundworms (nematodes), 110 of earthworms (oligochaetes) and about 500 species of molluscs, 347 of crustaceans, 1373 of arachnids, 161 of myriapods and about 35.000 species of insects (Petanović et al. 2015). Of course, these numbers change rather quickly with new and detailed explorations of different groups of invertebrates.

These examples of uneven/insufficient information amply justify our decision to present the estimated distribution of biodiversity in Serbia through comparatively well-researched groups of organisms – the vascular flora and the vertebrate fauna.

### 8.1.1 Richness and Distribution of the Vascular Flora

Today, the vascular flora of Serbia can to a great extent be considered the most thoroughly explored and best-known group of organisms in the country. Floristic investigations were begun some 150 years ago by J. Pančić (published in his major works: Flora of the Principality of Serbia, 1874; Appendix to Flora of the Principality of Serbia, 1884), to be taken up by his immediate followers and were later continued by numerous botanists throughout the twentieth century. The investigations were always carried out in great detail and at times were very intensive, encompassing the entire territory of Serbia. Currently, the vascular flora of

Serbia is estimated to contain 4246 taxa in the rank of species (3690) and subspecies of native and non-native naturalized plants (Stevanović 2015; Niketić and Tomović 2018). With respect to its taxonomic structure, there are six divisions of the vascular flora: (1) club mosses (Lycopodiopsida), with two families, four genera and seven species; (2) ferns (Polypodiopsida), with 14 families, 22 genera and 67 species; (3) Gnetopsida, with one family, one genus and one species; (4) conifers (Pinopsida), with three families, five genera and 15 species; (5) monocots (Liliopsida), with 28 families, 168 genera and 809 species and subspecies; and (6) dicots (Magnoliopsida), with circa 100 families, c. 600 genera and c. 3350 species and subspecies (Niketić and Tomović 2018).

The chorological spectrum of the vascular flora bears specific attributes of a transitional geographical area which holds together Mediterranean and continental European (mid-European, Euro-Asian and Pontic) floral elements; at the same time, it also shows the important presence of Balkan endemics, as well as species with Alpine, Boreal and to a lesser degree, Arctic-Alpine distribution. The transitional character of the territory is closely reflected in the taxonomic spectra of this mix of coexisting Mediterranean and continental European floras, in which the families and genera with the largest number of taxa (in the rank of species/subspecies) hold the most prominent places. Such families are Asteraceae (c. 700 taxa), Fabaceae (c. 320), Poaceae (262), Brassicaceae (205), Caryophyllaceae (210), Rosaceae (198), Lamiaceae (193), Apiaceae (162), Ranunculaceae (112), Cyperaceae (116), etc. On the territory of Serbia, the genera with the greatest number of species and subspecies are *Hieracium* (190 species and subspecies), *Carex* (81), *Centaurea,* including *Cyanus* (73), *Trifolium* (64), *Ranunculus* (61), *Dianthus* and *Veronica* (51), *Campanula* (50), *Silene* (41), Viola (36), etc.

The spatial distribution of autochthonous vascular plants in Serbia is uneven. Some of the floristically richest regions are the mountains and highlands of Kosovo and Metohija (Mt. Koritnik and the Šar Mountain massif with its northern spurs Mts. Ošljak, Kodža Balkan and Ostrovica (DM3) and the Prokletije Mountains (DN2), with an estimated presence of more than 1500 taxa in the rank of species and subspecies on an area of 2500 $km^2$). The following are places where floristic richness is estimated at 1000–1500 taxa: mountains of western Serbia (Mt. Tara – CP3 and Mt. Golija – DP2), central Serbia (Mt Kopaonik – DN3) and eastern Serbia (Mts. Rtanj, Ozren and Devica, and the Svrljiške Planine Mountains – EP4, the Suva Planina Mountain – EN1 and FN1 and the Stara Planina Mountain – FP2 and FN1); a region of northern Serbia (Đerdap – FQ2); different localities in southern, northern and southeast Serbia (the Vlasina region, Mts. Besna Kobila and Strešer – FN2; the surroundings of Vranje – EN4; the Pčinja Valley, Mts. Kozjak and Dukat – EM3); and southeast Banat in the Vojvodina Province (the Deliblato Sands and southern part of the Vršac Mountains – EQ1). The poorest in recorded numbers of taxa is northern Serbia, where the northern and central parts of Banat, central Bačka and the Upper Danube Valley are home to less than 500 plant taxa (UTM squares in Fig. 8.1).

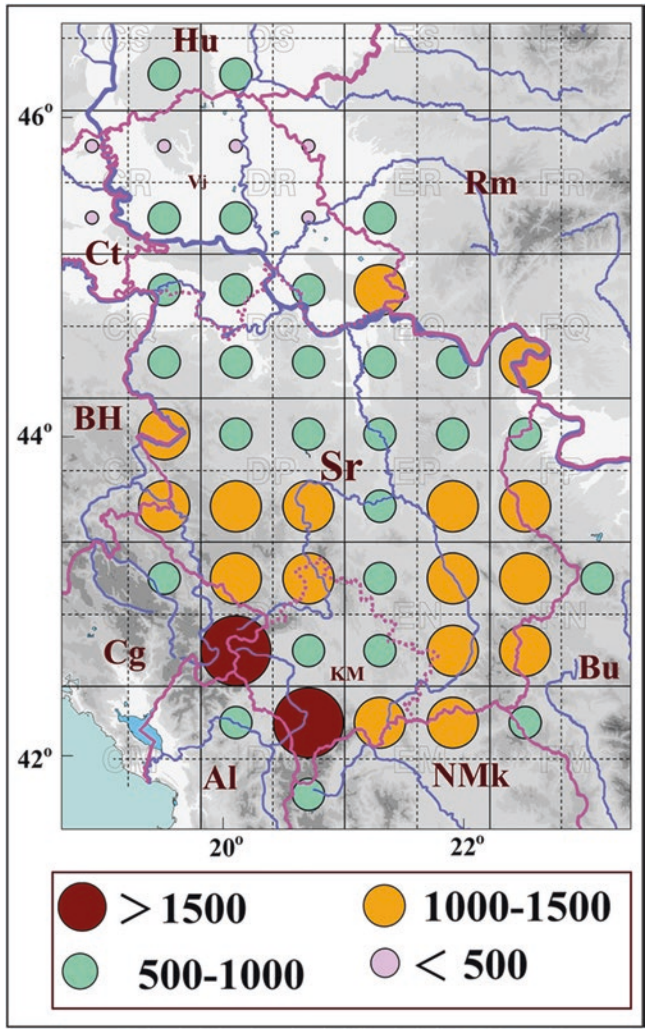


**Fig. 8.1** Estimation of richness and spatial distribution of the vascular flora of Serbia per UTM squares (50 × 50 km) (after Stevanović et al. 2002)

## 8.1.2 Richness and Distribution of the Vertebrate Fauna

In Serbia, as is the case in other parts of the world, vertebrates are the most thoroughly researched faunal group. Intensive investigations in the last 20 years have produced publications such as Check Lists and Red Data Books of certain groups of vertebrates, as well as specialized monographs and scientific articles on some particular species or groups of vertebrates (Simonović 2001; Jakšić 2003; Delchev et al.

2003; Ćurčić et al. 2004; Petrov 2006; Ćurčič et al. 2007; Kalezić et al. 2015; Tomović et al. 2015; Šćiban et al. 2015; Pavićević et al. 2015, 2018; Džukić et al. 2016; Radišić et al. 2019). The accumulated data greatly contributed to a more detailed and comprehensive understanding of the richness of species and their spatial distribution. These results also allowed for a critical appraisal of both the threat status of different constituents of the vertebrate fauna, and for the choice of an adequate strategy ensuring the conservation of faunal diversity. In this survey of biogeographical characteristics of the fauna of Serbia, we have drawn upon available data on the numbers and patterns of distribution of well-studied groups of these animals, viz., fish and tetrapod vertebrates such as amphibians, reptiles, birds and mammals.

**Freshwater Fish (Ichthyofauna)** The Serbian fauna of freshwater fish comprises about 90 species (of which 13, i.e. 14%, are introduced) belonging to 22 families and 59 genera (Janković and Krpo-Ćetković 1995; Simonović 2001). The highest number of species (about 70%) is recorded in rivers of the Black Sea basin (the Danube and its tributaries), which is the largest river basin in terms of drainage area. In comparison, there are significantly fewer species (17%) in rivers of the Adriatic drainage basin, which covers a limited area in Kosovo and Metohija (the Beli Drim River with its tributaries), and also in those of the Aegean basin (6%) in southern Serbia (the rivers Lepenica and Pčinja with their tributaries). The total of about 90 freshwater fish species of Serbia represents 47% of the Balkan ichthyofauna, which numbers 190 species (Oikonomou et al. 2014). Only several families are somewhat richer in fish species, and these are Cyprinidae (14 species), Percidae (eight), Acipenseridae (six), Salmonidae (six), Gobiidae (five) and Cobitidae (four), whereas all others (16 families) are represented by only 1–2 species. The genera with the largest number of species are *Acipenser* (five species), *Neogobius* (five), *Gobio* (four), *Leuciscus* (four), *Alburnus* (three), *Abramis* (three), *Barbus* (three), *Rutilus* (three) and *Gymnocephalus* (three), the other recorded genera being represented by only 1–2 species. In terms of biogeography, the ichthyofauna of Serbia includes various faunal elements, dominated by European (39%), Ponto-Caspian (24%), Euro-Siberian (19%) and Palaearctic (19%) chorotypes, while the Euro-Mediterranean and Holarctic chorotypes are present in smaller numbers (14 and 4%, respectively) (Simonović 2001).

**Amphibians (Batrachofauna)** The territory of Serbia is home to 21 species of amphibians, which constitutes 64% of this fauna in the Balkans (circa 33 species), or about 25% of the batrachofauna of Europe (c. 85 species). The amphibians of Serbia are classified into two orders: Caudata and Anura. The order Caudata is represented by a single family, Salamandridae, with four genera: *Salamandra* (two species), *Ichthyosaurus* (one), *Lissotriton* (one) and *Triturus* (four); the order Anura by five families: Hylidae with the genus *Hyla* (one species), *Bombinatoridae* with the genus *Bombina* (two species), Bufonidae with the genera *Bufo* (one) and *Pseudepidalea* (one), Ranidae with the genera *Pelophylax* (three) and *Rana* (three), and Pelobatidae with the genus *Pelobates* (two species) (Džukić and Kalezić 2004; Vukov et al. 2013; Frost 2018).

It is important, however, to emphasize that the ancient phylogeographic clades of amphibians, centres of species origin and speciation, and microrefugia of these animals have remained preserved on the territory of Serbia (Vukov et al. 2013). This accounts for the presence of some primitive amphibians, such as Alpine newts, crested newts, fire-bellied toads and spadefoot toads (Džukić et al. 2005; Arntzen et al. 2007; Hofman et al. 2007; Sotiropoulos et al. 2007; Ivanović et al. 2012) (Fig. 8.2).

The number of amphibian species is highest in the northern part of central Serbia (Pomoravlje, Mačva and southern Banat), where 15–17 species are recorded in 50 × 50 km grids (Fig. 8.3a). The presence of six chorotypes – Europeo-Mediterranean (4.7%), Turano-Mediterranean (4.7%), European (14.3%), Turano-European (19%), Central European (28.6%) and Southern European (28.6%) – points to the biogeographical complexity of Serbia's amphibian fauna (Vukov et al. 2013).

**Reptiles (Herpetofauna)** The herpetofauna of Serbia is comprised of 24 species classified into three orders, Testudines, Lacertilia and Serpentes. The order Testudines includes two families, Testudinidae with the genus *Testudo* (two species) and Emydinae with the genus *Emys* (one). However, the majority of reptiles belong to the order Lacertilia, including four families, viz., Gekkonidae, with the genus *Mediodactylus* (one species); Lacertidae, with the genera *Algyroides* (one species), *Lacerta* (two), *Darevskia* (one) and *Podarcis* (three); Scincidae, with the genus *Ablepharus* (one species); and Anguidae, with the genus *Anguis* (one species). The order Serpentes contains two families: Colubridae, with the genera *Dolichophis* (one species), *Platyceps* (one), *Elaphe* (one), *Zamenis* (one), *Coronella* (one) and *Natrix* (two); and Viperidae, with the genus *Vipera* (three species) (Tomović et al. 2014). The total number of species of reptiles hitherto recorded in Serbia (24) represents about 34% of the Balkan herpetofauna and only about 17% of registered reptiles in Europe. The small contribution to the European reptile fauna can be explained by Serbia's geographical position. To be specific, Serbia is located in the Mediterranean hinterlands, and the spreading of species from this (the Mediterranean) region, the richest herpetofau-

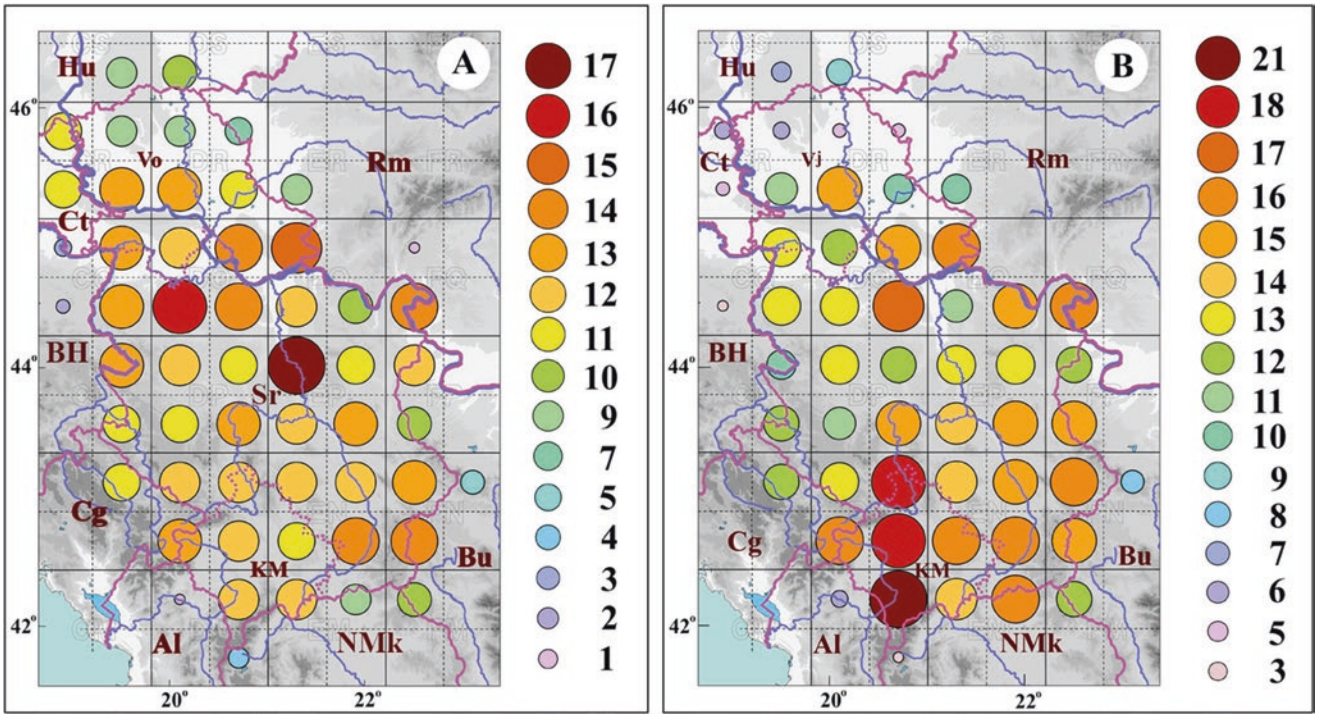


**Fig. 8.2** Richness and spatial distribution of the batracho- and herpetofauna per UTM squares (50 × 50) in Serbia: (**A**) Amphibians (after Vukov et al. 2013) and (**B**) Reptiles (after Tomović et al. 2014)

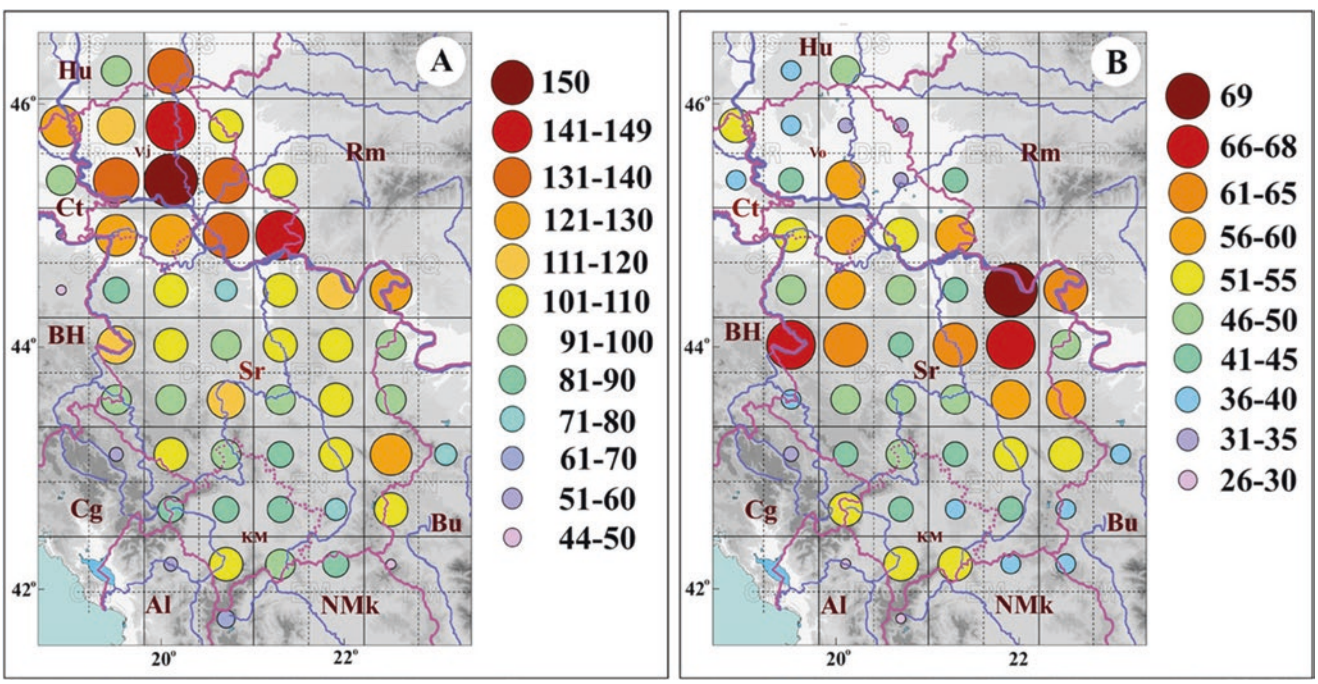


**Fig. 8.3** Richness and spatial distribution of nesting birds (from 1950 to the present) and mammals in Serbia per UTM squares (50 × 50): (**a**) Nesting birds (after Matvejev 1950, 1976; Radišić et al. 2019; Hagemeijer and Blair 1997; Puzović 2000; Puzović et al. 1999; Ham 1980; Vasić 1980; Vasić and Grubač 1983; Tucakov et al. 2009; Šćiban et al. 2012, 2015); (**b**) Mammals (after Paunović 2016; Petrov 1992; Paunović and Milenković 1996; Milenković and Paunović 2000; Paunović et al. 2008; Mitchell-Jones et al. 1999)

nal region in Europe, is thereby limited by inland orographic and climatic conditions. Even so, some Mediterranean endemic or subendemic species, ones such as *Algyroides nigropunctatus, Podarcis erhardii* and *Vipera ammodytes*, successfully thrive in Serbia.

In general, richness of the herpetofauna on the territory of Serbia is uneven, as is its distribution. Northern Serbia, particularly the northern part of Vojvodina, is noticeably poorer in comparison with the areas south of the Sava and the Danube (Fig. 8.3b). The highest number of reptiles is recorded in Metohija, primarily due to the presence of Mediterranean species that arrived in this area through the Drim Valley. The herpetofaunal chorotypes are mainly of Mediterranean origin, that is, East Mediterranean (nine species or 37,5%), or else they are Southern European chorotypes (five species or 20.8%); a smaller proportion of them are European elements, for example, Euro-Siberian elements – three species or 12.5%; and European elements – two species or 8.3% (Tomović et al. 2014).

**Birds (Ornithofauna)** The birds of Serbia have been better explored in its northern part (in Vojvodina) than in the area south of the rivers Sava and Danube. The ornithofauna includes a total of 352 species recorded in Serbia from the second half of the twentieth century. Of these species, c. 246 are regular breeding species, while c. 100 are vagrants, accidental guests, wintering or migratory birds (Vasić 1995; Šćiban et al. 2015; Radišić et al. 2019). Cumulative anthropogenic influences have had negative effects on the present composition of the breeding birds of Serbia. The most recent data are a warning and give rise to concern, since 168 species are listed as endangered to varying degrees according to IUCN criteria (Radišić et al. 2019).

Breeding birds of Serbia (241 species) represent around 50% of the breeding ornithofauna of Europe, which numbers 495 of these species according to the European Atlas of Breeding Birds (Hagemeijer and Blair 1997). The genera of breeding birds with the highest number of species are as follows: *Falco* (eight species), *Sylvia* (seven), *Parus* and *Emberiza* (six each), *Acrocephalus* and *Turdus* (five each) and *Caruelis* and *Corvus* (four each).

The nesting ornithofauna in Serbia has unequal spatial distribution (Fig. 8.3a). Numerous breeding birds, belonging to between 131 and 150 species (i.e. 55–60% of the total breeding ornithofauna), are registered on the territory of Vojvodina (Fig. 8.3a). There, the richest breeding bird areas are Mt. Fruška Gora and southern Bačka (DR2 and CR4), northeast Bačka and northern Banat (DR1) and the Subotica-Horgoš Sands with Palić and the Ludaš Lakes (DS2), as well as central and southern Banat, the surroundings of Belgrade and the Deliblato Sands with the Vršac Mountains and neighbouring wetlands (EQ1, DQ3 and DR4).

Other areas with a marked abundance of breeding birds (110–128 species) are to be found south of the Sava and Danube Rivers. Favourable nesting places in forests and rocky hills exist in eastern (FN1) and northeast (EQ4 and EP4) Serbia, on Mts. Tara (CQ3) and Kopaonik (DP4), as well as in the Šar Mountain massif (DM3 and EM1) (UTM squares in Fig. 8.3a).

The region of Vojvodina is remarkable for hosting a huge number of nesting waterbirds (32% of the total number of breeding birds in Serbia) owing to a plenty of wetland-type habitats. Usually nesting in these places are birds from the orders Anseriformes, Ciconiiformes, Pelecaniformes, Charadriiformes and Gruiformes, as well as some species from several genera belonging to the order Passeriformes (*Acrocephalus, Locustella* and *Motacilla*).

Wetland birds almost never or else rarely or sporadically make their nests in areas south of the Sava and Danube; for example, they nest in the following regions: the neighbourhood of Kladovo (FQ2), the Vlasina highlands (FN2) and the Krupačko Blato mudflats near Pirot (FN1) (see UTM squares in Fig. 8.3a).

In contrast to composition of the ornithofauna of Vojvodina, birds with Boreal, Alpine (in smaller numbers) and Mediterranean distribution reside in the central and southern parts of Serbia, where mountains, hills and valleys prevail.

**Mammals (Teriofauna)** Mammals of Serbia are represented by 95 species, out of which 91 are native and 4 (*Ondatra zibetica, Myocastor coypus, Nyctereutes procyonoides* and *Herpestes auropunctatus*) are alien. The species are divided into following orders: Rodentia (34 species), Chiroptera (30), Carnivora (19), Eulipotyphla (11) and Artiodactyla (four) (Petrov 1992; Savić et al. 1995; Paunović 2016). The total number of mammals registered in Serbia (95 species) amounts to 46% of the European terrestrial teriofauna.

The order Rodentia is represented by 32 native and 2 alien species belonging to 21 genera. The number of rodent species (34) in Serbia constitutes 37% of the total European fauna of these mammals (Petrov 1992; Savić et al. 1995). The genera with somewhat more species are *Microtus* incl. *Pitymys* (seven species), *Apodemus* (five) and *Mus* (four). Moreover, it should be noted that three endemic rodents (*Mus macedonicus*, *Microtus feltenii* and *Dinaromys bogdanovii*) have been found on the territory of Serbia.

In the order Chiroptera (bats), 30 species are recorded, representing even 57% of the total number of European bats. The species are classified into four families (Rhinolophidae, Vespertilionidae, Miniopteridae and Molissidae) and 11 genera. Taxonomically richer genera are *Myotis* (10 species), *Rhinolophus* (five), *Pipistrellus* (four) and *Plecotus* (three) (Karapandža and Paunović 2014; Paunović 2016). It is important to note that the bats' centres of distribution are situated in karst caves in western, southeast and eastern Serbia.

The order Carnivora numbers 18 species, 16 native and 2 alien, which represents 84% of terrestrial carnivorans in Europe. Native species belong to the families Mustelidae, Canidae, Felidae and Ursidae, and there are eight genera belonging to those families, namely *Mustela* (six species), *Canis* (two), and *Vormela, Lutra, Vulpes, Lynx, Felis* and *Ursus* (one species each).

The order Eulipotyphla has 11 species, or 38% of the European fauna of this group of mammals (Petrov 1992; Savić et al. 1995). The species are grouped into three families (Erinaceidae, Soricidae and Talpidae) and five genera. All genera have only a few species: *Talpa* and *Sorex* (three species each), *Neomys* and *Crocidura* (two species each) and *Erinaceus* (one species). It should be noted that the sole Balkan endemic species belonging to this order, *Talpa stankovicii*, is found in Serbia, in the Šar Mountain massif in the region of the border with North Macedonia.

Serbia is also home to some representatives of the order Artiodactyla (even-toed ungulates), belonging to three families (Suidae, Bovidae and Cervidae) and four genera. The indigenous even-toed ungulates *Sus scrofa*, *Rupicapra*, *Cervus elaphus* and *Capreolus* are animals that are hunted for food or for sport. Two alien game species, *Dama dama* and *Ovis orientalis*, members of the same order, are also to be found and are bred only on hunting grounds in Serbia.

A general survey of the distribution of mammals (Fig. 8.3b) shows that regions with a high number of species are located in southeast Serbia and western Serbia. To be precise, 61–69 species (or 64–72%) of mammals are found in the following places in southeast Serbia: Djerdap, the Homolje Mountains, the Kučaj Mountains and Mt. Beljanica (UTM squares EP1, EP3 and FQ2); and at several localities in western Serbia, such as Mts. Tara and Zlatibor and the town of Valjevo (UTM squares CP3 and DP1). Notably, the presence of an abundance of bats (55–65 species) inhabiting karstic caves increases the overall faunal richness of these parts of Serbia.

The complexity of biogeographical relationships within the heterogeneous vertebrate fauna in Serbia arises from the presence of a significant number of different chorotypes. A distinct feature of the entire territory is the convergence and overlapping of faunal elements of different geographical origin. In general, European and Eurasian chorotypes dominate the territory of Serbia, which indicates the widespread presence of species typical for the temperate continental zone. Mediterranean and Turano-Mediterranean chorotypes are present in smaller numbers. Finally, Boreal faunal elements occur as relics, this being a consequence of the species' southward retreat during the glacial periods. The presence of Boreal and Eurasian mountain chorotypes occurs on Serbian mountains only as isolated mountain "islands".

Viewed overall, the biogeographical composition is further enriched with faunal elements which (a) thrive in marginal zones of their ranges, (b) survive in fragmented parts of their ancient range or (c) live in refugial habitats.

Generally, endemism within the presented groups of vertebrates is rather small in Serbia when compared to the neighbouring territories of Southeast Europe, Greece in particular. Endemic species are rare among reptiles and mammals (three species per order) and lacking among amphibians and birds. There exist, however, some endemic subspecies, particularly among birds (Vasić 1995).

Taken altogether, a knowledge of biogeographical features of the presented vertebrates is of great importance in attempting to understand and interpret the full range of different faunistic and biogeographical relationships in Europe and the Mediterranean hinterland.

## 8.2 Endemism

Endemism is a biogeographical feature of exceptional importance, since awareness of its existence and appreciation of its presence greatly contribute to the ultimate evaluation of biodiversity for any region and help to define requirements for its protection. To say that elements of flora or fauna have an endemic character means they are characterized by a restricted geographical distribution in a defined area determined by interaction of physical, climatic and biological factors. Because endemics usually thrive in small restricted places, their survival is easily endangered, even to the point of extinction, particularly through negative human impact.

It is well known that the Balkan Peninsula is among the richest floristic-faunistic regions of Europe, and Serbia's territory in the peninsula's central part is notable for its richness in Balkan endemic species. Numerous endemic species inhabit its highland regions, gorges and canyons, karstic caves and edaphically specific habitats such as those on serpentine bedrock. As is always necessary in any case of endemism, the endemic flora and fauna of Serbia have to be studied within the historical context that is to say in light of the geomorphological, geotectonic and climatic changes that have unfolded in the Balkans from the Tertiary and Pleistocene until the present day. During this long period, manifold and active floro- and faunogenetic exchanges and relations took place between the Balkan Peninsula and its closer neighbourhood (the Mediterranean, Alps, Carpathians and Asia Minor) and/or remote territories (the Caucasus and mountains of Central Asia).

The great number of endemic species of different ages and with ranges of varying size are evidence of a multitude of influences and interrelationships, particularly in the case of Serbia's flora, but in that of its fauna as well. At present, this territory harbours Tertiary palaeoendemic species and at the same time species which evolved through speciation from Tertiary ancestors, and the evolved species can be either indigenous or imigrant elements from neighbouring or remote regions.

The complexity of biogeographical connections in the Balkans and in Serbia is also witnessed by the presence of vicarious species whose closest relatives originated from and today live in the neighbouring regions of Europe and Western Asia (the Mediterranean, Alps, Carpathians, Asia Minor and the Caucasus) or less often even in remote Arctic and Boreal regions of the Holarctic and Central Asia.

The greatest number of Balkan regional endemics and local or stenoendemic taxa are representatives of the vascular flora and certain groups of invertebrates, particularly ones that dwell in caves or in similar karstic structures.

### 8.2.1 Endemic Flora

Turrill (1929) gave the first complete analysis of the entire Balkan flora, setting its number at 6750 species, out of which 1754, that is, 28.86%, were endemic vascular plants. Since then and in work conducted from the beginnings of the twentieth century, numerous vascular plants with endemic distribution were found and described as new to science. At present, the entire vascular flora of the Balkan Peninsula is estimated at about 8000 species, with 2700–2800 endemic taxa in the rank of species and subspecies, which amounts to 33–35% of the entire flora (Stevanović 2005; Stevanović et al. 2007). This percentage of endemic taxa in the Balkan flora is similar to the share of endemic plants (36%) in the total Mediterranean flora (Greuter 1991).

The territory of Serbia has 490 recorded Balkan endemic taxa; their respective distributions can be confined to either a whole floristic province or only to some part of it, or else it can encompass several floristic provinces of the same floristic subregion (Tomović et al. 2014). Among the encountered species are as follows: *Acer heldreichii*, *Potentilla montengrina*, *Pedicularis hoermanniana*, *Geum bulgaricum*, *Ramonda serbica*, *Genista subspicata*, *Cerastium decalvans*, *Eryngium palmatum*, *Arabis bryoides*, etc. Relatively few in number are the district or steno-endemics, that is, local endemics with ranges limited to only a small part of the Serbian territory. They are found in different parts of Serbia, most often restricted to a single mountain or mountain massif. Examples of local endemism in the vascular flora of Serbia are as follows: *Centaurea melanocephala* (Mt. Stolovi); *Knautia pancicii* and *Centaurea zlatiborensis* (Mt. Zlatibor); *Achillea alexandrii-regis*, *Cerastium neoscardicum*, *Bornmullera dieckii*, *Potentilla doerfleri* and *Verbascum scardicola* (the Šar Mountain massif); *Aquilegia pancicii* (the Suva Planina Mountain); *Heliosperma oliverae, Pedicularis ernesti-mayei* (Mt Prokletije) and *Cardamine pancicii* (Mt. Kopaonik); *Nepeta rtanjensis* (Mt. Rtanj); *Potentilla nicicii* (Mt. Vrška Čuka); *Tulipa serbica* (Mt. Rogozna); *Crocus rujanensis* (Mt. Rujan), etc.

Balkan endemic species inhabit some distinctive places in Serbia: (a) regions of mountains and high mountains (the "mountain-island" type of endemism), (b) gorges and canyons (the refugial type of endemism) and (c) areas with a specific geological substrate (the edaphic type of endemism). It is not uncommon to encounter two or even all three types of endemism existing in close neighbourhood within some area.

The greatest numbers of endemic taxa are recorded on the Prokletije and Šar Mountain massifs, around 122–142 and 115–128, respectively (Fig. 8.4).

Richness of the endemic flora in mountainous parts of Serbia is closely correlated with height and massiveness of the mountains, their geological diversity and phenomena of Pleistocene glaciation, and it is favoured by relative isolation in the general landscape and from neighbouring mountains.

Limestone gorges and canyons are fascinating refugial habitats of Balkan palaeoendemics (the example in point are the plant species *Ramonda serbica* and *R. nathaliae*); of endemic orophytes of the surrounding high-mountain flora

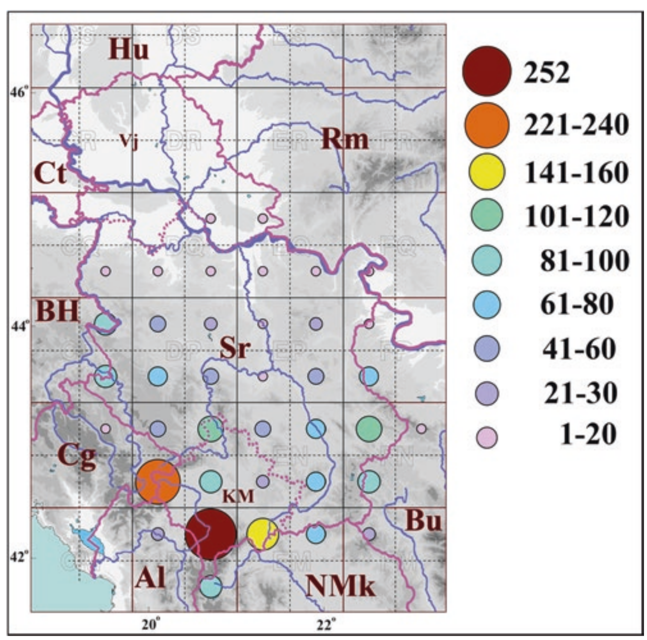


**Fig. 8.4** Summary of distribution of the Balkan endemic flora in Serbia represented by the number of taxa at species and subspecies rank per 10 × 10-km UTM square (after Tomović et al. 2014). Size and colour of the dots correspond to the numbers of endemic taxa

(*Amphoricarpos autariatus*, *Daphne malyana*, *Achillea serbica*, *Silene saxifraga* aggr. and *Edraianthus graminifolius* aggr.); and of Mediterranean (Adriatic) endemic plants.

In fact, especially many Mediterranean endemic plants (*Teucrium arduinii*, *Micromeria albanica*, *Dioscorea balcanica, Genista dalmatica*, *Onosma stelulatum,* etc.), in their retreat from the perils of climatic changes, remained in refugial habitats of the Balkan gorges, where the prevailing conditions made their survival possible; the refugia kept them thriving, albeit in isolation, as events during the Ice Age brought about shrinking and fragmentation of their ancient, widespread ranges. Those refugial spaces deserve special attention, care and protection, since they are now distant from the present-day centres of distribution of their endemic inhabitants. The best-known refugial spaces of endemic flora in Serbia are in narrow and steep-sided river valleys, canyons and gorges: the gorges of the Pećka Bistrica River, those of the Prizrenska Bistrica River, the canyon of the Drina River, the gorges of the Jerma River and Nišava River near Sićevo, the canyon of the Lazareva Reka River near Zlot, the gorges of the Ibar River, those of the Mileševka River, etc.

Particularly interesting is the existence of diverse edaphic endemism in the Balkans and in Serbia. In western and central Serbia, and especially in Metohija, there are discontinued serpentine areas of varying sizes, covered with highly specialized serpentinophytes. A singular feature of these habitats is the presence of endemic obligate serpentinophytes, plants such as *Potentilla visianii*, *Drymocallis malacophila*, *Haplophyllum boisserianum*, *Gypsophila spergulifolia*, *Halacsya sendtneri*, etc. In the Balkans altogether, the richness of endemic plants growing in serpentine habitats increases going from central Serbia across Albania to Greece (Stevanović et al. 2003).

### 8.2.2 Endemic Cave Fauna (Troglofauna)

Caves represent a unique oligotrophic underground environment distinguished by microclimatic stability throughout the year; these are cool and humid dwelling places with constant temperature. The cave food chain is extremely lopsided, since it lacks any producers and all the inhabitants are consumers and/or decomposers (fungi and bacteria). The bottom of the food chain, as the source of energy, consists of organic detritus washed in from outside, bats guano and other excrements. There are three basic types of cave-dwelling animals: (1) troglobionts, true cave dwellers; (2) troglophiles, cave-loving animals that inhabit caves but also survive aboveground; and (3) trogloxenes, cave guests, sporadic, facultative components of the troglofauna. The most numerous residents of karstic caves in Serbia are diverse groups of invertebrates, mainly troglobionts and troglophiles, both with numerous endemics.

Focused investigations of the troglofauna in the last 30 years kept bringing to light new facts about the living world from caves of the karstic terrains in the eastern Dinarids (in western and southwest Serbia and in Metohija) and in the Carpatho-Balkan mountain massifs (in southeast and eastern Serbia). In almost every cave explored to date, previously unknown species and genera of various groups of invertebrates were discovered and taxonomically described as new to science.

This subterranean habitat is home to heterogeneous, mixed communities of diverse groups of invertebrates with different taxonomic ranks. The present survey will centre on representatives of the phylum Annelida (class Oligochaeta); the phylum Arthropoda: subphylum Chelicerata (class Arachnida, orders Araneae, Opiliones and Pseudoscorpiones); the subphylum Myriapoda (classes Diplopoda and Chilopoda); the subphylum Crustacea; the subphylum Hexapoda (classes Entognatha and Insecta); and the phylum Mollusca (class Gastropoda).

The class Oligochaeta of the phylum Annelida in Serbia numbers 74 species of terrestrial worms, of which 26 species or 35% are endemics. Endemism is particularly pronounced in the following genera: *Dendrobaena, Allolophophora, Cernosvitovia* and *Fitzgeria.* However, only a few endemic species are troglobionts and/or troglophiles (Stojanović et al. 2008, 2017; Trakić et al. 2018).

According to Deltchev (1999), *1409 spiders from the order Araneae (Arachnida, Arthropoda) are registered on the Balkan Peninsula. In Serbia, 635 species have been recorded so far, or 45% of the total number of Balkan spiders* (Deltchev et al. 2003; Ćurčić et al. 2007a). In Serbia, there are 59 cavernicolous spider species, or 18% of the Balkan troglofauna. The major contributors are trogloxenes (26 species) and troglophiles (20), in contrast to the smaller number of troglobionts (13). Caves in Serbia are the dwelling place of seven Balkan endemic troglobionts (from the genera *Protoleptoneta, Centromerus, Fageiella Lepthyphantes Palliduphantes and Sulcia), but only one troglophile (from the genus Histopona).* All other cave-dwelling spiders are widely distributed on the Balkan Peninsula *(Deltchev* 2008*; Deltchev* et al. *2014).*

The fauna of the order Opiliones *(Arachnida, Arthropoda) in Serbia includes more than 100 species split into 32 genera and eight families (Karaman* 1995a*). Five* troglobionts and troglophiles from the genera *Cyphophthalmus* (four species) and *Trojanella* (one species) are local Balkan endemics (Boyer et al. 2004; Karaman, 2005, 2009).

The order Pseudoscorpiones (Arachnida and Arthropoda) in Serbia is represented by 84 cave-dwelling false scorpions, of which more than 60% are predominately local endemics. To be precise, endemic species from the genera *Chthonius*, *Neobisium* and *Roncus* generally occupy either only one or several nearby caves in northeast, eastern and western Serbia (Ćurčić et al. 2004).

According to current data, the fauna of the class Diplopoda (Myriapoda and Arthropoda) in Serbia consists of more than 100 species classified into 44 genera, 16 families and 7 orders. This group of arthropods is characterized by a great number of endemics, that is, 27 species are Balkan endemics, whereas 18 are strict local endemics of Serbia, which account for 45% of presently known millipedes in Serbia (Makarov et al. 2004; Antić et al. 2013).

The number of myriapods from the class Chilopoda (Myriapoda and Arthropoda) in Serbia amounts to 61 species from four orders, namely Scutigeromorpha (one species), Lithobiomorpha (31), Scolopendromorpha (five) and Geophilomorpha (24) (Mitić and Tomić 2002; Mitić et al. 2014).

Troglobionts and/or troglophiles are recorded in both classes of Myriapoda in Serbia. Cave-dwelling species of the class Diplopoda belong to the genera *Serbosoma, Leptioiulus* and *Serboiulus,* while those of the class Chilopoda belong to the genus *Lithobius*. All cavernicolous endemic myriapods usually live in karstic caves of the Carpatho-Balkan mountain massif in southeast and eastern Serbia, as well as in caves of the eastern Dinarids in western and southwest Serbia and Metohija.

In general, the subphylum Crustacea (Arthropoda) in Serbia includes organisms living in aquatic or moist terrestrial habitats. Of the two crustacean orders in Serbia (Isopoda and Amphipoda), Isopoda has more cave-dwelling species, either troglobionts and/or troglophiles (especially in the genera *Hyloniscus, Macedonicus*, *Microtithanetes, Trichoniscus* and *Sphaeromides*) (Ćurčić and Decu 2008). As noted by Karaman (1995), a certain number of endemic crustaceans from the genera *Nyphargus* and *Bogidiella* (Gammaridea and Amphipoda) sporadically colonize caves in Serbia. Apart from that, a large number of such endemic shrimp-like troglophile crustaceans inhabit caves of the Dinaric karst in Montenegro, Herzegovina and Croatia.

Representatives of the cave fauna from the subclass Collembola of the class Entognatha (Hexapoda, Arthropoda) in Serbia number about 20 species from 13 genera and 4 families (Hypogastruridae, Neanuroidae, Enthobryidae and Sinthuridae). Troglobiont and troglophile springtails are usually present in the genera *Trojanura*, *Hymenaphorura* (*H. uzicensis*), *Onychiurus*, *Protaphorura, Entomobrya*, *Heteromurus, Pseudosinella, Arrhopalites, Megalothorax* and *Serbiella* (Ćurčić and Decu 2008).

Endemic taxa inhabiting caves in Serbia have been confirmed in several orders of the class Insecta (Hexapoda, Arthropoda). Thus, the endemic-rich order Orthoptera, which numbers 190 taxa in total (or 40% of the Balkan and 17.5% of the European fauna of these insects), has 20 endemic species. However, only four of those endemics are cave-dwelling animals, and all of them are from the same genus, namely *Troglophilus* (*T. brevicauda*, *T. lazaropolensis*, *T. neglectus* and *T. cavicola*) (Karaman I et al. 2011; Pavićević et al. 2018). On the other hand, the order Coleoptera is distinguished by a huge number of endemic cavernicolous insects, particularly in its families Carabidae (subfam. Trechinae) and Leiodidae (subfam Cholevinae). About 50 endemic taxa from these families have been found in caves, sinkholes and other karstic cavities in western and eastern Serbia. The genera richest in troglobiont and troglophile endemics are the genus *Duvalius* (more than 20 species); the genera *Pheggomisetes, Velesaphaenops* and *Acheroniotes* (fam. Carabidae); and the genera *Pholeuonopsis, Remyella, Proleonhardella* and *Pavicevicia* (fam. Leiodidae, subfam. Cholevinae) (Ćurčić et al. 2004, 2018a; Vrbica 2017; Vrbica et al. 2017; Njunjić et al. 2017).

Serbia harbours about 300 species from the class Gastropoda (Mollusca), which reside in aboveground and underground waters, in moist terrestrial habitats and in caves and cave entrances (Karaman 2007). In addition, out of the total number of gastropods, more than 70 taxa are Balkan endemics, whereas only several taxa have restricted distribution on the territory of Serbia (Jovanović 1995; Karaman 2007). Endemic subterranean taxa from the class Gastropoda are affiliated with the following families: Orientalidae (genera *Grossuana, Terranigra, Sarajana, Saxurinatror, Paladithiopsis* and *Iglica*), Bythinelidae (*Bythinella*), Pupillidae (*Speleodiscus*) and Zonitidae (*Vitrea*) (Jovanović 1995; Ćurčić and Decu 2008).

To fully appreciate the richness, diversity and, in particular, endemism of the troglofauna in Serbia and the Balkans as a whole, one has first to bring to mind the vast, unbroken expanse of the ancient Balkan landmass, with practically unrestricted possibilities for expansion of its floral and faunal elements, including the ancestral invertebrate species. This whole territory in the course of time was subjected to tremendous geologic perturbations that broke and fragmented the land, changed its borders and altered its landscape. Specifically, the strong formation of massive carbonate sedimentary rocks in the Mesozoic and continuous evolution of karstic underground relief brought about a progressive colonization of subterranean habitats by elements of the epigeal fauna during the Tertiary, and especially at the beginning of Pleistocene glaciations (Ćurčić and Jovanović 2004). These phenomena made possible the long-lasting and undisturbed evolution of almost all cave-dwelling invertebrates in an isolated subterranean ecological niche with highly specialized characteristics.

## 8.3 Biogeographical Regionalization

Attempts to work out the biogeographical regionalization of any geographical area are from the very beginning met with the problem of how to fit together hierarchical classifications of flora and fauna and their respective spatial distributions. Specific biological characteristics of organisms and their reproduction, ecology and way of dispersal generally define differences between the flora and the fauna. These basic biological dissimilarities between the plant and animal worlds give rise to difficulties in attempting to create an integrated pattern of their spatial distribution, from the highest biogeographical divisions (floristic kingdom vs. faunistic realm) to the lower units (subregions, provinces and districts). Many or almost all efforts to devise a biogeographical regionalization made in the second half of the twentieth century were based on the distribution of zonal vegetation and/or biomes. With this ecogeographical approach, many inconsistencies between the earlier phytogeographical versus zoogeographical divisions were reduced, mainly in the case of the higher biogeographical units. Some disagreements that still remain at the level of lower biogeographical units (provinces and districts) come from different patterns of distribution and ecological specificities of certain groups of plants and/or animals.

Matvejev (1961) produced the first integrative attempt to lay down biogeographical division for the territory of the former Yugoslavia, in which Serbia was a constituent. His system was based on the distribution and ecological features and preferences of the vascular flora and of some faunal groups (grasshoppers and tetrapod vertebrates), as well as on the arrangement of zonal ecosystems.

Already by the end of the twentieth century, the prevailing opinion was that the major types of zonal vegetation, that is, zonobiomes, should be the key principle of a comprehensive biogeographical division. Accordingly, Matvejev and Puncer (1989) proposed a new division of the territory of Yugoslavia based on the Map of the natural potential vegetation of this territory (Fukarek and Jovanović (eds.) 1983).

In agreement with that concept, this survey in its geographical analysis of the living world will present biogeographical characteristics of the territory of Serbia based on the distribution of climazonal ecosystems.

As already pointed out, one of the fundamental biogeographical characteristics of the territory of Serbia is the coexistence and overlapping of various floral and faunal elements and co-occurrence of diverse ecological influences.

In terms of biogeography, Serbia as a whole is a transitional area with a mosaic-like distribution of ecosystems. Plant and animal species of varying distributions and origins determine the composition and structure of these ecosystems. Clearly, the pronounced heterogeneity of ecosystems makes it very difficult to delimit the lower biogeographical units (provinces and districts) and determine the higher categories to which they belong. However, current knowledge about the distribution of plant and animal life on the territory of Serbia makes it possible to formulate a general biogeographical regionalization of the present ecosystems based on the distribution of climax and/or oroclimax vegetation along horizontal and vertical gradients.

Along the horizontal, the territory of Serbia is characterized by the meeting of three biogeographical regions outlined by specific zonal ecosystems and spreading from lowlands (plains and fluvial valleys) to the foothill zone. They are the Mediterranean-sub-Mediterranean, Central European and Pontic-South Siberian regions (Fig. 8.5).

**Mediterranean-sub-Mediterranean Region** This region spreads along the coast and hinterland of the Mediterranean Sea. On the Balkan Peninsula, the region is divided into two subregions: (1) Mediterranean and (2) sub-Mediterranean. Two provinces of the sub-Mediterranean subregion are present in Serbia, namely the Adriatic-Ionian and the Macedonian-Thracian provinces (Meusel et al. 1965; Horvat et al. 1974).

The Adriatic-Ionian province is restricted to that sector of the territory of Serbia which is under direct influence of the Mediterranean climate from the Adriatic Sea, penetrating along the valley of the Beli Drim River and across Albania to Metohija. The Macedonian-Thracian province extends into southern Serbia, closely following influence of the mild climate from the Aegean Sea to its northernmost reaches, as it spreads across canyons and valleys of the Vardar, Lepenac and Pčinja Rivers. Both provinces are characterized by thermophilous forests and scrublands (alliance Ostryo-Carpinion orietalis), and also by the presence of rocky grounds, the result of the man-made environmental degradation.

The dominant representatives of the subregion are Mediterranean-sub-Mediterranean plants (e.g. Pistacia terebinthus, Quercus trojana, Acer monspessulanum and Salvia officinalis) and animals (e.g. Apodemus mystacinus, Elaphe quatroulinneata, Sylvia crassirostris and Lanius senator). It is of interest to note that many of these floral and faunal elements also reach some areas in northern Serbia, where they inhabit thermophilous limestone or serpentine terrains in western, eastern and central Serbia. For instance, the sub-Mediterranean oriental hornbeam (Carpinus orientalis) is frequently found in xerophilous shibljak vegetation on limestone in eastern Serbia, whereas European hornbeam (Carpinus betulus) can be seen in western and central Serbia in humid canyons of the Ibar, Drina and Lim Rivers. Degradation of zonal forests through human impact and the appearance of pastures and/or warm rocky grounds on calcareous and/or serpentine soils make possible the spread of Mediterranean-sub-Mediterranean faunal and floral elements towards the northern part of Serbia.

**Central European Region** (Meusel et al. 1965, Walter and Straka 1970; Horvat et al. 1974). The Central European region includes broad-leaved deciduous forests extending over the greatest part of the Balkan Peninsula, hence, over most of the territory of Serbia as well. The region is characterized by three altitudinal forest belts – lowland (60–100 m), hilly (150–500 m) and montane (up to 1200–1300 m on aver-

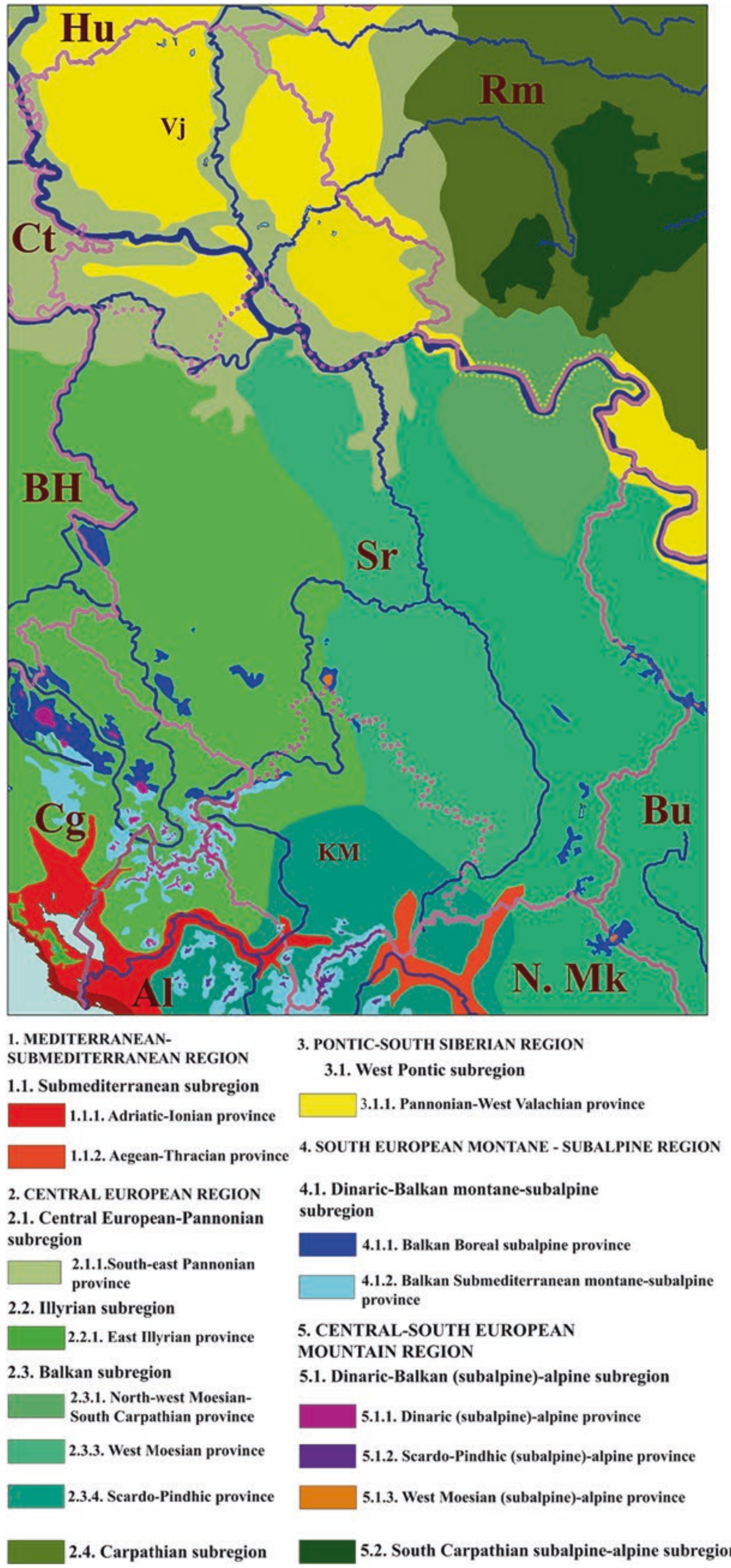


**Fig. 8.5** Biogeographical division of the territory of Serbia based on distribution of climactic and oroclimatic ecosystems

age), and it may have, although rarely, a subalpine belt of climazonal deciduous forest ecosystems (1500–1800 m). The lowlands along rivers of the Danube basin (the Sava, Tisza, Morava, Kolubara and Mlava Rivers) are overgrown with hygrophilous and hygromesophilous forests (alliances *Salici-Populion, Quercion roboris* and *Querco-Carpinion betuli*). The hills are characterized by oak forests (alliances *Quercion frainetto* and *Quercion petraea-cerridis*), while forests of sessile oak, European hornbeam and beech (alliances *Carpinion betuli* and *Fageion*) grow already at elevations over 500 m in the montane belt. The main floristic and faunistic representatives of this region are species of wide European and Eurasian distribution. The region is divided into three subregions: Central European-Pannonian, Central European Illyrian and Central European-Balkan.

The Central European-Pannonian subregion is inhabited by forest ecosystems (alluvial and hilly forests) in Voivodina, Mačva and northern Pomoravlje. The Central European Illyrian subregion is present in western and southwest Serbia and is dominated by mesophilous forests. The Central European-Balkan subregion is composed of: (a) the West-Moesian province in eastern and central Serbia, characterized by meso-xerophilous forests; and (b) the Scardo-Pindic province, with xero-mesophilous forests in Kosovo.

The major agents responsible for apparent differences in the floristic and faunistic composition of deciduous forests of this region are: (1) the altitudinal climate zonation and (2) the increase in temperature from north to south and decrease in humidity from west to east. Thus, Mediterranean-sub-Mediterranean elements appear in ever increasing numbers towards the warmer areas in the southern parts of Serbia. Likewise, the shift towards drier environmental conditions favours an increase in forest-steppe floral and faunal elements in Vojvodina and in eastern Serbia, whereas the more humid conditions in western Serbia give rise to mesophilous forests. It should be added that some authors (Meusel et al. 1965, Walter and Straka 1970; Frey and Lösch 2004; Bohn et al. 2001/2003) were led by such biogeographical heterogeneity and complexity of variables to classify the thermophilous deciduous forests of the hilly area in the central Balkans and Serbia (alliance *Quercion frainetto*) as a sub-Mediterranean subregion.

**Pontic-South Siberian Region** (Meusel et al. 1965; Walter and Straka 1970). This region is defined by the presence of primary and secondary steppes and forest-steppe ecosystems extending eastward from Southeast Europe, Ukraine and Russia to southern Siberia. These ecosystems in Serbia belong to a subdivision of this biogeographical region, that is, to the Pannonian-West Wallachian province of the Western Pontic subregion.

The Pannonian-Wallachian province includes ecosystems in Vojvodina, on the southeast part of the Pannonian Plain and along a narrow stretch on the right bank of the Danube River in northeast Serbia. The main ecosystems are steppes and forest steppes on loess plateaus, sandy areas (the Deliblato Sands and Subotica-Horgoš Sands) and summer dry salt steppe-like grasslands (in Banat and Bačka). A stretch of land (between the settlements of Ram and Radujevac) along the Danube's right bank is also covered with forest steppes and sandy areas. More specifically, this mosaic-like cover of vegetation includes steppe communities (alliances *Festucion rupicolae* and *Artemisio-Kochion),* forest-steppe communities (alliance *Aceri tatarici-Quercion*), sandy plant associations (alliance *Fesucion vaginatae*) and halophilic plants growing on salt grasslands (alliances *Cypero-Spergularion*, *Puccinellion limosae* and *Puccenillion peisonis*). Today, indigenous steppes and forest steppes are reduced to small patches, as almost all of them have been converted into agricultural land. Taken altogether, this region, subregion and province in Serbia (Vojvodina) are characterized by species of Pontic-South Siberian, Pontic-Caspian and wider Eurasian steppe distribution. The indicator plant species of this region and province are *Paeonia tenuifolia*, *Astragalus dasyanthus, Stipa capillata, Stipa borystenica, Adonis vernalis, Festuca vaginata, Lepidium catilagineum* and *Limonium gmelinii*. The most commonly present steppe faunal species are *Spermophilus citellus, Sicista subtilis, Cricetus, Falco vepertinus, Lacerta tauric* and *Acrida hungarica*.

In the vertical zonation of ecosystems in Serbia, there are two biogeographical entities: (1) the South European montane-subalpine region and (2) the Central-South European subalpine-Alpine region (Fig. 8.5). Differences in geography, geology, climate and ecology outline define these two regions.

**South European Montane-Subalpine Region** This region contains coniferous forests typical for Southern Europe of the kind existing on all three of its major peninsulas – the Iberian, Italian and Balkan Peninsulas. The region is divided into several subregions and provinces, each of them with typical altitudinal zonations, environmental conditions and biotic compositions. The western and central parts of the Balkan Peninsula belong to the Dinaric-Balkan montane-subalpine subregion covered with coniferous forests of different origin, distribution and ecology.

The Dinaric-Balkan montane-subalpine subregion in Serbia is split into: (a) the Dinaric-Balkan-Boreal-subalpine province; and (b) the Dinaric-Balkan sub-Mediterranean montane-subalpine province according to whether Boreal or Mediterranean floral and faunal elements are dominant in the ecosystem.

The Dinaric-Balkan-Boreal-subalpine province is represented by southern enclaves (42° N – 44° N) that are the southernmost sites of the Boreal coniferous vegetation in Europe. They are situated in the mountains of western, eastern and central Serbia. The lower subalpine belts (1500–1900 m) are covered with coniferous forests (alliance *Vaccinio-Piceion*), whereas coniferous shrubs (alliances *Juniperion sibiricae, Pinion mugo, Vaccinion uliginosi* and *Bruckenthalion spiculifoliae*) grow above the tree line, at altitudes of 1600–2100 m. Such Boreal-type coniferous forests of this Serbian province were figuratively called the "Balkan tajga" by Matvejev (1961). The diversity of ecosystems of this province is enriched with the presence of subalpine highland moorlands (alliance *Caricion canescentis-nigrae*). In general, the vegetation of this province abounds in circum-Boreal and Euro-Siberian floral elements, for example: *Moneses uniflora, Vaccinium uliginosum, Pyrola rotundifolia, Comarum palustre* and *Drosera rotundifolia*. The Boreal subalpine habitats are home to animal species such as *Tetrao urogallus, Aegolius funereus, Nucifraga caryocatactes, Parus montanus, P. cristatus, Zootoca vivipara* and *Vipera berus*.

Forests of Serbian spruce (*Picea omorika*), characterized by a very limited distribution in western Serbia and eastern Bosnia, are also constituents of this biogeographical entity. This status is corroborated by the co-occurring presence of *Picea abies, Abies alba* and *Pinus sylvestris*, as well as of some other Boreal, Alpine and central European floral elements.

The Dinaric-Balkan sub-Mediterranean montane-subalpine province includes Balkan Mountains (40° N – 43° N) influenced by Mediterranean climate. Such mountains in Serbia are Mt. Koritnik, Mt. Pastrik and the Šar Mountain massif with its spurs (Mts. Ošljak, Ostrovica and Kodža Balkan) and the Prokletije massif. The subalpine zone (1500–2200 m) of this province is occupied by coniferous forests where the edifacator species are the Balkan endemic Macedonian pine (*Pinus peuce*) and the Apennine-Balkan subendemic Bosnian pine (*Pinus heldreichii*). These pines can be considered as vicarious species, that is, edaphic vicariants, on account of their preference for different kinds of geological bedrock. To be precise, *P. peuce* (an acidophilic species) almost always grows on siliceous soil, whereas *Pinus heldreichii* (a basophilic species) is widespread on limestone. Very rarely do these two pines live together, and that only in zones of contact between silicate and limestone substrates, or else in serpentine areas. In addition, it should be noted that the two pines in question differ markedly in their basic ecological requirements and coenotic relations (Janković 1960; Stevanović et al. 1994). Usually found growing in forests of Bosnian pine are South European mountain elements that have their centres of richness on the Balkan Peninsula, like species of the genus *Sesleria*. In contrast, forests of Macedonian pine host acidophilic Balkan mountain and Alpine species and Boreal elements characteristic of spruce and spruce-fir forests. Thus, Macedonian pine forests have the characteristic of being transitional to the Dinaric-Balkan-Boreal-subalpine province. The ecological conditions of cool climate and water-retaining ground make forests of Macedonian pine suitable habitats for plants of Boreal provenance. Taken altogether, the forests of *P. peuce* and *P. heldraichii* are distinguished by various unique biogeographical features, in both floral and faunal organization, and as such deserve special attention and protection.

Also belonging to this province are Austrian pine forests, mixed stands of Austrian and Scots pine, and Scots pine forests (alliances *Orno-Pinion* and *Erico-Pinion*), which are present in western and southwest Serbia. They grow at altitudes of 950–1200 m on cool mountain plateaus, mainly on serpentine soil. The mixed pine forests (*Pinetum nigrae-sylvestris*) harbouring Boreal (*Vaccinium myrtilus and Goodyera repens*) and Dinaric-Alpine (*Erica herbacea*) species exhibit a biogeographical character transitional to the Dinaric-Balkan-Boreal-subalpine province.

**Central-South European Subalpine-Alpine Region** This region extends to altitudinal zones above the tree line in the mountains of Central and Southern Europe (1600) (2000–2700 m). It is also called the Alpine-high Nordic region (Horvatić 1967), or the Central-South European mountain region (Walter and Straka 1970). Our own detailed investigations of this region in the Balkans revealed an abundance of endemic and relic species of different age and origin, which, in a way, makes it more difficult to divide the region into subregions (Stevanović 1995, 1996). Taking into account (among other things) the diversity of endemic vicariants having relatives that populate the surrounding mountain massifs – some in the Alps and Carpathians, others in the Apennines and the mountains of Greece – we deemed it tenable to postulate two subregions: (1) the Central European mountain (Alpine) subregion and (2) the Southern European mountain (oro-Mediterranean in a wider sense) subregion. However, we verified in later explorations that some parts of the high mountain vegetation characteristic of one or the other of the two hypothetical subregions were randomly distributed across neighbouring mountains, with overlapping occurring on nearly all of them. We therefore believe that it would be more appropriate to keep these two "sub-regions" integrated as a single unit, that is, the Dinaric-Balkan-Alpine subregion**,** which comprises a part of the subalpine and entire alpine zone of mountains of the central and western Balkans. Its ecosystems are subalpine and alpine grassland, associations inhabiting rocky grounds, ones inhabiting screes and associations inhabiting rock crevices.

**Dinaric-Balkan-Alpine Subregion** This subregion is divided into the following provinces: (a) Dinaric Alpine, (b) Scardo-Pindic Alpine and (c) Moesian Alpine. The differentiation between these provinces is determined mainly on the basis of their content of endemic flora and endemic invertebrate fauna. In contrast, the vertebrates, especially the birds, are shared, not only in these provinces of the given subregion, but even in the Central-South European subalpine-Alpine region. Among the commonly shared birds are: *Anthus spinolleta*, *Pyrrhocorax graculus, P. pyrrhocorax, Eremophila alpestris, Prunella collaris, Montifringilla nivalis*, etc.

**Dinaric-Alpine Province** The Dinaric-Alpine province in Serbia is represented in the eastern and south-eastern parts of the Dinaric Alps in western and southwest Serbia, especially on high mountains such as those of the Prokletije massif. The Prokletije mountain massif is of heterogeneous geological composition, with prevailing limestone and comparatively less siliceous bedrock. The limestone ecosystems of the Prokletije Mountains include: high-mountain rocky grassland (alliances *Oxytropidion dinaricae, Seslerion robustae* and *Saliceion retusae*); associations of rock crevices (alliances *Amphoricarpion bertiscei* and *Potentillion cauclescentis*); and associations of limestone screes (alliances *Silenion margintae* and *Saxifragion prenjae*). The siliceous areas of the mountains are also defined by the presence of high-mountain rocky grasslands, but of different plant composition (alliances *Seslerion comosae* and *Jasionion orbiculatae*) and by the associations of snowbeds (alliances *Salicion retusae* and *Ranunculion crenati*). The outstanding floristic richness of alpine ecosystems of the Prokletije Mountains is fascinating for the numerous endemics and abundance of diverse Dinaric-Alpine and Central-South European orophytes, as well as of glacial elements of the Arctic-Alpine and Alpine type of distribution (Stevanović 1996; Stevanović et al. 2009). The real wealth of the flora of the Prokletije Mountains is the large number of Balkan endemics, especially the Dinaric and local endemics (*Pedicularis ernesti-mayeri, Draba bertiscea, Heliosperma macranthum, H. oliverae, Valeriana pancicii*, etc.). The presence of this type of endemics is a specific mark of the Prokletije Mountains, but also of the entire Dinaric-Alpine province. In this province, an Arctic-Alpine distribution can also be recognized in some genera of mountain insects, such as *Erebia* (Lepidoptera) and *Oropodisma* (Orthoptera).

**Scardo-Pindic Alpine Province** This province covers the high-mountain belt (1800–2700 m) of the largely siliceous massif of the Šar Mountain and also of its northern spurs and Mt. Koritnik, which are of mixed geological composition. The siliceous highland zone is defined by the presence of high-mountain rocky grounds and/or grazing areas (pastures) (alliances *Seslerion comosae* and *Caricion curvulae*), by snowbed plant communities (alliances *Salicion herbaceae* and *Ranunculion crenati*) and by associations of rock crevices (alliances *Asplenion septentrionali, Silenion lerschenfeldianae* and *Saxifragion cymosae*). The limestone parts of the Šar Mountain massif are covered by rocky grassland (alliances *Edriantho-Seslerion* and *Onobrychido-Festucion*), with associations of rock crevices (order *Potentilletalia speciosae*) and screes (order *Drypetalia spinosae*). This province is distinguished by a huge number of local and Balkan endemics, acidophilous Alpine and Arctic-Alpine species. The most attractive are the species *Potentilla doerfleri, Achillea alexandrii-regis, Silene schmuckeri, Crocus scardicus* and *Dianthus scardicus*. The richness of floral elements in this province is not unlike that encountered in the Dinaric-Alpine province; it is, however, the specific composition of floral elements which distinguishes one from another. The high-mountain insect fauna of the Šar Mountain massif, especially on its limestone sections, is rich in both local and Balkan endemic species coming from southern parts of the Balkan Peninsula.

**Moesian Alpine Province** This province spreads on the high mountains (1500–2200 m) of eastern, southeast and central Serbia. Most of these mountains are composed mainly of siliceous rock (Mt. Kopaonik, the Stara Planina Mountain, Mts. Besna Kobila and Strešer), while the Mt. Rtanj and the Suva Planina Mountain are composed of limestone bedrock. The siliceous mountains are overgrown with subalpine and alpine rocky grassland and pastures (alliances *Caricion curvulae* and *Poion violaceae*) and with the plant formations of stony slopes (alliance *Silenion lerchefeldrianae*). The limestone mountains are also dominantly covered by rocky grasslands, but of different plant composition (alliances *Seslerion filifoliae* and *Seslerion latifoliae*) and by the associations of rock crevices (alliance *Ramondion nathaliae*) and mountain screes (alliance *Achnatherion calamagrostis*). This province is floristically significantly poorer than the other two provinces, having fewer Balkan and local endemic species. Noteworthy local endemics are *Cardamine pancicii* and *Viola aetolica* subsp. *kopaonikensis* on Mt. Kopaonik, and *Aquilegia pancicii* in the Suva Planina Mountain, while *Jacobaea arnautorum* and *Hieracium balcanicum* grow in the Stara Planina Mountain. The Balkan endemics found in this province are mainly Moesian and Moesian-Carpathian orophytic elements, such as *Minuartia bulgarica, Saxifraga cymosa*, *Soldanella carpatica* and *Silene lerchefeldiana*. Also to be noted is the only average number of local and Balkan endemic species in the insect fauna of this province.

## 8.4 Conclusion

The living world of Serbia – plants, animals and fungi – is quite rich in proportion to the territory's size and relative to its geographic position in the southeast part of Europe. Its biodiversity is richer than that of any Central European country, but poorer than in countries of the Mediterranean region, where the richest in biodiversity are Spain, Italy, France and Greece. However, distinctive features of the territory of Serbia are the mixing and coexistence of floral and faunal elements of different provenance, the presence of a variety of habitats and considerable diversity of its biocoenoses and ecosystems. Serbian territory is a crossroads of different biogeographical influences, one that is marked, moreover, by the effects of historical geomorphological and biological changes occurring before and throughout the Tertiary and Pleistocene. The outcome was that many species originating from different European regions came into contact on this territory, where some found adequate refugia, leading to the emergence of a biota that is complex or even exceptional in composition.

Corridors of various geographical architecture reached and/or traversed the country and made possible the phenomenon of a biogeographical crossroads. Thus, elements from Northern and Central Europe had open access across the Pannonian Plain and from there were able to penetrate farther south along the valleys of the Morava and Vardar (North Macedonia) Rivers to reach the Mediterranean. Some Mediterranean representatives reached Serbia travelling northward by the same route. In the east, species from the Pontic-Caspian steppes migrated across the Walachian Plain. The inhabitants of high-mountain zones in the Alps and Carpathians spread towards Serbia across the Dinaric Alps and the Balkan-Rhodope Mountains, respectively. The "newcomers" made contact and shared habitats with ancient, most often endemic indigenous orophytes.

Canyons and gorges are especially important places for the survival of ancient Tertiary species (relics and palaeoendemics), including representatives of the relict dendroflora, and are the seats of various specific communities and ecosystems which these plants build. Almost every canyon or gorge in Serbia represents a unique refugium for certain species and communities of very complex chorologic composition.

When assessing and evaluating biodiversity, it is important to note that Serbia is a significant centre of speciation and divergence for many plant and animal groups. On its territory are to be found aggregates and complex species of vascular flora (i.e. *Hieracium*, *Viola*, *Stachys*, *Thymus*, *Centaurea,* etc.), as well as cryptobionts (troglobionts and troglophiles in karstic caves) and phanerobiont types of fauna (arthropods, gastropods and vertebrates). Today, all of these are highly attractive objects of modern research and analysis.

To sum up, the biogeographical regionalization of the territory of Serbia is truly complex; it is the outcome of a succession of events and changes evolving through time and space, geomorphological upheavals and climatic perturbations, which have created manifold ecological relations and influences, and all of it being mainly due to the country's geographical position.

Intricacies and difficulties become evident in efforts to envision a regionalization that takes into account the existence of multiple contacts, overlappings and mosaic-like arrangements of biogeographical regions, subregions, provinces and districts, all played out on a relatively small area.

Even so, taking some liberty, we can say that the biogeographical regionalization of Serbia reflects in miniature the arrangement of basic zonal ecosystems of Europe. The main modifications of the general arrangement of European ecosystems occurring on the Balkan Peninsula are primarily due to the presence of Balkan endemic, subendemic and relic species and their communities.

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# 9 Geohazard and Geoheritage

Ivan Novković, Slavoljub Dragićević, and Mirela Djurović

**Abstract**

On the territory of the Republic of Serbia, during the long-time period, many different physical-geographical processes created various features and landforms. In the contemporary period, they are under a strong influence of different human activities. Depending on the effects they have on human civilization, we can classify them into a group with the destructive consequences (geohazards) and a group of positive values (geoheritage). The Republic of Serbia belongs to a group of moderately risk areas regarding natural hazards. Dominant geohazards in Serbia are earthquakes, landslides, floods, torrential floods, atmospheric disasters (hail, drought, strong winds, and intensive precipitation), and forest fires. Geoheritage sites, as representations of the overall geodiversity, are distinguished and systematized into 12 groups, with a number of subgroups and a total of 551 individual sites, including 99 objects within the catalogue ex situ. The distinguished objects are objects of historical-geological and stratigraphic heritage, objects of petrological heritage, structural sites, geomorphological forms, neotectonic activity phenomena, geophysical occurrences, speleological sites, and objects of hydrogeological, pedological, and hydrological geoheritage.

**Keywords**

Geohazards · Landslides · Floods · Torrential floods · Geodiversity · Geoheritage · Serbia

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## 9.1 Geohazards

When natural disasters vulnerability is observed at worldwide scale, we could say that the territory of the Republic of Serbia is not vulnerable as most parts of the world. There is no active volcanism in Serbia, no high-magnitude devastating earthquakes, no tropic cyclones, and real tornadoes. Some natural disasters such as frost, drought, and avalanches are present, but not with such intensity as in some other countries. Nevertheless, parts of Serbian territory are prone to the occurrence of such disasters as landslides, torrential floods, hailstorms, and forest fires, which from time to time, if conditions are matching, can cause numerous deaths and serious material damage.

Former SFR Yugoslavia had very organized aforementioned field of activities, with organized units of civil protection, very strong and organized army capable for coping with most emergency situations, significant funding, and even organized economic aid for areas affected by disastrous events. Unfortunately, a lot has changed negatively since disintegration of Yugoslavia. Lack of funding and organization and equipment obsolescence made the territory of the Republic of Serbia much more vulnerable to natural disasters than it should be.

First multihazard analysis for the whole territory of Serbia shows that natural hazards are various and the vulnerability is not uniform, but depends on the type of hazard and potential damages (Dragicevic et al. 2011).

### 9.1.1 Earthquakes

Serbia belongs to a region that features moderate seismic activity, according to the number and frequency of earthquakes as well as their magnitude (Richter scale) and intensity (MCS-64 scale). Although there were no high-magnitude devastating earthquakes with epicenter in Serbia during instrumental period of seismic activity monitoring, still it is


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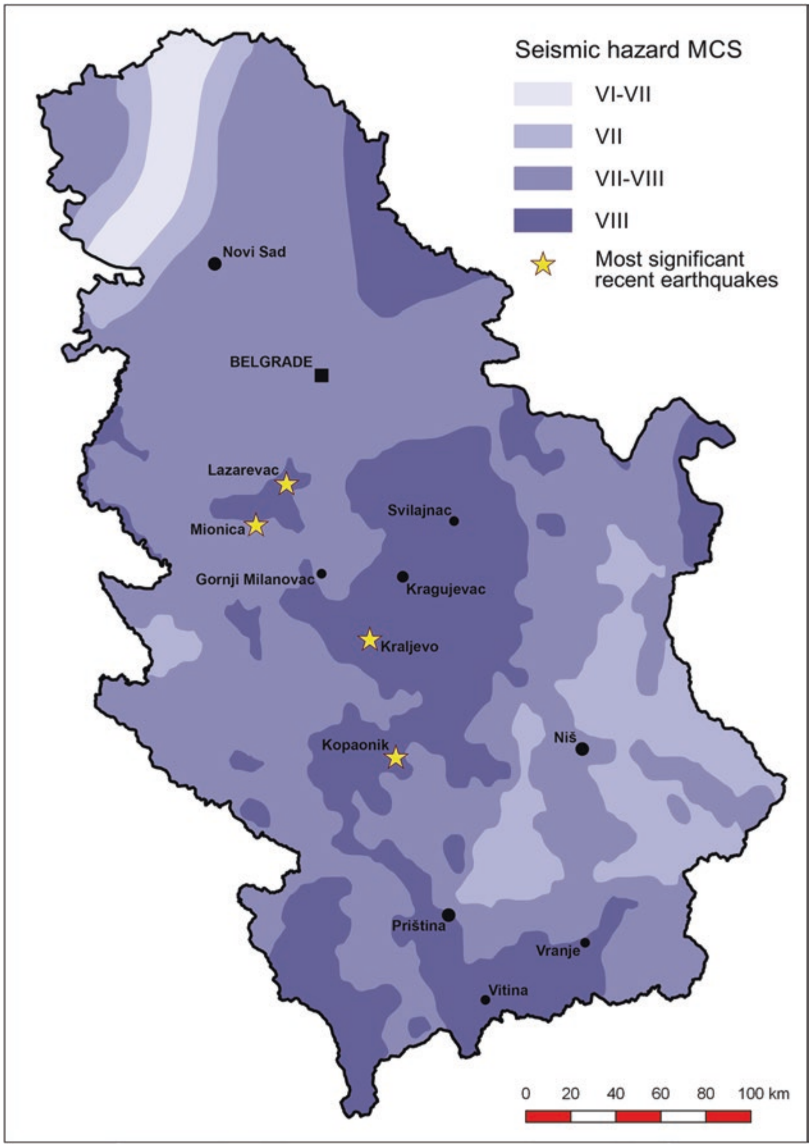


**Fig. 9.1** Seismic hazard map of the Republic of Serbia for the 475-year return period. (*Source:* Dragojević 2018, with most significant recent earthquake events)

very important to distinguish zones with different level of seismic hazard in order to protect people together with their property and belongings. According to the Map of Seismic Hazard of the Republic of Serbia with a return period of 475 years (Dragojević 2018), about 26.6% of total Serbian territory have possibility of VIII MCS or higher seismic event occurrence, 58.1% of territory from VII to VIII MCS, 12.6% VII MCS, and 2.7% of VI–VII MCS. Highest seismic hazard, with VIII MCS, is determined for parts of Banat (Vojvodina), Kolubara and Drina basins (West Serbia), Negotinska Krajina (East Serbia), Central Serbia, Vranje basin (South Serbia), and Kosovo and Metohija (Fig. 9.1).

Earthquake catalogues show that one of the strongest earthquakes was registered in Lazarevac in 1922, with magnitude between 5.7 and 5.9 (Radovanovic 2003). On May 18th, 1980, a magnitude of M = 6.0 earthquake occurred in the Kopaonik seismogenic zone. Maximum epicenteral intensity (MCS) was VIII–IX. This earthquake was followed by numerous aftershocks, many recorded at Brzeće (43 records) and at Leposavić (9 records), on the slopes of Kopaonik Mt. In the period from May 21st, 1980, to June 2nd, 1982, 44 events were registered, 42 of which were identified, and almost all (43) were recorded at Brzeće P.T.T. The main event of May 18, 1980, was not recorded at the Brzeće and Leposavić strong-motion stations because those stations were installed after the main shock (Trifunac and Ivanovic 2003).

One of the strongest quakes in twentieth century was the one that hit the region of Mionica on September 30th, 1998. This quake ($M_L$ = 5.4, or an intensity of VIII MCS-64 at the epicentre) was one of the four strongest earthquakes in Serbia in the last century. It caused damage on the objects within a diameter of 31 km from the epicenter, and the earthquake tremors have been felt even in Hungary. It was observed that the earthquake damaged over 24,000 objects, and the damage from this earthquake was estimated at around 400 million euros (Alendar and Aćić 1999; Dragicevic et al. 2011). Series of quakes continued over the next year, with the strongest aftershock on April 30th, 1999.

The Kraljevo earthquake occurred on November 3rd, 2010, at 1:56 local time (0:56 UTC), with the epicentre several kilometers north of the city of Kraljevo, in Vitanovac; it had a focal depth of about H = 13 km. Approximately 70% of all structures in Vitanovac were damaged and declared unsafe. Approximately 6000 structures in Kraljevo and its vicinity were damaged, with about 1500 being declared unsafe and 138 being damaged beyond repair. Two people were killed in Grdica, and about 100 were injured. There were more than 350 aftershocks, including an M = 4.3 event on November 4th. During the main shock, reported intensity in Kraljevo was VII, and it was IV in Belgrade (Herak et al. 2011).

### 9.1.2 Landslides

Most landslides in Serbia occur in lithological formation of Tertiary sediments (clays, marls, sands, and gravels), which originate from the lake phase of the Pannonian Basin evolution (Lazarević 2000). Besides these sediments, flysch, and volcanoclastic rocks are most susceptible to landslide occurrence.

Landslide susceptibility of the territory of the Republic of Serbia was determined according to index-based method (IBM) (Voogd 1982; Anbalagan 1992). It is simple ranking and rating technique for landslide susceptibility zonation (Tošić et al. 2014). By applying the aforementioned method, taking into account lithological formations, terrain slope, and land use/cover, it was determined that very high landslide susceptibility is determined on 8.7% of the territory of the Republic of Serbia, high susceptibility on 8.1%, medium on 27.9%, and low on 55.3% of Serbia's total territory (Fig. 9.2). Most susceptible to landslide process in Serbia are parts of southern circumference of the Pannonian Basin, Šumadija, Veliko Pomoravlje, Zapadno Pomoravlje (Central Serbia), Južno Pomoravlje (South Serbia), Metohija (Kosovo and Metohija), Timočka Krajina, and Žagubica basin (East Serbia). These are areas with high percentage of Tertiary sediments in total area, and highest percentage of all landslides in Serbia occurs there.

The largest number of landslides in Serbia is found on the outskirts of the Pannonian Plain on the right banks of the Sava and Danube Rivers (Jovanović 1954; Jovičić 1956), as well as in the central parts of Serbia in the isolated Tertiary basins. Landslides of the right banks of the Sava and Danube are of deep landslide surfaces (over 20 m), formed on the contact of the weathered zone and fresh clay or clay-marl sediments. The basic trigger of the processes, apart from precipitation, is prolonged erosion of the right banks of the Sava and Danube Rivers (Perić 1970; Lokin et al. 1988).

The good landslide example is in the settlement of Umka, near Belgrade (Vujanić et al. 1984; Jelisavac et al., 2006; Mitrović and Jelisavac 2006). The large active and slow-moving landslide in the depth of 10–26 m, created in marly clays, takes up the area of 1.8 km$^2$. This landslide is fan shaped, with the length along the slope of 900 m, toe width of 1450 m, area of 100 ha, average depth of 14 m, volume 14,000,000 m$^3$, and average gradient of 9° (Abolmasov et al. 2017). One more landslide example is in the Jovačka River basin (left tributary to the Southern Morava River), in the Jovac village. Landslide process started in 1977, and volume of landslide mass is estimated to be 150 million cubic meters (Lazarević 1977). Landslide was 3 km long, 1 km wide, with sliding surface of 500 m deep and total horizontal movement of 500 m, for 1 month. Landslide closed the Valley of Jovačka River, and 1500 m long, 200 m width and 10 m deep lake was created. The total damage was estimated to be 15 million euros (Jevremović and Kostić 2011).

Another interesting example is mass movement in the valley of the Visočica River (East Serbia). In February 1963, due to rapid melting of massive snow cover, movement was triggered. As a result, 1,950,000 m$^3$ of material barred the river, causing the flooding of the settlement of Zavoj, and creation of lake. The barrier had maximum height of 40 m and maximum width of 530 m (Zeremski 1964).

### 9.1.3 Floods

Potentially floodable areas in the Republic of Serbia cover about 18% of its total territory and there are about 500 larger settlements and 515 industrial objects situated on such areas. Also, floods endanger about 680 km of railway and 4000 km of road network (Petković and Kostadinov 2008; Dragićević et al. 2009). The largest potentially floodable areas are in Vojvodina, in the floodplain of the Danube, Sava, Tisa, Tamiš, Begej, and other Rivers, and also areas that are in danger from excessive underground waters. South from the Sava and Danube, there are also vast floodable areas in the flood plain of the Danube, Sava, Morava, Western Morava, Southern Morava, Drina, Kolubara, Timok, Sitnica, Beli Drim, and other major Rivers.

There were numerous examples of floods on Serbian major rivers. Most well-known were on the Danube River in 1924, 1926, 1940, and 1965, Sava river in 1937 and 1974 and Tisa in 1970 (Gavrilović 1981). Lately, major floods occurred on the Tamiš River in 2005, when settlement Jaša Tomić was devastated and in the Danube River basin in Serbia in 2006.

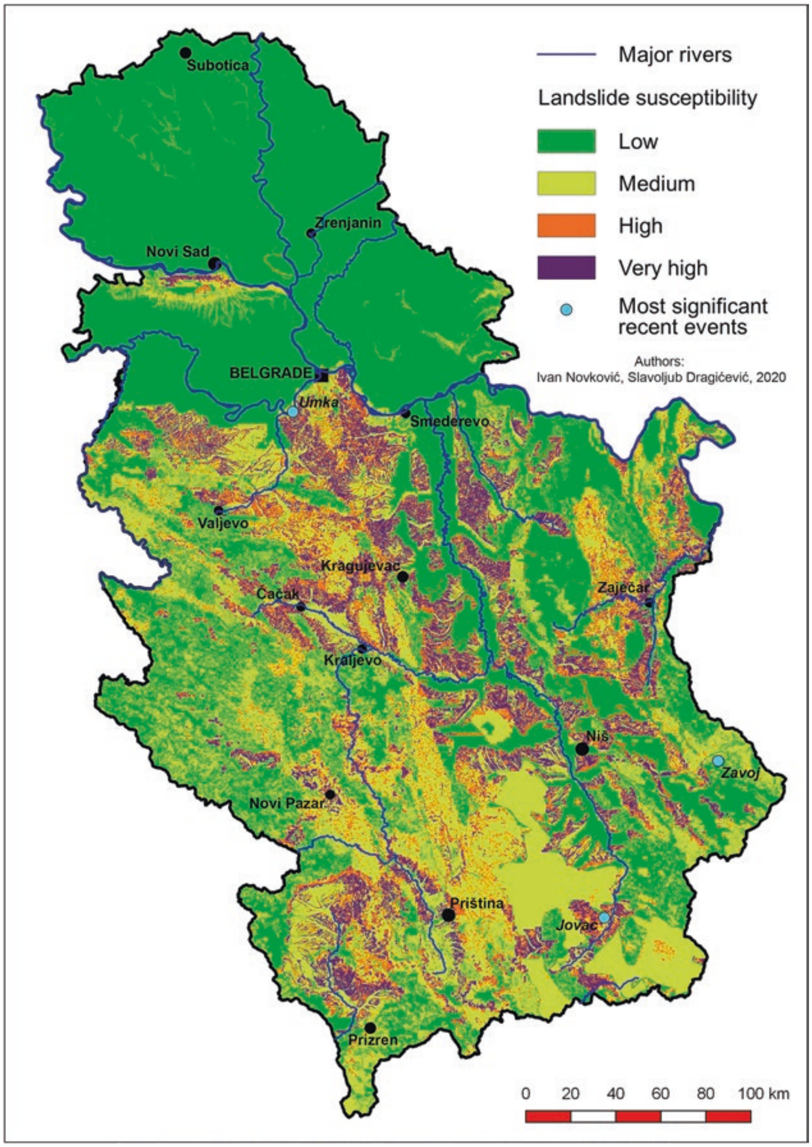


**Fig. 9.2** Landslide susceptibility map of Serbia

Besides floods connected to major rivers, big problem in Serbia is torrential floods on smaller watercourses. Torrential floods are considered as one of most devastating natural disaster on Serbian territory. Their intensity, frequency, and layout across the Serbian territory make them a continual threat to the ecological, economic, and social spheres (Kostadinov 1988; Ristic et al. 2000; Ristic et al. 2006). There are more than 12,000 torrential watercourses in the Republic of Serbia (Kostadinov 2007). Analyses of the frequency of maximal discharges over the referential show that the critical periods are at the end of spring (from May to the first half of June), as period of primary maximum for most of the watersheds, which is the result of intensive rainfall that lasted for few to several hours, and at the end of winter (from February to the first half of March), as a result of intensive dissolution of snow cover (Ristić 2002; Dragicevic et al. 2011).

For the purpose of determining susceptibility to torrential floods of the territory of the Republic of Serbia, Flash Flood Potential Index (FFPI) (Smith 2003) method was used. The analysis of the results after the classification of obtained FFPI values shows that a class of very high torrential flood potential is represented at 4.7% of the total Serbian territory, class of high potential on 13.6%, medium on 36%, and in the case of low potential class that share is 46%. Most prone to torrential floods occurrence are watercourses in the basins of

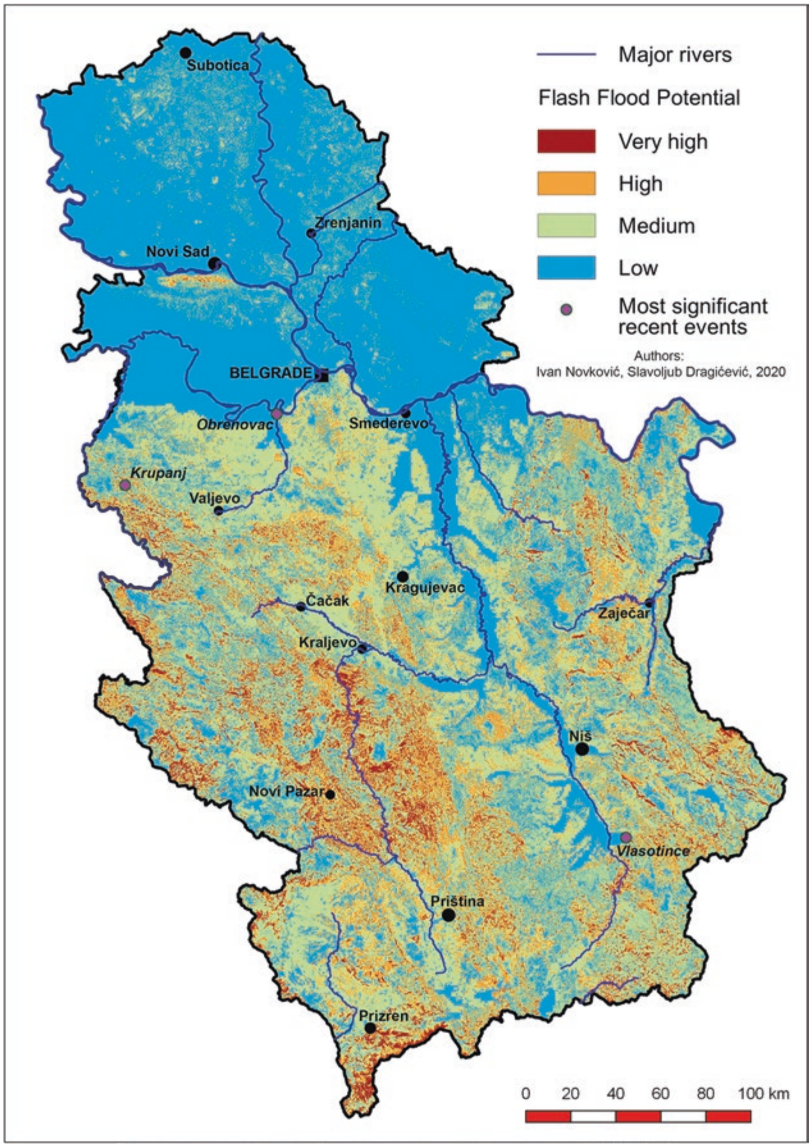


**Fig. 9.3** Flash flood potential map of Serbia

Drina, Ibar, Kolubara, Mlava, Southern Morava, Pčinja, and Beli Drim Rivers (Fig. 9.3). This is a natural predisposition to torrential floods development, and their occurrence also depends on the influence of other factors, mostly of rainfall amount.

There are numerous examples of catastrophic torrential floods in the territory of Serbia, and one of the most famous is one on the Vlasina River on June 26th, 1988. It happened as a result of intensive 3-h rainfall, when a third of the average annual rainfall precipitated on the basin. A flood wave damaged or destroyed about 500 houses, 80 km of regional roads, 32 bridges, a dam, a shopping center, and a bus station in Vlasotince (Southeast Serbia) (Gavrilovic and Matovic 2006; Dragićević and Filipović 2016).

In the Pčinja River basin, on May 15th, 2010, intensive rainfall due to cyclone activity caused increase in the discharge by an incredible 411 times, from Q = 0.81 $m^3/s$ to $Q_{max}$ = 328.4 $m^3/s$. As a result of this torrential flood, two inhabitants lost their lives and great material damage was caused (Dragićević et al. 2013). In late June 2010, torrential flood wave on the Kolubara River destroyed several bridges, flooded area of 500 ha and 230 households (total damages were estimated at 370,000 euro) (Dragićević et al. 2013).

**Fig. 9.4** Flood in Obrenovac in 2014 (left) and flood consequences in Krupanj in 2014 (right). (Photo by: Slavoljub Dragićević)

Floods that occurred in the territory of Serbia in May 2014 caused catastrophic consequences: 51 people lost their lives, 32,000 people were evacuated from their homes, most of them (25,000) from Obrenovac; 5000 people are temporarily placed in camps formed by the Government and the Red Cross of Serbia; 6 million people are directly or indirectly affected throughout the country; the total value of destroyed goods in the 24 affected municipalities amounts to 885 million euros and the value of losses is 640 million euros, which gives a total amount of 1.5 billion euros; 80,000 ha of agricultural land were flooded; a total of 945 km of roads were damaged, 307 bridges were destroyed or damaged, and 110,000 consumers in 28 municipalities were affected by interruptions in electricity supply (Dragićević and Filipović 2016).

One of the municipalities that was most affected by the 2014 floods is the Municipality of Krupanj. During 15–16 May, in Krupanj, 149.7 mm of rainfall was recorded, while at the station Planina 389 mm, which is 2–3 times more than the average for the month of May. This led to the occurrence of a flood wave of an extremely large return period (5000–6000 years on the river Čađavica, 1000 years in river Kržava, and 100 years in river Brštica). Two people were killed, 40 houses were destroyed, and the total material damage is estimated at 1.8 million RSD (University of Belgrade – Faculty of Forestry 2014) (Fig. 9.4).

### 9.1.4 Atmospheric Disasters and Forest Fires

Hail and drought are atmospheric disasters with the largest consequences on the territory of Serbia. After the disintegration of Socialist Federative Republic of Yugoslavia, lack of funding for anti-hail defense resulted in a significant increase in hail vulnerability, with northern, western and central parts of Serbia as most vulnerable.

Based on analysis of annual quantity of precipitation, pluviometric regime, lack of water in the soil, as well as temperature analysis and air humidity during the vegetation period that determine duration, frequency, and intensity of drought, four zones of drought vulnerability were singled out (due to their dryness) within the territory of Serbia – area most vulnerable to drought, moderate drought area, moderately humid area, and very humid area (Rakićević 1988). The regions of Serbia at the highest risk of drought are northeast Bačka, north Banat (Vojvodina), Niš, and Leskovac basins, with Dobrič, Bela Palanka, and Aleksinac basins (Southeast Serbia), Vranje and Gnjilane basins (South Serbia), Kosovo polje with Drenica and Metohija (Kosovo and Metohija), and Negotinska Krajina (East Serbia) (Rakićević 1988). The longest drought in Serbia in instrumental period of monitoring was observed in Vranje and it lasted 61 days, from June 22 to August 21 1928 (Rakićević 1988; Dragicevic et al. 2011). Recently, significant droughts have been observed in 2000, 2007, 2012, and 2018.

Winds that could have significant consequences in Serbia are Košava (mostly south-eastern wind) and south-western wind (Dukić 1998; Dragićević and Filipović 2016). Interesting phenomena was emergence of tornado-like wind in village Negbina, near Nova Varoš, on July 10th, 1977, with maximum speed of about 83 m/s, with diameter of 100 m and path length of 10–15 km, causing destruction of several houses, vehicles, trees, but luckily without human victims (Maksimović 1987; Dragićević and Filipović 2016). Other notable atmospheric disasters in Serbia include intensive rainfall (up to 5–10 mm/min), snow blizzards, thunderstorms, fog, frost, and ice glaze.

Forest fires are considerable disaster within the territory of Serbia. During the high-temperature dry summers and dry autumns, forest fires are expected not only because of appropriate natural conditions but also because of human activities that include illegal woodcutting, burning of agricultural areas before autumn agricultural works, and various irresponsible actions during people's stay in forest. During the period from 1990 to 2005, around 43,000 ha of Serbian forests were devastated by forest fires. Within this period, the largest number of fires was registered in 2000, with about 13,000 ha of forest burnt in 339 fires (Dragicevic et al. 2011). In 2007, there were 482 fires that destroyed about 34,000 ha of forests (Petković and Kostadinov 2008). Recent years with significant forest fires were 2011, 2012, and 2018 when significant areas within Serbian protected natural areas were devastated.

Serbian society is changing toward the acceptance of European standards in all areas of public activity, and a part of this change is harmonization of legislation and practices in the field of natural hazards mitigation. Better understanding of the processes for some historical events and scientific methodologies for prediction can be useful to mitigate their negative impacts of natural disasters. The natural hazard vulnerability assessment is the key element within the decision-making process in natural hazard management and zoning areas with different degrees of vulnerability is just the beginning of integrated management of natural disasters in order to reduce risks, prevent, and mitigate the effects on people, other living beings, and ecosystems. The natural hazard vulnerability assessment should first of all determine the further spatial development and protection of existing facilities and infrastructure.

With the deployment of the Spatial Development Strategy of the Republic of Serbia (2009) and the Spatial Plan of the Republic of Serbia (2010–2021), considerable attention was paid to the protection of people and their material goods from natural disasters. In the area of disaster risk reduction, the central strategy document is the National Strategy for Protection and Rescue in Emergencies ("Official Gazette of the Republic of Serbia" 86/2011 (2011). According to that, specific spatial planning will be applied to potentially risky zones, with regionalization of the surfaces according to the degree of risk. So, for further strategies, spatial and urban plans and protection from natural hazards will represent a very important segment of land use planning, especially in vulnerable regions.

## 9.2 Geoheritage

The abundance and complexity of geoheritage sites are the result of density and a rich variety of geodiversity sites. Albeit shortly in use (Wiedenbein 1993; Sharples 1995; Eberhard 1997) and constant adjoin to a term (Gray 2004; Serrano and Ruiz-Flaño 2007), the geodiversity should be in the narrowest sense defined as the abiotic diversity of the Earth.

The above-mentioned density and abundance of geodiversity sites in Serbia is the consequence of composite geological composition and range of physical-geographical processes that took part in the distant or recent past leading to a variety of features and forms.

On the other side, the complex geological background is the consequence of lots of factors. There are five geotectonic units in Serbia: Carpatho-Balkanides (eastern part of Serbia), Vlasko-Pontian (Dacian) (the eastern part of Serbia), Serbo-Macedonian mass, and the Vardar zone (middle part of Serbia) and Dinarides (western part of Serbia) (Dimitrijević 1995; Karamata et al. 1998). The units consist of rocks of different origin and age (from prior to the Paleozoic era until the youngest Quaternary deposits) resembling a rich variety of geological geodiversity sites. Many different types of rocks from all three main groups are included.

Magmatism in Serbia took part with more or less intensity over the whole geological past and left behind different quantities of igneous rocks all over it (Petković 1981). The areas of significant distribution of igneous rocks of different type and age are: the Timok eruptive area (East Serbia) (Drovenik et al. 1962; Antonijević and Mićić 1964; Dimitrijević 1995; Milovanović et al. 2005) that includes andesites, andesite-basalt assemblages, and latites and trachy-andesites; the Rudnik-Kotlenik volcanic zone (Divljan and Cvetić 1991) built mostly by dacite and occasionally quartz latite and solidified coarse-granular dacite, as well as by labradorite andesite, basalts, and trachyte; volcanic and pyroclastic rocks on the Rogozna Mt. (south-western Serbia) (Mićić 1988) are represented by volcanic and subvolcanic rocks (dacite – andesitic rocks, andesite-basalts, and trachy-basalts), and the Lece-andesite complex (south Serbia) (Pešut 1976) comprises pyroclastites, andesite flows, and dykes. Igneous and metamorphic rocks built approximately 26% of the Serbian total area (Manojlović and Živković 1997).

Sedimentary rocks are represented by diverse clastic and carbonate rocks, ranging in age from Paleozoic to Quaternary. Among clastic rocks of special importance are Neogene sediments related to marine and lacustrine sedimentary basins (Obradović and Vasić 2007). Due to the abundance of preserved life forms (Anđelković 1978; Pantić 1998; Pantić et al. 1998a), they significantly contribute to a richness of paleontological diversity in this area. Of particular importance for the complexity of geodiversity sites are different carbonate rocks (limestones, marbles, etc.) with numerous and various forms of surface and sub-surface karst relief formed within (Petrović 1976; Djurović 1998; Djurović

2018). Carbonate rocks cover the area of about 8144 km$^2$ (Gavrilović 1976). Quaternary aeolian sediments (sand and loess) cover a significant part of the northern Serbia (Pannonian Plain and the eastern Peripannonian regions) (Laskarev 1951; Marković – Marjanović 1951; Marković et al. 2008) allowing a rich variety of aeolian relief forms to be created within (loess plateaus and sands).

The composite geology is additionally inferred by rich fossil remains as the records of the past and a pretty long biological activity in Serbia. Relicts of the intraoceanic platform, that is, of the deep and vast Tethys Ocean, could be traced at the relatively small area along with remains of numerous archipelagos and shallow-water products from the northern Tethyan margin. Here, they alternate with land sediments from the European continent and carry preserved plant and animal remains that reveal diverse life and depositional settings (Pantić et al. 1998a, 1998b).

The region of Serbia has been subjected to different tectonic (Andjelković 1978; Andjelković and Nikolić 1980) and neo-tectonic events (Marović et al. 1998), which left behind a diverse primary and secondary structures, as well as tectonic elements that had the strong influence on the contemporary relief – morphostructures (Zeremski 1973, 1990; Menković 2018).

The geoheritage, the term derived at the beginning of the 90s in the twentieth century (Joyce 1994; O'Halloran et al. 1994; Wimbledon 1996), deserves great attention in Europe regarding its scientific, practical, and conservation importance. These problems gathered many researches of various geodisciplines in Serbia, too. Within the last 30 years, researches were concerned to designation of the main terms (Dangić 1998; Pantić et al. 1998a, b; Mijović and Miljanović 1999; Mijović et al. 2005; Djurović and Mijović 2006; Ilić 2006; Belij 2007; Djurović and Djurović 2010; Simić et al. 2010a, 2010b; Milovanović 2017). Afterward, the National Council for geoheritage of Serbia was established (Karamata and Mijović 2005) and the inventory list of geoheritage sites was created (Archive of the National Council for geoheritage of Serbia 2005 ).

The definition of the term geoheritage has been assumed in Serbia in 1995 by the declaration from the conference "Geoheritage of the Serbia Republic." Then, it has been accessed that the "Geoheritage includes all geological, geomorphological, pedologic and special archaeological values originated throughout the formation of the lithosphere, its morphological formation, and interdependence of nature and human cultures which have to be a special concern of all social factors as the part of unique geoheritage of Europe that is, world due to extreme scientific and cultural significance." (Declaration of the Conference "Geoheritage of Serbia" 1995). The representative geodiversity sites might be considered the geoheritage sites.

The disproportionate concept and different basement, as well as the lack of unique strategy in valorization, systematization and attempt in creating inventory lists of geoheritage sites within the whole Europe led to constitution of the European Association for the Conservation of the Geological Heritage in 1995 (ProGEO). The universal classification of geoheritage sites was proposed by it (Wimbledon 1996) and served as the template for creation of the inventory list of geoheritage sites in each country included in this association.

Leaning to the proposed classification, the National Council for geoheritage of Serbia in 1996 formed the 16 working groups of different geodisciplines but with the unique goal to draft the inventory of geoheritage sites and distinguish the most representative sites within. The early first recognition of geodiversity sites was made according to the Geotectonic Division of Serbia (Dimitrijević 1995) in the aim of the complex valorization and emphasizing the educational and tourism significance (Dinarides, Vardar zone, Serbo-Macedonian mass, and Carpatho-Balkanides). Afterwards, the inventory list was based on regional-territory organization. The main criterions for selection were the rarity of the given occurrence, its representativeness, the level of its meaningful, the importance for the evolution history, stratotype, the protection degree, etc. (Mijović et al. 2005).

### 9.2.1 Geoheritage Sites

Geoheritage sites in Serbia are presented in the inventory list of geoheritage sites of Serbia (Karamata and Mijović 2005). Sites are divided into 11 groups, and further into subgroups (551 sites) including the catalogue of the ex situ geoheritage sites (99 sites), that is, total 650 sites. Hydrological geoheritage sites, lacking in the first version of the inventory, were subsequently added in its 5 groups, 8 subgroups, and a sum of 246 sites (Gavrilović et al. 2009).

I. Sites of historical-geological and stratigraphic heritage (sum 130 sites)
   1. Paleozoic age (22 sites)
   2. Triassic age (4 sites)
   3. Jurassic age (18 sites)
   4. Cretaceous age (39 sites)
   5. Neogene (47 sites)

II. Petrological geoheritage sites
   – Sedimentary rocks (13 sites)
   – Igneous and metamorphic rocks (40 sites)

III. Structurally identified geoheritage sites (5 objects)

IV. Sites of geomorphological heritage
   – Surface karst relief (56 sites)
   – Fluvial relief (48 sites)

- Erosional relief forms (11 sites)
- Aeolian relief (9 sites)
- Paleovolcanic relief (11 sites)
- Glacial relief (21 sites)
- Periglacial relief (6 sites)
- Peatlands (30 sites)

V. Sites of neotectonic activities
- Epeirogenic movements (15 sites)
- Fault movements (19 sites)

VI. Sites of geophysical heritage (8 sites)

VII. Sites of speleological heritage
- Caves (56 sites)
- Pits (10 sites)
- *Swallow holes or ponors* (14 sites)

VIII. Sites of hydrogeological heritage (from the first 19 sites given in the inventory, their number is afterwards enlarged to 239, within 5 distinguished groups and 18 subgroups) (Mijović et al. 2009)
1. Springs of slightly mineralized groundwater
   - Springs on river and river-lake terraces (6 sites)
   - Karst springs (exsurgence)
   - • In Mesozoic carbonate rocks (46 sites)
   - • Karst springs in Neogene limestones (4 sites)
   - • Karst springs in marbles, marbleized limestones, calcshist, and calcite (5 sites)
   - • Karst springs of elevated temperature (28 sites)
   - Artesian springs of magnesium water
2. Mineral waters
   - Hyperalkaline mineral water (11 sites)
   - Sodium-chloride water (2 sites)
   - Ferruginous-arsenic sulfate water (3 sites)
   - Sulfur-hydrogen mineral waters (4 sites)
   - Acidic hydrogen mineral waters (50 sites)
3. Thermal (thermomineral) waters
   - Thermal waters in spa centers (40 sites)
   - Drill holes with thermal water (14 sites)
   - Wells with thermal sodium-chloride waters (8 sites)
4. Submerged springs (7 sites)
5. Hydrogeological sites of historical importance (8 sites)

IX. Pedological geoheritage sites (4 sites)

X. Archeological geoheritage sites (14 sites)

XI. Geoheritage sites of climate specificities (13 sites)

XII. Sites of hydrological heritage (the group distinguished in 2009)
1. Springs
   - Springs and karst springs (48)
   - Intermittent springs (5)
   - Thermomineral springs (22)
2. Rivers
   - Springs – water resources (parts of riverbeds) (33)
   - Waterfalls and cascades (28)
   - Sinking streams (30)
3. Lakes (19)
4. Swamps, marshes, oxbow lakes, and peatlands (32)
5. Hydrographic points (6)

Although the significant number of geoheritage sites has been distinguished, the inventory list of geoheritage sites of Serbia is still incipient, as distinct groups did not succeed to distinguish sites. Certain neglects caused either by a different interpretation of the term geoheritage or by a different methodology applied during evaluation as well as by a different experience of researchers were additionally recorded. Consequently, the selection of sites was inefficient as the attention was paid to distinct groups of sites, or sites were not verified on a field along with subjective valorization, etc. (Mijović and Stefanović 2009). The same sites due to their complexity are often included in different groups (hydrological, hydrogeological, geomorphological, speleological, etc.) leading to confusion in a real number of selected sites. The recognized pedological sites do not replicate pedological diversity of Serbia and need to be significantly replenished. A similar situation is with sites of archeological heritage where Paleolithic heritage sites completely are lacking.

Modern activities directed on further work on the inventory should not be positively assessed. The initial interest of the broader scientific publicity, which was in accordance with the dynamic of the job and courses given by ProGeo, is stagnating. One of the reasons is the cease of work of the National Council for geoheritage of Serbia, which has been in charge and responsible for activities in the past period. Some optimistic ideas concerning the future renovated activities related to geoheritage of Serbia arise from individuals and their research papers, Master, and Ph.D. thesis (Vasiljević 2015; Ilić 2016; Grujučić-Tešić 2017; Miljković 2018).

Due to the exceptional value, certain geoheritage sites are placed under special legal protection. Duties concerning the protection of geoheritage sites differ in goal, extent, and dynamic (Belij 2009). In the first period since the end of the nineteenth century until World War II, the need for protection of various collections, parts of mountains or extraordinary relief forms was given by some scientists, but without any law regulative. The second period begins with the establishing law for the protection of cultural monuments and natural values in 1946. Afterwards, many individual objects were considered as geoheritage sites and put under protection (Čolić 1951; Nojković and Mijović 1998; Belij 2009). On the other side, some objects were protected by their

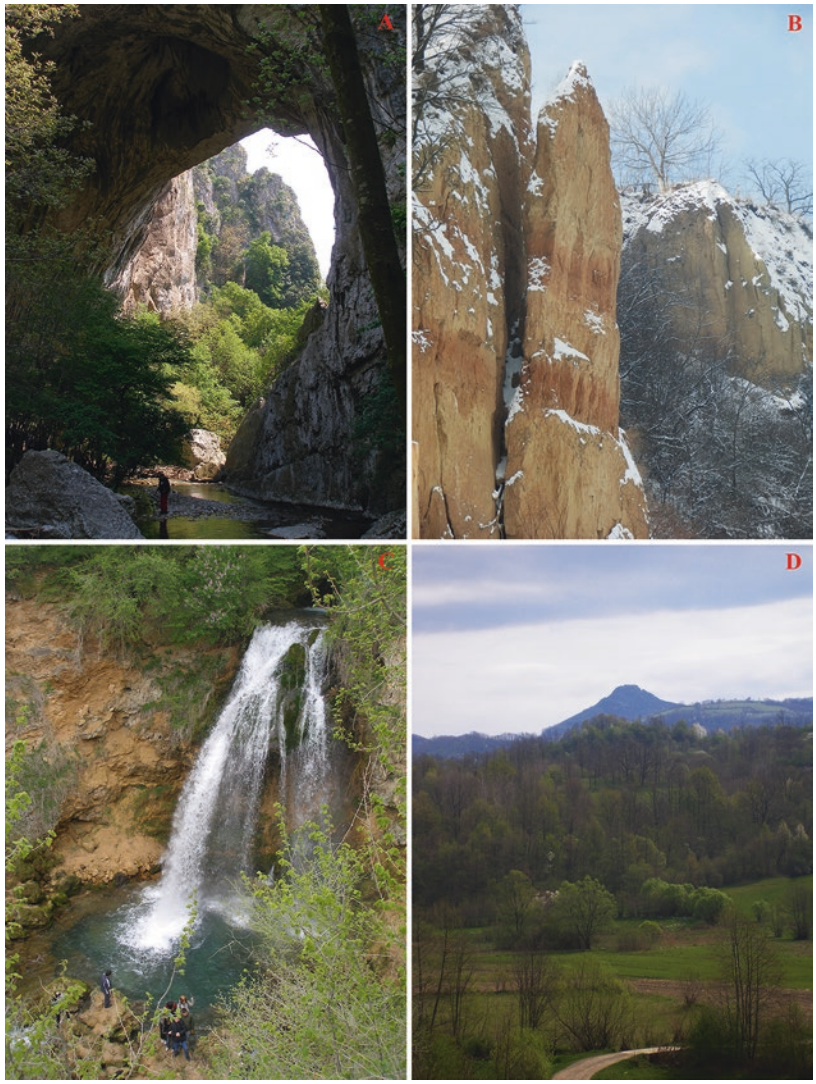


**Fig. 9.5** Geoheritage sites of Serbia. (**a**) natural bridge, Vratna: (**b**) loess cliff, Zemun loess plateaus; (**c**) Waterfall Veliki Buk, Eastern Serbia; (**d**) Paleovolcanic neck, Ostrovica. (Photos by Mirela Djurović)

inclusion into broader protected natural monuments, such as national parks. In spite of the newly brought laws (Law on Nature Protection 2009, 2016; Law on Water Resources 2010, 2012; Law on Spa Resorts, 1992; etc.), the number of protected geoheritage sites (about 80) is not following a richness geodiversity of Serbia. Thus, the protection of geoheritage sites requires significantly more advanced activities in the future.

The spatial distribution of geoheritage sites was presented according to Archives of the National Council for geoheritage of Serbia from 2004. It encompasses all sites from the first 11 groups, the adjoining hydrogeological geoheritage sites identified in 2009, and the enlarged list from 2009 of the same, hydrogeological sites (without subgroups such as spa resorts, drill holes, wells, submerged springs, and sites of historical importance). Geoheritage sites of specific climate conditions and those from the catalogue of ex situ geoheritage features (paleontological collection and collection of rocks and minerals) are not presented due to their spatial characteristics and limitations. The presented spatial distribution of geoheritage sites of Serbia includes 681 features (Fig. 9.5 and Fig. 9.6).

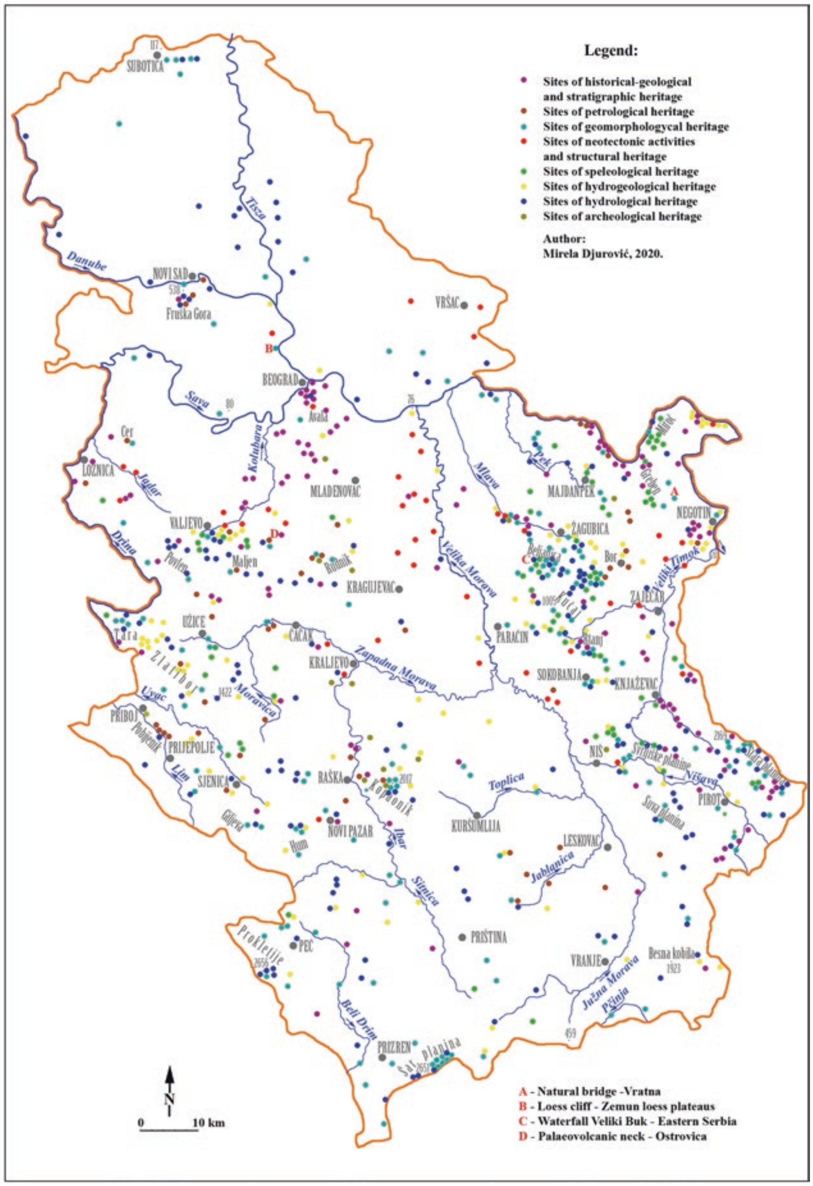


**Fig. 9.6** Geoheritage sites of Serbia

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# Part III

# Demography

Vladimir Nikitović

# Demographic Profile of Serbia at the Turn of the Millennia

10

Daniela Arsenović and Vladimir Nikitović

**Abstract**

Serbia, together with most of its neighbours – Bosnia and Herzegovina, Croatia, Hungary, Bulgaria and Romania, belongs to the world countries experiencing highest population decline. Its total population has been declining since the dissolution of the former Yugoslavia when the rate of natural change turned negative. The rising net emigration speeded up this trend at the turn of the millennia. In addition, Serbia is lagging behind most EU member states in terms of educational attainment of their working age population. The region of the capital city is the only one with a positive population growth in the country exclusively due to a positive balance of internal migration induced by attractiveness of the metropolitan area. Albeit Serbs are dominant majority, demographic profile of the country reveals rich ethnic heterogeneity, particularly in the Vojvodina region, resulted from the multifaceted interaction of historic, geographic and political factors. Yet, there are only four spatially homogeneous ethnic communities, three of which are grouped in the border areas, forming subregional majorities close to their homelands.

**Keywords**

Population change · Population density · Rate of natural change · Population ageing · Ethnic minorities · Education attainment

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## 10.1 Population Change

According to the population censuses held between 1961 and 1991 in the former Yugoslavia (1945–1991), the population residing in the territory of the Republic of Serbia excluding Kosovo had been rising. Quite conversely, the population in this territory has started to decline since the dissolution of the former Yugoslavia as indicated by the two censuses conducted in Serbia in this century – 2002 and 2011 (Fig. 10.1).

According to the census results, the total population of Serbia was almost the same in 1971 and 2011 and amounted to about 7.2 million inhabitants (Fig. 10.1). Yet, it seems that the current declining trend of population change is speeding up. Even though the total resident population of Serbia is officially estimated to 6,963,764 inhabitants at the beginning of 2019 (SORS 2019), its real size would undoubtedly be smaller if the effect of international migration is accounted for. Accordingly, the estimate of 6,787,888 inhabitants residing in Serbia in the mid-2018, which includes the estimate of net emigration since the 2011 census (Nikitović 2019), suggests that the change between 2011 and 2021 could be analogous to the one observed in the 1961–1971 period but of the opposite direction.

Both components of population change – natural change and migration, induced the declining trend of Serbia's population of which natural change has become increasingly important as time passes. The rate of natural change turned negative first time in 1992 since when it has started to continuously decline reaching the annual average of −5.3 per thousand population in the 2016–2018 period (Fig. 10.2).

Despite the rise in importance of international migration for the total population change during the 1990s wars due to intensive displacements of population in the region of the former Yugoslavia (Nikitović and Lukić 2010), natural change was the main driver of population dynamics in Serbia during the second half of the twentieth century. Nevertheless, migration joined negative natural change in reducing the


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**Fig. 10.1** Population change in Serbia according to the censuses between 1961 and 2011. (Source of data: Penev G (ed) 2006; Nikitović V (ed) 2015)

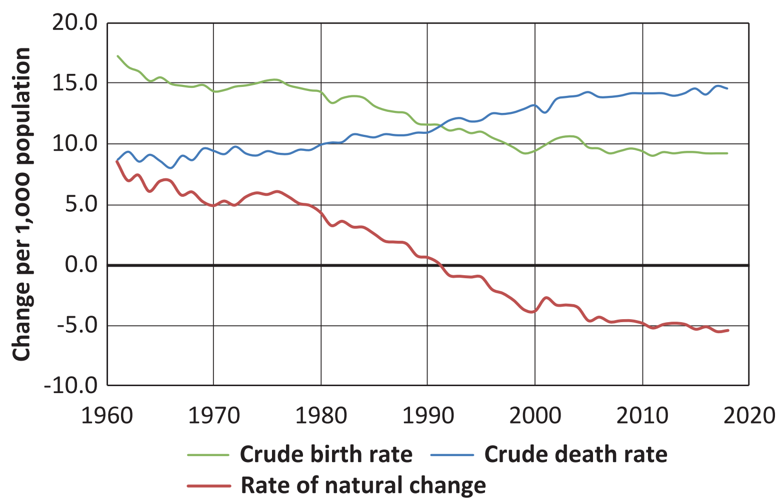


**Fig. 10.2** Annual crude rates of natural change in Serbia, 1960–2018. (Source of data: SORS 2012a, 2014; SORS database 2019)

total population size of the country in the twenty-first century as indicated by the census (Nikitović 2015).

Very low or negative population growth rates are among demographic issues of great concern in all countries of the developed world. The population growth in Europe is the lowest of all major world regions, and the Europe's population is expected to gradually decline by the end of this century unlike the global population (Van Nimwegen 2013; UN 2017). Although the population of the EU-28 is still growing but at rather slow rate, which is assumed to turn negative beyond 2050 (Eatock 2019), 13 EU member states have experienced decline in total population. Four of them are neighbouring countries of Serbia: Croatia, Bulgaria, Hungary and Romania, all of which have been affected by negative population growth rate. In Croatia, Bulgaria and Romania, the population decline was induced mostly by negative natural change supplemented by net emigration, while in Hungary, it was solely due to negative natural change (European Commission 2015). In all of them except in Hungary, the decline by more than 15% is expected by 2050, which is the world highest according to the UN Population Division (UN 2017, p 5).

### 10.1.1 Regional Differences

The average **population density** in Serbia (about 93 inh./km2) according to the 2011 census is almost double the world average (about 50 inh./km2), but typical for the countries of South and East Europe – somewhat higher than in Croatia, Bulgaria and Romania, and a bit lower than in Hungary or Slovenia. However, the indicator values are below the national average in the regions of Vojvodina (89), Šumadija and West Serbia (77) and South and East Serbia (60). On the other hand, the highest population density refers to the region of the capital city (Belgrade), with an average of 514 inh./km$^2$ and a peak of 18.8 thousand inhabitants per km$^2$ in the urban core of the city. The least populated areas (below 25 inh./km$^2$) occupy about 9.6% of the country's territory where 2% of the total population lived in 2011, and are mainly located in the region of South and East Serbia (Đurđev and Arsenović 2015).

If we exclude most densely populated and nearly deserted areas of the country, three zones of population density encompassing 143 out of total 168 municipalities can be distinguished: low (25–50 inh./km$^2$), medium (50–100 inh./km$^2$) and high density (100–1000 inh./km$^2$) (Fig. 10.3). Each of the two less populated zones (the low and the medium) occupies around 28% of the territory of Serbia, where 13% and 25% of the total population lived according to the 2011 census, respectively. At the same time, around 43% the total population lived in the high-density zone covering 20% of the country.

Regional differences in **population growth rate** in Serbia have been strongly pronounced since the break of the former Yugoslavia. The Belgrade region (coinciding with the capital city) and the Vojvodina region had a positive growth rate in the 1991–2002 period, while the regions of Šumadija and West Serbia (ŠWS) and South and East Serbia (SES) had a negative growth rate. The majority of this growth was provided by migration inflow, particularly in the Vojvodina region where about 48% of the refugees from the former Yugoslav republics settled down by the end of the 1990s (Lukić and Nikitović 2004; Nikitović and Lukić 2010).

The Belgrade region was the only one with a positive population growth in Serbia between 2002 and 2011, while other parts of the country were affected by a negative rate of population change. This was exclusively a result of a positive balance of internal migration induced by attractiveness of the Belgrade metropolitan area. However, the intra-regional divergences across municipalities in this region, particularly between the central and peripheral ones, are also evident (Fig. 10.3).

If we look at lower administrative level of spatial units, there are only several 'islands' that experienced an increase in total population between the census years of 2002 and 2011. Those are the largest cities in the country, which are the centres of the NUTS 2 regions, municipalities at the southwest, predominantly populated by Bosniaks – one of the few ethnic groups in the country still having total fertility rate well above the replacement level (Rašević 2015) and a municipality with the largest share of internally displaced persons from the region of Kosovo and Metohija (Nikitović 2015). The highest growth (above 10%) had been reported in the municipalities of the Belgrade region, the centre of the Vojvodina region (Novi Sad) and the largest municipality of the Bosniaks' ethnic community (Fig. 10.3b). The cities of Belgrade and Novi Sad are the homes for the country's major

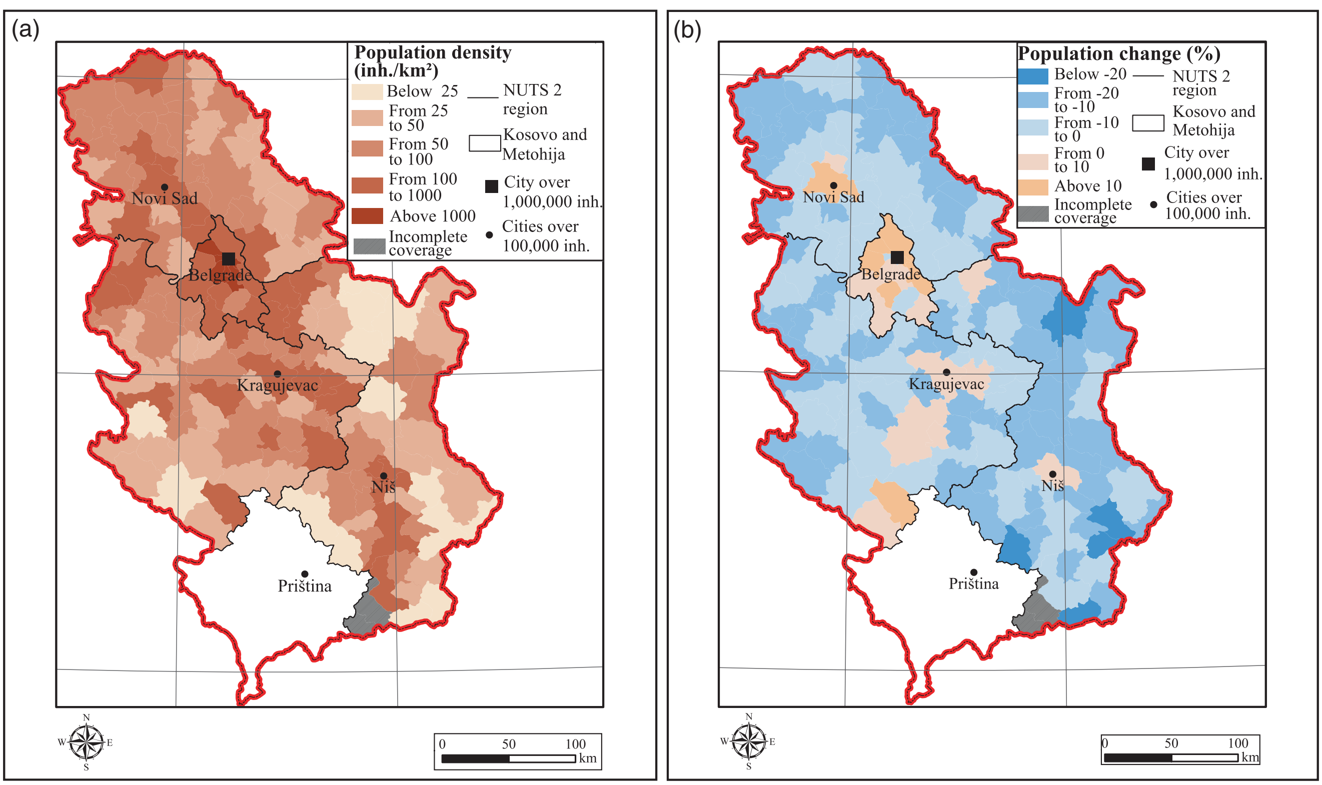


**Fig. 10.3** Population density in 2011 (**a**) and population change 2002–2011 (**b**) across local administrative units of Serbia. (Source of data: RZS 2019; SORS 2012a, 2014)

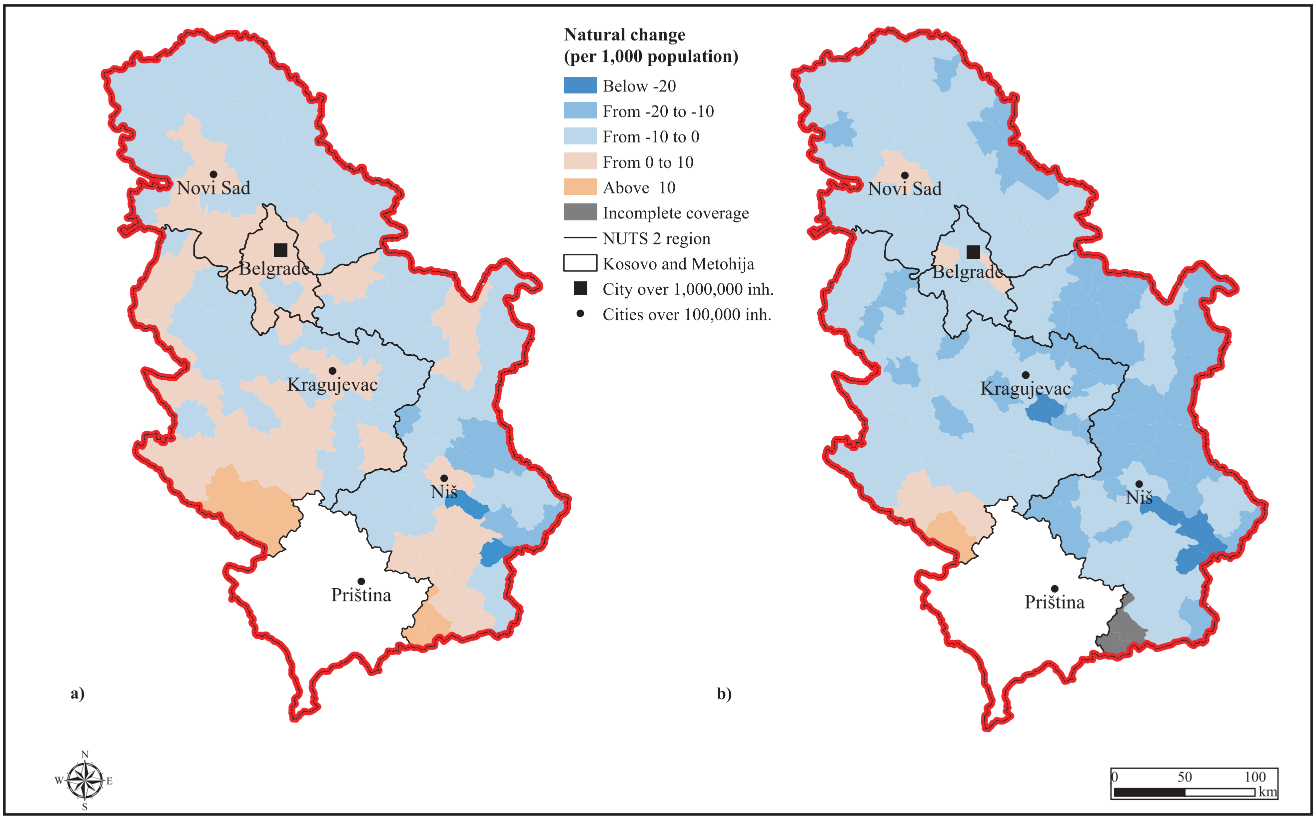


**Fig. 10.4** The 3-year average rate of natural change across local administrative units in Serbia in (**a**) 1991 and (**b**) 2011. (Source of data: SORS 2012a)

universities. Moreover, the two cities are financial, administrative, economic and cultural centres, which coupled in the unique fast-growing metropolitan area (see Chap. 21).

The importance of internal migration for subnational differences in the rate of population change can be best perceived if the two figures showing rates of population (Fig. 10.3b) and natural change (Fig. 10.4b) in 2011 are compared. The 3-year average rate of natural increase (2010–2012) based on the 2011 census was between −2.1 (the Belgrade region) and − 5.8 per thousand population (the South and East Serbia region). The rate of natural change that was positive in nearly 40% of municipalities in the country in 1991 turned negative in most of the local administrative units in the country. If the two intercensus periods are compared, the share of municipalities with negative rate of natural change has increased from 86% (1991–2002) to 96% (2002–2011). Thus, only seven municipalities had a positive rate of natural increase in 2011, four of which – all in Belgrade and Novi Sad, had a marginally positive. The majority of municipalities with the rate of natural increase lower than −10‰ was located in the region of South and East Serbia (Fig. 10.4).

## 10.2 Population Ageing

Like almost all the European countries, Serbia is experiencing population ageing as a result of below replacement fertility and increasing life expectancy (Kupiszewski et al. 2012). This process has been recently supported by an increasing trend of emigration coupled with returning of retired baby boomers from abroad (Nikitović 2019). The rise in the average age of population is a long-term trend that began several decades ago and is manifested in the growing trend of the elderly (aged 65 and over) and the declining trend of the working age population (European Commission 2015). In demographic terms, together with its neighbours Croatia and Bulgaria, Serbia was one of the oldest countries in the world according to the 2011 census, with an average age of 42.2 years, ageing index of 1.22 and the share of elderly of 17.4% in total population. The region of South and East Serbia had the highest average age of 43.3 years, while its oldest area reached 46.7 years (Lukić et al. 2013). The most common indicators of population age structure illustrate continuous population ageing of Serbia between the census years of 1991 and 2011, with the share of elderly becoming

**Table 10.1** Major age groups and indicators of population ageing in Serbia in the census years of 1991, 2002 and 2011

| | 1991 | | | 2002 | | | 2011 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female | Total | Male | Female |
| Age group – Share of total population (%) | | | | | | | | | |
| 0–14 | 19.4 | 20.4 | 18.5 | 15.8 | 16.7 | 15.0 | 14.3 | 15.1 | 13.5 |
| 15–64 | 68.7 | 69.4 | 67.9 | 67.6 | 68.8 | 66.3 | 68.3 | 69.9 | 66.9 |
| 65 and over | 11.9 | 10.2 | 13.6 | 16.7 | 14.5 | 18.7 | 17.4 | 15.1 | 19.6 |
| 80 and over | 2.1 | 1.7 | 2.5 | 2.0 | 1.5 | 2.4 | 3.6 | 2.7 | 4.4 |
| Indicators of population ageing | | | | | | | | | |
| Average age | 37.7 | 36.6 | 38.8 | 40.2 | 39.0 | 41.5 | 42.2 | 40.9 | 43.5 |
| Ageing index | 0.62 | 0.50 | 0.74 | 1.05 | 0.87 | 1.25 | 1.22 | 1.0 | 1.45 |
| Old-age dependency ratio | 17.4 | 14.7 | 20.0 | 24.6 | 21.0 | 28.2 | 25.2 | 21.6 | 29.3 |

Source: Penev 2006 and Nikitović 2015

Note: Ageing index – population 65 and over to population aged 0–14. Old age dependency ratio – population 65 and over to population 15–64

higher than the share of youngsters since 2002 (Table 10.1). Expectedly, female population is older than male population due to higher life expectancy particularly at older ages, which is typical for developed world regions (Devedžić and Stojilković 2012).

Emigration of guest workers abroad between the late 1960s and 1980s, which was more typical for rural and less developed areas of the country, coincided with intensive internal rural to urban migration (see Chaps. 12, 21 and 22). As a result, rural areas had experienced population ageing much earlier than cities. Although the stadiums of population ageing, as they were defined by Penev (2006), can point to only few municipalities in the southwest of the country not labelled as being demographically old or very old, the current pace of ageing is generally faster in urban zones, especially in the most populated centres, as the large population of in-migrants from the earlier periods enters the old age.

## 10.3 Ethnic Profile of the Population

Demographic profile of Serbia reveals rich ethnic heterogeneity, particularly in the Vojvodina region, resulted from the multifaceted interaction of historic, geographic, demographic and political factors (Lukić et al. 2013; Nikitović et al. 2016). According to the 2011 census, there were 45 ethnic groups of which 21 had more than 2000 people. Yet, apart from Serbs as the dominant majority (83.32%), only three ethnic communities participate in the total population with more than 1% – Hungarians (3.53%), Roma (2.05%) and Bosniaks (2.02%) (SORS 2012b). On the other hand, there are four spatially most homogeneous ethnic communities (Fig. 10.5), three of which are grouped in the border areas (Hungarians, Bosniaks and Bulgarians), thus forming subregional majorities close to their homelands (Nikitović et al. 2016).

Hungarian ethnic minority is located in the north, the Bosniaks in the southwest and the Bulgarians in the southeast of the country. Of total 168 municipalities in the country according to the 2011 census, the Serbs were the majority in 153 municipalities (an absolute majority in 152), Hungarians in eight municipalities (an absolute majority in five of them), Bosniaks in three, Bulgarians in two and Slovaks in two municipalities (an absolute majority in the one) (Đurić et al. 2014). Albanian ethnic minority was represented with an absolute majority in two municipalities in the south along the administrative border with the region of Kosovo and Metohija according to the 2002 census. However, their actual number from the 2011 census is unknown because they boycotted it. Yet, the increase in share of the population with no clear ethnic affiliation in Serbia between 1991 and 2011 is worth noting. This category makes up 4% of the total population in 2011 if the 'undeclared' group, which has grown since the break-up of Yugoslavia, is summed up with persons who declared regional affiliation, those feeling Yugoslavs, and the unknown category (Lukić et al. 2013).

Most ethnic minorities in Serbia follow the same declining trend in population size primarily due to the negative natural change. The exception to this rule is represented by three ethnic minorities – Roma, Bosniaks/Muslims and Albanians, which traditionally have a high rate of natural increase induced by total fertility rate that is well above the replacement level (2.1). The cumulative fertility rate of women aged 40–49 years is far below two children per woman in all ethnic groups, except in Roma population (2.75), Bosniaks/Muslims (2.39) and Albanians (2.23) (Rašević 2015). During the recent years, intense migration outflows have become typical for ethnic minorities, particu-

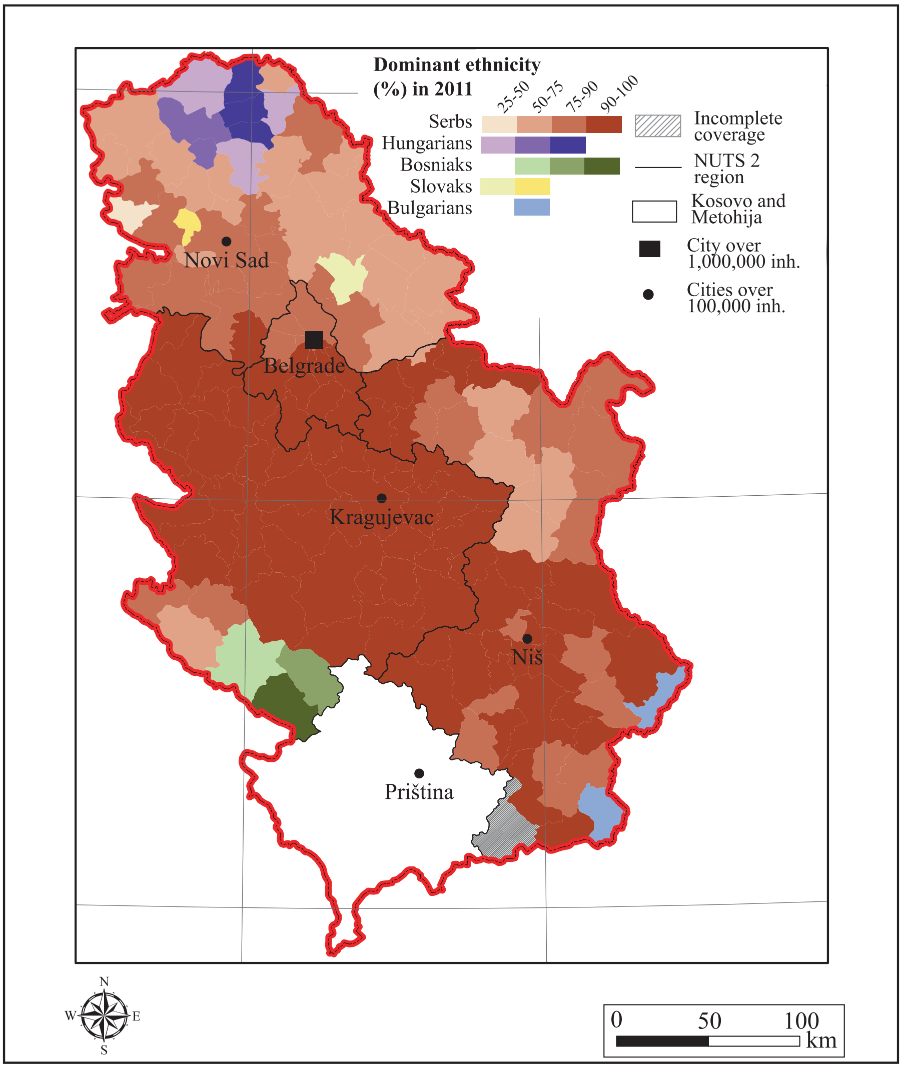


**Fig. 10.5** Spatially most homogeneous ethnic groups in Serbia, 2011 census. (Source of data: SORS 2012b)

larly after their countries of origin joined the EU, for example, Hungary, Slovakia, Croatia, Bulgaria and Romania.

## 10.4 Education Structure of the Population

Between the census years of 1991 and 2011, literacy rate in Serbia has risen from 93.9 to 98.0% (SORS 2013), which makes it similar to the rates in other countries in Central and Eastern Europe where adult literacy reaches 99% (UNESCO 2013). In the new EU member states (EU-13), literacy rate ranged from 93 to 99.9% in 2011.[1]

[1] A methodological difference should be taken into account – the census in Serbia calculates literacy rate for the population aged 10 and over, whereas in international methodology, it is based on the population aged 15 and more (World Health Organization 2019).

However, disparities between Serbia and other European countries by educational attainment are more pronounced. According to the 2011 census, 55.1% of working age population (15–64) in Serbia had some of upper or post-secondary educational levels – ED3_4 according to ISCED 1997, which represents the increase comparing to 2002 (47.1%). The percentage of persons with tertiary education (ED5_6) also raised from 11.8% to 17.8%, while the percentage of persons without formal education, and with primary or lower secondary education (ED0_2) dropped from 38.1% to 26.8% between 2002 and 2011. In all regions, most of the working age population had upper or post-secondary education. Despite improvements in educational structure of population in all regions of Serbia between 2002 and 2011, regional differences have not been alleviated. The region of Belgrade is still distinguished by the best education structure in relation to other regions, with almost 30% of working age persons having tertiary education (Table 10.2).

**Table 10.2** Population aged 15–64 years by highest level of education attained (%) in Serbia, 2002 and 2011 census

| | 2002 census | | | 2011 census | | |
|---|---|---|---|---|---|---|
| Region | ED0–2 | ED3_4 | ED5_6 | ED0–2 | ED3_4 | ED5_6 |
| Republic of Serbia | 38.1 | 47.6 | 11.8 | 26.8 | 55.1 | 17.8 |
| Belgrade region | 23.0 | 54.6 | 20.4 | 14.5 | 55.5 | 29.6 |
| Vojvodina region | 38.6 | 50.2 | 10.2 | 27.8 | 56.6 | 15.4 |
| Šumadija and West Serbia | 43.4 | 45.8 | 8.9 | 31.9 | 54.8 | 12.9 |
| South and East Serbia | 45.3 | 40.2 | 9.0 | 32.5 | 53.0 | 14.1 |

Source: Lukić et al. (2013)

The 2011 census was the first to collect data on computer literacy of population in Serbia. Amongst persons aged 15 and over, there had been 49% of those familiar with at least one of four basic computer skills, of which the two-thirds were fully computer literate persons (Šobot 2015; SORS 2013). This puts Serbia close to the EU countries having the lowest shares of persons (aged 16–74) having used a computer – like Romania (50%), Bulgaria (55) and Greece (59), and far from the countries having the highest share – like Denmark, Netherlands and Luxembourg (94) or Sweden (96) (Eurostat 2012).

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# 11 Demographic Challenges in Serbia

Mirjana Rašević and Marko Galjak

**Abstract**

The present chapter focuses on fertility and mortality problems as the two big demographic challenges facing Serbia. The trend of the average number of live births to women who were past the reproductive age in 2011, considered by age cohorts, indicates an early below-replacement fertility and a long period in which the number of live births per woman was stable at the value of 1.8. Although younger cohorts have yet to age beyond their reproductive years, markedly lower average number of live births by women aged between 36 and 40 compared to women aged 41 and over in 2011 will probably deepen due to completed fertility declining below the 1.8 mark. At the same time, Serbia is struggling with high premature mortality. Premature deaths of middle-aged people, but also younger, reproductively capable people, have effect on the economy, childbearing, and depopulation. In Serbia, men are dying more prematurely than women. About half of all deaths of men younger than 75 in 2015 could have been avoided by either prevention or adequate and timely healthcare. Big urban centres are much better off in this regard, unlike more remote regions which often lack good healthcare services.

**Keywords**

Below-replacement fertility · Postponement of childbearing · Birth control · Family policies · Life expectancy · Premature mortality · Avoidable deaths

Serbia is facing a multitude of serious population challenges. The most notable ones are childbearing far below the replacement level, resulting in depopulation and intensive population ageing, the relatively high death rate and the negative migration balance. The present chapter focuses on fertility and mortality problems as the two big demographic challenges Serbia is facing. Due to the lack of reliable data for the region of Kosovo and Metohija, it is excluded from this chapter.

The childbearing crisis in Serbia is considered from a long-term perspective, including the trends of completed fertility in the immediate future, based on the selected micro, meso and macro factors influencing the low fertility levels. To that end, the first part of this chapter gives an overview of research results that are important for understanding low fertility in Serbia. In addition to the 2011 Population Census results, the first part of this chapter also examines the findings of a series of quantitative or qualitative studies, which directly or indirectly relate to the causes of below-replacement fertility in Serbia.

Premature mortality is a relatively new concept that helps us view the mortality in Serbia through two lenses: that of age and of specific causes of death. The second part of this chapter gives an overview of avoidable mortality which in Serbia is happening prematurely. The data used in that analysis come from Serbia's vital statistics and population estimates made by Statistical Office of the Republic of Serbia (2018a).

Subchapter 11.1.1. (almost entirely) and subchapters 11.1.2. and 11.1.3. (partially) were originally presented under the title 'Low Fertility in Serbia: New Insight' at the Fifth International Conference of the Balkans Demography, held in Ohrid (Republic of North Macedonia), 21–24 October 2015, and were published in 2017 in the conference proceedings titled 'The Population of the Balkans at the Dawn of the 21st Century' by the Cyril and Methodius University and the Institute of Economics in Skopje.

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## 11.1 Childbearing Crisis

### 11.1.1 Completed Fertility Stabilized at a Low Level

None of the analysed 33 age cohorts of women who were past their reproductive age in 2011 had an average number of live births greater than two children (Fig. 11.1). Even the registered women in the oldest analysed age cohort (generation born in 1930) had given birth to 1.88 children on average. This is clearly the largest registered average number of live births. The age cohorts that were past the reproductive age in 2011 had, on average, between 1.85 children (generation born in 1931) and 1.75 children (generations born in 1937, 1938, 1939, 1940 and 1941), while the most frequently recorded average number of live births was about 1.8. The youngest age cohort of women who were past the reproductive age in 2011 (the generation born in 1962) had 1.82 children on average (Rašević 2017).

The trend of the average number of live births to women who were past the reproductive age in 2011, considered by age cohorts, indicates an early appearance of the phenomenon of below-replacement fertility in Serbia and a long period in which the number of live births per woman was stable at the value of 1.8 (Rašević 2017). The socialist type of accelerated modernization process, abrupt transition from rural to urban areas, a significant share of women in the labour market with full-time jobs during their reproductive period, fast secularization, as well as widespread economic hindrances for meeting reproductive needs were certainly the most important factors contributing to early occurrence of the phenomenon of below-replacement fertility and its persistence in Serbia (Rašević and Petrović 1995). Serbia's political and economic institutions and experience as a constituent republic of the Socialist Federal Republic of Yugoslavia differed from most of the other countries of the Soviet bloc since the late 1940s. In 1948, the Moscow-dominated Cominform denounced the relatively independent socialist policies of President Tito and expelled Yugoslavia. Yugoslav socialism shifted from central decision-making towards a policy of economic self-management organized around workers' councils and decentralized local governments (Rašević 2017). Moreover, unlike other socialist countries, Yugoslav society was considerably more open to the Western system of values and to a greater extent facilitated the satisfaction of individual needs. This contributed to an increase in the economic and psychological cost of children (Rašević and Petrović 1995).

The different societal conditions to some extent affected the childbearing behaviour not only during the 1960s, 1970s and 1980s, but possibly even later (Basten and Frejka 2015). One of the explanations for the childbearing stabilization is the preservation of the universality of marriage, which was contracted at a relatively early age, whereas alternative forms of cohabitation were practically non-existent (Rašević and Petrović 1995) (Rašević 2017).

In 1945, the Federal Government introduced child allowance and one-off financial assistance for new-born children (1945–1967), as employment-based entitlements. Child allowance had both social welfare and population policy elements almost from the very beginning. Namely, means testing was introduced as an additional eligibility criterion for child allowance, and parents could receive this entitlement until their child's 20th birthday (or 26th for children in regular education), while its amount directly depended on the number of children in the family. Child allowance amounts were substantial until the late 1950s. For instance, in 1958, they ranged between 16% of the average wage for the first child in the family and 59% for the fifth child. The respective proportions in 1967 were 7% and 31% (Gavrilović 2005). Parental leave was introduced in 1946 (84 days) and was continuously extended (90 days in 1949, 105 days in 1957, 133 days in 1965, 180 days in 1974, 210 days in 1977, 270 days in 1984) (Gavrilović 2005). The reimbursement of

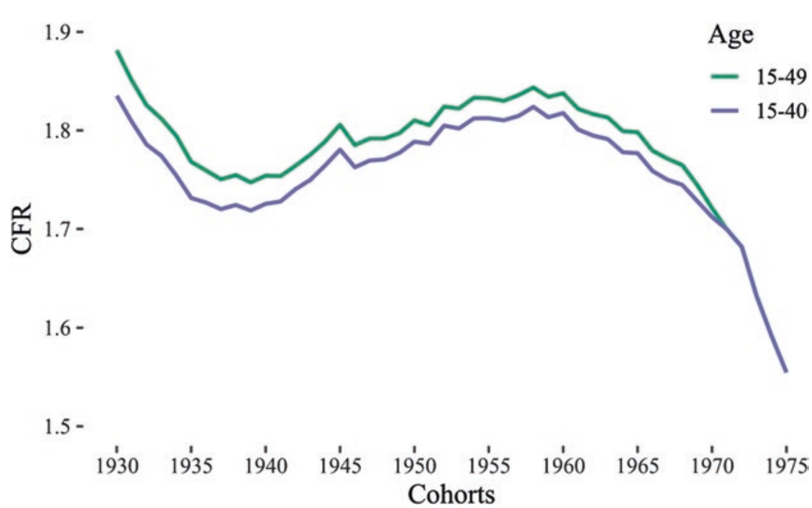


**Fig. 11.1** Cohort total fertility rate in Serbia, birth cohorts 1930–1975. (Reproduced from Rašević 2017)

the costs of childcare in preschool institutions was also introduced immediately after the Second World War.

The analysis of the average number of live births to women under 40 years of age, in age cohorts 1930–1962, shows that it is expectedly the largest in the oldest generation of women (1.84 children per woman). The same generation is also associated with the biggest difference (0.05 children per woman) between the cohort total fertility rate, which includes live births until age 45, and the rate that refers to live births until 40 years of age (Fig. 11.1). Despite being the biggest, this difference is insignificant and, for younger considered age cohorts, it is minimal and shows unambiguously that Serbian women who were past their reproductive age in 2011 rarely gave birth to children after turning 40 (Rašević 2017).

The 2011 Census results also facilitated ascertaining the mean age of women at birth, by age cohorts. The value of this family planning indicator did not vary substantially among the considered generations of women who were past the reproductive age at the time of the Census (Fig. 11.2). Thus, in the generation born in 1930, the mean age of women at birth was slightly less than 3 months lower than that of the cohort born in 1962 (25.30 years and 25.53 years, respectively) (Rašević 2017).

### 11.1.2 Deepening Childbearing Crisis

The average number of live births by women who were approaching the end of their reproductive age at the time of the 2011 Census (Fig. 11.1) continuously decreased from 1.81 (the generation of 1963) to 1.55 (the generation of 1975). The registered difference of 0.26 children per woman is substantial. The mean age of women at childbirth increases from older to younger generations (Fig. 11.2). For the generation born in 1963, the value of this family planning indicator was 9.5 months lower than the cohort born in 1975 (25.62 years and 26.41 years, respectively) (Rašević 2017).

The generations of women who were aged between 36 and 41 at the time of the 2011 Census were in their optimum childbearing period in the 1990s and 2000s. In Serbia, those two decades were marked by crisis and turbulence. The 1990s were an exceptionally complex period for the population of Serbia. In addition to the impact of long-term factors, various tumultuous events affected its demographic development, such as the dissolution of former Yugoslavia, armed conflicts in the neighbouring countries, sanctions imposed by the international community, deep economic crisis, the collapse of social stratification, political problems, institutional crisis and the 1999 NATO military intervention. Maladaptation to the changed system of values and norms, a lower level of personal attainment, the feeling of insecurity and living under permanent stress are the main features of life at an individual, psychological level. Deprivation or living at the subsistence level is the main element of the economic cost sustained by the majority of the population (Rašević 2004).

In the 1990s, the government attempted to mitigate the influence of irregular factors by imposing a pronatalist climate which entailed, above all, the introduction of working mothers' entitlement to paid maternity leave, where an allowance in the amount equal to mother's earnings is paid for 12 months after the birth of the first and second child, or for 24 months after the birth of the third child. Working women were entitled to 12 months of maternity leave for the fourth and every subsequent child, with maternity pay in the amount of 80% of their wage (Rašević 1999).

It is difficult to explain the low birth level after the year 2000 without an in-depth investigation of this phenomenon. In contrast to a large number of European countries, no significant demographic surveys have been conducted in Serbia. Not only was the *Fertility and Family Survey* not conducted in the 1990s, the authorities also failed to carry out more recent surveys, such as the *Population Policy Acceptance Study* and the *Generations and Gender Survey*. Despite this lack of information, in trying to identify the factors of low birth levels after the year 2000, logically the most prominent

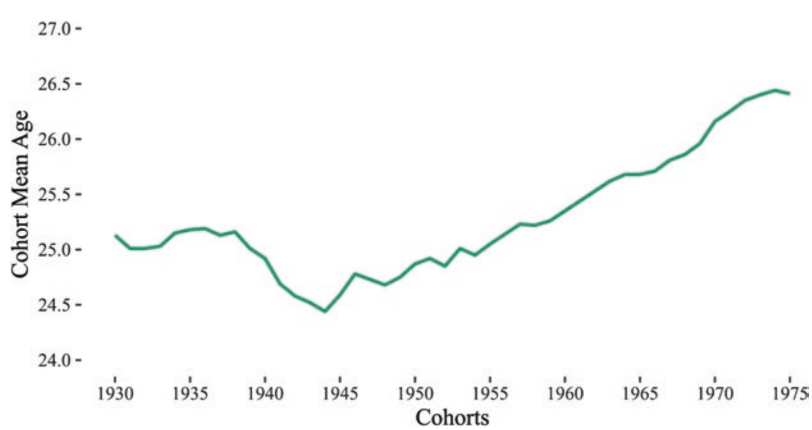


**Fig. 11.2** Cohort mean age of women at birth in Serbia, birth cohorts 1930–1975 (Reproduced from Rašević 2017)

seems to be the ones related to and/or resulting from the severe economic and social crisis which has been affecting Serbia for a prolonged period of time. The list of distinct structural barriers to childbearing has included new elements of individual passivation, such as, for example, the feeling of economic and psychological insecurity or social anomie, as well as women's dissatisfaction with their status in partner relationships, family and society. In addition to these factors, the low birth levels can be explained by a deep transformation of the society, corresponding to the changes that began earlier in the developed European countries, which are a cause of low fertility (Sobotka 2004). These include, on the one hand, the promotion of individualism, the desire for self-actualization, changed concept of family, different partner relationships, insisting on the quality of one's own life and the life of a child, while, on the other hand, there is strong inclination towards consumption and leisure (Rašević 2017).

At the same time, there is no comprehensive response of the state to the childbearing crisis. There have been two direct population policy measures significant for birth promotion at the national level since 2002. These are birth grants and maternity/parental leave. Birth grant was initially designed as a one-off allowance paid to the mother, in the amount of EUR 1000 for the second child, EUR 2000 for the third and EUR 4000 for the fourth child. After 2006, the model also included a one-off allowance for the first child, in the amount of about EUR 300. As a result, the amount of the birth grant for the second-born and every subsequent child remained the same, but it was paid in 24 equal monthly instalments until the mid-2018. The expenditures for this measure in Serbia were approximately 0.2% of the Gross Domestic Product (GDP) – greater than any European Union countries' expenditures on birth-related grants, expressed as a proportion of the GDP (Matković et al. 2018).

However, the sum of the GDP shares spent on child allowance (0.29% of the GDP in 2016) and on birth grant (0.17%) was still smaller than the EU-28 average GDP share spent on child allowance alone (1.1% in 2014), since this social transfer is not means-tested in many of the countries, unlike Serbia, and is usually given to all children (Matković et al. 2018).

Since 1 July 2018, the design of the birth grant has changed considerably in Serbia. It amounts to EUR 830 for the birth of the first child (paid as a lump sum), EUR 2000 for the second child (paid in 24 equal monthly instalments), EUR 12,000 for the third child (paid in 120 equal monthly instalments) and EUR 18,000 for the fourth child (also paid in 120 equal monthly instalments) (Kabinet ministra bez portfelja zaduženog za demografiju i populacionu politiku 2018).

The law also provides for a maternity pay equal to the employed mother's earnings, during maternity leave and childcare leave for 1 year for the first and second child, or 2 years for the third and any subsequent child. A comparative analysis (2016) of the duration of the maternity and childcare leave with a maternity pay equal to the employed mother's earnings shows that this system in Serbia is more generous that in most EU countries, although not extremely generous, except in the case of third and any subsequent child when mothers are entitled to 2 years of childcare leave (Matković et al. 2018).

Although younger cohorts still have a chance of participating in reproduction, the identified markedly lower average number of live births by women aged between 36 and 40 compared to women aged 41 and over in 2011 raises doubts whether the completed fertility in Serbia will remain stable or if it will actually decline below the 1.8 mark (Rašević 2017) despite the newly introduced significant financial birth incentives. Especially considering that the postponement of childbearing is widespread and has intensified among women between 20 and 34 years of age.

### 11.1.3 Postponement of Parenthood

The postponement of first birth until increasingly older age has been a significant factor in the low fertility rate, which is nowadays a concern for many (or all) European countries (Schmidt et al. 2012). The problem is even greater when the population includes a relatively large share of women aged 30–34 who are still childless. The majority of women who postpone childbearing will eventually have children. However, it is reasonable to expect that a number of them will not be able to achieve the desired number of children owing to various reasons, such as physiological decrease of fertility, secondary infertility, higher psychological cost of marriage and childbearing at an older age, or not entering into a marriage owing to illness (Rašević 2017). In addition, the postponement of childbearing until advanced reproductive age entails numerous risks of unfavourable course and outcome of pregnancy (Benzies 2008).

A large number of women in the 20–24 age bracket (82%), more than a half (55%) of women aged 25–29 and about a third (31%) of those aged 30–34 were childless in Serbia (Table 11.1)

**Table 11.1** The share of women without live-born children in respective age cohorts, by regions in the Republic of Serbia, 2011 census

| | Women's age cohort (years) | | |
|---|---|---|---|
| Region | 20–24 | 25–29 | 30–34 |
| Republic of Serbia | 82.1 | 55.3 | 30.6 |
| Belgrade region | 88.6 | 69.1 | 42.8 |
| Vojvodina region | 82.4 | 54.9 | 29.2 |
| Šumadija and West Serbia region | 80.0 | 48.4 | 24.6 |
| South and East Serbia region | 77.4 | 45.9 | 23.0 |

Source*:* authors' calculation based on additional processing of the 2011 Census results at the time of the 2011 Population Census (Rašević 2017). The 2011 Census results do not give insight into the age at which men engage in reproduction in Serbia, because the question regarding the number of live-born children was posed only to women (Rašević 2017).

There are also distinct regional disparities of the share of women of various age cohorts without live-born children. Among women aged 20–24 years, the greatest proportion of childless women is registered in the Belgrade Region (89%), while the smallest was in the Southern and Eastern Serbia Region (77%).

The disparities among the regions in terms of the share of women without live-born children are even more pronounced in the age cohort 25–29 years. The share is still the largest in the Belgrade Region, where more than two in three women of the said age were childless, whereas it was the smallest in the Southern and Eastern Serbia Region, where almost half of the women aged 25–29 years had no children.

Compared to the other large regions of Serbia, the proportion of women aged 30–34 years who do not participate in reproduction is the largest in the Belgrade Region, at 43%. The share of childless women in this age cohort is smaller in the Vojvodina Region (29%) and the Šumadija and Western Serbia Region (25%), and the smallest in the Southern and Eastern Serbia Region (23%).

The analysis of the share of women aged 30–34 years who were childless at the time of the 2011 Census shows that, at the municipal level (Fig. 11.3), the largest share was registered in Belgrade's central municipalities of Stari Grad, Vračar and Savski Venac (64%, 58% and 55% respectively).

Between 1981 and 1991, a trend of a slight increase in the number of women who did not give birth to any children in their optimum childbearing period was recorded in Serbia (Rašević and Penev 1995). This trend intensified in the period 1991–2002 and it is considered to be the heaviest toll of the 1990s in demographic terms (Rašević 2006a). The share of childless women also continued to grow between the last two population censuses. This trend was perceived in all three age cohorts. In 2002, the respective shares of women who did not participate in reproduction for age cohorts 20–24, 25–29 and 30–34 were 75%, 43% and 21% (Rašević 2006b).

Unemployment, housing issues, low standard of living, young parents' childcare-related problems, as well as the sense of insecurity and social anomie undoubtedly play a major role in the decision to postpone parenthood in Serbia (Rašević 2017). However, in addition to the above economic factors, there are also factors that influence the postponement of childbearing in the developed European countries, too (Rašević 2017). The factors relevant to the postponement of childbearing in contemporary societies include increased female education and female economic autonomy; rising and high consumption aspirations that created the need for a second income in households and equally fostered female labour force participation; increased investments in career developments by both sexes, in tandem with increased competition at the workplace; rising 'post-materialist' traits such as self-

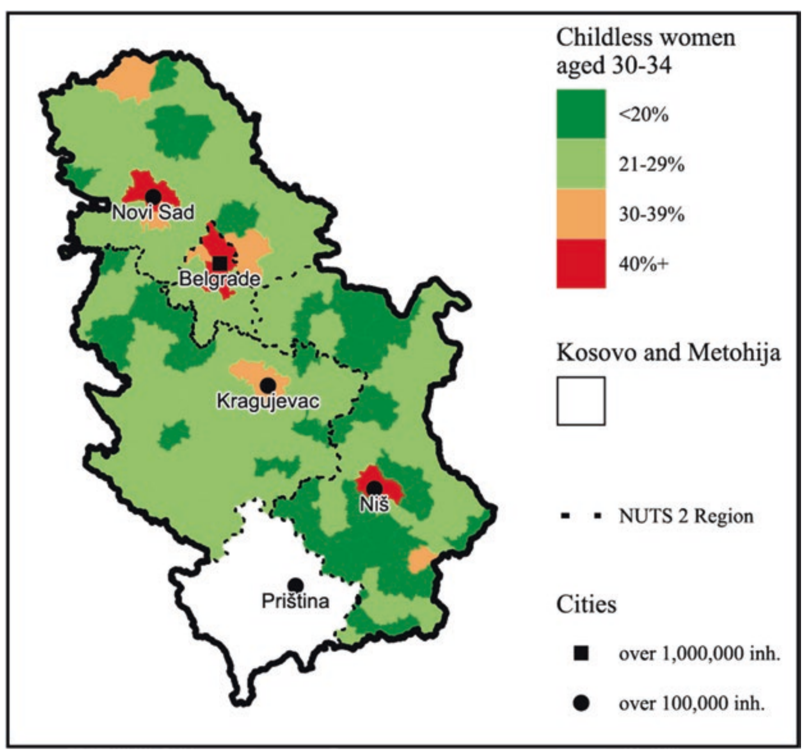


**Fig. 11.3** Percent of childless women aged 30–34 according to the 2011 Census. (Source*:* authors' calculation based on additional processing of the 2011 Census results)

actualization, ethical autonomy, freedom of choice and tolerance for the non-conventional; a greater stress on the quality of life with a rising taste for leisure; a retreat from irreversible commitments and a desire for maintaining an 'open future'; rising probabilities of separation and divorce, and hence a more cautious 'investment in identity' (Lesthaeghe 2001).

The Population Census data and the findings of various studies with various target groups indicate the increasing prominence of the above factors in the deterministic cause of subreplacement fertility and/or the postponement of childbearing in Serbia, as well. The 2011 Census identified a total of 74,666 childless women between 30 and 34 years of age. Targeted processing of the socio-demographic census data yielded the information about their profile, which is defined as a set of characteristics most frequently found among the respondents. An average respondent from this subpopulation declared to be of Serbian ethnicity (86%), lived in a city (78%), outside of a union (73%), was employed (64%) and had non-university or university-level higher education (48%) (Rašević 2017).

A number of research studies have been conducted in the recent years which addressed, either directly or indirectly, the cause of childbearing postponement in Serbia. Their findings have indicated the significance of economic factors, as well as of the factors of other nature, in the deterministic cause of postponed parenthood in Serbia. In that sense, one qualitative research study will be presented.

The research considered the key causes of the postponement of childbearing in Serbia based on a qualitative analysis of the opinions of the readers of the respectable daily newspaper *Politika* on this issue, posted online as comments on a published article on childbearing postponement. In addition to general opinions regarding to roots of this problem in Serbia, many readers also cited personal reasons for postponing parenthood until a later stage of their lives. The authors of the research identified 251 individual reasons among the readers' comments, of which 43% were at the macro-level, 26% at the meso-level, and 31% at the micro-level. The problem of finding a suitable partner stands out as the most frequently cited reason and accounts for almost a fifth of all identified reasons for the postponement of parenthood. Readers underlined livelihood problems, dissatisfaction with the socio-political context and uncertain future as the crucial considerations influencing the postponement of childbearing at the national level. Among the meso causes, emphasis was placed on the difficulties in achieving a stable relationship, women's heavy burden of family duties and the lack of belief in the institution of marriage. Individualism, hedonism and consumer mentality were identified as the key micro causes of the postponement of childbearing (Rašević and Sedlecki 2016).

### 11.1.4 Predominance of Conservative Birth Control

Motherhood at an advanced childbearing age in Serbia is additionally put at risk by the fact that women's health and fertility are compromised by predominantly conservative birth control practices. Namely, the low fertility level in Serbia goes hand in hand with its integral aspect – the predominantly traditional approach to birth control, most often based on the reliance on *coitus interruptus*, and consequently, in cases when pregnancy is unwanted or unacceptable, resorting to induced abortion. Hence the long history of induced abortions in Serbia.

This sphere has not achieved progress in the twenty-first century, either. The most recent representative research showed that condoms, combined oral contraceptives or intrauterine devices, were used by only 18.4% of women who are married or in a stable union and do not want children (Fig. 11.4). At the same time, according to the Westoff (2007) method, the estimated total induced abortion rate was 2.9 (Sedlecky and Rašević 2015).

Research findings have identified a series of factors related to the lack of acceptance of modern values in the sphere of birth control. The main ones are easy access to

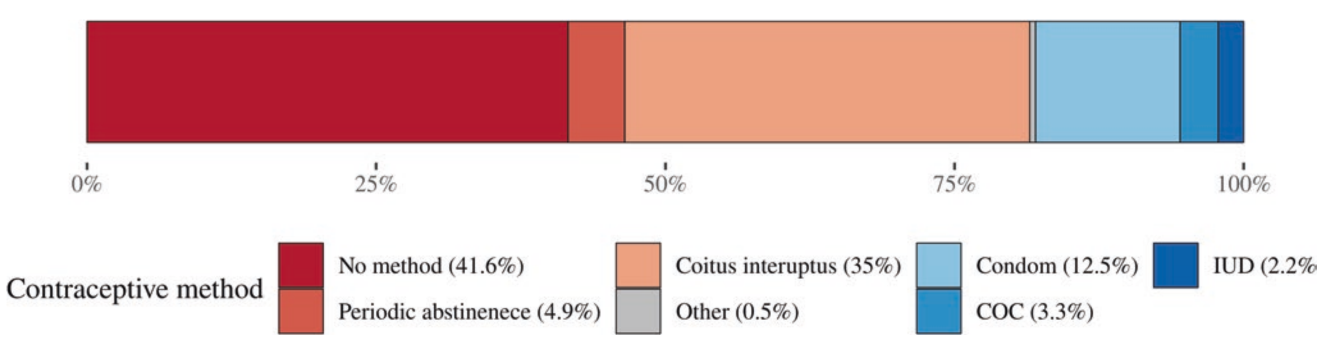


**Fig. 11.4** Use of contraception in Serbia: Percentage of women aged 15–49, married or in union, who were using (or whose partner was using) a contraceptive method in 2014. (Source of data: Statistical Office of the Republic of Serbia and UNICEF 2014)

induced abortion coupled with substantial obstacles to efficient use of contraception, insufficient relevant knowledge about and resistance to modern contraceptives among women and men in need and health-care providers, a firm social basis for traditional birth control and limitations in the family planning programme (Rašević and Sedlecky 2009).

Reproductive health preservation is also threatened by the absence of screening for sexually transmitted infections causing pelvic inflammatory disease. The most common among these is genital chlamydia, which usually causes subclinical chronic infections resulting in damaged fallopian tubes. A study conducted among sexually active adolescents in Belgrade detected the presence of chlamydia in the uterine cervix in 30% of examinees (Sedlecky et al. 2001).

Young women from higher social strata in Serbia also threaten their reproductive health with their behavioural patterns. A study that included a large number of women aged 19–20 years, who visited the website of the Serbian Association for Reproductive Health in 2011, showed that about one in four respondents engaged in sexual intercourse before turning 17, had four or more partners, had sexual contact in relationships shorter than 1 week and were exposed to unplanned pregnancy and sexually transmitted infections (Rašević and Sedlecky 2013).

### 11.1.5 Consequences of Subreplacement Fertility as the Cause of the Childbearing Crisis

The prolonged presence of the phenomenon of subreplacement fertility is the principal cause of depopulation and extensive changes in the age structure of Serbia's population (See Chap. 10). An intrinsic part of this process is the smaller fertile population, especially the one in the period of optimum fertility. Thus, the number of women aged 15–49 years in Serbia decreased from 1,632,708 to 1,537,044 between 2011 and 2017, that is, by 95,000 in only 6 years. At the same time, the population of women aged 20–34 years shrunk by 60,000 (from 702,107 in 2011 to 641,941 in 2017) (Statistical Office of the Republic of Serbia 2018a). This is a typical example of how the consequence of a phenomenon becomes one of its causes.

### 11.1.6 Emigration from Serbia Contributes to the Childbearing Crisis

Serbia is traditionally a country of emigration. In addition to the effects on the size of the population, emigration has also affected the scope of insufficient childbearing and population ageing in Serbia. Namely, it is in the nature of the emigration process that predominantly young people leave the country of origin (See Chap. 12).

In the context of considering the fertility trends in the immediate future, it is vital to underline that Serbia's emigration potential is still substantial. The results of a representative survey conducted in 2010 (Baćević et al. 2011) showed that, in a hypothetical situation that Serbia has already become an EU member state, one in four respondents (26.4%) from the general sample would 'surely' look for employment in another EU country. 'Probably', the next offered modality as an answer to the question asked, was chosen by one in six surveyed persons (15.2%) from the general sample. In other words, 41.6% of the respondents from the general sample demonstrated manifest or latent preparedness to look for employment outside of Serbia. Returnees to Serbia from abroad expressed manifest preparedness to look for employment in a different country (one in three respondents), compared to somewhat lesser preparedness of the general population (one in four participants). However, if we look at the cumulative manifest and latent preparedness, there is almost no difference between the general sample and the special sample in terms of the preparedness of the respondents to seek employment outside Serbia (41.6% and 42.4% respectively).

Particular preparedness to do so was notably expressed by respondents under 30 years of age (high school and university students), active persons, the unemployed, persons from large and poor families, those who believed that staying abroad had positive effects on the people from Serbia, as well as pro-West oriented respondents (Baćević et al. 2011).

A study conducted in 2018 on a sample of about 11,000 students confirmed that a significant share of them (32.4%) planned to search for better living and working conditions outside Serbia (Bjelobrk 2018). More than 90% of the students said that they enjoyed full support from their parents to leave the country. About 70% of the students who intended to leave Serbia upon graduation had relatives and friends who lived abroad. It is also important to underline that, when asked about possible motivation to stay in Serbia, one in four students (25.6%) responded: 'There is nothing that can reverse my decision to leave the country'.

### 11.1.7 More Recent Insights into Low Fertility and the Policy Response

The results of the 2011 Population Census and the findings of a number of relevant studies suggest that the childbearing crisis in Serbia will not only continue, but will probably deepen, as well. The findings on the non-participation of younger age cohorts of women in reproduction indicate to decision makers that it is vital to make efforts to mitigate the barriers to bearing and raising one's first child during the optimum period. To that end, it is essential to reduce not only the economic but also the social and psychological cost of parenthood through support to modern forms of union between women and men and assistance in reconciling family and work, as well as childbearing and education. At the same time, it is important to raise the public awareness of the health concerns related to the postponement of childbearing. This includes the promotion of the modern family planning concept with a view to preserving reproductive health (Rašević 2017). Actions taken towards these outcomes would also be an incentive to giving birth to a second and/or third child in the family.

## 11.2 Premature Mortality

### 11.2.1 Mortality Circumstance in Serbia

While Serbia is faced with a plethora of demographic problems, one that is probably the most often overlooked is the problem of high mortality rates, especially among those relatively young. High mortality rates are to be expected in a country with a high proportion of old people; however, problems with mortality that Serbia faces are only exacerbated by its age structure, whilst having different causes. Most of these causes revolve around quality and availability of timely and effective healthcare (Galjak 2018a). Current life expectancy at birth in Serbia (2016 data) is 75.7 years (Statistical Office of the Republic of Serbia 2018a). This places Serbia among countries of Europe with lower life expectancy, while on the global scale, it ranks similar to other middle-income countries.

Being that mortality circumstances, most often expressed through life expectancy at birth, have a strong positive correlation with economic development, the future of premature mortality in Serbia is tied to its economic prospects (Galjak 2014; Preston 1975).

When considering mortality situation in Serbia, it is important to consider a couple of factors, each of which is not exclusive for Serbia, but their combination is very unique to Serbia. One of these factors is the legacy of Yugoslavia and Communism, which affected almost all demographic aspects, but especially mortality in the countries of Europe where it was present (Billingsley 2010; Mesle and Vallin 2002; Minagawa 2013; Sobotka 2003). The mortality situation in Yugoslavia was not as bad as it was in the other former Communist countries of Eastern Europe. The marks Communism has made are present even now, with a clear East-West divide in Europe (Galjak 2018b). Another factor was the extremely difficult period during the 1990s which was marked by three wars that followed the dissolution of Yugoslavia, and the various sanctions which brought about deep economic recession. This is important in two ways – the obvious one is the correlation between the mortality levels and GDP/c, but another one concerns the timing of this recession. Namely, right after the crisis came was the period when other demographically similar countries could reap the rewards of the second demographic dividend, while in Serbia all the pension funds and savings were depleted during the 1990s marked by wars, economic sanctions, hyperinflation and corruption (Guardiancich 2010; Lyon 1996; Wallace and Latcheva 2006). The third special factor that is affecting Serbia is its unreformed healthcare system designed to serve much smaller population of old people. This is becoming more apparent with *boomers* reaching the critical age of sharply increasing death and hospitalization rates. This is only exacerbated with the *healthcare brain-drain*, which has intensified to such a degree that a recent survey found that more than two-thirds of medical students want to emigrate (Marušić and Marković-Denić 2018).

Economically more developed countries went through the cardiovascular transition and are now experiencing very low mortality rates from cardiovascular diseases, especially France (Vallin and Meslé 2004). Unlike them Serbia has yet to transition fully from high cardiovascular mortality to low cardiovascular mortality, which is currently very high not only among elderly but also among middle-aged people (Marinković 2012a). The tragedy of countries at the similar stage of cardiovascular transition as Serbia is that many *younger elderlies* die too early of avoidable cardiovascular events.

### 11.2.2 Gauging Premature Mortality in Serbia

Gauging premature mortality is not an easy task. The fuzziness and relativity of the concept make it difficult to determine exactly what premature mortality means. There are at least two important components of premature mortality as a concept: First, the chronological age component, but also the qualitative component when it comes to classifying discrete instances of death. A measurement for premature mortality including only this one facet concerning chronological age exists in terms of years of potential life lost (YPLL) indicator. This indicator is relevant when the emphasis is on chronologically young people's mortality (see: Marinković 2012b). When we are taking into account chronological age only, and disregard the cause of death, we are ignoring a very pertinent facet of mortality. For example, a young person (e.g. 25 years old) dying of stroke will be considered premature in any society. However, with the recent advances made in last decades in tackling cardiovascular diseases, a death of a 60-year-old caused by stroke can also be considered premature. Nolte, E. and McKee, M (2004) working on the shoulders of Walter W. Holland (1986) devised a list of causes of death which, with current standards of healthcare practices, methods and technologies, can be considered avoidable. They further break down this list by listing the causes of death they consider *preventable* and *amenable* in the presence of timely and effective healthcare in specific age ranges (Nolte and McKee 2004). A cause of death can be considered both preventable and amenable, so these two lists overlap. Most of causes belong to either or both categories for only certain age ranges, and almost all of them are amenable or preventable only when they occur in those younger than 75. For calculations done in this chapter, the most recent classification made by UK Office of National Statistics was used (Olatunde et al. 2016). This list totals 723 individual causes of death, 338 amenable, 437 preventable and 52 that are both preventable and amenable.

Causes of avoidable death that are the most prominent in Serbia (Fig. 11.5) belong to the cardiovascular diseases, which is not surprising considering that Serbia still has very high cardiovascular mortality, as over half of all mortality in Serbia is caused by cardiovascular disease (Galjak 2018a).

Among the cardiovascular diseases, the biggest contributors to avoidable mortality are acute myocardial infarction and cerebral infarction, that is, heart attack and stroke. This is very unfortunate since as far as avoidable deaths go, curbing this kind of mortality can be considered *low-hanging fruit*. Same goes for the biggest contributor to avoidable deaths when it comes to tumours. Even though the cardiovascular causes of death are the main culprit in the avoidable mortality, the most common cause of avoidable deaths does not belong to this category. Namely, lung cancer, a preventable cause of death is the single biggest cause of death among all avoidable causes of death in Serbia. Curbing deaths caused by smoking can also be considered as *low-hanging fruit*, considering that many countries drastically reduced this kind of mortality by reducing their smoking prevalence (Islami et al. 2015). Smoking is a problem that causes many of the preventable diseases and its higher prevalence among

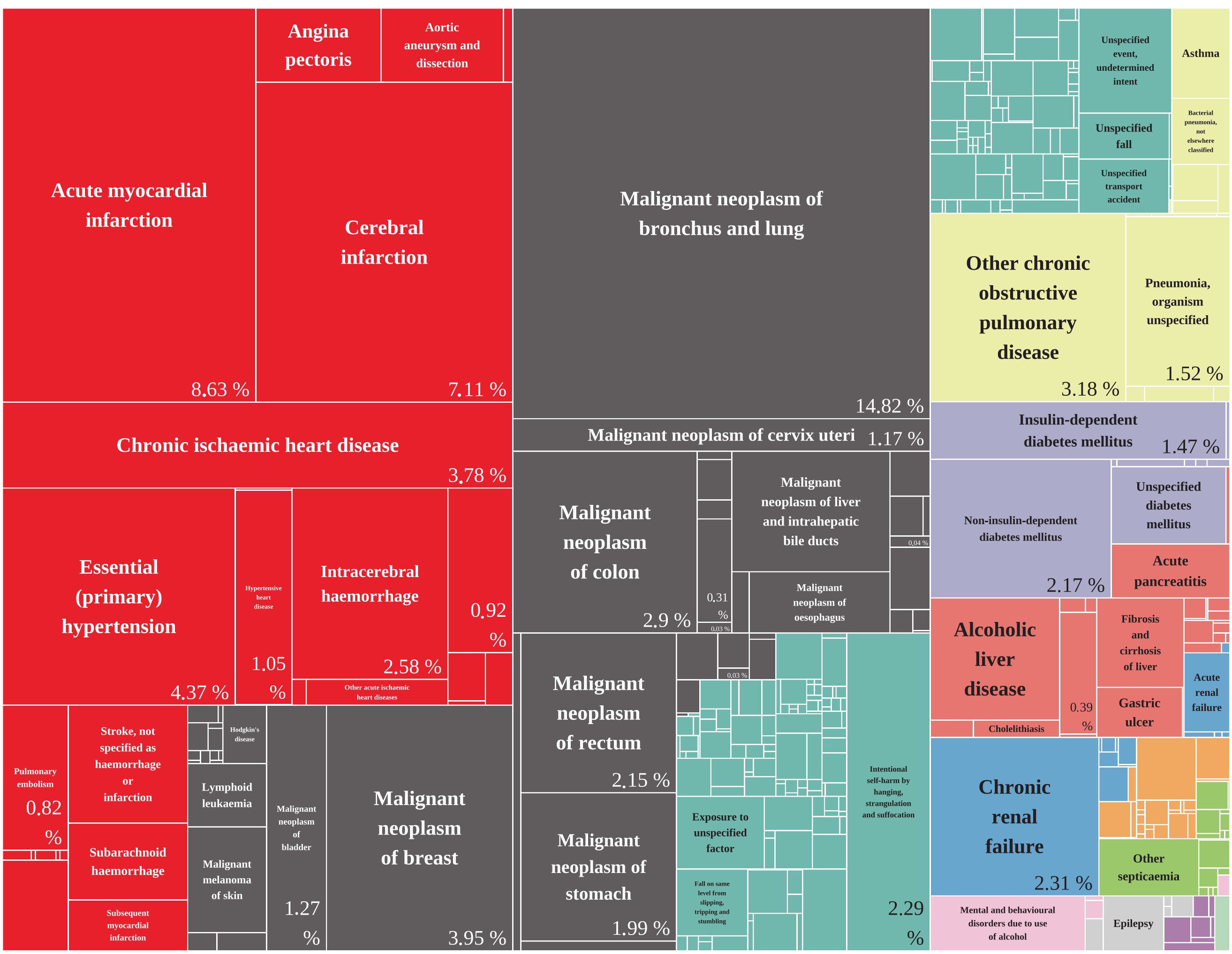


**Fig.11.5** Causes of avoidable death in Serbia 2015. (Source of data: World Health Data Platform 2018)

men is a major factor in sex differences when it comes to this kind of mortality (Marinković 2017).

### 11.2.3 Sex and Age Differences in Avoidable Mortality

Age and sex structure of a population are best comprehended by taking a view at a classic population pyramid that shows sex and age structure of the population. A mortality pyramid shows the age and sex structure of population that died in a particular year. The mortality pyramid additionally outlines the mortality that could have been avoided (Fig. 11.6). The main takeaway from this death structure is that avoidable mortality in Serbia is not equally distributed among sexes, not only when it comes to the age groups leading up to the 75 years old mark but also at much younger ages. The mortality pyramid shows similar number of total deaths among men and women for ages younger than 75, but we must keep in mind that the older the age the more sex structure is skewed. The fact that the mortality pyramid is so heavily skewed to the right at the oldest ages is a testament to the fact of big sex differences among men and women, which are well known and seem not to be changing much in the last 50 years (Marinković 2018). The fact that men die prematurely, from avoidable causes, is evident, since about half of deaths of men younger than 75 could have been avoided. The sex imbalance exists with the ages older than 75, but as total proportion of deaths these differences are negligible.

### 11.2.4 Geographical Distribution of Premature Mortality

Prevalence of avoidable mortality is not uniform across Serbia (Fig. 11.7). Municipalities with high amenable mortality tend to have high preventable mortality as well ($\rho = 0.756$). This high correlation is expected, not only since the two indicators partially overlap when it comes to causes but also because it comes down to chronological age. In other words, older populations exhibit higher rates of both amenable and preventable mortality. Municipalities of Serbia that are marked by high amenable and preventable mortality are also marked by an ageing population, with municipalities of Eastern Serbia being the most prominent example (Magdalenic and Galjak 2016). Those parts of Serbia are more rural, and it does not come as a surprise that amenable mortality is much higher in rural parts of Serbia than in the big urban centres, since much of the amenability of amenable mortality rests on *timely* effective healthcare, which is almost impossible to get in remote parts of the country with bad infrastructure.

Overall variability of amenable mortality, with 0.31 coefficient of variation (CV), is significantly higher than variability of preventable mortality in Serbia which has CV of 0.24. Preventable, as less variable kind of avoidable mortality is more deeply woven into the mortality pattern that is affected by so much more than just healthcare system, things like diet and behaviour. This also means that it is more difficult to effect its change by economic development or by targeted special programmes.

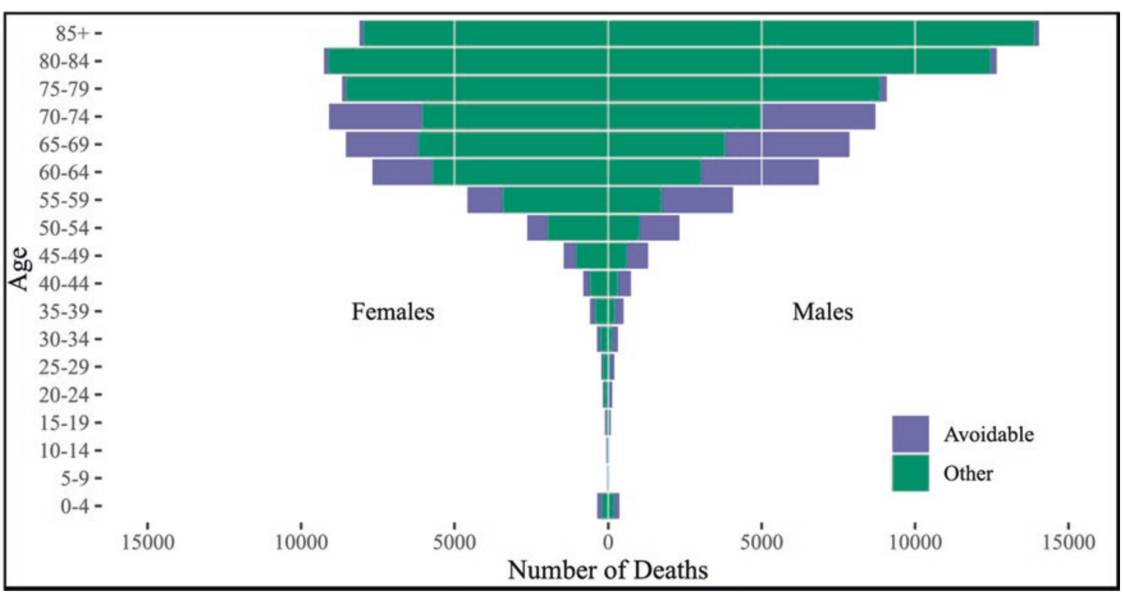


**Fig. 11.6** Mortality Pyramid of Serbia in 2015. (Source of data: World Health Data Platform 2018)

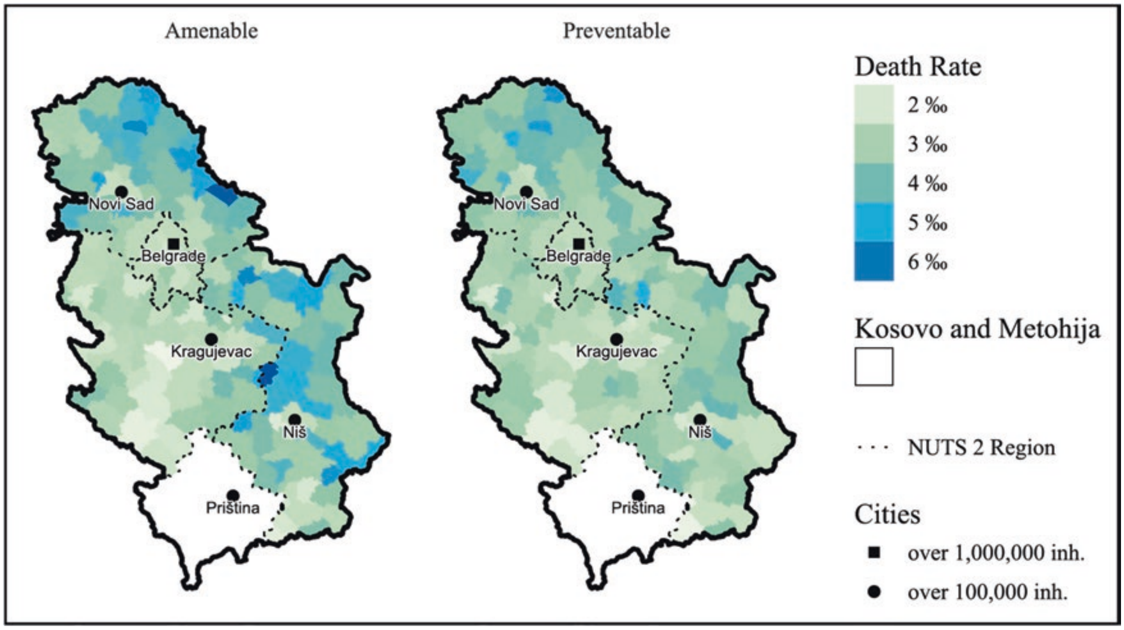


**Fig. 11.7** Geographical distribution of preventable and amenable mortality in Serbia 2017. (Source of data: Statistical Office of the Republic of Serbia 2018b)

### 11.2.5 Trends in Avoidable Mortality

Avoidable mortality rates are currently very high, compared to economically more developed countries (Galjak 2014). However, avoidable mortality has been falling in Serbia in the last decade (Fig. 11.8). Amenable more so than preventable. Reason for this is that there were a lot of gains to be made when it comes to *low hanging fruit* with basic upgrades of the healthcare system which has been financially deprived and neglected for decades and especially during the turbulent 1990s. Gains in the preventable mortality department are more difficult to reap, since the effects of current efforts take more time to realize due to the nature of *prevention*. Consider anti-smoking campaigns, where full benefits of lowering prevalence of smoking would be seen throughout the longer period in the future, but less so immediately. That's why amenable mortality reached the levels of preventable mortality in 2011.

The countries in Europe that have much lower avoidable mortality rates, like France and Finland, show the pattern of significantly higher preventable than amenable mortality rates (Galjak 2018b). The trend for most recent years shows signs of reaching a plateau for both amenable and preventable mortality, but 2014 and 2015 were atypical years regarding mortality because of an especially deadly flu season which managed to lower the overall life expectancy in Serbia and many other countries of Europe (Ho and Hendi 2018).

Future gains in tackling premature mortality will be realized with further economic development. However, recent economic stagnation means that catching up and converging with the most developed European countries will be difficult. Improving the quality of the healthcare system and changing unhealthy habits in the general populous do follow economic growth, but much can be achieved with clever policy and special programmes, especially in tackling the long-term problem of preventable death.

Together with other demographic challenges, principally the childbearing crisis and negative net migration, premature mortality puts Serbia in a demographically problematic spot. This *demographic dark triad* is by no means isolated from the other socioeconomic problems Serbia is currently facing. With all demographic phenomena, there are multitudes of feedback loops. Early mortality has been recognized as feedback loop with poverty in the context of infectious diseases in the developing countries (Lim et al. 2012).

However, the effects of premature mortality in the more developed economies must be considered. Premature deaths of middle-aged people, but also younger, reproductively capable people, affect both the economy and childbearing. Furthermore, high premature mortality means that many potential mothers cannot count on support of the child's grandparents which is important in countries with high proportion of multigenerational households like Serbia (Glaser et al. 2018). Therefore, it is important to consider mortality

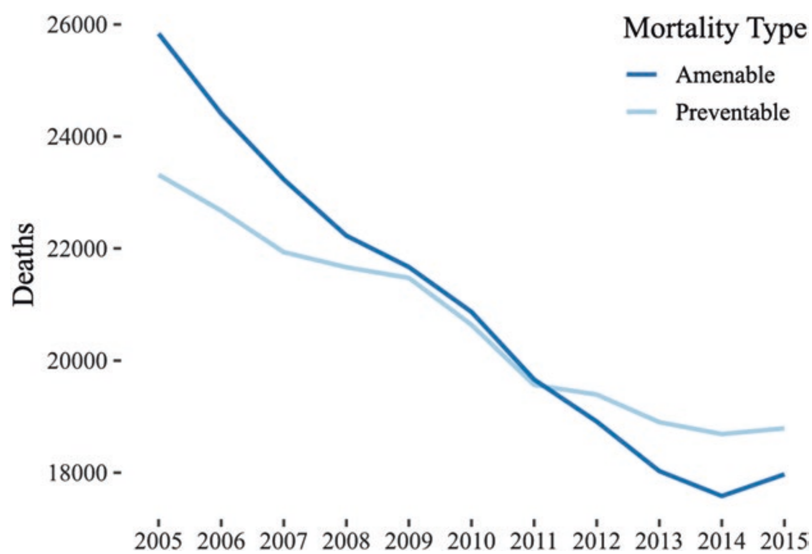


**Fig. 11.8** Trend of preventable and amenable mortality in Serbia between 2005 and 2015. (Source of data: World Health Data Platform 2018)

as an element in the overall socioeconomic and demographic dynamics, and not just as some isolated end of the line phenomena. With shifting paradigm of ageing, and people staying productive well into their advanced age, the prominence of premature mortality challenge will only continue to grow. In ageing countries like Serbia, which have much catching-up to do with curbing premature mortality, overcoming this demographic challenge will become even more urgent in the years to come.

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# 12 Migration and Mobility Patterns in Serbia

Vesna Lukić

**Abstract**

Population mobility across borders and boundaries is of major relevance for shaping and development of both the areas of origin and destination as well as social relations between them. Building on the literature on migration, this chapter highlights different types of spatial mobility of the population in Serbia, focusing on international migration, internal migration and commuting. Although they can have common determinants, and some of them can also have the same societal effects, those population movements are characterized by a distinct type of administrative crossing and duration of residence at the destination. In Serbia, the migration type is even more blurred due to the state changing boundaries dating from the breakup of Yugoslavia in 1991. The majority of the population covered by those population movements are individuals who are active in the workforce while gender dynamics of migration is becoming more noticeable.

**Keywords**

Emigration · Daily commuting · Immigration · Internal migration · 2011 census

In this chapter, recent developments in mobility and migration patterns in Serbia have been discussed and briefly compared with the ones in other countries, revealing the insights into mobility and migration dynamics across different social and economic settings. In this regard, Serbia's path towards EU membership should be kept in mind as a means towards enhancing a more developed society. The focus is primarily on the first decade of the twenty-first century but called upon earlier data where available.

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## 12.1 On International Migration in the Serbian Context

The importance of wider migration systems for linking people, families and communities over space, thus resulting in geographical structuring and clustering migration flows, has been pointed out by Bakewell (2014). Within the South–Eastern European region, Serbia is integrated into the common area of the European migration space. This migration system has been affected by unstable borders and political and economic systems in the past. According to Fassmann et al. (2014), Serbia belongs to the 'emigration countries' type, still characterized by major emigration flows but that could transform into 'countries of immigration' type in the future.

### 12.1.1 Emigration

In emigration countries, the Census of population is the highest quality source of data on the structure of emigrant population, despite it typically underestimating this contingent. Because of that and the lack of sufficiently reliable statistics from destination countries, this section will focus on the Census data on the stock of people abroad. Contingent of persons working/residing abroad includes persons studying abroad provided they do not return daily, or weekly to Serbia, as well as persons staying for other reasons abroad (vocational training, guest stay, treatment, high school attendance, etc.) (Stanković 2014, p 14).

Serbia is a country with a long tradition of emigration, with zones of substantial emigration. According to the results of censuses carried out in 1971, 1981 and 1991, the number


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of Serbian citizens working or staying abroad had been increasing (from 2.8% in 1971 to 3.5% in 1991) (Lukić et al. 2013). Emigration from Serbia intensified during the 1990s, given the economic and political circumstances. Therefore, the 2002 Census showed that 415,000 Serbian citizens (5% of the total population) were registered as working or staying abroad. Although a traditionally emigration country, in the inter-census period 2002–2011 Serbia recorded a decrease in the level of emigration. Thus, according to the results of the censuses intensive emigration periods were the second half of the 1960s and the last decade of the twentieth century. According to the 2011 Census, 313,000 Serbian citizens or 4.2% of the total population was abroad. Assumed under coverage of this contingent is about 50% (Lukić et al. 2013; Reynaud et al. 2017). That is partly the result of the fact that there are families where all household members are abroad, so there was no one to give the information. Nevertheless, the recorded emigration from Serbia in the 2002–2011 period was smaller than in the 1991–2002 period when a large number of individuals left the country due to unstable political and economic situation. Current estimates (Nikitović 2019) indicate that the number of emigrants from Serbia has increased in recent years, with an average annual negative migration balance of −20,692.

Traditional emigration countries for Serbian citizens are Germany, Austria, Switzerland and France. Due to well-developed migration networks from previous periods, in 2011 more than half of Serbian citizens abroad lived in those countries. When intercontinental, geographically far destinations are observed, the countries with a larger number of Serbian citizens are USA and Canada. Migration policies of destination countries largely affected the direction of emigration flows from Serbia. From the 1990s, when France has triggered restricted conditions for obtaining visas for the citizens of Serbia which slowed down immigration into the country, new receiving countries emerged for Serbian emigrants, such as Italy, Hungary and Russia (Predojević-Despić and Penev 2016; Reynaud et al. 2017). Emigration to the EU countries has been facilitated since the end of 2009, when a visa-free regime between Serbia and Schengen zone countries was established and when Serbia was included on the *White Schengen list*.[1] It was the same year that Serbia and Russia signed a visa-free travel agreement.

If we consider the gender structure of population abroad, men prevail (53%), opposite to the population residing in the country (49%). Expectedly, men also prevail among the working population abroad, whereas women prevail among their family members and among students (Stanković 2014, p 112). However, a trend of higher female mobility and slowly increasing share of females in the population abroad can be observed. Due to the selectivity of emigrants by age, the population abroad is younger on average (35 years) than the resident population of Serbia (42 years). Youth population (15–29) continuously makes an important part of the population of Serbia working/residing abroad (about 20%) and significant demographic and human capital loss for Serbia. There are some differences at the regional level regarding the age structure of the population abroad. Thus, in the Šumadija and West Serbia and South and East Serbia regions, a larger share of individuals aged 10–19 in the population abroad, compared to other regions in Serbia, is explained by more descendants of emigrants from those regions, given that they participated numerously in the first migration wave abroad (Stanković 2014, p 67).

The population abroad has a better educational structure than the total population of Serbia partly as a result of differences in the age structure. According to the 2011 Census, similar to the resident population in the country, the largest number of Serbian citizens living/working abroad older than 15 years had secondary education (39%). The sharp rise of the highly educated Serbian citizens abroad in the 2002–2011 period (from 7% to 12%) has been registered. The most educated Serbian citizens emigrate to UK, USA and Canada. Out of the student population abroad, the largest number live in the USA (15.8%) and the smallest in the Russian Federation (0.7%) (Stanković 2014, p 62, 75). The high share of population abroad from the Belgrade region that encompasses highly educated individuals (36%) as Stanković (2014, p 75, 131) points mark this region as the main starting point of brain drain. Given its acting as a growth pole attracting internal migrants, emigration from Belgrade points to stepwise migration practice, as defined by Conway (1980) with implications on international migration, where according to Lerch (2014) moving from rural to urban settlement or moving up the urban hierarchy can increase the likelihood of international departure.

The *brain drain* phenomenon is widely represented when discussing emigration from Serbia. In contrast to the emigration flows in the mid-1960s and 1970s that mostly encompassed unqualified persons, during the 1990s, when emigration from Serbia was intensified, a large number of highly educated citizens had left the country. It is estimated that, at that period, up to 400,000 people had left the country (Nikitović and Lukić 2010), among which there were about 30,000 highly educated persons (Grečić 2001). Given the value of the *brain drain* indicator in the pillar of labour market efficiency of the Global Competitiveness Index (2011–

[1] The allowed period of stay without a visa for Serbian citizens in Schengen countries is maximum 90 days within a period of 6 months.

2012), Serbia was ranked 139th out of 142 countries (Schwab et al. 2011).

The 2011 Census data on the occupation of the population of Serbia abroad point to structural changes that have happened in the last few decades. It manifests in a significant reduction in the share of farmers and related occupations with an increase in the share of experts, artists and engineers (Stanković 2014, p 78) as the indication of the *brain drain* process. In recent years, a lot of attention in Serbia has been given to the phenomenon of emigration of healthcare workers that affects all Western Balkan countries.

According to the 2011 Census, the largest number of Serbian citizens working or residing abroad were individuals who were active in the workforce (166,390), followed by their family members (114,060), while the student population was the least numerous (12,092) (Fig. 12.1).

Regarding the duration of living abroad of Serbian citizens, differences are emphasized according to the groups of population abroad (workforce, family members, students) and the country of destination. According to the 2011 Census, Serbian citizens lived abroad 11 years on average – those in the workforce for more than 12 years and family members 8 years. The average duration of living abroad is expectedly the shortest for students. Stanković (2014, p 40) points out that entry of the workforce of family members can be seen after 10–14 years of living abroad where the number of individuals who are active in the workforce exceeds the number of family members. The longest period of living abroad is for those who live in old destination countries for Serbian citizens like France. It is important to emphasize that, according to the increase in the number of persons residing abroad for less than 1 year, some authors advert to the emerging of the new forms of international migration in Serbia, such as circular, transnational or transregional migration (Predojević–Despić and Penev 2014).

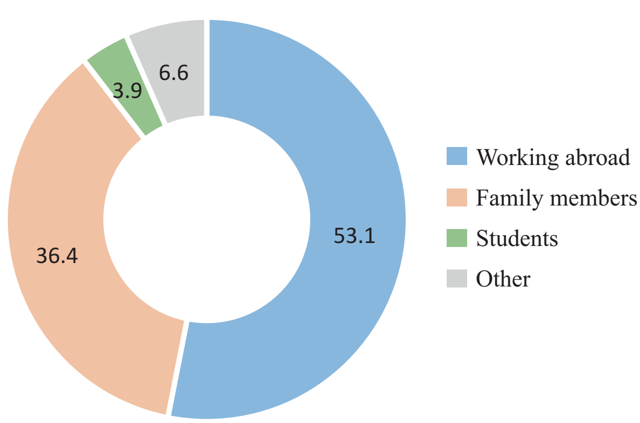


**Fig. 12.1** Serbian citizens working or residing abroad – share of main categories (%), Census 2011. (Source of data: Stanković 2014, p 33)

The 2011 Census results on the main reasons for living abroad (Stanković 2014, p 30) as well as qualitative research findings on the reasons for youth and student emigration (Dejanović et al. 2018) point to the prevalence of economic reasons for emigration from Serbia. The high unemployment rate (32% in 2017) of youth aged 15–24 (Statistical Office of the Republic of Serbia [SORS] 2018) is a significant driver of emigration. Youth emigration affects both demographic and socio-economic development of the country. It influences further depopulation, as well as shrinking of the fertile contingent, declining and ageing of the workforce and human capital loss. A sharp increase in the old-age dependency ratio is expected in the near future (Nikitović 2019), putting the pressure both on the economy and on social and healthcare systems (Zdravković et al. 2012).

According to the 2011 Census, the highest number of the population residing abroad was from the South and East Serbia region, whereas the lowest number was from the Belgrade region. The share of population abroad in the total resident population was between 2.8% for the Belgrade region and 6.6% for the South and East Serbia region Stanković (2014, p 104, 106). In Serbia, intra-regional differences in size and features of emigration and accompanying effects are more expressed, compared to inter-regional differences. Predojević Despić and Penev (2014) distinguish several traditional zones of pronounced emigration in Serbia. They are numbered by the starting time of emigration. The first zone encompasses 14 municipalities distributed over three districts in the east part of the South and East Serbia region. There, since the 1980s, the vast majority of municipalities have always had at least twice the share of the population abroad than the national average. The second zone includes two municipalities mainly populated by ethnic Albanians at the very south of the South and East Serbia region along the administrative border with the region of Kosovo and Metohija. The third zone encompasses five municipalities with a high share of Bosniaks (ethnic community of Muslim religion) distributed in two districts in the southwest of the Šumadija and West Serbia region. Regional differences in the share of population abroad are more expressed on a lower administrative level. Three municipalities from the first emigration zone had the largest share of population abroad in 2011 (more than 30%). About one third of municipalities in Serbia have a very low share of population abroad (Fig. 12.2).

Rural settlements have traditionally been more affected by emigration. Therefore, Serbian citizens from urban settlements have been living abroad less on average, when compared to citizens from rural settlements. Due to the depletion of population potentials of rural settlements, especially the small ones, these differences lowered in the 2002–2011 period according to Stanković (2014, p 37).

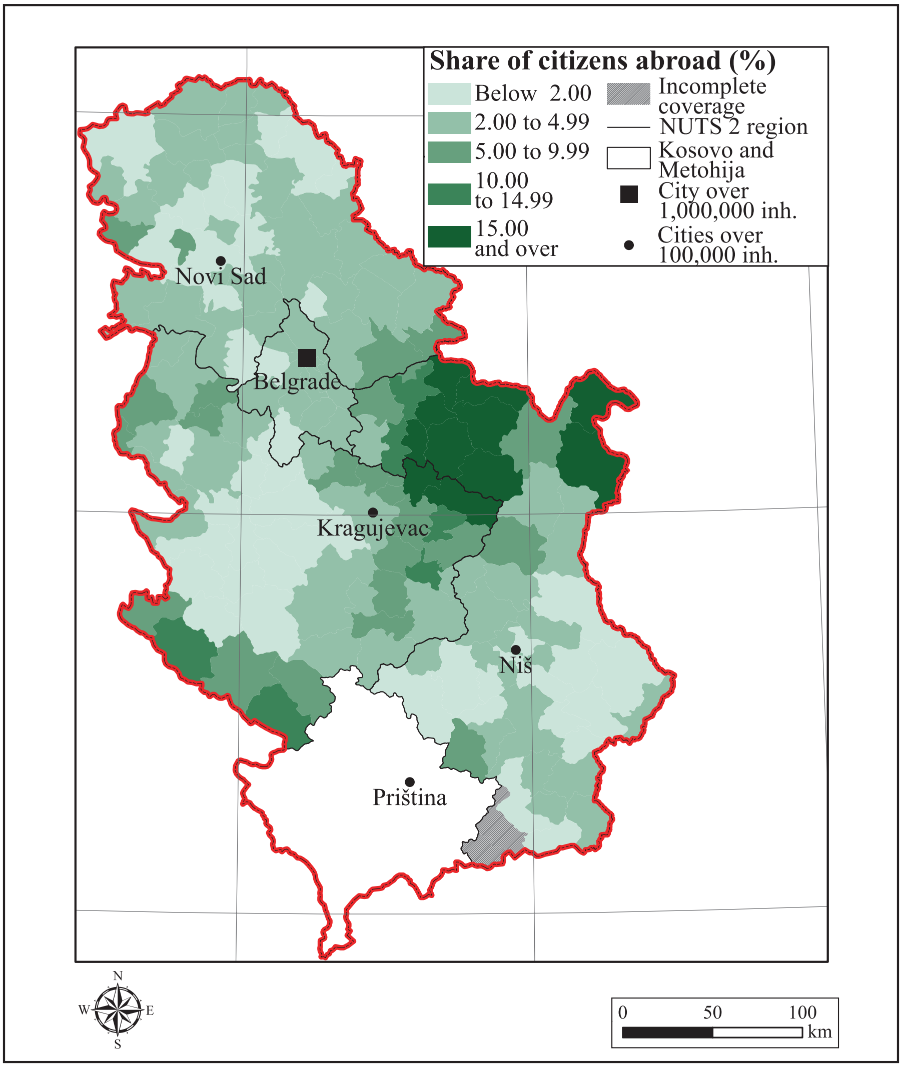


**Fig. 12.2** Serbian citizens working/residing abroad – share of total population (%), by municipalities, 2011 census. (Source of data: Stanković 2014, pp 104–106)

### 12.1.2 Asylum Seekers in the EU Countries

Upon the establishment of the visa-free regime between Serbia and the EU member countries, an increase in the number of asylum requests of citizens of Serbia was observed in the EU. The citizens of Serbia made a majority of the Western Balkan applicants for the international protection in the EU countries between 2009 and 2013, with a share ranging from 60% to 80%. Those individuals are repeated applicants in the same or any other EU country characterized by the seasonality of migration, starting usually from October (European Asylum Support Office 2015). Namely, the population at risk of poverty used the freedom of travel to make asylum claims in an attempt to solve their economic problems, given the allowances and benefits linked to the asylum procedure in the EU countries. Thus, in most cases those individuals do not fulfil requirements needed for granting asylum protection. The flow of Serbian asylum applicants mainly consists of not only families of poor Roma population but also ethnic Albanians from the region of Kosovo and Metohija and southern parts of the country, whose main preferred destination is Germany (The Government of the Republic of Serbia [GORS] 2012). Consequently, an issue of lifting the visa-free regime of Serbia with the countries of the European Union is occasionally questioned. This problem is being tackled in cooperation with the countries of destination in terms of reducing social financial assistance and the classification of Serbia into a group of countries where citizens are not exposed to the risk of political persecution. For example, in 2015 Asylum recognition rates in the EU differed significantly between citizenship ranging from less than 3% for citizens of the Western Balkan countries to more than 97% for Syrians (Eurostat 2016a). These activities have had a significant impact on the decrease in the number of asylum seekers from Serbia in the last few years.

### 12.1.3 Immigration

In-migration flows to Serbia encompass Serbian citizen returnees from abroad and foreigners. According to the 2011 Census, 235,000 returnees had been residing in Serbia. In the first decade of the twenty-first century, the largest number of returnees came back from Germany and Austria. As many as 59% of these individuals indicated family reasons for return. The fact that older than 65 years made 30% of the returnees in Serbia in 2011 points to the return of retired migrants from traditional destination countries for Serbian citizens (Stanković 2014, p 88, 138).

With the conclusion of the readmission agreement with the EU, Serbia accepts its citizens who do not meet the conditions for entry, stay or accommodation in the territory of another country (returnees). Administrative sources indicate that from 2011 to 2016, the number of requests that Serbia received for the takeover of its citizens had increased from 4,600 to 5,800. This was predominantly the Roma population returning from Germany (GORS 2012, 2018). However, according to the 2011 Census the share of readmission returnees within the stock of returnees is very small – less than 1% (Stanković 2014, p 86).

Even though Serbia is not an immigration country, low but a slowly increasing level of immigration can be perceived. According to the census, the number of foreigners immigrating to Serbia, excluding the former Yugoslav republics, increased from 30,800 in 2002 to 82,600 in 2011 (Statistical Office of the Republic of Serbia [SORS] 2005; Statistical Office of the Republic of Serbia 2013a). However, foreign citizens made up only 1% of the total population of the country in 2011 (SORS 2013a). Administrative sources indicate that the largest number of immigrants in Serbia in 2016 was from China, Romania and Russia. This structure has slightly changed in relation to 2010 only when it comes to the increase in the number of persons coming from Libya. While immigrants from China show the characteristics of predominantly work-based immigration, with minor participation of women, another group of immigrants, especially those from Romania and the Russian Federation, indicate a strong majority of female immigrants with the prevailing family reasons for migration to Serbia (GORS 2018).

In the 1990s, Serbia received large numbers of refugees from the former Yugoslav republics, mostly ethnic Serbs from Bosnia and Herzegovina and Croatia. Their social integration was facilitated by historical and ethnic links they had with the autochthonous population in Serbia, as well as with the absence of a language barrier. Change of Serbia's borders after the dissolution of the socialist Yugoslavia in 1991 changed the character of this migration from internal to international. The maximum number of refugees (617,728) was registered by the 1996 Census of refugees. As a result of both the repatriation and resettlement of refugees to third countries, apart from mortality effect, Nikitović and Lukić (2010) estimated that 378,805 refugees had been residing in Serbia at the time of the 2002 Census, which had presented 5% of the total population of the country, excluding Kosovo and Metohija. The number of refugees had decreased to 250,000 according to the 2011 Census due to their integration into the Serbian society, return to the countries of origin, relocation to third countries and mortality impact (Lukić 2016b).

Geographic position of the country reflected an increased level of irregular transit migration that has been noted in Serbia since 2012. In 2015, Serbia became one of the main transit countries for asylum seekers heading to the EU via the so-called Western Balkan Route. While raising humanitarian and security questions, this corridor enabled migrants to cross the Balkans from northern Greece to Western Europe within few days (Beznec et al. 2016; Bobić and Šantić 2020). During the second half of 2015 and in the first months of 2016, more than 700,000 persons passed through Serbia. The situation changed in March 2016 after closing the Western Balkan Route, when the number of asylum seekers decreased and their stay in Serbia became much longer. In 2016, 12,800 persons claimed for asylum in Serbia. The most numerous were people from Afghanistan, Syria and Iraq (GORS 2018). The questionnaire-based research conducted in the Banja Koviljača asylum centre in the western part of Serbia (at the border with Bosnia and Herzegovina) showed that most of the asylum seekers were unmarried males at peak working age from countries affected by war and political turmoil. These findings point to their mixed migration motives, where besides fleeing to safety, the economic status and migration networks have a significant impact on migration routes and destinations (Lukić 2016a). The main destination countries of asylum seekers in Europe are Germany, Austria and Sweden (Aiyar et al. 2016). So far, only a negligible number of them have stayed in Serbia, thus setting new legal and social challenges for the country. In 2015 and 2016, asylum was granted to less than 30 persons (GORS 2018).

## 12.2 Spatial Patterns and Dynamic of Internal Migration

Little attention given to cross-national comparisons in the level of internal migration is considered to be related to the absence of data on internal migration in international statistical databases. This has been recognized as a result of the data harmonization issue and missing of commonly agreed statistical indicators (Bell and Charles-Edwards 2014). However, variations in Europe in regard to the scope of internal migration generally show high mobility in Northern and Western Europe, but lower mobility in the South and East Europe (Bernard 2017). This is in line with the recent empirical findings suggesting the impact of migration on population redistribution and its link to different aspects of development in Serbia and other countries (Lukić and Andjelković–Stoilković 2017; Rees et al. 2017).

The largest share of migrants in Serbia moved within national borders. According to the census, internal migrants made 76% of all persons in Serbia that have not been living in their place of residence since birth in 2011, compared to 74% in 2002 (SORS 2013a). Given the official statistics in the 2011–2017 period, the number of Serbian citizens changing their place of residence was between 120,000 and 125,000 annually, making continuously 2% of the population. This number slightly decreased from 130,000 in 2010. The declining trend in the level of internal migration in other transition former socialist countries has been noted (Čermák 1999).

The average age of a person who changed his/her place of residence in Serbia was 34 years in 2018 according to the administrative statistics (SORS 2019a). On average, an internal migrant is almost 10 years younger than the average citizen of Serbia. The internal migration in Serbia shows a trend of greater mobility of the female population as well as upward movement along the settlement hierarchy. More than half of internal migrants are females, whereas 70% of the internal migrants settle in the cities (GORS 2012, 2018). When compared to men, women are more likely to participate in the migration of a local type as a result of marriage migration. Regarding educational level, a regularity is observed – the longer the migration distance, the higher the level of education of migrants, irrespective of gender (Nikitović et al. 2015).

Inter-regional and intra-regional disparities have been one of the most challenging issues in Serbia, similar to other European countries (see Chap. 23). Large regional disparities are a significant driver of internal migration in Serbia. Given the negative natural change of population throughout the country, the Belgrade region is the only of the four regions in Serbia (not including Kosovo and Metohija) with a continuous population increase in the 1991–2011 period due to positive migration balance (Nikitović et al. 2015). The scope and directions of internal migration in Serbia have been determined by the large regional inequalities rooted in the past, which are in synergy with the contemporary transition to the market economy and the privatization of large state-owned enterprises. The less developed areas are characterized by demographic (emigration, depopulation, population ageing), socio-economic (unemployment, lack of educated and qualified labour force, poverty) and infrastructure problems (underdeveloped traffic and public utility networks) (Lukić and Andjelković–Stoilković 2017).

If we look at the level of local administrative units, only the three biggest cities in the country (Belgrade, Novi Sad and Niš) have a continuously positive balance of internal migration in this century. The average annual migration rate between the Census 2002 and 2011 had been the highest in those cities (Fig. 12.3).

Population distribution at the regional and sub-regional levels in Serbia is the outcome of the long-lasting polarization of population and investments at larger urban centres along the centrally positioned Danube-Morava corridor. The rural and peripheral areas are affected by long-term out-migration. The main internal migration flows have had the same (South–North and rural–urban) direction for decades following the patterns of socio-economic development and intensifying South–North and rural–urban disparities (Lukić 2013). Yet, it should be noted that the South–North and high- to low-lands' migration had been established already at the time of forming modern Serbian state two centuries ago (Nikitović 2016). Lukić and Andjelković-Stoilković (2017) show that the municipalities with higher unemployment rates are those having the higher number of internal out-migrants. Furthermore, they suggest more pronounced importance of the socio-economic drivers of migration in border municipalities, when compared to other municipalities in Serbia. Qualitative research conducted in six towns of Serbia has shown that, like in other European countries, the main motives for in-migration towards towns are work and education (Bobić et al. 2016).

The patterns of internal migration in Serbia over the last decade show that in the 2002–2011 period, the share of migrants moving between municipalities/districts has increased (Table 12.1). According to the 2011 Census, the region of Šumadija and West Serbia has the highest share of migrants within the same municipality, while the Belgrade region, which includes the capital city, attracts people from larger distances (SORS 2013a).

Internal migration in Serbia used to take place mostly from rural to urban settlements during the period of socialist Yugoslavia (1945–1991). Similar to former socialist countries in Central and East Europe, this process, as a result of rapid socio-economic development, was the most intense in times of accelerated industrialization in the 1960s and 1970s (Ivanović-Barišić 2015). The massive rural–urban expansion resulted in an unprecedented urban growth largely expressed not only in the capital cities (Slaev et al. 2018) but also in pre-war small towns, new industrial centres of the socialist period in Serbia (Ivanović-

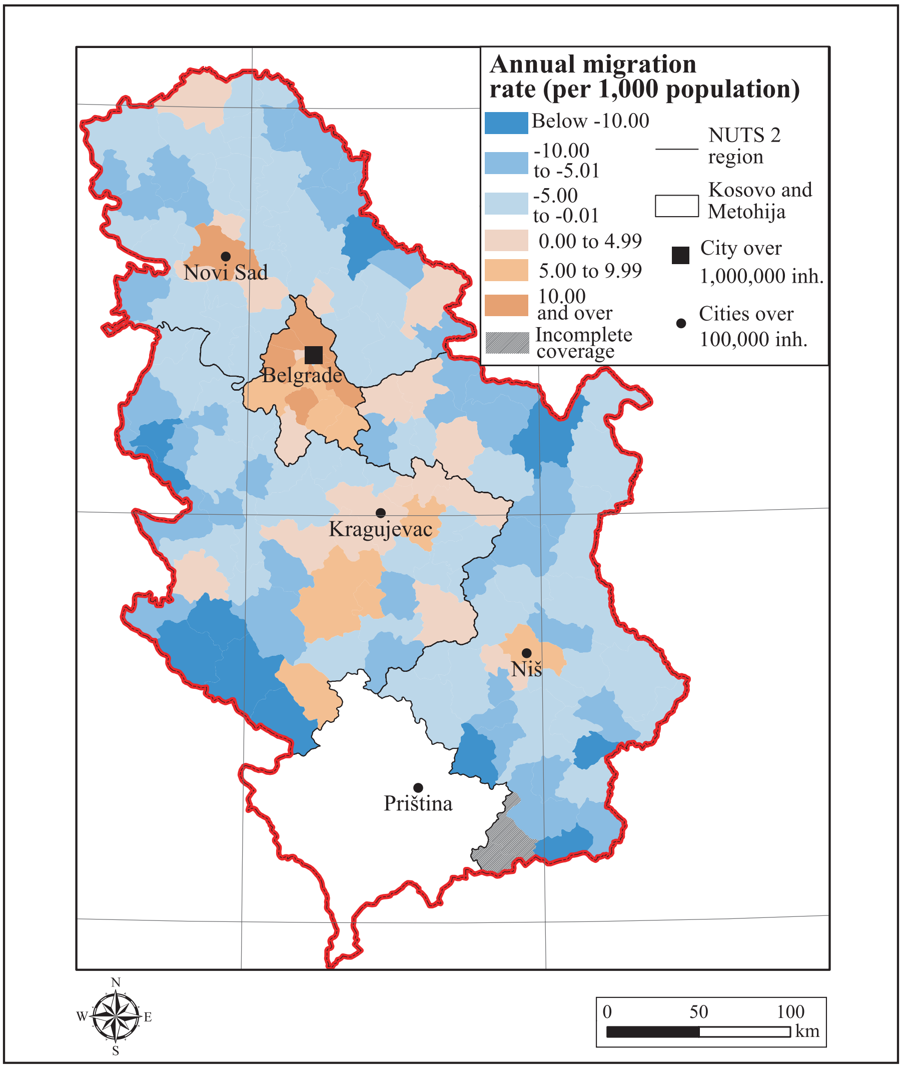


**Fig. 12.3** The average annual migration rate (‰) by municipalities in Serbia in the 2002–2011 period. (Source of data: Statistical Office of the Republic of Serbia 2005; Statistical Office of the Republic of Serbia 2015)

**Table 12.1** Internal migrants in Serbia, censuses 2002 and 2011

| | 2002 | | 2011 | |
|---|---|---|---|---|
| | Number | % | Number | % |
| Total internal migrants | 2,556,449 | | 2,465,097 | |
| Migrants within the same municipality | 918,084 | 35.9 | 697,442 | 28.3 |
| Migrants to another municipality/district | 1,638,365 | 64.1 | 1,767,665 | 71.7 |

Sources: Statistical Office of the Republic of Serbia (2005); Statistical Office of the Republic of Serbia (2013a)

Barišić 2015). Due to the decrease in the demographic potential of rural settlements in Serbia and the collapse of fast-growing industrial centres from the socialist period, this migration pattern is losing its importance. Therefore, the current internal migration has been increasingly taking place in a direction from smaller to largest urban and economic centres, in particular towards Belgrade and three other cities with more than 150,000 inhabitants. The exceptions are rural settlements in the immediate vicinity of larger regional centres. They have become attractive for internal migrants in the last two decades due to low real estate prices or illegal housing. In suburbs of the Belgrade city, the illegal construction is most evident (Djukić et al. 2017). The positive link between in-migration and out-commuting in rural settlements that belong to the commuting zones of the cities of Belgrade and Novi Sad has been found (Lukić 2012a).

Given the selectivity of migrants by sex and age, the rural–urban migration in Serbia contributed to the further depopulation, gender composition imbalance, declining and ageing of the workforce as well as human capital loss in rural settlements (Nikitović 2016). Furthermore, there is a trend of increasing number of settlements with small number of residents or even without population. Those are mainly mountainous or border villages in the region of Southeast Serbia, most often along the administrative border with Kosovo and Metohija (Lukić 2013). Furthermore, Filipović et al. (2016) point to internal out-migration as a threat to disturbance of the demographic potential of small towns that act as a bridge between urban and rural.

A specific group of internal migrants in Serbia refers to the population of internally displaced persons (IDPs) who fled from the region of Kosovo and Metohija during and after the NATO military campaign in 1999. In 2005, there were 210,000 IDPs registered in Serbia, while their number was estimated to be 199,584 persons in 2018 (Commissariat for Refugees and Migration – Republic of Serbia 2019).

## 12.3 An Overview of Changes in Daily Commuting Patterns

The interrelation between different types of geographical mobility has been increasingly recognized in the literature, where commuting can be an alternative for internal or even international labour migration (Green et al. 1999; Sandow and Westin 2010). Commuting to work, likewise, can precede or follow migration (Romani et al. 2003; Lukić 2012a).

Census is the main source of data on commuting in Serbia. Changes in the percentage of commuters among those who are active in the workforce point to a general increase since the 1960s,[2] whereas it raised from 21% in 2002 to 27% in 2011 (Lukić 2006; SORS 2013b). An increasing level of commuting could be compensation for a decreasing level of internal migration, given that in 2011 the share of commuters within the total population of Serbia (8%) was larger than the share of internal migrants (2%). Comparing with 2011 Census data for some other countries, the commuting rate[3] in Serbia is lower than in Croatia (40%) or Hungary (34%), while it is higher than in Romania (21%) (Državni zavod za statistiku Republike Hrvatske 2011; Gerse and Szilagyi 2016; Benedek et al. 2017).

Unlike the period of intensive socialist industrialization when daily commuters in Serbia were mostly mixed-income unskilled or semi-skilled workers, as was the case in other socialist countries at the time, the current commuting population in Serbia is characterized by a higher participation of women, educated workers and those employed in the service sector (Lukić 2006, 2007; Lukić and Tošić 2009). These shifts resulted from changes in the structure of the active population and transformations of the national economy (Lukić 2007). The share of females in the total daily commuting population in Serbia increased from 12% in 1961 to 35% in 2002 and to 38% in 2011 (Lukić 2007; SORS 2013b).

Findings on the larger geographic mobility of more educated commuters (Van Ham 2001) were confirmed in Serbia, too. The share of commuters with tertiary education within the commuting population is significantly higher than the share of persons with tertiary education in the total workforce (Lukić and Tošić 2009).

The structure of daily commuting flows by economic sectors reflects the existing quantitative and qualitative mismatch of the economically active population and the local needs of business subjects. In Serbia, the decrease in the share of commuters employed in primary and secondary sector has been noted over time (from 64% in 1961 and 53% in 2002 to 41% in 2011). Moreover, there has been an increase in the share of commuters employed in the tertiary sector from 34% and 44% to 58% (Lukić 2012b; SORS 2019b). The research findings that referred to the regional dimension of deindustrialization and commuting in Serbia in selected large industrial centres in transition showed that adjustment to changes in those labour markets has been through out-migration rather than through out-commuting (Miletić et al. 2011).

The higher level of in-commuting is generally associated with cities offering a greater variety of jobs (Lukić 2011b). According to the 2011 Census, the positive level of net commuting as the difference between the number of in-commuters and the number of out-commuters was in the Belgrade region, while the other three regions have more out-commuters than in-commuters (SORS 2019b).

In Europe, the largest number of commuters arrives daily to the capital and major Western European cities. More than half a million commuters were arriving in Lisbon, Madrid and Brussels in 2008 (Eurostat 2016b). Recent research points out that commuting has significantly increased in the post-socialist metropolis also, largely due to suburbanization over the first decade of the twentieth century (Krisjane et al. 2012). According to the 2011 Census, the net inflow of daily commuters in the City of Belgrade was 45,000 (SORS 2019b).

In 2015, 8% of the EU workforce commuted to work in a different NUTS 2 region in the same country. This pattern of national commuting was the most expressed in Western European countries, whereas the least expressed in Eastern and Baltic EU member states (Eurostat 2020). The inter-regional commuting pattern is little represented in Serbia. According to the 2011 Census, the majority of the workforce in Serbia lived in the same region where they worked, while about 3% of the workforce commuted nationally to a different NUTS 2 region (SORS 2019b).

Although the main directions of commuting flows within Serbia remained largely unchanged over time, characterized by the prevailing intra-municipality commuting pattern as well as commuting up in the settlement hierarchy, there has been an increasing share of inter-municipal commuting from

[2] When commuting began to be followed by the official statistics.

[3] The share of commuters in the economically active population.

**Table 12.2** Daily commuters in Serbia, 2002 and 2011 Census

| | 2002 | | 2011 | |
|---|---|---|---|---|
| | Number | % | Number | % |
| Total daily commuters | 565,054 | | 615,990 | |
| Daily commuters within the same municipality | 356,137 | 63.3 | 341,959 | 55.5 |
| Daily commuters to another municipality/district | 194,345 | 34.4 | 271,877 | 44.1 |
| Daily commuters to foreign country | 2,034 | 0.4 | 2,154 | 0.2 |

Source: Lukić 2011a; Statistical Office of the Republic of Serbia 2013b

34% (2002) to 44% (2011) (Table 12.2). In 2011 in Slovenia, half of the commuters (50%) travelled daily to another municipality for work, while in Croatia it was 49% (Republic of Slovenia Statistical Office 2018; Državni zavod za statistiku Republike Hrvatske 2011). However, although illustrative, cross-national comparisons in scope and directions of commuting flows depend on the size of the territory of the country and the size of region/municipality/settlement, population size and traffic policy.

According to Lukić (2011b), commuting patterns revealed through commuting flows in Serbia uncover dominant stable rural–urban direction where rural commuters commute to urban settlement, which is the centre of the same municipality. However, due to decrease of rural population and population ageing in rural settlements, an increasing share of commuters with usual residence in urban settlements, from 26% (2002) to 32% in 2011 (Lukić 2006; SORS 2013b), can be noticed.

The complex interrelationship between mobility and migration plays out differently across the country. Migration and mobility patterns in Serbia are shifting through time, thus changing the demographic and socio-economic environment, largely affected by the post-socialist transformation context. Both internal and international migration had been gradually declining in the inter-census period 2002–2011, while the other forms of mobility, such as commuting, had increased. However, estimation on the international migration trend, based on the census data solely, should be taken with caution. While young skilled migrants are moving up in the settlement hierarchy, the effects of internal migration on international migration reflect in a wider multistage migration pattern. Likewise, gender dynamics of migration is becoming more noticeable, while an intensive activity of migration networks can be noticed. Will it be likely that Serbia from emigration country becomes the immigration one in the future that will cause blurring of cultural boundaries, still remains to be seen. Serbia's future within the European migration system in conditions when EU member states are divided over migration policy in managing irregular migration flows as well as asylum seeker flows is also unpredictable.

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# Approaching Regional Depopulation in Serbia

13

Vladimir Nikitović

**Abstract**

What would demographic future of Serbia look like if the recently adopted pronatalist policy became successful? How the change in migration patterns related to the Serbia's expected EU accession can affect population dynamics of the country? These emerging demographic issues are discussed in the framework of the scenario-based population projection disaggregated at the district level. The declining and ageing trend of the total and working-age population in Serbia is strongly selective with respect to regional and sub-regional levels, even in the optimistic scenario of the successfully implemented pronatalist policy. Moreover, a resurgence in the number of live births can be expected only in districts along the central transport corridor, which connects the most developed and populous urban centres having a positive migration balance. On the other hand, the predominantly less developed border areas facing long-term out-migration will remain endangered. The results suggest that the policy measures have to be implemented much longer than the projection horizon shown, that is, in a strategic way, because their initial reach is limited to the improvement of the age structure, while the positive impact on the total population can be expected only in the decades after recovering the fertile contingent.

**Keywords**

Sub-national population projection · Pronatalist policy · Migration transition · Migration estimates · Demographic scenarios · Depopulation

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The need for projections of population dynamics in Serbia's districts and regions stems from the challenges of demographic development at the sub-national level, which is often an overlooked or incorrectly addressed issue in official projections, strategic documents and spatial development plans (Nikitović 2019b).

The idea of this chapter is to explore, by means of population projections at the district level (NUTS 3), what would demographic implications in Serbia look like if the two major societal shifts come true in the coming period: (a) successful implementation of the recently adopted pronatalist policy and (b) the change in migration patterns related to the expected country's EU accession. Some of the specific goals closely connected to the leading idea imply estimating the net international migration at the district level and providing an alternative to the official sub-national population projections, given their known methodological shortcomings (Nikitović 2013, 2016).

## 13.1 Conceptual Framework and Empirical Background of the Projection

The projection time horizon covered in this chapter represents the medium-term period – from the most recent population estimates to the mid-century. Official estimates of the Serbia's population by sex and age at the district level as of 30 June 2018 (STAT Database 2019) were taken as the basis for calculating the initial age and sex population structure in the projection. These estimates are based on the 2011 Census and the subsequent changes of the population structure that have been induced by births, mortality and internal migration between the census day and mid-2018. Given that the estimates thus obtained did not include the impact of international migration, which is particularly important for highly emigration areas, it was necessary to correct them by including an assessment of the balance of international


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migration between 30 September 2011 (the Census day) and 30 June 2018.

To express uncertainty about the future trends of all three determinants of population dynamics, the scenario approach was chosen. Despite advancements of methodology in probabilistic projections, albeit primarily at the national level (Nikitović 2016), the choice of the scenario approach for projections presented in this chapter can be simply explained. Users of demographic projections at lower territorial levels typically seek answers to the "what if" questions offered by projections presented through multiple scenarios/variants. Assessing the potential effects of the current Birth Promotion Strategy, as one of the basic goals in this chapter, involves just such an approach. Also, probabilistic methods require longer time series of historical data on demographic and migration events, which are most often unavailable at the sub-national level. However, it should be noted that we used the benefits of the probabilistic approach in terms of reducing the subjective judgement while formulating both fertility and mortality hypotheses in the expected (reference) scenario. The future paths of total fertility rate (TFR) and life expectancy at birth in this scenario represent the most likely trajectories from their prediction intervals derived by running the same global model used to produce the current World Population Prospects (WPP) by the United Nations' Population Division (hereafter: the UN model) (United Nations 2019a).

The objectives of this chapter were to formulate two fertility scenarios – expected (reference) and optimistic. The first relates to the future change in total fertility rate (TFR) resulting from the projection by the UN model on the basis of available time series, and the second to the realization of the goals defined in the current Birth Promotion Strategy. The syntagma "optimistic scenario" can be explained by the very goals of the Strategy, which presuppose a much higher increase in TFR, if compared either to observed tendencies or to the forecasts based on the UN model. In formulating the mortality hypothesis, no alternative scenario was defined because of the relatively stable changes in this component, and because of the focus of the chapter itself on the impact of fertility and migration at the sub-national level. Given the limited quality and availability of time series on migration and far greater uncertainty about their future trends, especially at the sub-national level and in the longer term, compared to the natural components of population change (births and deaths), only the "expected" migration scenario is formulated. Thus, the two scenarios of Serbia's demographic future presented in this chapter differ from one another only in the fertility assumption.

The UN model implies that low-fertility areas across the globe should experience a mild to moderate, post-transition recovery in total fertility rate. This model, in its first version from 2010, predicted that countries that had experienced very low fertility rates would in the long run restore the replacement fertility rates (United Nations 2011), that is, within the next 3–4 generations. It thus implicitly suggested that the contemporary decline in birth rates is not an irreversible process, as it is not unprecedented in the twentieth century (Kohler et al. 2002).

The concept of the UN model allows each country to have its own pace in the process of fertility recovery, reflecting one of the general principles of the demographic transition in terms of the peculiarities of individual trajectories (Sobotka 2008). The key counterarguments to the general assumption of the model in terms of global convergence of total fertility rates towards the replacement level (fertility decline in high-fertility regions and recovery in low-fertility ones) are that it has no theoretical or empirical justification globally, especially in the advanced economies of the Eastern Asia (Basten et al. 2012). On the other hand, in addition to the empirical evidence from the last 10 to 15 years suggesting that the period of the lowest recorded fertility in the world may be behind us, a recent research based on the Human Development Index suggests that a well-known negative correlation between economic development and fertility, typical of the entire twentieth century, may be reversed, that is, economic progress can lead to higher birth rates in the richest societies (Myrskylä et al. 2009; Luci-Greulich and Thévenon 2014) and thus become a development guideline for all other low-fertility populations. Successive adjustments in the revisions of the UN model after 2012 including the current WPP 2019 set could be interpreted in that way as they allow each country to reach its target total fertility rate based on its own as well as the experience of other low-fertility countries that have experienced fertility recovery. Consequently, it would result in target TFR of 1.53 by 2050 and 1.67 by 2100 in the Southern Europe region (United Nations 2019b).

Such a conceptual framework takes into account the macro- and micro geographic differentials in the spread of demographic change – driven by differences in economic and sociocultural character, which is consistent with the diffusion of innovation theory (Rogers 2003). More recently, interpretations of the spatial patterns of demographic change based on this theory indicate that sociocultural heterogeneity prevents the equal diffusion of attitudes and information that supports contemporary reproductive ideas and behaviour (Yücesahin and Özgür 2008).

In this chapter, we have developed the hypothesis of international migration in Serbia within a theoretical concept called "migration cycle model" that describes the country's transition from emigration to immigration. The concept can be regarded as a specific interpretation of the "pull and push" migration theory (Fassmann and Reeger 2012), which reflects the path of the "old" immigration countries in Europe that had experienced a transition from emigration to immigration in the conditions of below-replacement fertility (Fassmann et al. 2014). In that way, we opted for an empirically grounded scenario that relies on contemporary changes in the European context instead of an almost completely arbitrary scenario, such as that in regular revisions of world population projections by the UN, which keeps the initial net migration constant during the projection horizon (United Nations 2019a). Based on the empirical evidence about spreading of the migration transition not only from northwest to south, but also to the east of the continent (Drbohlav et al. 2009), as well as undisputed facts about the expected continuation of migration pressure on Europe from the Middle East and Africa (Pastore 2017), we thought that the migration cycle model is the best framework for formulating the hypothesis on international migration in the territory of Serbia. Given that the EU membership is Serbia's strategic goal, and that the accession process of the Western Balkan countries remains one of the European Union's priorities (European Commission 2019), Serbia's EU accession is set as a pivotal point in the migration transition hypothesis, primarily because of the socio-economic transformations that EU membership entails, which also give rise to opportunities for transforming the country's migration pattern.

From the viewpoint of the migration cycle model, the Western Balkan region could be considered as stuck in the initial, pre-transition stage (Nikitović 2019a). Similar to the concept of demographic transition, the migration cycle model does not imply that the stages of the cycle last for the same amount of time or exhibit identical characteristics in different countries. It is rather general concept of the transition process according to which some countries that are entering the process later could potentially require a shorter period of time to adapt than the states that transitioned earlier (Fassmann and Reeger 2012: 67).

## 13.2 Possible Change in Fertility Rates

The total fertility rate in Serbia has fluctuated between 1.40 and 1.45 since 2005. Most former socialist states that belonged to the lowest fertility group have recently experienced a rise in TFR (Bulgaria, Czechia, Estonia and Slovenia have even exceeded 1.5). In the pre-projection period, practically the entire territory of Serbia is characterized by a below-replacement TFR.

The optimism of contemporary official projections of the Serbia's population, which is reflected in the overestimation of the registered total population, is primarily the result of unreasonably optimistic assumptions about the change in TFR (Nikitović 2013). Similarly, the current projection by SORS (Statistical Office of the Republic of Serbia) (2011–2041) assumes according to the "medium", or most likely, variant that the TFR will grow between 22% in the region of South and Eastern Serbia and 27% in the Vojvodina region, in just 30 years. However, no grounding in the theoretical and/or empirical domain has been provided for the "predicted reversal in fertility trends" (Statistical Office of the Republic of Serbia [SORS] 2014, p 10). Therefore, the "middle" variant can be characterized as very optimistic, as it predicts a major change in the observed "tendency to decrease fertility".

Other relevant projections of fertility of the population of Serbia for the same period did not find sufficient arguments to predict a significant increase in TFR, predicting levels of 1.50 and 1.58 by 2041, respectively (Kupiszewski et al. 2012, p 22; Nikitović 2013, p 71). In addition, the main scenario of population projections for all EU Member States (EUROPOP2018) predicts, for example, only a slight increase in TFR in Croatia (1.53 in 2050) (Eurostat 2019), which has a similar history of this indicator as Serbia. The UN WPP 2019 foresees a TFR of 1.54 for Serbia by 2050 (United Nations 2019b, p 1003).

### 13.2.1 Expected Scenario

As the UN model recognizes only the territory of Serbia including the region of Kosovo and Metohija, it was necessary to model TFR for the territory of Serbia without data for this region. The model was adjusted to lower territorial levels (regions and districts) in accordance with the available historic datasets. For every district, a median of the prediction interval resulted from the UN model was taken as the forecasted TFR over the projection horizon. In general, a target TFR for districts with a pre-projection TFR below 1.45 would be around 1.55, and for those with TFR above 1.45, a target TFR would be close to 1.70. The UN model has shown that districts in eastern Serbia represent the nucleus of a low TFR in the country, that is, that the potential for positive changes in this indicator is the weakest in this area. A slightly higher forecast of TFR would characterize the surrounding districts in the region of Southern and Eastern Serbia and certain districts of Vojvodina. According to the UN model, the maximum target TFR was projected for western and southwestern districts in the region of Šumadija and West Serbia. These findings were supported by the results of the spatial autocorrelation analysis with respect to change in TFR between 2002 and 2011 at the municipal level in Serbia (Nikitović et al. 2019).

### 13.2.2 Optimistic Scenario

The projected values of the total fertility rate in the optimistic scenario, aligned with the goals of the Birth Promotion Strategy, were put in the context of the prediction interval obtained by the probabilistic procedure when formulating the hypothesis of the expected fertility scenario. This evaluation, based on the UN model, indicates the probability of 7–10% for achieving the optimistic scenario in 2035 and 3–7% in 2050 in the case of districts with a lower TFR at the beginning of the projection, or 5–10% in 2035 and below 3% in 2050 for the districts with higher TFR at the beginning of the projection. In this scenario, the highest increase in TFR was predicted for the first 15 years of the projection. Although the scenario implies that policy measures will last even beyond the horizon of the current strategic document, experiences from countries with a long tradition of population policy implementation indicate that the effects on birth rates are generally strongest in the initial period of the implementation (Frejka and Gietel-Basten 2016). The forecasted increase in TFR across districts would be 20–35% by 2035, and 10–15% from 2035 to 2050 depending on the pre-projection TFR in each district; the range of the target TFR across districts would be 1.70–1.85 in 2035 and 1.85–2.10 in 2050, which is in accordance with the target TFR of 1.85 at the country level after 15 years of the Strategy implementation, and with the potential 2.10 on the long run (Government of the Republic of Serbia 2018, p 16). However, even in the case of an optimistic scenario, there is no realistic basis to assume that the replacement TFR could be reached by the mid-century in all districts. This is a conclusion based on the recognized spatial patterns of demographic trends in Serbia over the past half-century, in accordance with the theory of diffusion of social innovations (Nikitović et al. 2016), as well as on recent findings on the link between fertility and economic development at the sub-national level in a European context (Fox et al. 2019). Therefore, as in the expected scenario, the lowest target values (TFR = 1.85) would be in districts of traditionally lower fertility in the region of South and Eastern Serbia, whilst that level would be reached already in 2035 in higher fertility areas in the western and southwestern Serbia.

## 13.3 Expected Mortality Reduction

As compared to the European average, and particularly to the EU level, Serbia is lagging behind it as regards life expectancy at birth for both sexes. In 2017, the difference in life expectancy between Serbia and the EU-28 average amounted to 5.4 years for females and 5.2 for males. However, the differences are considerably greater if one makes a comparison with the countries that have achieved the best results in decreasing mortality. So, for example, the life expectancy at birth for males was in 2017 over 81 years in Switzerland, Iceland and Norway, and for females exceeded even 85 years in Spain, France, Switzerland and Italy. Nevertheless, the life expectancy of males in Serbia is higher than in Belarus, Moldova, Russia, Ukraine, Bulgaria, Estonia, Lithuania, Hungary and Romania and close to the ones observed in Slovakia and Poland. As for the life expectancy for females, there are only a few countries (Russia, Ukraine, Belarus and Moldova) lagging behind Serbia (United Nations 2019b). Thus, if one considers the life expectancy at birth, Serbia is much closer to the ex-communist countries than to other ones. However, the gap between the sexes in life expectancy at birth in Serbia (4.9) is almost the same as the one in the EU-28 (5.2) in 2017. In addition, it is worth noting that, according to official abridged life tables, the sex gap has been stabilized since the 1990s amounting to the average of 5 years in the period 2011–2018.

Unlike the majority of past population projections, which underestimated the actual increase in life expectancy at birth during the twentieth century (Nikitović 2013), the current official projection of Serbia assumes a very optimistic change of this indicator in the 2011–2041 period. The authors justified it by the observed improvements in life expectancy in Serbia since the beginning of this century (SORS 2014, p 10). The lowest increase in life expectancy per decade is predicted for women in the Belgrade region (1.5 years) and for men in the region of South and Eastern Serbia (1.8), while for the rest of the population this increase amounts to above 2 years; the highest increase is assumed for the region of Šumadija and West Serbia – 2.5 and 2.4 years for men and women, respectively.

In the European context, such a high increase in life expectancy has been recently observed only in post-communist societies after the fall of the Berlin Wall. However, the historical pattern of mortality in the population of Serbia is different from that pattern (Kupiszewski et al. 2012), which is the first counterargument to the assumption made in the official projection by the

SORS. The second refers to the very slow changes in survival rates of the persons aged 55 and above since the 1980s (Devedžić and Stojilković 2012), which, on the other hand, should be the main source of future rise in life expectancy (*e0*) based on the preventable mortality indicators in Serbia (Marinković 2017) and the potential for progress, compared to the progress made in the European context (Galjak 2018) (see Chap. 11). This is why other relevant projections of mortality in Serbia over the same period 2011–2041 are much more prudent in predicting further increase in e0 – an increase per decade is 1.3 years for women and 1.6 years for men in the projection made by Kupiszewski et al. (2012, p 30), and 1.15 years for men and 1.05 years for women in the first ever projection of the population of Serbia that had been made by means of the probabilistic model used for the UN projections (Nikitović 2013).

Additionally, the official projection includes a controversial assumption regarding the reduction of the gap between the sexes in life expectancy at birth. Numerous projections by statistical institutes across Europe and international statistical agencies, and both stated projections of Serbia's population, predict a mild trend in the reduction of this gap. On the other hand, the current projection by SORS predicts a very intense reduction of the gap between the sexes in e0 in the Belgrade region (2 years in three decades), and minimal in the region of Šumadija and Western Serbia, while it predicts the opposite trend in the other two regions – an increase in the gap for 0.5 years in the region of South and Eastern Serbia and even for 1 year in the region of Vojvodina (SORS 2014, p 10).

### 13.3.1 Mortality Hypothesis

In formulating the hypothesis on mortality of the population, the UN model was used. The same procedure as in the case of the hypothesis on fertility was applied – adjustments were made to the input data regarding the coverage of the territory and the chosen level of its administrative division (districts), while for every district a median of the prediction interval that resulted from the UN model was taken as the expected e0 over the projection horizon.

Depending on the pre-projection level of e0, an increase in this indicator for women from 2018 to 2050 would be between 3.45 years in the northern districts of the Vojvodina region and eastern parts of the region of East and Southeast Serbia and 3.97 years in the Belgrade region, in most districts in the region of Šumadija and West Serbia, and in districts that are regional centres of Vojvodina (Novi Sad) and South and East Serbia (Niš).

In the case of men, the increase in e0 by the end of the projection period would be between 4.12 years in most districts of the Vojvodina region (excluding the district of Novi Sad) and eastern parts of the region of East and Southeast Serbia and 4.76 years in most districts of the region of Šumadija and West Serbia, in the Belgrade region and in the central district of the region of South and East Serbia (Niš).

## 13.4 Expected Migration Patterns

### 13.4.1 Internal Migration

Frequent changes of political borders in the region of former Yugoslavia since 1991 affected the availability and quality not only of the statistics on international but also on internal migration in Serbia. It was one of the reasons that limited our analysis of input data on internal migration to the period after the 2011 Census. Regional and sub-regional differences, and especially the growing gap between the major urban centres and the rest of the country in terms of not only economic development, diversification and supply of jobs, housing, health care, overall quality of life but also subjective perception of opportunities to achieving personal life goals, are the factors that determine the directions and the intensity of internal migration. The metropolitan area of Belgrade and Novi Sad, consisting of the two largest cities in the country, represents the central focal point of the country for internal migrant inflows. Most other districts in the country have been characterized by migration outflows for years, especially those in the border and mountain areas of the South and East Serbia region and in the region of Šumadija and West Serbia. This pattern of internal migration is not only deeply rooted in previous periods (see Chap. 12) but also intensified by the process of reducing and ageing of population since the 1990s.

At the beginning of the projection period, the 3-year average of the net migration rate (2016–2018) according to official statistics was positive in only 5 out of 25 districts in Serbia. The centres of those districts are the largest cities in the country, where the most prestigious Serbian universities are located. However, with the exception of the districts of Belgrade and Novi Sad, their net migration rate was below 1. On the other hand, the highest out-migration rates were recorded in the three border districts of which one is in the east, one in the west and one in the south along the administrative border with the region of Kosovo and Metohija.

According to the only (expected) migration scenario, the net migration rate is projected to gradually decrease by 15% until 2030 in all 20 districts where a negative internal migration balance was observed at the beginning of the projection. At the same time, the share of the metropolitan area of Belgrade and Novi Sad, as the most prominent zone of in-migration, would decrease slightly in the country's balance of positive flows of internal migration at the expense of the increase in attractive power of the next three largest districts (Niš, Kragujevac and Subotica). This hypothesis is the result of two factors. The first relates to the successful implementation of policies aiming at a more balanced development of the country, which is one of the strategic goals of Serbia's sustainable development (Government of the Republic of Serbia 2008). The second factor is an estimate of the expected decline in the share of the most active age groups in migration flows in line with the trend observed at the beginning of this century, caused by the decline and ageing of the population.

From 2030 to 2050, that is in the period when Serbia should become an EU member, a further gradual decrease of the negative balance of internal migration by 15% was assumed in every of 20 districts characterized by this migration pattern; further strengthening the attractive power of the three districts whose centres are the cities highly ranked by the population size and the gravity power (Niš, Kragujevac and Subotica) at the expense of the Belgrade and Novi Sad districts is also expected.

### 13.4.2 International Migration

Serbia is a typical emigration country with a negligible influx of immigrants, that is, foreign nationals. Therefore, its international migration balance essentially boils down to the difference between emigrants and returnees, in both cases, of Serbian nationals. Still, certain portion of current returnees includes retired gastarbeiters or "guest workers" from the first mass waves of emigration that began in the mid-1960s as a policy response to the challenge of "surplus in unskilled labour" in the socialist Yugoslavia.

A review of the available population projections that refer to the successor states of former Yugoslavia indicates a rather optimistic view on the future migration balance of the region, despite the pronouncedly negative trend in this indicator in the last couple of decades. The current projection for Serbia in the period 2011–2041 by SORS is no exception in that regard, although there is no doubt that the country's net migration rate in the pre-projection period 2002–2011 was negative (Kupiszewski et al. 2012; Penev and Predojević-Despić 2012; Lukić et al. 2013). Moreover, the current official projection contains a very serious methodological omission regarding migration hypothesis, which is the most important component when projecting small-size populations, such as municipalities or districts. Based on Table 4 in the SORS publication (2014, p 11), which provides the starting and projected annual migration balance by regions of Serbia, it appears that the total migration balance of the country is positive (excess of 514 persons), which is certainly impossible given the extremely emigration character not only of Serbia, but of the entire region of the former Yugoslavia except Slovenia (Fassmann et al. 2014; Josipovič 2016; Nikitović 2016; United Nations 2019b). In addition, the supporting methodological explanation does not specify how migration hypotheses are formulated at the municipal level (the estimate of international migration is not stated), which should be the essential information, given the marked differences between municipalities regarding this component of population dynamics. It is likely that the current SORS projection does not include an estimate of international migration in Serbia, as it starts from an unrealistic (positive) balance in 2011. Also, by 2041, it is predicted that the net immigration rate will reach more than four per thousand population of the country in 2011 (SORS 2014), which is twice as high as the forecast for Slovenia, or equal to the forecast for Austria in the same year by EUROPOP2018 (Eurostat 2019).

There are only a few studies that have offered an estimate of the annual international migration flows in Serbia according to the definitions of the United Nations (UN) and the EU (Kupiszewski et al. 2012; Lukić et al. 2013). These are based on the migration statistics of the countries that are main destinations of Serbian citizens. The basic limitation of such estimates is methodological in its nature, as it is practically impossible to analyse the statistics of all destination countries due to the unavailability of data or their statistical unreliability in the case of countries where Serbian citizens make up a very small share of immigrants. An additional limitation of this procedure is the inability to obtain longer time series on emigration from Serbia due to frequent changes of the state borders in the period 1991–2008. The result is a data series shorter than a decade, which makes it impossible to draw valid conclusions about trends in the international migration flows from/to the present-day territory of Serbia.

The starting point for obtaining an up-to-date estimate of the balance of international migration in Serbia was the estimate of this indicator for the period 2008–2010 by Kupiszewski et al. (2012). The analysis of the available data showed that the negative migration balance increased after 2010, which was also contributed by the reduced influx of returnees who completed their working career abroad, as the volume of these generations decreased. Nikitović (2019b) estimated that the average annual migration balance of

Serbia was −20,692 in the 2011–2018 period, which is certainly a very rough estimate. Nevertheless, it is a starting point that is far closer to reality than any scenario that neglects the migration component or starts from a significantly underestimated volume of emigration based on the census results.

Despite the known issue of underestimation of the number of Serbian citizens abroad by the census, it is the only source of data that allows the analysis of previous trends in international migration at the district level in Serbia. We assumed that the distribution of emigrants by district of origin that had resulted from the analysis of the 1991–2011 census data was the same as the distribution of the actual number of emigrants that is unknown to us. Such an approximation will induce certain deviation when both the estimated and forecasted total international migration balance of the country is distributed at the district level. However, the estimated total migration balance is itself the rough estimation of the unknown actual figure. The final estimate of the international migration balance by districts at the beginning of the projection was obtained by assuming that the share of the oldest emigration zone in Eastern Serbia in the total negative migration balance of the country decreased by 25–30%, due to the increase in the share of other non-traditional areas of emigration. Besides the emergence of new "hot emigration zones" in the southwest and southeast of the country (Penev and Predojević-Despić 2012) and new emigration waves from major city centres across the country, the reason for this assumption is the decrease in the demographic potential of the traditional emigration zone, as well as the evidence of recently established emigration of ethnic minorities – from the north of Vojvodina to Hungary and from the east border municipalities to Bulgaria.

From the perspective of the projection horizon in this chapter (2018–2050), the stages of migration transition, according to the migration cycle model by Fassmann and Reeger (2012), have been interpreted in relation to the symbolic turning point in the transition process in Serbia (2030), which implies that the country should join the EU by then. After 2030, a transition phase should follow during which immigration gradually outweighs emigration, which coincides with the migration assumption in the current EUROPOP2018 projections (2018–2100) for EU Member States (Eurostat 2019). However, in the period up to 2030, the hypothesis was formulated by analogy with recent and current experiences of emigration from most former communist states immediately after they joined the EU (Draženović et al. 2018). In addition, the current relaxation of immigration policy towards Serbia by the major destination countries, such as Germany, indicates that increased emigration is also possible in the immediate pre-accession period. In other words, even in a scenario that would not imply Serbia's accession to the EU, it is difficult to avoid the hypothesis that does not predict intensive emigration as long as there is a marked gap in living standards between Serbia and the most developed countries of Europe, as well as the growing demand for labour in these countries due to intensification of population ageing.

Given the above reasoning, as well as the expected decrease in Serbia's migration potential due to population ageing, we assumed that the increase in the average annual negative migration balance would be at maximum 15%. This means that the already high level of the balance in 2018 of −3 per 1000 population or −20,692 persons would reach −3.5 in 2030 or −23,685. Such a forecast is the result of a previously formulated assumption about the regional distribution of the country's total migration balance. Numerically, the negative net migration rate will increase by 25%, compared to 2018 in all districts not recognized as traditionally emigration ones, while the migration balance of "hot zones of emigration" will remain unchanged until 2030.

In line with the gradual transformation of the migration pattern in Serbia after 2030, we assumed that the net international migration of the country would turn positive by 2050 and amount to 0.8 per 1000 population or 5222 persons annually. The benchmarks for defining the target rate were EUROPOP2018 projections (Eurostat 2019), which implicitly see the EU as an immigration zone. The projected rate is the result of a hypothesis at the regional level, which implies that all districts should reach at least zero migration balance by 2050, that is, enter the transition phase according to the migration cycle model. The highest rate of positive migration balance, 1.5 per 1000 population, would be in the districts with the largest university centres, in line with the strategic national goals for sustainable population development.

In order to meet the main assumptions regarding the assumed dynamics of the process of Serbia's accession to the European Union and to achieve a more balanced regional development of the country, two reference points were set in the projection period – 2030 and 2050. For both points, the net migration rate for every district was expressed as the net migration per thousand population in 2018 and was calculated on the basis of previously projected rates of internal and international migration. The rate changes linearly between the reference points, resulting in more districts with positive net migration rate in 2050, whereas no district is expected to exceed the net emigration rate of −5 (Fig. 13.1).

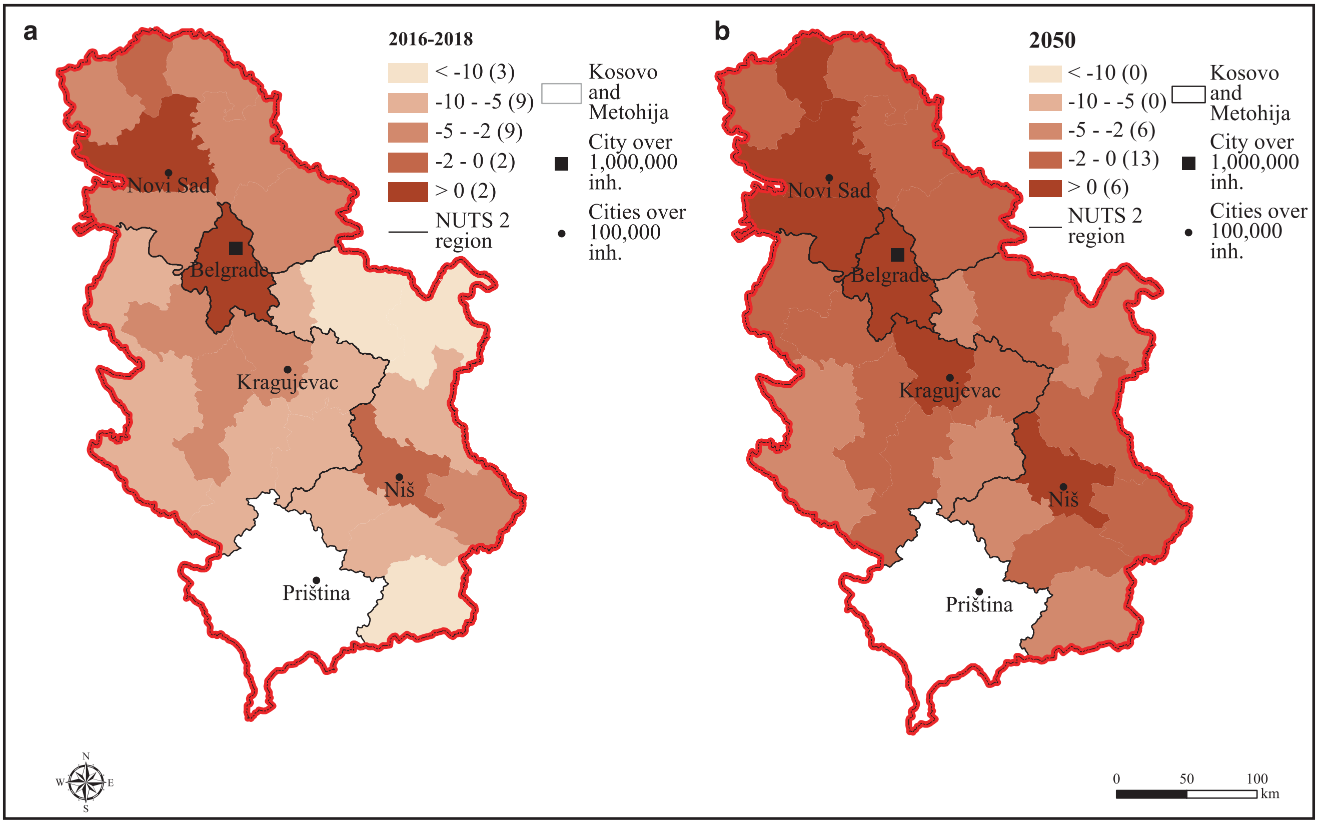


**Fig. 13.1** Net migration rate (per 1000 population) across districts of Serbia – (**a**) estimated 2016–2018 average and (**b**) expected in 2050

## 13.5 Population Projection Results[1]

### 13.5.1 Expected Scenario

By the time Serbia should join the EU (2030), the total population of the country would be around six million according to the expected scenario. The decrease would continue in the period 2030–2050, though, at a slightly slower pace due to the country's transition from the net emigration to the net immigration stage, and a slight increase in fertility rates. Thus, the current population size of Serbia would be reduced by almost two million or by 30.4% until 2050. This puts Serbia in the group of top 10 world countries (including its neighbours Croatia, Bulgaria and Romania) expecting to see their populations decline by more than 15% by 2050 according to the most recent UN World Population Prospects (United Nations 2019b).

While in the same period, the decrease of the total population in the Belgrade region would be just 4.5%, and in the Vojvodina region slightly less than the national average (27.8%), the region of South and East Serbia would lose almost half of its population (48%), and the region of Šumadija and Western Serbia somewhat less than that (42.2%). The most dramatic loss of population (over 50%) is projected for the area of traditional emigration – in two districts in East Serbia by over 75%, compared to their present population size (Table 13.1). In addition to the Belgrade district, reductions of less than 30%, that is, below the national average, were forecasted only in districts with the largest city centres, which are not characterized by a negative balance of internal migration during the projection horizon – Novi Sad (10.3%), Niš (23.7%), Subotica (24.5%) and Kragujevac (27.8%).

The number of live births in Serbia would decline by almost a third (32.4%) between 2018 and 2050, with this decline going faster by 2030. The average annual number of live births in the entire South and East Serbia region could be less than 5000 by the mid-century – a decrease of

[1]Non-commercial software was used for all calculations. Probabilistic simulations of trajectories of TFR and *e0*, as a tool for formulating the expected fertility and mortality scenario, were performed using *R* software and its packages *bayesTFR* (Ševčíková et al. 2015) and *bayesLife* (Ševčíková and Raftery 2015). Projections of the population by age and sex at the district level in Serbia were calculated using Spectrum software.

**Table 13.1** Forecast of selected indicators by NUTS 2 regions of Serbia according to the expected scenario

| | Serbia | Belgrade | Vojvodina | Šumad. & West S. | South & East S. |
|---|---|---|---|---|---|
| Total population | | | | | |
| 2020 | 6,713,415 | 1,675,378 | 1,804,577 | 1,824,629 | 1,408,831 |
| 2030 | 6,007,895 | 1,648,876 | 1,634,711 | 1,560,254 | 1,164,054 |
| 2040 | 5,282,599 | 1,604,200 | 1,455,347 | 1,292,594 | 930,458 |
| 2050 | 4,765,915 | 1,600,616 | 1,323,886 | 1,083,576 | 757,837 |
| Live births | | | | | |
| 2020 | 59,318 | 17,600 | 16,048 | 14,901 | 10,769 |
| 2030 | 46,910 | 14,581 | 12,936 | 11,528 | 7,865 |
| 2040 | 41,446 | 14,809 | 11,594 | 9,314 | 5,729 |
| 2050 | 40,440 | 16,494 | 11,069 | 7,996 | 4,881 |
| Working age (20–64) | | | | | |
| 2020 | 3,979,295 | 1,008,036 | 1,087,412 | 1,063,527 | 820,320 |
| 2030 | 3,379,797 | 955,374 | 935,354 | 846,670 | 642,399 |
| 2040 | 2,899,568 | 934,702 | 819,113 | 664,827 | 480,926 |
| 2050 | 2,480,357 | 878,709 | 708,798 | 525,547 | 367,303 |
| Elderly (65+) | | | | | |
| 2020 | 1,456,827 | 335,171 | 369,995 | 415,626 | 336,035 |
| 2030 | 1,537,759 | 351,569 | 398,568 | 449,845 | 337,777 |
| 2040 | 1,482,064 | 357,933 | 384,106 | 423,849 | 316,176 |
| 2050 | 1,460,212 | 406,121 | 384,097 | 385,429 | 284,565 |
| Age dependency ratio (0–19&65+ / 20–64) | | | | | |
| 2020 | 0.69 | 0.69 | 0.66 | 0.72 | 0.72 |
| 2030 | 0.78 | 0.73 | 0.75 | 0.84 | 0.81 |
| 2040 | 0.82 | 0.72 | 0.78 | 0.94 | 0.93 |
| 2050 | 0.92 | 0.82 | 0.87 | 1.06 | 1.06 |

55% when comparing to the current number, while the two districts in East Serbia would practically reach the limit of survival (Fig. 13.4). It is extremely warning to decision-makers. The reason for the large differences in the decreasing trend of live births between the districts is migration, both in the direct (reduction of the fertile contingent) and in the indirect sense (loss of potential descendants of out-migrants).

Both southern regions of Serbia are more vulnerable in terms of the expected decline in working-age population by the mid-century, compared to the north of the country – 57.2% in the South and East Serbia region, and 52.8% in the Šumadija and West Serbia regions versus 36.8% in the Vojvodina region and 14.4% in the Belgrade region. Importance of the transition from net emigration to net immigration, particularly at the sub-national level, can be best perceived if the expected scenario is compared with the scenario that excludes migration (all other assumptions being the same, except net migration that is set to zero throughout the projection) (Fig. 13.2).

The number of those aged 65 and above will reach its maximum by 2030 and then decrease until it returns to near the present size, as the impact of the large baby-boom generations on the size of the older population will gradually disappear after 2030 (Fig. 13.3).

The ratio showing the number of working-age persons per one person over 65 years of age in Serbia is projected to decrease by 41.1%, from the current 2.9 to 1.7 in 2050. If we take a look at the distribution of this ratio across districts, we will notice that the range between the district with a minimum and the district with a maximum ratio increases over the projection horizon. Some highly emigrant districts such as the two in East Serbia would be particularly affected as their working-age contingent is expected to be smaller than the contingent of older ones, which indicates the unsustainability of the current demographic regime in the long term. These results indicate that the existing pronounced regional differentiation in terms of this indicator can only be exacerbated, which would contribute to deepening the large differences in the overall level of development between districts.

### 13.5.2 Optimistic Scenario

Although this scenario predicts a significant increase in the current total fertility rate by 2050 compared to the "expected scenario" shown above, up to the replacement level in most districts of Serbia, a striking decline in total population is inevitable. The long-term implemen-

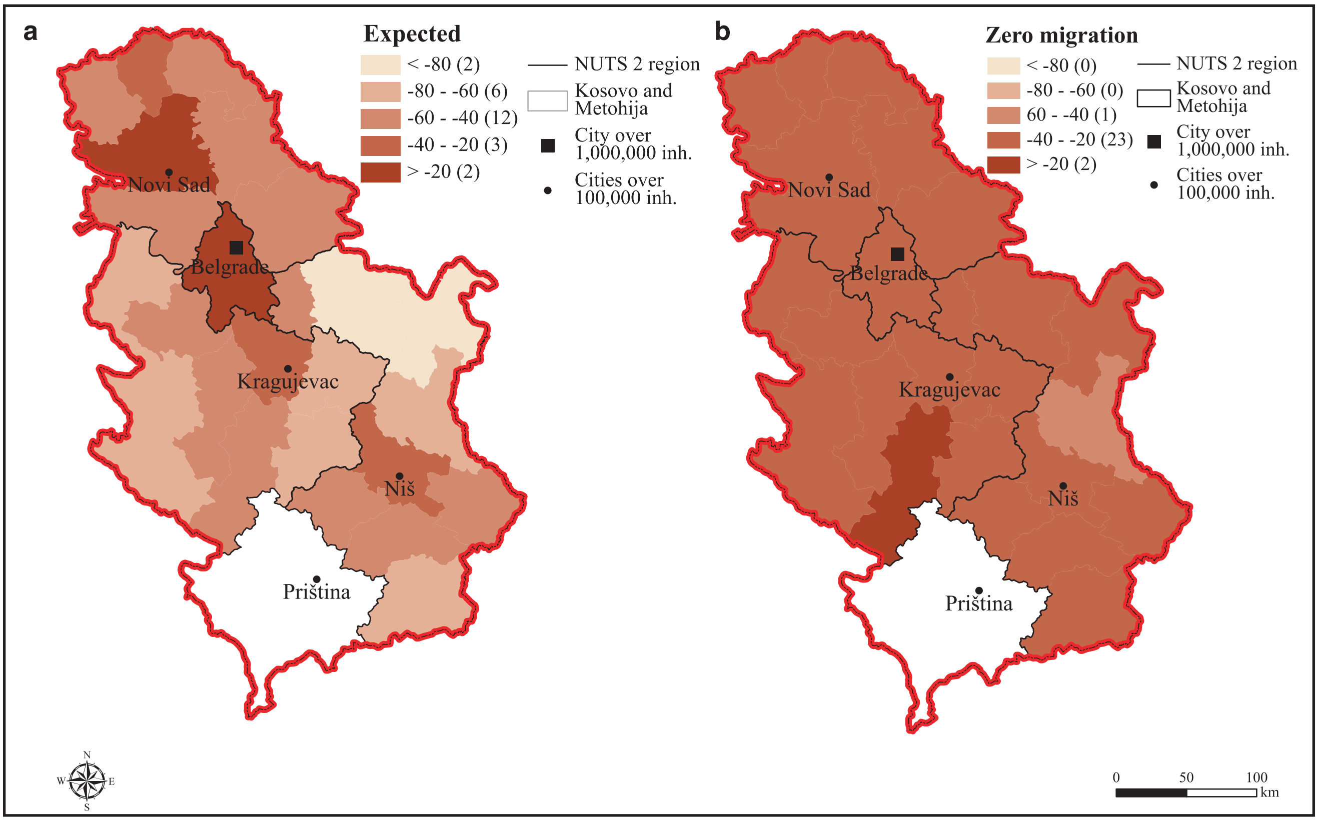


**Fig. 13.2** Percentage change in the working-age (20–64) population 2050/2018 across districts of Serbia – (**a**) (expected scenario) and (**b**) (zero migration scenario)

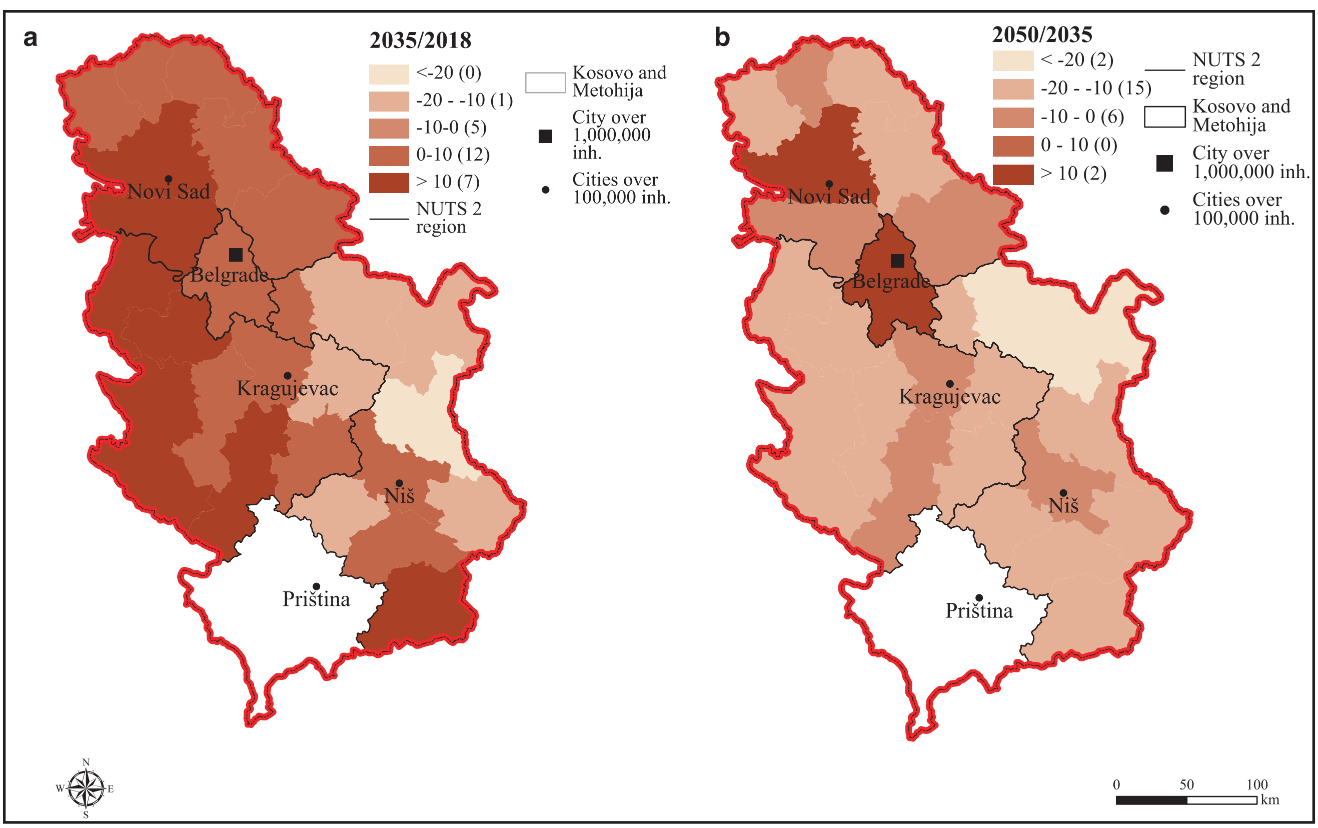


**Fig. 13.3** Percentage change in the number of elderly (65+) across districts of Serbia – (**a**) (2035/2018) and (**b**) (2050/2035)

tation of the Birth Promotion Strategy, which is assumed by the optimistic scenario, would mitigate the reduction of the country's total population predicted by the expected scenario by only 173,000 in 2050. Moreover, the realization of the Strategy could be interpreted as unlikely if evaluated by the UN model – the likelihood of TFR scenario is below 10% by 2030 and 5% by 2050 in all districts, suggesting that the population decline forecasted by the expected scenario will be difficult to slow down.

However, the good news according to the optimistic scenario is that the fall in the number of live births in Serbia by the middle of the century would be far smaller than in the expected scenario, only 14.7% versus 32.4%. If we interpret these results in a probabilistic context, reduction in the number of live births by a third until 2050 would be the most probable future, while achieving the goals of the Birth Promotion Strategy would result in the live births' reduction of only one-seventh, but the chances of such a scenario are less than 10%.

Even such an unlikely scenario would not significantly affect the highly emigrant districts in the east of the country (Fig. 13.4).

This shows that the implementation of measures in the field of fertility policy has almost no effect if there is no implementation of measures in the field of migration. On the other hand, already after the first half of the projection, the number of districts projected to have a minimal decrease in live births (below 15%) would be six in the optimistic scenario versus none in the expected scenario. In the second half of the projection, six districts would even experience an increase in the number of live births according to the optimistic scenario compared to only two according to the expected scenario. It should be stressed that the main effect of the successful implementation of the Strategy is the recovery of the age structure of the population, primarily the fertile contingent in the medium term. The beneficial effects of these policies on the size of the working-age population can only be expected in the long run, that is, beyond the projection horizon considered in this chapter.

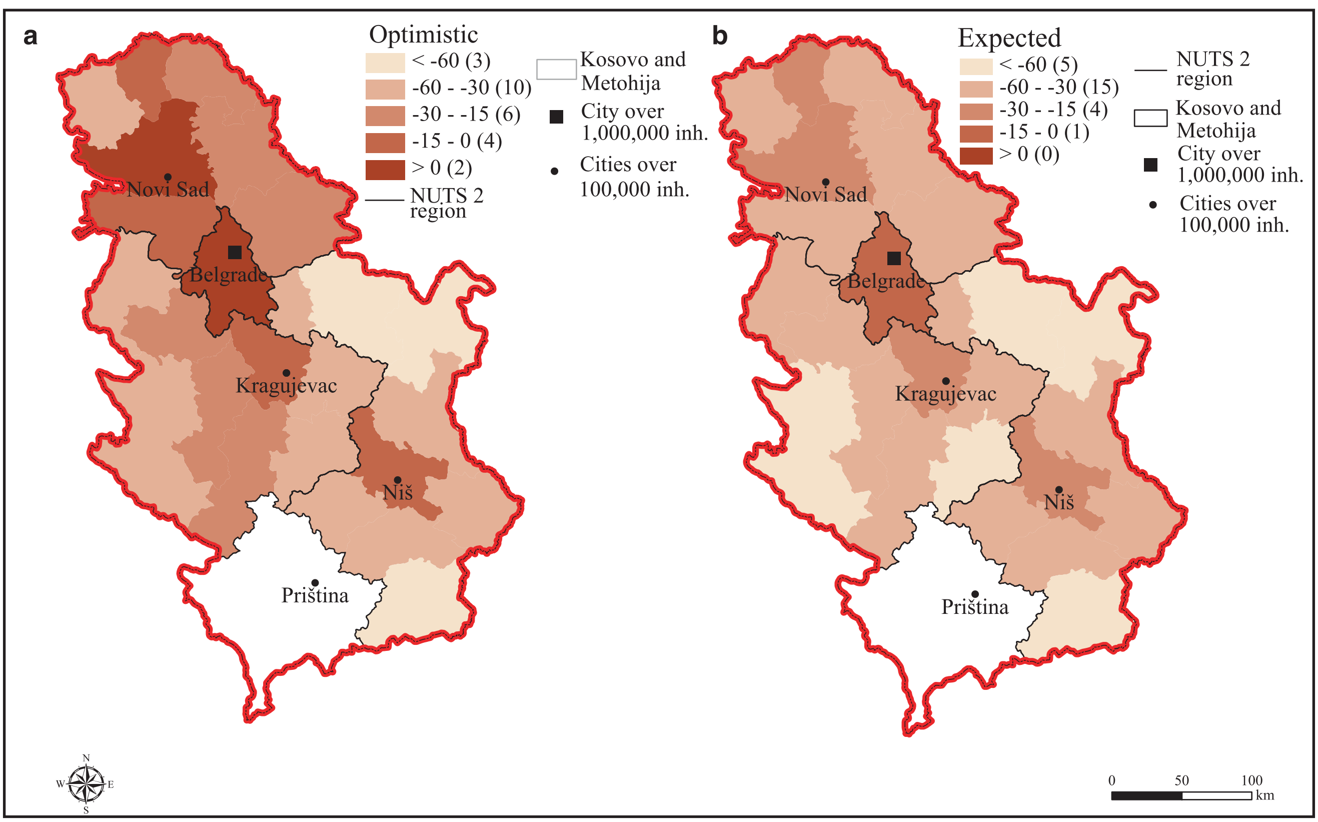


**Fig. 13.4** Percentage change in the number of live births 2050/2018 (%) across districts of Serbia – (**a**) (optimistic scenario) and (**b**) (expected scenario)

## 13.6 Recommendations for Policymakers

The projected decrease in the population of Serbia, probably by almost one third or nearly two million inhabitants by the middle of the century, is the first and most important message to policymakers. Moreover, the two southern regions would lose almost half of their population, while some districts in the east would experience an even more dramatic population loss. Such consequences, in the form of regional and sub-regional depopulation and the consequent lack of labour supply, even in the optimistic scenario of the successfully implemented pronatalist policy, will present a strong constraint to the already weak economy of the country. Also, according to this scenario, a resurgence in the number of live births can be expected only in districts along the Danube-Morava corridor, which connects the most developed and populous urban centres having a positive migration balance. On the other hand, the predominantly less developed border areas facing long-term out-migration will remain endangered.

The measures envisaged by the Birth Promotion Strategy are certainly not inefficient and/or inadequate in terms of potential impact, but they have to be implemented much longer than the projection horizon shown, that is, in a strategic way, because their initial reach is limited to the improvement of the age structure, while the positive impact on the total population can be expected only in the decades after recovering the fertile contingent. This confirms the findings of previous studies (Kupiszewski et al. 2012; Nikitović 2016) that measures in the field of migration policy are urgent, not only because of the improvements in the size and vitality of the working-age contingent, but also because of the total population.

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# Part IV

# Economy

Emilija Manić

# Serbian Economy – History, Transition and Present

# 14

Đorđe Mitrović

**Abstract**

After liberation from the Ottoman rule, Serbia was primarily focused on building its internal political system, while most of its economy relied on primary sector activities such as agriculture and mining. During the First World War, Serbia suffered enormous material damage and human victims which additionally slowed down its economic development. Serbian economy development in the period between the two world wars was the consequence of ad hoc economic policies, with no long-term plans or government guarantees that the economic well-being of wider population would improve. Immediately after the Second World War, Serbia (as part of the former Yugoslavia) became a centrally planned economy with predominantly state-owned property. However, unlike other Central and Eastern European countries, the market economy elements were, more or less successfully, introduced in Serbia within the framework of socialist economy model. After the breakup of Yugoslavia, Serbian economy transition to a complete market economy model was evolving in two phases. The 1990–2000 period was characterized by wars, international isolation of Serbia and high material and human losses. After the democratic changes in the year 2000, Serbia begins its journey of a new economic development in compliance to the standards of the European Union accession.

**Keywords**

Macroeconomy · Economic growth · Economic development · Economic history · Transition

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## 14.1 Economic Development Until the Second World War

After liberation from the Ottoman rule, the Kingdom of Serbia was not focused on economy development and efficient use of its resources, but on building of its internal political system. Immediately after gaining political independence, and also long after that, Serbian statesmen and politicians emphasized political issues, while putting economy issues aside. Most of the population was working in agriculture, thus earning the basic livelihood. More than three quarters of people worked in primary sector, dominated by agriculture and mining. Industrial production was predominantly at the level of cottage industry, and mainly in the form of milling industry, meat production, textile production and sugar industry (Srpski Centralni Komitet and Radovanovic 1918).

After the First World War, Serbia allied with other Yugoslav nations, and on December 1, 1918, the Kingdom of the Serbs, Croats and Slovenes was founded. After the Great War, the economic situation in Serbia was extremely difficult. The damage to its agriculture was enormous, while industrial production nearly ceased entirely. Rail transport was no longer functional, trade was limited to the domestic market and national banking system had collapsed (Vučo 1968). During the Great War, aside from heavy demographic losses, Serbia also lost more than half of its property, which had devastating consequences to the already underdeveloped economy. Recovery and further development of the Serbian economy were significantly slowed down and made more difficult due to the lack of capital, raw materials and qualified workforce.

In the given circumstances, during the first years following the Great War, Serbian economy based its development predominantly on high custom taxes (as protection of domestic economy) and the inflow of foreign capital. In this period, agricultural development played a major role in economic growth and development of Serbia (the demand of food was already at the extremely high level in Europe, and especially



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Western Europe). Serbia used this fact well, because more than four fifths of the population of Northern and Southern Serbia were farmers (Milenković 1998). The trend increasing demand was especially noticeable with respect to flour, grains and meat which led to a dramatic rise in the prices of agricultural products. On the other hand, concessions given to foreign partners significantly contributed to the industrial development.

Foreign capital was present the most in copper mines of the town of Bor (Eastern Serbia), metallurgy industry in Trepča where lead and zinc were produced (Kosovo and Metohija), antimony mines in Zajača (Western Serbia), etc. As the result of mining and black metallurgy development, Serbia was developing rather quickly, but other countries that used Serbia as a base for raw materials grew much more quickly in economic terms (Serbia was mostly importing finished products, while exporting raw-materials and semi-finished goods). The foreign capital was also interested in producing goods for domestic consumption, but only when they could hold a high-profits-yielding monopoly position on the market. Existence of monopolies resulted in high prices of product for end-customers (e.g. sugar, cooking oil and electrical power), which had a further negative impact on the population's living standard. Therefore, the most developed industries in the period after the First World War in Serbia were food industry (e.g. sugar, beer and chocolate), chemical industry, wood-processing and paper industry, textile industry, mineral and metal industry and air-craft production (Ikarus – the first Serbian company for production of air-planes – was founded in 1923 in the town of Novi Sad). The proportion of industry, mining and craftsmanship in gross domestic product (GDP) had risen between the two wars from 21% to 30%, while the proportion of agriculture and forestry had declined from 58% to 51% and proportion of other industries had fallen from 21% to 19% (Čobeljić and Rosić 1989).

The development of Serbian economy in the period between the two world wars was actually the consequence of the economic policy which was created ad hoc, with no long-term plans and no government guarantees that the economic well-being of wider population would improve. Undeveloped, the economy was left to the mercy of fluctuations of the world market, foreign capital interests and other forces whose sole goal was to keep the existing, regressive economy system. The economic crisis, especially in agriculture sector that occurred in Europe a few years before the First World War had shown all the weaknesses of such Serbian economy. On the eve of the Second World War, heavy social stratification was already noticeable – a small number of very rich capitalists and huge masses of poor workers and farmers.

The Second World War brought about new losses, both in human lives and material goods. In addition, the communists at the territory of Yugoslavia materialized the victory over German occupiers by changing the political system: creating of the republic and establishing a single-party system and a centrally controlled planned (command) economy. After the Second World War, being a part of a bigger country, Yugoslavia, Serbian economy grew similarly to other Eastern European countries (Neal 1967; Kovac 1995). Serbian economic development in the next several decades could be analysed through three or four differentiated periods (Crafts and Toniolo 2008):

1. The period until the beginning of 1970s (the communist "Silver Age" growth period), when Serbian economy developed rapidly due to accelerated industrialization of the Socialist Federal Republic of Yugoslavia (SFRY)
2. The period of slowdown, which finished with a collapse at the end of the 1980s
3. The period of transition to market economy (1990–2000) – the period of the initial, unsuccessful transition
4. The accelerated transition to market economy (2000 and on)

## 14.2 "Silver Age" – A Growth of Yugoslav Economy

Immediately after the Second World War, SFRY (Serbia) was a communist country with a centrally planned economy and predominantly state-owned property (just like all other countries in Central and East Europe). The initial enthusiasm of planned economy development had soon fizzled out (there had been a political split between SFRY and USSR in 1948). By the beginning of 1950s, SFR Yugoslavia had already began introducing the first elements of market economy by transforming the state-owned property (establishing of the workers' self-management system in its companies which was supposed to provide a significant role in decision-making to the workers).

In the next decades, there were a string of reforms with the aim to decentralize the country's economy system and to introduce a market mechanism which implied liberalization of prices and foreign trade, introduction of multi-banking system and passing legislation for joint ventures in order to attract foreign investments as much as possible. Although such built market system did have significant limitations (low share of private property, existence of "soft" budgetary limitations in companies' debt settlements and constant presence of the state in companies' business operations), the Yugoslav economy managed to achieve significant growth after the Second World War. Owing to high rates of economic growth, Serbian and Yugoslav economies had, in a relatively short period, achieved the rank of medium developed countries (Serbian GDP in 1947 was only 3% lower than in

1939, and by 1952 the average GDP growth rate was 1.9%) (Devetaković et al. 2019). The economic development of the period was based on building of heavy industry and energetics which required very high infrastructure investments.

In the 1960, the GDP per capita in Yugoslavia had reached world average (Kovač 1995; Neal 1967), although it grew more slowly and annually amounted on average to 0.6% (Kukić 2018). The period between 1952 and 1964 was especially productive, when an extremely quick economic growth was achieved, with the average annual rate in Yugoslavia of 8.3%, and in Serbia 8.7%. This was a period when employment, fixed assets and labour productivity grew rapidly due to implementation of the selected economic development strategy in Serbia and Yugoslavia during the entire post-war period. The economic policy creators believed that the population's living standard could be increased exclusively by the industrial development. The emphasis was on the production of capital and interphase goods. Special attention was dedicated to energetics, mechanical industry and basic capacities for processing of domestic raw materials. Thereby, the necessary amounts for investments were provided in prioritized industries, which were, by means of imported technologies, elevated to a higher technological level in a very short time. During the second half of the 1950, industrial investments were redirected to industrial branches and groups that were to produce final products. All this resulted in high industry growth rates and consequentially also in economic growth.

Economy continued to grow even after this period of initial economic rise and comparisons of domestic products from 1952 to 1989, which was seven times higher, testifies to that (Table 14.1). The largest contribution to the increase of gross domestic product (GDP) could be assigned to the social economic sector (industry and mining the most), whose output in the given period rose 8.5 times, and its share in total GDP was 88% (Miljković 1989).

After the Second World War, industry became the leading economic sector in Serbia (Table 14.2). Constant investment

**Table 14.1** Gross domestic product (GDP) growth indexes of individual industries in the period 1952–1990

| Year | 1952 (%) | 1972 (%) | 1990 (%) |
|---|---|---|---|
| Total economy | 100.00 | 100.00 | 100.00 |
| Manufacturing and mining | 21.70 | 35.10 | 43.60 |
| Agriculture and fishery | 30.80 | 16.80 | 15.10 |
| Forestry | 3.70 | 1.10 | 0.80 |
| Craftsmanship | 5.30 | 3.10 | 3.30 |
| Construction | 12.50 | 10.60 | 6.80 |
| Traffic | 6.80 | 8.60 | 9.60 |
| Trade | 12.20 | 18.80 | 14.50 |
| Hospitality | 4.50 | 3.10 | 2.40 |
| Other industries | 2.50 | 2.80 | 3.80 |

*Source:* Author's calculation based on data from Statistical Office of the Republic of Serbia (1953, 1972, 1991a)

**Table 14.2** Participation of individual economic industries in the total domestic product of SFRJ

| Industries | Growth Index 1989/1952 | Average annual growth rate (%) (1952–1989) |
|---|---|---|
| Total economy | 703 | 5.4% |
| Manufacturing and mining | 1785 | 8.1% |
| Agriculture and fishery | 338 | 3.3% |
| Water resources management | 622 | 5.1% |
| Forestry | 214 | 2.1% |
| Craftsmanship | 285 | 2.9% |
| Construction | 388 | 3.7% |
| Traffic | 985 | 6.4% |
| Trade and hospitality | 641 | 5.1% |
| Other industries | 912 | 6.2% |

*Source:* Author calculation based on data from Statistical Office of the Republic of Serbia (1953, 1991b)

activities had created a strong production potential as the basis for development of the entire Serbian economy. On the other hand, the implemented economic policy of industrialization resulted in a significant decrease in the share of agriculture in the making of GDP (from 39% to 14%) (Miljković 1989).

In the period 1947–1989, industrial production grew more than 20-fold, whereby secondary sector recorded the highest rise in the share of the country's GDP. Chemical industry had the fastest growth, while production of vehicles had the slowest one. The shares of construction industry and craftsmanship in the structure of GDP sources also decreased (Miljković 1989).

At the beginning of the 1980s, tertiary sector achieved an increase in the structure of GDP from around 18% to about 32%, while this share somewhat decreased by the end of the decade (Devetaković et al. 2019). However, the primary sector branches – agriculture and forestry – had the slowest growth. The reasons were of structural and fundamental nature.

The growth of agriculture in the period after the Second World War was evolving in the setting of two forms of property – private and state-owned. A new social sector emerged as the result of agrarian reform that was supposed to harmonize agricultural sector with the socialist way of earning profits. However, in the end, more than four fifths of the total cultivable agricultural land remained privately owned, and this conditioned a specific development of this branch in SFRY (which was completely different when compared to the Central and Eastern European countries). On the one hand, the state-owned agricultural sector was also developing, and it rapidly modernized itself, made more investments and applied new technologies. On the other hand, the private sector also survived, but achieved significantly slower growth because individual owners of agricultural lands did not have enough accumulated capital to be able to keep up with the investments in new technological solutions in agricultural production. Also, the education structure of the employees in social sector was favourable, which reflected on the emergence of differences in labour productivity, at a disadvantage to the private sector.

Although agricultural production had grown trifold in the period 1952–1989 (average annual growth was about 3.1%), it was lagging behind in comparison to other economic branches, above all industry, became noticeable in the 1970s (Kukić 2018). The main reason for this was the disparity in agricultural products' prices when compared to industrial products' prices – always to the disadvantage of the former ones. This was especially evident in the cases and industrial branches that were using agricultural products as their raw materials. Agricultural products (inputs) were paid to the farmers at very low prices, while finished industrial goods on the market were much more expensive. This especially affected the agricultural private sector. Due to this, the supply of agricultural products was decreasing over time in comparison to the demand, which created additional pressure for their import. This, in turn, increased the foreign trade deficit and impeded the foreign trade balance of the country, which was already compromised by importing of raw materials, semi-finished goods and investment goods for all other economy sectors (in the 1980s, this had significantly worsened the macroeconomic position of the country). In addition to the said price disparities, other factors had also influenced slower agricultural development. One of the more important ones was the fact that agrarian policy was non-existent in the country's economic policy framework. In other words, agriculture development policy in SFRY was either non-existent or, if it had indeed been created in some previous periods, it was not consistently executed. Also, the fragmented privately owned land properties and weak application of agrarian-technical measures disabled the agricultural producers to achieve economy of scale and decrease costs of production per unit of yield. Thereby, the private agricultural sector was becoming less and less competitive, and this further caused a slower growth in agricultural production, so the very branch became unattractive for foreign investments.

The stated changes in the Serbian economy structure had numerous economic, but also wider social consequences. They had incited significant changes in population's relocations and demographic structures. An increasing number of people migrated from rural to urban areas, and this changed the composition of active population as well as the arrangement of employed population by economy sectors (see the Chap. 12).

In the period between 1957 and 1990, out of all SFRY republics, Serbia had the largest individual share in total Yugoslavian GDP (Fig. 14.1), which was mostly constant and amounted around 38% (Miljković 1989). Unlike Serbia, the share of other republics in total Yugoslavian GDP was volatile. Croatia, as the second largest economy in ex-Yugoslavia, decreased its share in total Yugoslavian GDP from 28% to 25%, while the share of Slovenia was 17%, Bosnia and Herzegovina around 13%, Macedonia 6% and Montenegro 2% (Gregory 1973).

However, although it contributed the most to the Yugoslav GDP, Serbia was not economically speaking the most developed Yugoslav republic. Based on per capita GDP movements, it is noticeable that, in the stated period, Slovenia was, in economic terms, the leading republic of the ex-Yugoslavia (almost a 100% above Yugoslav average). At the given period, Serbian per capita GDP was 8% lower than the Yugoslav average, while Croatian was 20% above the average (Miljković 1989). Such huge differences between the regions (republics) in one country occurred under the influence of different factors: impact of informal institutions (in Slovenia, it was most compatible with capitalist system) and implementation of all reforms towards some market economy model, which was sincere in Slovenia, since Slovenians paid attention to small companies and also, when it was allowed, to private business. This was simply not

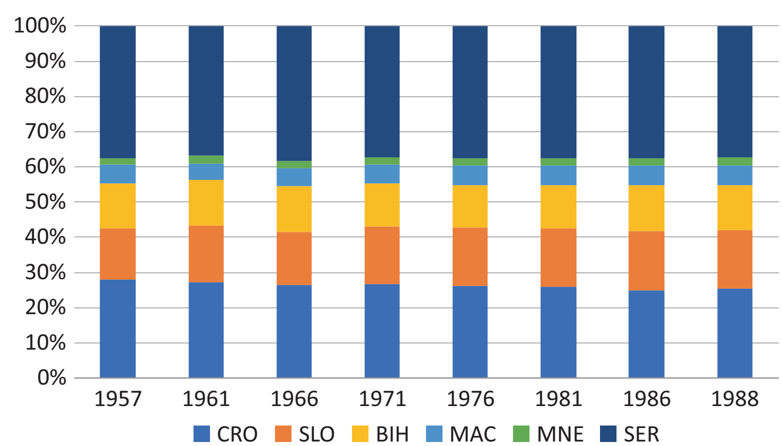


**Fig. 14.1** Shares of individual republics in total Yugoslav GDP (1957–1988). (*Source:* Author's calculation based on data from Statistical Office of the Republic of Serbia 1953, 1991b)

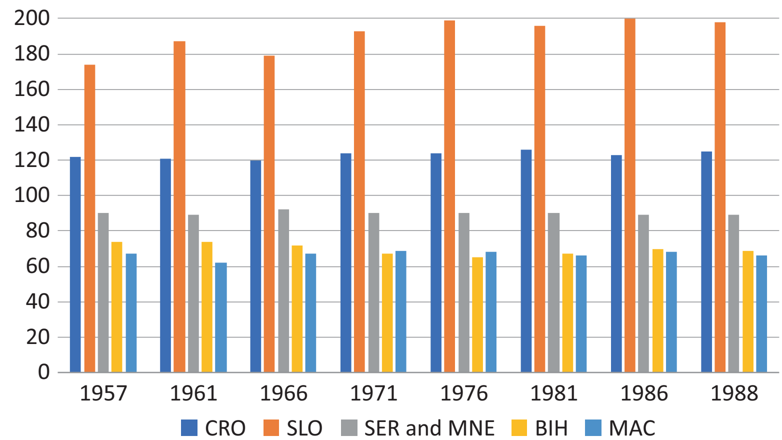


**Fig. 14.2** Levels of per capita GDP achieved in individual republic in comparison to Yugoslav average (=100) (1957–1988). (*Source:* Author's calculation based on data from Statistical Office of the Republic of Serbia 1953, 1991b)

popular in other republics, so it is no wonder that the degree of Slovenia's economic development was constantly improving, while in other cases, such as Bosnia and Herzegovina and Macedonia, it was decreasing (Fig. 14.2).

Therefore, Serbia strayed further away from the most developed parts of Yugoslavia, primarily from Slovenia. On the other hand, economic differences in Serbia itself were decreasing, except in Kosovo and Metohija. Due to extremely rapid growth of population in the said autonomous province, the effect of above-average increase in GDP was neutralized, which caused this part of Serbia to lag behind both Yugoslav and Serbian averages (Kosovo and Metohija's GDP was 24% of Yugoslav average) (Miljković 1989). Central Serbia had per capita GDP equal to Yugoslav average, while the same indicator in autonomous province Vojvodina was 18% higher than that average (Miljković 1989).

During the 1960s, the economic growth of Yugoslavia was already slowing down significantly (in the period 1965–1979, the average annual economic growth rate in Yugoslavia was 5.6%, while in Serbia it was 5.6%). Although production was still rising, the quality of economic growth considerably deteriorated. The production efficacy was lowering, the rate of employment increase was slowing down due to high inflow of workforce, industrial production was not in concord with the demand, while foreign trade deficit was increasing, mostly due to increasing import of reproduction materials (oil, above all). The total foreign trade deficit of SFRY between 1970 and 1980 increased from slightly less than 10% to about 50% of GDP (Kovačević 2019).

In response to the problems it was facing in the 1970s, Yugoslav and even Serbian economy based its growth on significant foreign debts. This resulted in constant growth of the degree of the country's indebtedness abroad (Fig. 14.3).

One of the causes of the economic crisis that hit Yugoslavia at the end of 1980s was precisely the inability to take new loans and settle the debts for loans taken in the previous period. At the beginning of 1980s, Yugoslavia was one of the most indebted countries, and it remained such until its

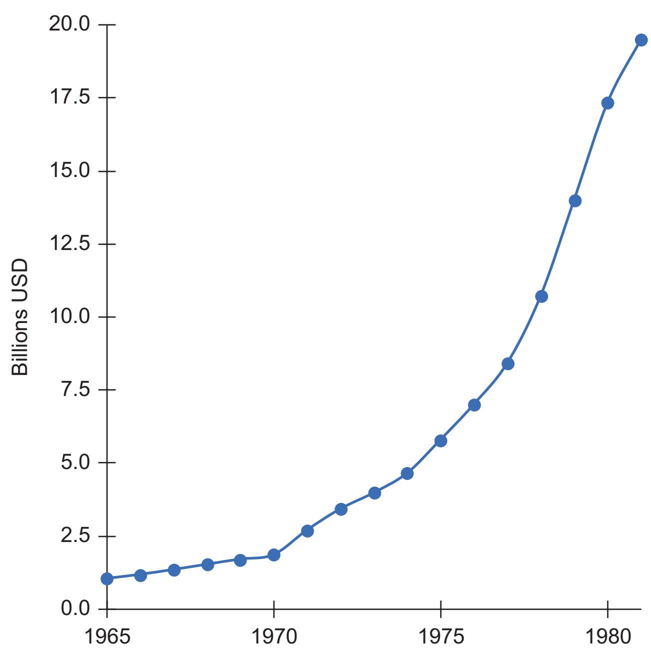


**Fig. 14.3** Fluctuations of the net foreign debt of SFRY (1965–1980) (in billions USD). (*Source:* Author's calculation based on data from Čolanović 1985)

economic and political collapse. In addition, the crises that shook the entire world in the 1970s ("oil shocks" in 1973/74 and 1979/80) had the impact on Serbian economy as well. In truth, the first oil crisis did not significantly disturb Yugoslav economy, because Yugoslavia was getting cheap oil from Libya. However, problems arose during the second oil crisis, when negative effects of the rapid economic growth – founded on rapid de-agrarization of the country and extensive investments and employment growth, accompanied by a slow work productivity growth and absence of efficient use of resources and new technologies – became visible. All of this led to a decrease of Serbian economy's competitiveness and payments balance deficit, which was covered by an ever-larger indebtedness abroad. New investments were covered by loans and reissuing of money.

In the meantime, the constitutional reforms in 1974 had brought much higher economic and political independence to the Yugoslav republics and autonomous provinces (see the Chap. 4). These provisions had, among other things, enabled individual republics and provinces within the federation to make independent loans, which quickened their development. However, the republics did not individually take on repayments of these loans. They acted as free riders, counting on the fact that someone else (that is, the federal government) will repay the debt in the name of the federation. Thus, separate monetary systems were created within the Yugoslav federation, which facilitated the decomposition of the common state at the beginning of the 1990s.

## 14.3 Slowdown Period – Serbian Economy in the Last Yugoslav Decade

For the last two decades of the twentieth century in SFRY, Serbia had the largest territory within it (34.5%), the largest number of inhabitants (41.5%), the largest share in Yugoslav gross domestic product, the largest share in total Yugoslav investments (38%) and in the total number of employees (38%) (Fig. 14.4) (Uvalic 2010). Also, one half of agricultural production and one third of industrial production of SFRY was happening in Serbia. Serbia was much less export-oriented than Slovenia or Croatia, but it still had the largest share in Yugoslav export and import (30% and 33%, respectively). Serbia cooperated the most with OECD countries, where it placed 57% of its export and procured 60% of its import (Kovačević 2019). On the other hand, although Serbia had the largest number of signed agreements on international cooperation in the 1980s, the total amount of foreign investments in Serbia amounted to only one third of the investments in Slovenia, that is, it was only one fifth of the total foreign investments in entire Yugoslavia.

During 1980s, Yugoslavia and Serbia experienced a drastic slowdown of economic growth. The average annual growth rate of the Yugoslav GDP was only 0.7%, whereby the growth in Serbia was 0.9% (Uvalic 2010). Since the population movement was happening at the similar rate (in Serbia, somewhat slower than the domestic product rate), per capita domestic product stayed practically unchanged.

The growth of employment and production capacities was significantly slower than in the previous periods. Work productivity and fixed assets' effectiveness, as well as investments decreased, while inflation was becoming more prominent. Unemployment was getting an ever-larger proportions. Although trade balance deficit was decreasing, this was due more to the limitation set on import than to the growth of export. Namely, in 1979, in the eve of crisis, the federal government decided to devalue dinar by about 30% in order to incite export, while it set higher prices on import as a response to the catastrophic trade deficit and enormous debts. This had a negative effect on production and, through it, also on employment, spending, investments and other macroeconomic parameters. By the end of the 1980s, per capita GDP amounted to $2520 at the official exchange rate for the entire SFRY, while by the purchasing power parity of dinar, GDP amounted to almost $5550 (Uvalic 2010).

Economically weakened in such a way, Yugoslavia faced another crisis at the end of the 1980s. In a certain way, this crisis represented the final phase of a long-term process of the production growth slowdown, but its causes were rooted in the period when Yugoslavia and Serbia had high rates of economic growth that were not based on sustainable economic foundations. Facing this new challenge, the economic policy creators in SFRY decided to dramatically change economic and social systems: to turn to market affirmation and to abandon the socialist way of doing

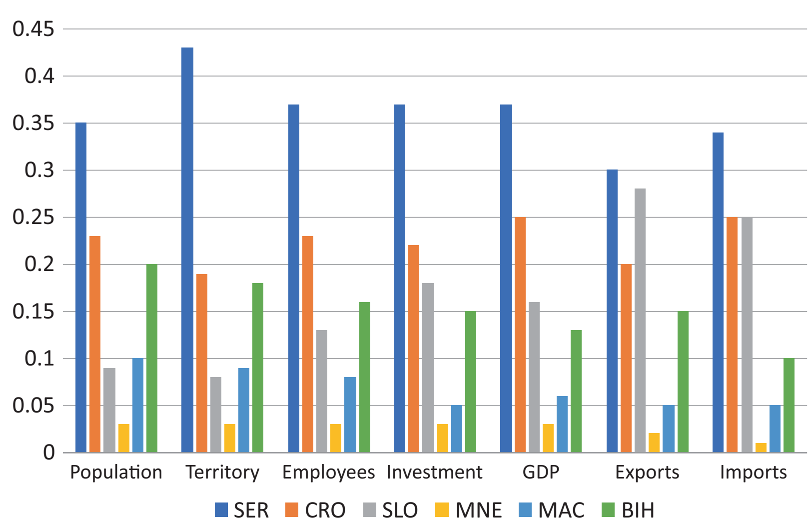


**Fig. 14.4** Main economic indicators of the republics in SFRY (1991) (share in total). (*Source:* Author's calculation based on data from Statistical Office of the Republic of Serbia 1991b)

business based on state-owned property. This was practically the start of transition of the Serbian, that is, Yugoslav economy. However, in the absence of the expected results of such reforms, tensions occurred in the political relations between the republics of the federative state at the beginning of 1990s, which eventually led to their final disagreement, that is, to the breakup of Yugoslavia.

## 14.4 Economic Transition – Phase #1 (1991–2000)

In 1989 (globally observed), out of all other socialist countries, Serbia (within the frames of SFRY) had the most favourable conditions to shift to the market economy model; however, due to political reasons, from being in the position of the leading country, Serbia turned into a country which lags behind the most in the transition.

Transition of Serbia to a market economy model started while Serbia was still within the ex-SFRY, at the time when the process of transition was just starting in Central and Eastern Europe (CEE), in 1989. The ex-SFRY had a vast number of competitive advantages compared to the other countries in the region: specific geo-political position in the world and a very favourable position in international economic relations, the largest trade with European economic community compared to other CEE countries and a relative openness to the abroad also attracted significant amounts of foreign capital (as early as 1954, the first business agreement was concluded between Serbian car manufacturer *Zastava* and Italian car manufacturer *FIAT*). Reforms from 1988 to 1990 were especially important for Serbia's economic position, and they represented a package of measures for transition to market economy. Although implemented just before the break-up of the state, the reforms had positive and long-term effects on all the republics of the ex-SFRY.

After the dissolution of the former Yugoslavia (see Chap. 3), the Yugoslav market quickly disintegrated and almost all forms economic cooperation between the republics ceased to exist. In such circumstances, the federation's gross domestic product decreased significantly (Yugoslav GDP was 7.6% and Serbian GDP was 8.3%) (Litwack and Price 2002). Serbian economy was facing numerous problems: a strong inflationary pressure occurred which was caused by an enormous inflow of dinars into Serbia from other republics (the space where dinar was official currency was shrinking); problems occurred in collection of the unpaid debts due to cash flow interruptions; public revenues decreased due to disintegration of the common customs union; loss of the goods' vendors and cheap production factors from other republics; loss of large protected markets in other parts of the country; loss of traditional connections between business partners; trade limitations imposed by the newly formed states; decrease of the foreign investors' interests due to decreasing of the market size and extremely high political risks, etc. (Uvalic 2001). The wars that were ongoing in the immediate proximity of Serbia or at its territory (Kosovo and Metohija) additionally burdened its economy, in addition to the loss of human lives and material devastation – by 1996, approximately 560,000 refugees poured into Serbia, according to UNHCR data (Ambroso 2006). The economic situation was additionally worsened by the United Nations (UN) embargo introduced at the end of 1991, due to alleged involvement of Serbia in the civil war in Croatia. Sanctions were intensified in May of 1992, after the war had spread to Bosnia and Herzegovina. Federal Republic (FR) of Yugoslavia (with which Serbia was a continuity state as of 1992), was completely excluded from all international trade and financial flows, whereby it was prevented to import and export goods and services, to engage in payment operations abroad and to repay of loans.

After the Dayton Peace Agreement in 1995, which ended the civil war in Bosnia and Herzegovina, embargo on the FR Yugoslavia (consisted of Serbia and Montenegro 1992–2003) was partially lifted, but the so-called "outer wall" of the sanctions remained in force preventing FR Yugoslavia from becoming a member of international organizations. Also, Serbia was prevented to participate in any form of the help that the European Union provided to the countries in transition. Unfortunately, not only that the "outer wall" of sanctions was not lifted, but a new "package" of sanctions followed in May of 1998 (using the situation at the southern Serbian province, Kosovo and Metohija, as the pretext). This quite adverse socioeconomic situation worsened when the NATO conducted air strikes against the FR Yugoslavia in March 1999 (See Chap. 4).

All the stated external factors in the last decade of the twentieth century had either a direct or an indirect extremely negative impact on macroeconomic stabilization, economic recovery and systems' reforms in the country, that is, on all the processes that make up the foundation of the transition towards market economy. In the period 1990–2000, the macroeconomic performance of Serbian economy varied significantly, although the long-term trend implied a general fall in most macroeconomic indicators, especially after the war in Kosovo and Metohija. In the period 1990–1999, GDP in Serbia and Montenegro had dropped more than 50%, while at the end of 1993, domestic product dropped to the level of 43% of the GDP in 1989 (Economic Commission for Europe 2004). The country's defence at the time of war and providing assistance to the refugees was financed by means of expansive monetary and fiscal policy. Such policy created one of the biggest hyperinflations ever recorded in the economic history of the world (in 1993, the inflation reached the level of over 1800%) (Đukić 2018).

Due to macroeconomic instability and hyperinflation, domestic currency was practically abandoned, and the practice of expressing the prices mostly in Deutschmarks was introduced, while at the same time "grey economy" appeared in Serbian economy. The government had an ever-larger role in directing economic spheres in the state-owned sector, but on the other hand, debts of companies and banks were increasing, as well as the country's budgetary expenses. The largest part of the legal economic sector depended on direct or indirect government subsidiaries, while the unofficial economic sector developed elaborate mechanisms to "by-pass" laws and regulations. Business banks and energy sector were used to approve indirect subsidies, which caused major problems within the said sectors at the end of the 1990s. The living standard of the people was constantly decreasing, while their foreign currency deposits were "frozen" in the banks (OECD 2002; Uvalic 2001; Habib 2001).

Amidst all these unfavourable processes in Serbian economy, the state managed to establish a temporary economic stability in 1994 by implementing a monetary reconstruction program, prepared by a team of economists lead by Mr. Dragoslav Avramović, who was the governor of the National Bank of Yugoslavia at the time. By means of the said applied economic measures, founded on the decision to tie Serbian dinar to Deutschmark, Serbia managed to stop hyperinflation and to recover production. However, such positive effects were soon reduced due to the problems caused by the absence of system changes, which imposed limitations on further maintenance of stability. The expansive monetary policy soon brought about new inflationary pressures, while financial repression of the foreign exchange market was constantly increasing. In the next few years, inflation remained very high (in 1995 and 1996, the retail prices inflation was 40% and 60%, respectively) (Đukić 2018). The officially recorded unemployment grew from 23% (in the period 1992–1994) to 27.1% in 1998 (Đukić 2018). Somewhat more favourable trends in monetary stabilization and the undertaken economic measures reflected on the economic growth rates which were higher in Serbia in the period 1994–1997 than they were in other countries of the Southeast Europe (Litwack and Price 2002), primarily because of the low starting point. In the observed period, the foreign capital inflow was extremely small, mostly due to the country's unregulated status in international financial institutions and high political risk. The only considerably large privatization concerned the company "Telekom Srbije" in 1997 (49% of the company was sold to Greek and Italian partners), and the money earned in this transaction enabled the country to stop inflationary financing of its economy for a short period of time (Uvalic 2001). Even though embargo had been slightly loosened and there had been certain positive movement in foreign trade exchange, a great deficit was still present in current balance (in 1999, the share of current balance in GDP was 9.4%). Old foreign exchange reserves were only $300 million, while the total foreign trade debt in 1999 was $14.1 billion (Litwack and Price 2002). Therefore, at the end of 1998, the inflation started to rise once again.

The NATO Pact military operation in 1999 had the biggest negative effect on Serbian economy in this phase of transition. At the beginning of 1999, and especially in March when the NATO bombing began, the considerably weakened Serbian economy was already in recession (Habib 2001). According to the data of Federal Statistical Office of Yugoslavia, in 1999, GDP dropped by 19.3%, per capita GDP dropped by 20% and industrial production decreased by 23.1%. The biggest production fall was observed in the capital goods production, as well as in iron, steel and chemical industries, while consumer goods production was decreased only by several percent (Devetaković et al. 2019).

After the NATO bombing, SR Yugoslavia became one of the poorest countries in Europe. Per capita GDP was only $1688 (1999) – only slightly higher than in Albania, whose per capita GDP for the same year amounted to $1181, and a lot lower than in other countries of the Southeast Europe (Habib 2001). In December of 1999, the average net salary in Serbia was 95 Deutschemarks, while just a year before that it amounted to 167 Deutschemarks (G17 2000). This salary was not sufficient to cover even a half of the consumer basket. Payments of salaries and pensions were delayed for several months and they were often paid *in kind*, and for a while they were paid as coupons for electric power purchase. According to the UN estimates, in 2000, about two thirds of the SRY population lived below the poverty line which is defined as a per capita income lower than $2.4 a day (for Montenegro, the poverty line is income below $3.5 a day) (G17 2000).

**Table 14.3** Estimated damage to physical infrastructure as the consequence of NATO bombing 1999

| Sector | Direct damage ($ millions) |
|---|---|
| **Infrastructure** | **753.8** |
| Transport | 334.4 |
| Electric power facilities | 258.0 |
| Other infrastructure | 161.4 |
| **Economic infrastructure** | **2712.3** |
| Industrial facilities | 2609.9 |
| Agricultural infrastructure | 27.3 |
| Tourism and hospitality | 42.8 |
| Other | 32.3 |
| **Non-economic civilian objects** | **372.8** |
| Cultural and historical monuments | 100.0 |
| Public sector | 71.8 |
| Private sector (households) | 201.0 |
| **TOTAL** | **3838.9** |

*Source:* Economic Commission for Europe (2004)

The damage of NATO bombing to Serbian economy was extremely high (Table 14.3). According to some estimates, the total cost amounted to $30 billion: direct cost included $4 billion of physical damage (70% of which was the damage of destroyed industrial capacities), $2.3 billion was the cost of human capital lost and $23 billion was the cost of the loss of potential GDP due to physical damage to capacities, which became evident 10 years after the war (G17 2000).

During the last decade of the twentieth century, having in mind all the circumstances under which the Serbian economy tried to transform itself, an entire set of systems that a country is based on was destroyed. The rule of law was practically dysfunctional because most of the laws were applied arbitrarily, that is, different criteria were applied to different segments of economy.

This had highly negative effects and long-term consequences, since this was precisely the way in which the power became concentrated in the hands of few state-owned companies (or private companies that were under protection of the state). These companies were operating under "soft" budgetary limitations in the form of direct and indirect privileges, such as bank loans with low interest rates, import licenses, purchase of foreign currencies at official exchange rate and tax rate decreases or complete tax exemptions. Close relationships were formed among political and economy elite that allowed overlapping of economic and political authorities. Before political change in 2000, the general managers of 30 biggest companies were at the same time the key politicians, Members of Parliament, ministers in federal and republic governments and close political associates of the ruling power of the time. Such economic and social climate gave birth to corruption. The long period (almost 10 years) under all sorts of sanctions gave the government a pretext to selectively apply laws and create privileged groups of population, whose activities could more often than not be filed under the domain of organized crime and war profiteering. The representatives of the state and the members of criminal organizations frequently cooperated very closely. In 1999, SR Yugoslavia was among ten most corrupt countries in the world and the most corrupt country in the Southeast Europe, and the share of "grey economy" in total GDP was somewhere between 35% and 50% (G17 2000). The accountability for the loss of the people's foreign currency savings (which amounted somewhere between 6.5 and 7 billion dollars) fell on the ruling structures, who had during the 1990s already elaborated the mechanisms of pouring these funds from the hands of the people to the hands of the ruling political elite: the frozen foreign currency savings in the banks of ex-Yugoslavia, issuing of the state bonds for reconstruction of Serbia whose value was completely decreased by inflation, pyramidal schemes offered by two large private or para-national banks founded in cooperation with the authorities, hyperinflation of 1992/93 that forced citizens to sell their entire foreign currency savings so they could survive. It is thought that the difficult economic situation, which reflected onto the social sphere, was one of the key reasons for the collapse of the socialist government at the parliamentary elections in the year 2000. This extreme social stratification manifested in the system that functioned exclusively in the interest of the ruling political and economic elite. This stratification reflected in a massive impoverishment of a large portion of population and fast enrichment of a small number of individuals who had the control over the economy of the entire country. Such extreme social polarization left long-term negative consequences on Serbian economy, and it turned out that eliminating or at least mitigating they represented the most difficult task of all reform programmes that were later planned, created and implemented.

## 14.5 Serbian Economy at the Beginning of the Twenty-First Century – Is Transition Over?

In the first years after the political changes in 2000, the transformation of Serbian economy towards market model continued. However, precisely due to the change of political environment, this was qualitatively a new phase of the transition process in Serbia. Political factors were changed, but social and economic circumstances in which transition was to continue still remained unfavourable, and overcoming them became one of the most important goals of the new creators of economic policies and economic reforms in Serbia.

At the beginning of the twenty-first century, Serbia significantly lagged behind the ex-Yugoslav republics of Slovenia and Croatia (in the year 2000, Slovenia's GDP was 293% above the average GDP for other ex-Yugoslav countries, while Croatian GDP was 81% above the value of the same indicator) (Stiperski and Lončar 2008). Still, unlike their predecessors, the new political structure in Serbia showed this time a genuine willingness and desire to stabilize the economy and transform it by an adequate macroeconomic policy and market-oriented structural reforms. In addition, in this period, the economic policy creators also had a significant help from the international community. It is important to note that, in the first years after the political changes, the relationship between the republics-members of SR Yugoslavia also changed, so in 2003 the State Union of Serbia and Montenegro was formed and it existed until 2006, when both member states proclaimed their independence. Thus, after 88 years, as the legal successor of the Yugoslav state, Serbia indirectly renewed its independence.

At the beginning of 2001, Serbia finally started the process of transitions, just like majority of other, much more developed countries in Central and Eastern Europe. However, even with a vast knowledge regarding the process of transition to market system of profit earning that was acquired based on the 10-year experience of the countries in transition, many measures were conducted in Serbia based on a trial-and-error principle which, although applicable at a macroeconomic level, left huge negative consequences. On the other hand, a different approach to transition could not have been expected, having in mind the specific contemporary economic history of Serbia, characterized by long periods of wars in the immediate surroundings and international isolation after the break-up of the ex-Yugoslavia. All of this created the desire, and also the need to begin the key economic reforms as soon as possible and as enthusiastic as possible, sometimes even without previously well-conceived concept of their implementation. Although some huge mistakes did happen, which were made in different segments of reforms (privatization, fiscal system, etc.), the new stage of transition in Serbia represented an important step towards introducing a market-based system of profit earning and a break-up with the quasi-reforms being implemented up until that point.

The new transition strategy towards building of a market economy in Serbia was founded on four elements: establishing macroeconomic stability and external balance, inciting economic growth and creating the basis for sustainable level of supply, improvement of the population's standard of living and building of market institutions and improvement of the systems for managing the state and economy. Although "transitional recessions" (which could have been rightfully expected based on the experience of other ex-socialist countries) was successfully avoided in this phase of transition, the result was disappointing because the accelerated economic growth failed to take place. In the period from 2000 to 2007, an average annual GDP growth of 5.6% was achieved, which additionally decreased by 2009 due to the world economic crisis, and even a negative growth was observed in some years (Fig. 14.5).

During the entire period from 2001 to 2017, Serbian economy was constantly facing the challenges of inflationary shocks. Because of that the state more often than not turned to monetary and fiscal policy measures, which kept inflation under control (inflation was decreased from 40.7% in 2001 to 10.1% in 2007, and dropped to just 3% in 2017 as the result of restrictive monetary and fiscal policy).

For example, the per capita GDP increased significantly, and in 2017 it reached almost $5900 (Croatia had per capita GDP of $13,294 and Slovenia $23,597) (Devetaković et al.

**Table 14.4** Real GDP Growth in Serbia, Central and East European countries (2000–2017) (in %)

| | Average 2000–2009 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Albania | 5.9 | 1.0 | 1.8 | 2.2 | 3.4 | 3.8 |
| B. and H. | 4.2 | 2.4 | 1.1 | 3.1 | 3.2 | 3.0 |
| Bulgaria | 5.0 | 0.9 | 1.3 | 3.6 | 3.9 | 3.6 |
| Croatia | 3.0 | −0.5 | −0.1 | 2.4 | 3.5 | 2.8 |
| Hungary | 2.4 | 2.1 | 4.2 | 3.4 | 2.2 | 4.0 |
| Macedonia | 3.1 | 2.9 | 3.6 | 3.9 | 2.9 | 0.0 |
| Montenegro | … | 3.5 | 1.8 | 3.4 | 2.9 | 4.3 |
| Poland | 3.9 | 1.4 | 3.3 | 3.8 | 3.0 | 4.6 |
| Romania | 4.8 | 3.5 | 3.4 | 3.9 | 4.8 | 6.9 |
| Serbia | 5.1 | 2.6 | −1.8 | 0.8 | 2.8 | 1.9 |
| Turkey | 3.8 | 8.5 | 5.2 | 6.1 | 3.2 | 7.4 |
| Slovak Rep. | 4.5 | 1.5 | 2.8 | 3.9 | 3.3 | 3.4 |
| Slovenia | 2.9 | 1.1 | 3.0 | 2.3 | 3.1 | 5.0 |
| Czech Rep. | 3.4 | 0.5 | 2.7 | 5.3 | 2.5 | 4.3 |

*Source:* International Monetary Fund (2018)

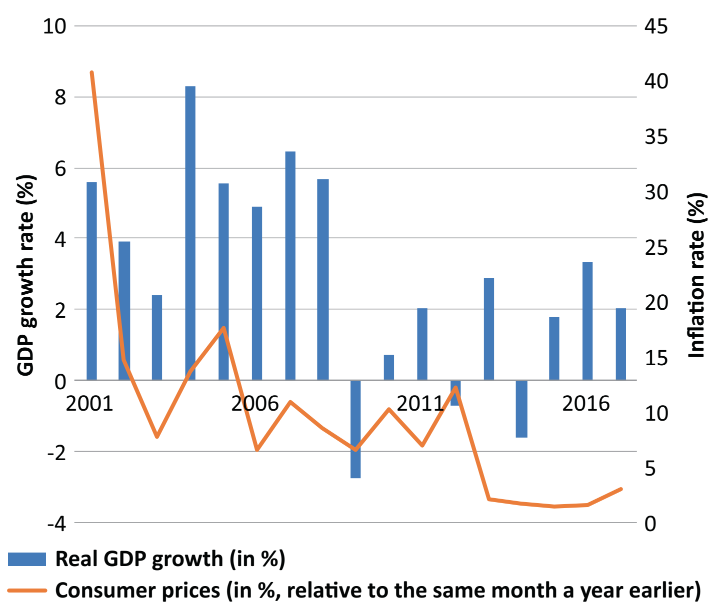


**Fig. 14.5** Real GDP growth and inflation in Serbia, 2001–2017. (*Source of data:* Author's calculation based on data from Statistical Office of the Republic of Serbia 2019)

2019) (Table 14.4). Although the average real GDP growth rate in Serbia was among three best results in the region during the period 2000–2009, it was declining in the following years falling in 2017 below 2% (International Monetary Fund 2018).

The transition in Serbia also implied privatization of the entire state-owned property, whereby a rise in productivity and efficacy of companies was expected. At the same time, some state-ownership sectors required restructuring (e.g. public enterprises). The selected privatization model was characterized by a targeted quick privatization along with the use of "shock therapy", and its main characteristic was the emphasis on selling of the enterprises, that is, selling of capital to external foreign and domestic investors. Privatization income was directed to the state budget, but instead of being used to finance investment projects that would boost employment, these funds were mostly used for current spending and covering of budgetary deficits. In the period 2002–2016, 2419 public enterprises were sold (with the earned income of 2.7 billion EUR and investments worth 1.046 billion EUR) (Grgurević 2018), whereby the largest number of enterprises was sold by 2008. However, this privatization model proved to be catastrophic for Serbian economy because it was often related with selling the companies to individuals who were incapable to continue and improve their business operations or to individuals close to politicians in key state positions who were inclined to rent seeking. The enterprises were often sold to individuals who did not have any references in the given fields where the enterprises operated and who often used the purchased property as a guarantee for obtaining mortgage loans from banks. These loans were never to be repaid, which caused liquidation of these enterprises and massive discharges from employment. In addition, the buyers of these enterprises often did not fulfil their obligations towards the state, so a large number of these sales contracts were cancelled (Grgurević 2018).

Besides the real sector, the privatization process also spread into the banking sector, and in addition to all this, even a large housing fund was privatized. At the beginning of 2002, four large state-owned banks in Serbia were privatized which, despite their strong tradition and experience in the banking field at domestic and foreign markets, had huge unpaid debts of their clients and the state itself was one of the biggest such clients. After their liquidation, Serbian banking market started being dominated by foreign banks: they increased their share in total assets from 27% in 2002 to 75.5% in 2007. At the same time, the state-owned banks' share was significantly decreased (from 35.6% to 15.8%), as well as the share of domestic private banks (from 37.4% to 8.7%) (Vuković 2009).

In the period 2001–2005, the total amount of direct foreign investments in Serbia was 3.1 billion EUR. However, their structure was unfavourable: the green field investments share was extremely small and it mostly included trade and real-estate. By privatization of highly profitable enterprises (such as cement plants, tobacco industry factories, food-industry factories, metal industry plants, etc.), as well as by privatization of banks, the main part of foreign direct investments (FDIs) was created in the said period. This trend continued until the beginning of the world financial crisis, whereby the total amount of FDIs in the period 2006–2008 reached the level of almost 6.3 billion EUR (Ratkaj et al. 2020). The slowdown in economic and investment activities worldwide as the result of global economic crisis also affected the Serbian economy. In 2008, the total FDIs in Serbia were still above 2 billion EUR, primarily due to privatization of the car factory *Zastava* by the Italian company *FIAT* (Fiat Chrysler Automobiles Serbia) and also due to the strategic agreement in the energy sector between the Republic of Serbia and the Russian Federation (Russian "Gazprom" took over the Petroleum Industry of Serbia for 400 million EUR) (Ratkaj et al. 2020). Since 2009, the FDIs in Serbia were decreasing, and after the world financial crisis they dropped by about 50% (Fig. 14.6).

During the period 2010–2018, the FDIs in Serbia were highly volatile in character. The sudden leap in 2011 was the consequence of an increased inflow from the purchase of the largest Serbian retail trade chain Delta-Maxi by Belgian supermarket chain Delhaize. An extremely low inflow of foreign direct investments compared to the previous 10 years occurred in 2012, and this could be explained by political instability in the country due to presidential and regular parliamentary elections. Since 2013, FDIs started to increase, while in 2018 they reached over 3 billion EUR (in 2018, the Chinese mining company *Zijin Mining* took over 63% of shares of the Serbian cooperative company *RTB Bor* in a

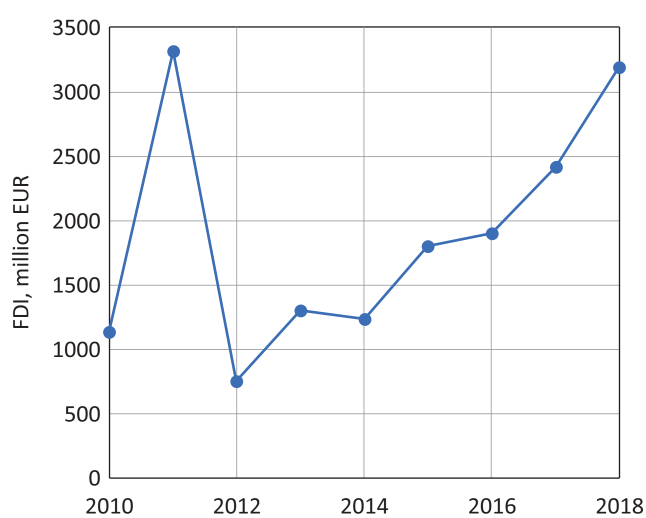


**Fig. 14.6** FDIs in Serbia (2010–2018, million EUR). (*Source:* Author's calculation based on data from the National Bank of Serbia 2019)

1.126 billion EUR deal with the Serbian Government) (National Bank of Serbia 2019).

Cumulatively in the period from 2004 to 2016, the largest FDI inflows were in two sectors: financial and insurance sector (27%) and manufacturing sector (26%) within which the leaders were automotive components, food and tobacco, textiles and real-estate – combined, they accounted for more than half (54%) of total inbound FDI projects in 2018 (Barklie 2019). Significantly lower level of FDI inflows was realized by wholesale trade, retail trade, motor vehicles repair (17%), real-estate activities (11%) and transportation and storage activities (10%) (National Bank of Serbia 2019).

According to the Statistical Office of the Republic of Serbia, at the end of 2016 the share of foreign branches operating in Serbia was 3% of the total number of business entities in the Republic of Serbia. Foreign branches employed a total of 223,125 workers, or 21% of the total number of employees in Serbia (Ratkaj et al. 2020). The largest number of employees was recorded in the manufacturing sector (50.1%), wholesale and retail trade, motor vehicles repair (22.5%) and administrative and support service activities (8.8%). Foreign business entities from the EU Member States were represented with 77.2% (from Austria, Italy, Netherlands, Germany, Luxembourg, Greece, Norway, Croatia and Slovenia), from non-EU countries with 21% (e.g. China, Russia, Turkey, Montenegro and USA), while the remaining 1.8% were foreign subsidiaries from offshore financial centres (National Bank of Serbia 2019).

Unlike foreign investments, domestic public and private investments in Serbia were among the lowest in Central and Eastern European (CEE) countries. Several years back, they were around 3% of GDP, while in other CEE countries their share was 4–5% of GDP (Republika Srbija – Fiskalni savet 2015). Domestic private investments accounted for somewhat higher percentage – about 10% of GDP (around 15% of GDP in CEE countries). Unfortunately, there were no signs that the situation would improve in the future, since public investments declined by 6.7% in 2014, while private investments declined by 3–4% (Republika Srbija – Fiskalni savet 2015). With such small investments, it was impossible to achieve high rates of economic growth. According to the estimation of the Fiscal Council of Serbia, the share of total investment in GDP should have been no less than 25% in order for a sustainable growth rate of 5% to be achieved (Republika Srbija – Fiskalni savet 2015). The situation was even worse regarding the public investments: they were lower than in any other comparable country and revealed a deep oscillating character. The level of current investments of approximately 3% of the GDP was below any acceptable criterion and such level definitely did not lay foundations for growth and development of the private sector. According to some analysts, the share of public investments in the GDP for the countries at the same level of development as Serbia should have amounted to 4–5%, although this ratio should be significantly higher during the phases of faster development and construction of infrastructure (Serbia's needs) (the estimation of the Fiscal Council of the Republic of Serbia) (Republika Srbija – Fiskalni savet 2015).

In the previous two decades, Serbia achieved macroeconomic stability, conducted basic transitional reforms and also managed to complete privatization, with the exception of few enterprises. International trade and capital flows were liberalized, inflation was stabilized at a low level and fiscal deficit was eliminated. GDP, employment and salaries increased, while public debt and the percentage of uncollectable loans decreased. However, the advancement achieved by establishing of macroeconomic stability and by basic economic reforms contributed to greater visibility of the core issues of Serbian economy. Above all else, these were institutional problems that in the past remained in the background due to macroeconomic problems: a modest progress made in structural reforms and economic policy that insufficiently incites growth.

There was an increase in foreign trade deficit and, most importantly, a very slow growth of investments. In the previous 10 years, Serbia had a significantly slower economic growth when compared to the CEE countries' average, and the main reason for this was a low level of investments. Starting from 2008, the investments level in Serbia did not surpass 20% of GDP, while the CEE countries had more than 22% of investments in their total GDPs (Republika Srbija – Fiskalni savet 2015). It takes much more than fiscal consolidation for a long-term sustainable growth. The previously mentioned weakness of institutions is reflected in insufficient protection of the contracts and ownership rights, low level of administrative staff's competencies and high corruption, poor public enterprises' management and insufficient efficacy in realization of public investments. All these elements create unfavourable environment for entrepreneurship, development of small and medium firms, investing and employment. Consequently, Serbia has a very low degree of innovations, insufficient domestic private and public investments and low employment. The World Bank's Ranking List regarding the quality of state governance (measured through elements such as corruption level and the like) shows that Serbia ranks 12 out of 14 CEE countries (only North Macedonia and Albania ranked lower than Serbia) (Kaufmann and Kraay 2019). This means that Serbia is ranked near the bottom of the list with respect to quality of its institutions.

Related to the previously stated is also the fact that in the past several years there has been very little progress in restructuring of public enterprises (to which the state has, in a large part, transferred social and fiscal functions). Ineffectiveness of Serbian public enterprises is, without a doubt, illustrated by several years of delays and high costs of road construction, extremely poor railway service, occasional problems with electricity production, low investments in public utilities infrastructure, etc. Therefore, in the following period, the highest potential for accelerating of economic growth in Serbia lies in structural and institutional reforms. When Serbia is concerned, these reforms are crucial, because the trend of its economic growth in the past 10 years was slower than the CEE countries' average. Crucial structural reforms in the following period must include restructuring of public enterprises, public administration reform and education reform. And one of the most important goals that Serbia set to itself after the year 2000 was the accession to the European Union, which would mark the end of the process of economic and institutional transition (in 2012, Serbia received the status of a candidate country and this marked the start of negotiation for accession to the EU).

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# Agriculture in Serbia

15

Žaklina Stojanović


## Abstract

Agriculture is an important sector in the Serbian economy (due to its relatively high share in GVA and total employment), in which the most of rural residents in Serbia are engaged. There are around 565,000 farms in Serbia. However, there are significant differences in average farm size, production structure and production value between farms located in the north and the south of Serbia. Partially, these differences are evident due to differences in agricultural land. Most of Serbia's high-quality land is located in the northern part of the country – Vojvodina (84% of total cultivable land in Serbia). The average utilized agricultural land (UAA) per holding in Serbia is 6.16 hectares, with slightly higher average size of farm in the Vojvodina region, while the farms above 100 ha utilized around 24% of Serbia's agricultural area. The farm sector structure is atomized – farms up to 5 hectares of UAA prevail in the overall structure with 62% share in total number of farms. Generally, fragmented land parcels with small average parcel size are identified as significant problem. Plant production dominates in the total agricultural production in Serbia, which is a strong indicator of less developed sector.



## Keywords

Agricultural production · Soil quality · Land use · Utilized agriculture area (UAA) · Farm structure · Sustainability · Rural areas


Agriculture plays a very important role in the Serbian economy. The share of gross value added (GVA) to agriculture, forestry, hunting and fishing in Serbia's GVA has been recorded around 9.3% during the period 2008–2018, with the maximum recorded in 2013 (11.4%). However, starting from 2013, the share of agriculture in the GVA recorded a continuous decline (Fig. 15.1).

Employment in agricultural sector is falling as well. However, the food and agriculture sector still accounts for about 20% of the total nation's work force, with agriculture and the agro-industry at around 16% and 4%, respectively.

As far as Serbia's foreign trade is concerned, agriculture (and food industry) still plays a significant role, especially in its exports (see Chap. 19). The share of agribusiness in the country's total has been 21.5% on average (2008–2018).

Due to stronger development of other industries, the share of agriculture and food industry in total exports recorded decline while the share of food and agricultural products in total imports was around 8% (Fig. 15.2).

According to the Serbian Agriculture Census from 2012, there were approximately 630,000 registered agricultural entities of which approximately 99.6% are family households and 0.4% legal entities. However, a significant decline in the number of farms in Serbia (565,000) was confirmed by the Farm Structure Survey (Statistical Office of the Republic of Serbia [SORS] 2018).

The substantial regional differences – such as average farm size, production structure and average production value, in the North and South of Serbia were confirmed as well. The majority of the identified differences are result of various

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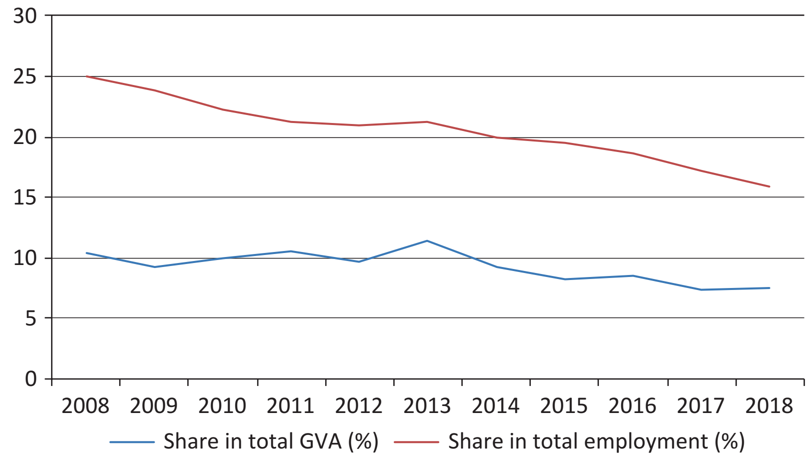


**Fig. 15.1** Agriculture, forestry, hunting and fishing share in total GVA and employment, 2008–2018. (*Source:* author's calculation based on data from Statistical Office of the Republic of Serbia database 2019)

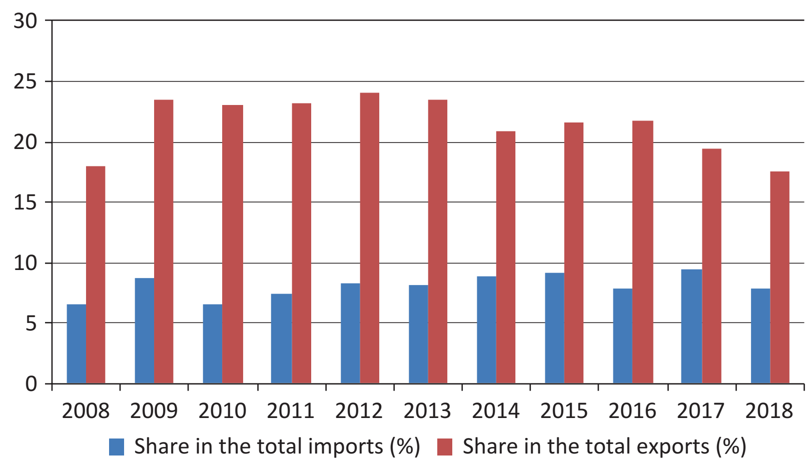


**Fig. 15.2** Agricultural and food products share in total export and import, 2008–2018. (*Source:* author's calculation based on data from Statistical Office of the Republic of Serbia database 2019)

production conditions existence. Further analysis in this chapter is devoted to characteristics of agricultural land as the basic agricultural resource that influence the farm structure, production and value created in different regions of Serbia.

## 15.1 Land Cover and Land Use

Agricultural land in Serbia (including natural grassland) accounts for 55% of total area (Ševarlić 2012). It is comparable with the data for EU-N13 (Eurostat 2013). The share of the different land cover categories varies across regions, and it is correlated with the physical characteristics of the land. Most of Serbia's agricultural land is located in the northern part of the country – Vojvodina (84% of total cultivable land in Serbia).

Serbia has possessed considerable resource in arable land – 5.05 million hectares (ha). However, utilized agricultural land (UAA) occupies less than 3.5 million ha (Agricultural, Forestry and Fishery Database 2019). Approximately 90% of Serbia's arable land is privately owned.

During 2006–2012, the conversion of arable land to pasture (set aside and fallow land) is evident. Comparing to the previous period (2000–2006), a strong increase of vineyards/orchards within the arable land is recorded. It is also important to point out a withdrawal of farming with parallel woodland creation. Forest land in mountain regions currently accounts for 37% of total land cover in Serbia (Fig. 15.3).

As far as the urban development is concerned (city land cover and infrastructure), the changes are more pronounced in northern, lowland part of Serbia. However, the overall mean annual artificial land take in Serbia is 0.25%, which is far beyond the European average (the area covered by agri-

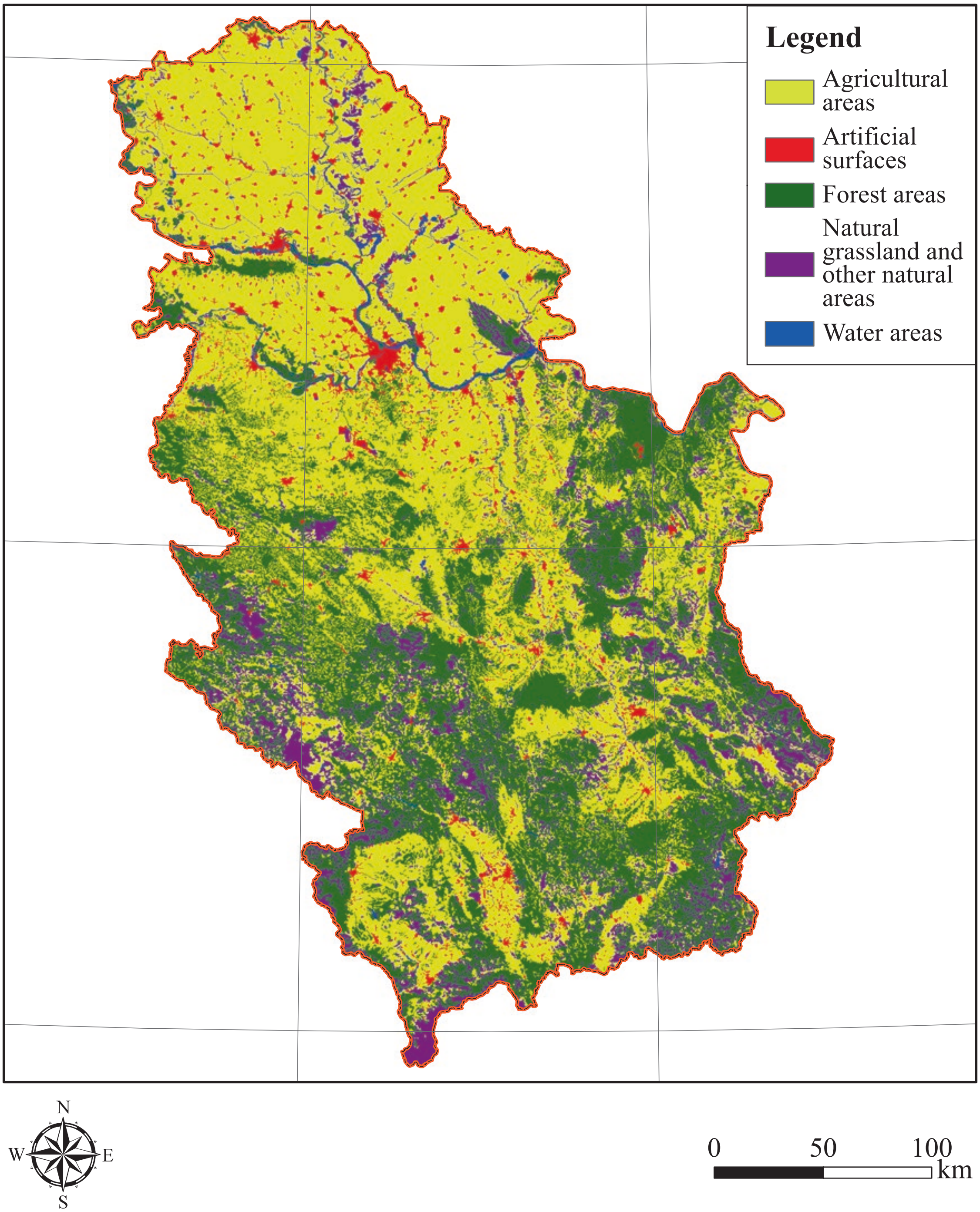


**Fig. 15.3** Land cover and land use, 2015. (*Source:* author's calculation based on data from European Environment Agency 2017)

cultural land decreased by 1.2% across the EU between 2000 and 2012) (Serbia land cover country fact sheet 2012, Montanarella 2007). UAA is dominated by arable fields and gardens in 2018 (Statistical Office of the Republic of Serbia [SORS] 2019). Almost 2/3 of UAA belongs to this category. Permanent grassland covers 19.5% of total UAA, while fruit plantations and vineyards present 5.3% and 0.6% of UAA, respectively (SORS 2019).

## 15.2 Quality of Soil and Parcelization

Being a country of diverse nature and conditions, Serbia has developed various types of soil. They are classified into eight classes: classes from 1 to 4 are the higher-quality soil types suitable for agriculture activity, while the last four classes (5–8) cover territory that is practically improper for agriculture production (Table 15.1).

**Table 15.1** Soil classes in Serbia

| *Soil class* | km² | % |
|---|---|---|
| 1 | 11,650 | 14.4 |
| 2 | 9375 | 11.6 |
| 3 | 10,522 | 13 |
| 4 | 8682 | 10.8 |
| *Arable land* | *40,229* | *49.8* |
| 5 | 11,073 | 13.7 |
| 6 | 20,144 | 25 |
| 7 | 8069 | 10 |
| 8 | 1178 | 1.5 |
| *Total* | *80,693* | *100* |

Reproduced from Karadžić and Mijović (2007)

Chernozem as highly productive soil type is concentrated in Vojvodina Region (totally 1,200,000 ha). Pseudogley, Fluvisol and Humogley are conditionally highly productive types of soil counted on around 1,175,000 ha, while vertisol as highly productive soil, too, is extended over 680,000 ha. Soil quality is the most pronounced in the Region of Vojvodina and the northern part of Serbia in general. The rankers as the soil type suitable for meadow/pasture covers around 375,000 ha. However, the soils types with considerable limitations of fertility are extended over one half of total land (Ličina et al. 2011). Also, the soil loss and degradation processes are strongly present in Serbia due to several reasons: industrial, mining and power-producing activities, soil pollution and excessive use of agrochemicals, loss of organic matter, acidification and salinization, as well as aeolian and water erosion (see Chap. 20).

Different soil, climatic and hydrographic conditions in Serbia made diverse agriculture environment. But, specific historical and economic factors have further shaped that environment.

Fragmented land parcels with small average parcel size produce significant problem for modern agriculture development in Serbia (Fig. 15.4). For example, the Bečej municipality (North Bačka in Vojvodina) is recognized as a typical representative of intensive agricultural production with combined private ownership (agribusiness and family farms). Plots are, even in this area, fragmented and small.

However, the biodiversity value has largely been maintained through traditional, low-intensity farming practices survived on small family plots. The farm sector structure is basically determined by coexistence of large legal entities and small, privately owned family farms in Serbia.

## 15.3 Structure of Farms and Regional Differences

The Farm Structure Survey conducted by the Statistical Office of the Republic of Serbia in 2018, completely in compliance with the Eurostat methodology, showed that the total number of agricultural holdings in Serbia is 564,541. These holdings utilize almost 3.48 million ha of agricultural land. The majority of households, more than 70%, are located in the area southern from Sava and Danube rivers – Serbia South (Table 15.2).

The farm sector structure is atomized – the farm size is under the strong pressure of the historic conditions primarily related to the land maximum regulation from the socialist period (see Chap. 14).

The highest number of agricultural households is recorded in Šumadija and Western Serbia region (43%), followed by


**Fig. 15.4** An illustration of plots size in the Bečej municipality (north Vojvodina). (*Source:* OneSoil 2019)

**Table 15.2** The agricultural holdings by legal status and their characteristics, 2018

| Territory | Type of holding | UAA [ha] | Holdings | LSU (livestock unit) | AWU (annual working unit) | ESU (economic size unit, mill Euro) |
|---|---|---|---|---|---|---|
| Serbia NUTS 1 | Total | 3,475,894 | 564,541 | 1,933,840 | 645733.1 | 4861 |
| | Family farm | 2,916,125 | 562,895 | 1,651,568 | 627406.3 | 4205 |
| | Legal entity | 557,866 | 1373 | 276,370 | 17576.92 | 644 |
| | Entrepreneur | 1903 | 272 | 5902 | 749.92 | 12 |
| Serbia North NUTS 2 | Total | 1,719,899 | 157,103 | 784,606 | 163381.8 | 2312 |
| | Family farm | 1,287,300 | 156,138 | 562,421 | 148957.4 | 1753 |
| | Legal entity | 431,356 | 853 | 221,200 | 14118.23 | 556 |
| | Entrepreneur | 1242 | 112 | 985 | 306.12 | 4 |
| Serbia South NUTS 2 | Total | 1,755,995 | 407,438 | 1,149,234 | 482351.4 | 2549 |
| | Family farm | 1,628,826 | 406,758 | 1,089,147 | 478448.9 | 2452 |
| | Legal entity | 126,509 | 520 | 55,170 | 3458.69 | 89 |
| | Entrepreneur | 660 | 161 | 4917 | 443.8 | 8 |

*Source:* Statistical Office of the Republic of Serbia (2018)

the Southern and Eastern Serbia (29%), Vojvodina (23%) and finally the Belgrade (slightly more than 5%). Regarding Serbia's utilized agricultural area (UAA), farms from the Vojvodina Region are overrepresented (45%), followed by Šumadija and Western Serbia (around 30%), Southern and Eastern Serbia (around 21%) and the Belgrade Region (around 4%). The average UAA per holding is only 6.16 ha.

It is, also, noticeable that there is a prevalence of small farms in ownership structure. Farms up to 5 ha of UAA prevail in the overall structure with 62%. Additionally, participation of very small farms with up to 2 ha of UAA is extremely high (38%). Lower participation of small holdings is registered in Vojvodina region.

Farms up to 5 ha in Vojvodina count for around 6.2% of Serbia's UAA while larger, industrialized producers (over 50 ha) represent over 49.1% of Serbia's UAA. Other regions have a significantly lower share of huge farms, both in the total number of holdings and in terms of UAA. Comparing with the average in the EU, size structure of farm sector in Serbia is less advantageous. Agricultural holdings working less than 5 ha utilize 9.3% of Serbia's agricultural area, whilst in EU they occupy 7% of UAA. On the contrary, the farms (>100 ha) utilize around 24% of Serbia's agricultural area, while in the EU these holdings make up over 50% of UAA (European Commission 2013). The average UAA per holding in Serbia is 6.14 ha, which is around 2.7 times lower than the EU average (16.6 ha) (Eurostat 2019). Additionally, as it was previously mentioned, the specific problem of Serbian agriculture is connected not only with small average farm size but also with plot fragmentation on the farm. On average, farmer in Serbia poses six plots. Also, there is a problem of holdings abundance, particularly in the group of farms from 10 to 20 ha of UAA.

According to the Farm Structure Survey, 48.7% of farms in Serbia rise cattle. The Šumadija and Western Serbia region have the highest number of livestock units (almost 41%), followed by Vojvodina (35.8%), Southern and Eastern Serbia (18.4%) and the Belgrade region (4.8%). The vast majority of livestock farms in Serbia are family owned (more than 99%) (SORS 2018). Holdings raising cattle have up to 3–4

**Table 15.3** Indicators per holding in different regions in Serbia, 2018

| Territory | Legal status | UAA | LSU | AWU | ESU |
|---|---|---|---|---|---|
| Serbia NUTS I | Total | 6.16 | 3.43 | 1.14 | 8611 |
| | Family | 5.18 | 2.93 | 1.11 | 7470 |
| | Legal entity | 406.31 | 201.29 | 12.80 | 469,046 |
| | Entrepreneur | 7.00 | 21.70 | 2.76 | 44,118 |
| Serbia North NUTS II | Total | 10.95 | 4.99 | 1.04 | 14,716 |
| | Family | 8.24 | 3.60 | 0.95 | 11,227 |
| | Legal entity | 505.69 | 259.32 | 16.55 | 651,817 |
| | Entrepreneur | 11.09 | 8.79 | 2.73 | 35,714 |
| Belgrade region NUTS III | Total | 4.85 | 3.07 | 1.06 | 8124 |
| | Family | 3.97 | 2.41 | 1.00 | 6878 |
| | Legal entity | 354.68 | 269.33 | 21.79 | 506,667 |
| | Entrepreneur | 6.67 | 0.00 | 5.15 | 0 |
| Vojvodina region NUTS III | Total | 12.39 | 5.45 | 1.04 | 16,274 |
| | Family | 9.26 | 3.89 | 0.94 | 12,259 |
| | Legal entity | 520.25 | 258.35 | 16.05 | 665,810 |
| | Entrepreneur | 11.48 | 9.56 | 2.52 | 29,126 |
| Serbia South NUTS II | Total | 4.31 | 2.82 | 1.18 | 6256 |
| | Family | 4.00 | 2.68 | 1.18 | 6028 |
| | Legal entity | 243.29 | 106.10 | 6.65 | 171,154 |
| | Entrepreneur | 4.10 | 30.54 | 2.76 | 49,689 |
| Sumadija and Western Serbia region NUTS III | Total | 4.27 | 3.28 | 1.24 | 6796 |
| | Family | 4.07 | 3.13 | 1.24 | 6589 |
| | Legal entity | 167.54 | 108.12 | 6.57 | 153,333 |
| | Entrepreneur | 3.88 | 40.05 | 2.73 | 62,500 |
| Southern and Eastern Serbia region NUTS III | Total | 4.37 | 2.15 | 1.10 | 5461 |
| | Family | 3.91 | 2.01 | 1.09 | 5203 |
| | Legal entity | 346.58 | 103.34 | 6.76 | 195,455 |
| | Entrepreneur | 4.59 | 8.82 | 2.82 | 20,408 |

*Source:* Statistical Office of the Republic of Serbia (2018) livestock units on average (Table 15.3), which is more than five times lower than in EU. Small farms possess 40.4% of LSU, while one third of LSU is owned by 2.8% of large, industrially organized farms (Popović 2014). Comparing with the EU, large farms with more than 50 LSU rise over 75% of livestock (European Commission 2013). Farms with a small number of LSU are mostly located in Šumadija and Western Serbia region, while more than 50% of all farms with >50 LSU are positioned in Vojvodina region.

The agricultural sector in Serbia employs 1.3 million people (SORS 2019). The large majority of employed persons belong to a group of self-employed (farm owners and their members). The total number of annual work units (AWU – corresponds to the work performed by one person working on an agricultural holding on a full-time basis for 1 year) in 2018 was 645,733 (Green Book 1 2018). More than 97% of total AWU are registered in family farming sector (engagements of the family labour force). The number of annual work units per agricultural holding in Serbia is 1.1, which is more than the EU average (less than 1 AWU per farm). The existing farm structure negatively influences the agricultural sector productivity. In Serbia, a person employed full time works 5.4 ha of farmland. However, UAA per AWU in Vojvodina is almost 12, while the lowest ratio is recorded in Southern and Eastern Serbia (slightly less than 4 ha of UAA per AWU).

## 15.4 Agricultural Production and Typology of Regions Based on "Around Agriculture" Activities

Plant production dominates in total agricultural production in Serbia with multiannual average around 2/3 (SORS 2019). Arable land share in UAA is 74.1% in 2018, followed by fruit plantations/orchards with 5.3%, vineyards with 0.6%, permanent grassland with 10.1% and pastures with 9.3%. Particular importance belongs to fruit growers in Serbia. In the fruit growing in 2018, most of the areas were used for the production of plums (72,923 ha or 39.87%), apples (26,658 ha or 14.57%), raspberries (24,901 ha or 13.61%) and sour cherries (19,579 ha or 10.70%). Although something less than 40% of fruit plantations consists of the plum, the most important fruit in the context of exports is raspberry. The vineyards have high potential as well due to old tradition of grapes growing and expansion of wine production in Serbia. There are nine winemaking regions with several "wine routs" starting from the northern part of Serbia (Palić) to the south of Serbia (Kosovo and Metohija), with small, family-owned vineyards and wine production capacities.

In the structure of sown arable land areas, cereals participated with 66.3%, industrial crops with 19.0%, vegetables with 1.9%, and fodder crops with 8.9% (SORS 2019). Cereals dominate in the arable crops, with predominance of maize and wheat. Industrial crops have a considerable share (19.0%), followed by fodder crops (8.9%) while the share of other crops in terms of area is significantly smaller, around 5%. Production of most crops has fluctuated in recent years due to adverse weather conditions and extremely low crops protection (for example, only 5.4% of UAA is irrigated in Serbia, while 7.7% of total vegetable production is under glasshouses and poly-tunnels) (Agricultural, Forestry and Fishery Database 2019).

Among the livestock production, which contributes total agricultural production with approximately 1/3, cattle breeding is the most important. Milk production constituted a larger percentage in the total value (every fourth farm in Serbia is producing cow's milk). This sector is under strong transition and structural reconstruction (Popović 2014). Number of milk farms in Serbia has decreased for two-thirds recently and number of cows halved. At same time, average milk yield increased three times. However, it is still for more than 50% lower yield compared with the EU average (Agriculture, Forestry and Fisheries Database 2019). The second livestock sector is pig breeding (produces 12% of total agricultural sector value), while the poultry production (meat and eggs) is less important.

Agricultural production is just a central sector, which occupies most of rural residents in Serbia. The rural areas are mainly located in the less-developed regions (particularly in eastern and southern parts of the country). These areas are characterized by extremely low level of agricultural productivity, strong depopulation and emigration processes. On the other side, it cannot be stated that the rural areas depend only on agricultural sector activity. There are other related activities "around agriculture" which determine prosperity of a modern rural areas.(Zakić et al, 2004).

The concept of agriculture as the central, but not exclusive activity in rural areas, has gained in importance recently in Serbia (Zakić and Stojanović 2008; Bogdanov and Stojanović 2006). Agricultural activity cannot be analysed and fully utilized by simple, single-sided sector approach. Instead, it is necessary to include a territorial economy component in the analysis in order to emphasize multidimensional role of agriculture in rural areas. A typology of the rural areas in Serbia was constructed in 2006 under the EU funding project – Support to Rural Development Programming and Payment System, Report on selecting pilot rural regions for rural development programming purposes (Efstratoglou 2006). Cluster analysis was performed based on the multifunctional characteristics of rural economy – agricultural activity, industry development, public sector importance, demography, accessibility, infrastructure, service dependency and health care (Bogdanov et al. 2008). According to that analysis, totally four different regions were identified.

1. *Highly productive agriculture and integrated economy (Region I)* – The most fertile land is mainly positioned in this region with intensive agricultural production. Negative demographic trends are less pronounced in this region. Positive changes related to entrepreneurship development and industry diversification are evident as well. This region is set on north and northwest Serbia – Vojvodina, Mačva and Stig. The economy of this region is generally well integrated and not solely dependent on agricultural production.
2. *Small urban economies with labour-intensive agriculture (Region II)* – From the spatial point of view, the region covers surrounding areas of large cities in Serbia. Intensive farming is encouraged by proximity of large urban markets. Producers in this region are mainly devoted to fruit and vegetables, as well as livestock production. Consequently, this region has recorded the lowest unemployment rate. The accessibility to different public services is better than in other regions.
3. *Natural-resources-oriented economies (Region III)* – This is mainly mountain region with highly heterogeneous characteristics. The extensive agricultural activity is dominantly based on natural resources exploitation. Rural poverty, underdeveloped secondary and tertiary activities, high unemployment rate and depopulation are main features of these areas. However, there are a few districts which can be recommended as a good example for full employment of outstanding outdoor amenities.
4. *High tourism capacities and poorly developed agriculture (Region IV)* – Western parts of Serbia are particularly devoted to truism development. Mountain (winter and summer), countryside, hunting, ecological and other forms of tourism have a great potential. However, the tertiary-sector contribution to the rural economy development and offer of high-quality labelled food (such as PDO, PDI and Organic) still remain underestimated. According to the last available data, this region is characterized by the largest number of young holders – farmers up to 40 years of age make 39% of all agricultural holders in this region (SORS 2018).

The explained typology provides a unique possibility for nonadditional, complementary "around agriculture" activities development in rural areas. As such, this approach best suits definition of future activities in rural economy that may unlock mechanism for abandonment of negative regional development trends in Serbia (see the Chap. 22). Furthermore, the regions in Serbia, classified as mentioned above, have a full potential for further development under the EU regional and rural development policy framework. The particular regional characteristics are taken into account to support multidimensional development path of each area. The framework of political and institutional reforms in the agricultural sector are defined by the strategic documents related to agricultural and rural development in Serbia and their basic guidelines fully support the pre-accession IPARD program implementation in the practice.

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# 16 Natural Resources and Manufacturing Sector

Emilija Manić and Milena Lutovac

**Abstract**

Serbia has certain potential in using natural resources, which was the base for strong industrialization of the country during the period after World War II. Having large deposits of metals such as copper and lead-zinc ore, and using huge resources of the brown coal deposits, Serbian manufacturing structure was predominantly founded on the metal-processing and thermo energy industry, processing industries such as food and beverage, textile and leather industry, as well as the engineering industry located in few industrial centres. After destructive deindustrialization during the 1990s, Serbian manufacturing sector try to recover mostly within those industries for which the foreign capital was interested in, both through privatization or new investments. The natural resources exploitation was and still is a subject of interest for many foreign companies, but still not having too much interest in renewable energy resources exploatation. Although the labour-intensive industries and industries relayed on cheap but qualified labour became the base of the contemporary Serbian industry, there is a potential in new industries such as software and ITC industry.

**Keywords**

Natural resources · Mineral resources · Energy resources · Deindustrialization · Processing industry · Software and ICT industry

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## 16.1 The Mineral Resources

The intensive research and subsequent mapping of the mineral resources in the territory of Serbia during the period after the Second World War established the unambiguous link between mineral resources and plate tectonic processes (Janković 1967; Janković et al. 2003). The distribution of the most valuable deposits of metallic and non-metallic mineral resources in Serbia within a part of the so-called north-eastern Mediterranean sector (Janković 1982, 1990), which includes Dinarides, Serbo-Macedonian and Carpatho-Balkanides metallogenetic province (ore zone, provinces, districts and ore fields), has been ascertained.

### 16.1.1 Metallic Mineral Resources and Metal Industry

The most promising metallic mineral resources in Serbia are from hydrothermal stile deposits, which comprise over 30 mineral resources. Due to their unequal economic importance, deposits were classified under exploration degree regarding geology, yet exploited mineral resources of economically beneficial reserves including those potential for future exploitation (copper, lead, zinc, gold and silver), mineral resources of secondary and tertiary importance (Jelenković and Mijatović 2014; Jelenković 2014; Table 16.1).

The exploitation of metals in Serbia started to be intensive during the medieval age (see Chap. 3). However, the mining industry in Serbia based on metal resources exploitation restarted during the first decades of twentieth century, mostly due to foreign investments. But, the real expansion in Serbian mining and mass industrialization took place after the World War II and after the rebuilt of a war-damaged country. The new communist government nationalized mines and established state mining institutions, revealing the base of metal-



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**Table 16.1** Classification of metallic and non-metallic mineral resources in Serbia based on produced quantities and potentials (Reproduced from Jelenković and Mijatović 2014, modified)

| Group | Resources | Characteristics of metallic resource |
|---|---|---|
| Exploited mineral resources of significant ore reserves | Copper, lead-zinc, quartz sand, fluorite, dolomite, magnesite, cement marl, natural stone | Generally low metal grade, large reserves, considerable potentials |
| Mineral resources of proven reserves, non-exploited or of insufficient reserves | Tin, manganese, uranium, molybdenum, titanium, tungsten, borates, feldspars, barite, asbestos, zeolite | Low reserves, limited importance in general. Requires upgrading (uranium) |
| Potentially mineable resources of insufficiently proven reserves | Nickel, cobalt, antimony, aluminium, natural iron alloys, phosphates, wollastonite, salt | Valorisation of resources based on techno economic parameters. The main limitation factor is economic benefit. Real possibilities for increasing reserves exist. |
| Expected deposits of mineral resources in Serbia | Gold, silver, rare and disseminated metals, new and untraditional mineral resources | According to conducted metallogenetic analyses of geological settings new reserves are likely. Additional researches are required. |
| Mostly exhausted or uneconomical to extract mineral resources | Chromium, iron | Doubtful option for discovering a new reserve; probably at greater depths of peridotite massifs with already known deposits |

lurgy in Serbia (Jelenković et al. 2014; Spasojević et al. 2014).

The most important metallic resource in Serbia is *copper*. Deposits of it are dominantly related to Timok igneous complex in eastern and southern Serbia (Carpatho-Balkanides and Serbo- Macedonian Metallogenic Province) (Fig. 16.1). The average copper grade in ore in this complex is about 0.39%, with the gold as the accompanied metal (about 153 tons of gold reserves of the average grade nearly 0.14 g/t is estimated) (Jelenković and Mijatović 2014). From the rest of the already explored copper deposits in Serbia, the most significant are deposits in the Lece volcanic complex in southern Serbia and a few deposits in western Serbia (Fig. 16.1).

Exploitation of copper has started at the end of nineteenth century under French capital and authorities. After the World War II, the mines in Bor and Majdanpek in eastern Serbia were nationalized and served as the base for public assets to be established: The mining and smelting basin "Bor" (RTB "Bor") and "The mine Majdanpek." Of particular importance was the decision of current communist government in mid-sixties of the last century to allow Yugoslavian copper to be sell at world trade market prices instead as formerly at maximal prices, which have been set by the government (Grujić and Jenić 2014). This had a positive impact on enlargement of further geological surveys, as well as on the mining and metallurgy development in Serbia. During the height of the crisis in the last decade of twentieth century, the aforementioned Serbian enterprises experienced a significant decline in production rate. The proceeded years of transition and a permanent subvention by government in the beginning of twenty-first century did not contribute to technological improvement. As one of the rare remaining state-owned companies, hard-pressed by debts, RTB "Bor" has been privatized in 2019 by the Chinese Company "Zijin Mining Group" (63% shares of the company was sold and the buyer obligated to invest to improve productivity level and to solve ecological problems).

The other metallic resource among the most valuable in Serbia is the *lead-zinc ore*. Majority of lead-zinc deposits is linked for the Serbo-Macedonian region in southern Serbia. The far richest within it is the Kopaonik zone at the region Kosovo and Metohija, where it is estimated to be placed approximately 83% of total balance reserves of lead-zinc ore in Serbia (Jelenković and Mijatović 2014) (Fig. 16.1). According to results of deficient explorations, the estimated average grade in the ore is about 4% of lead and 3% of zinc and is followed by elevated concentration of other metals such as cadmium, arsenic, bismuth and silver, which appears in particularly high concentrations (a reserve of the lead-zinc ore contains about 3 tons of silver and 65% of these reserves happens to lie in the Kopaonik zone) (Jelenković and Mijatović 2014).

Between two World wars exploitation of lead and zinc in Serbia has been carried in the region Kosovo and Metohija region by the British company (mines Ajvalija, Novo Brdo, Kižnica, and Badovac). After the World War II, these mines were nationalized and united in the mining-metallurgy and chemical combine "Trepča" (RMHK "Trepča"). Combine was active until 1999 and NATO bombing, with occasional breaks over nineteenths in the last century. With the arrival of the international peacekeeping forces in the area of the Kosovo and Metohija, the combine "Trepča" sustained to work only in northern mine under Serbs authority, while the southern mines were destroyed and largely put out of action. The ownership of this combinate and subsequent exploitation of lead-zinc ore will be probably solved when the status of this region finally be established. Exploitation of lead-zinc ore is of considerable lesser extent in other localities in Serbia: in northwestern Serbia (mine Ljubovija), in central Serbia (slopes of the mountain Rudnik), in the south (mine Grot and Lece, where along with lead and

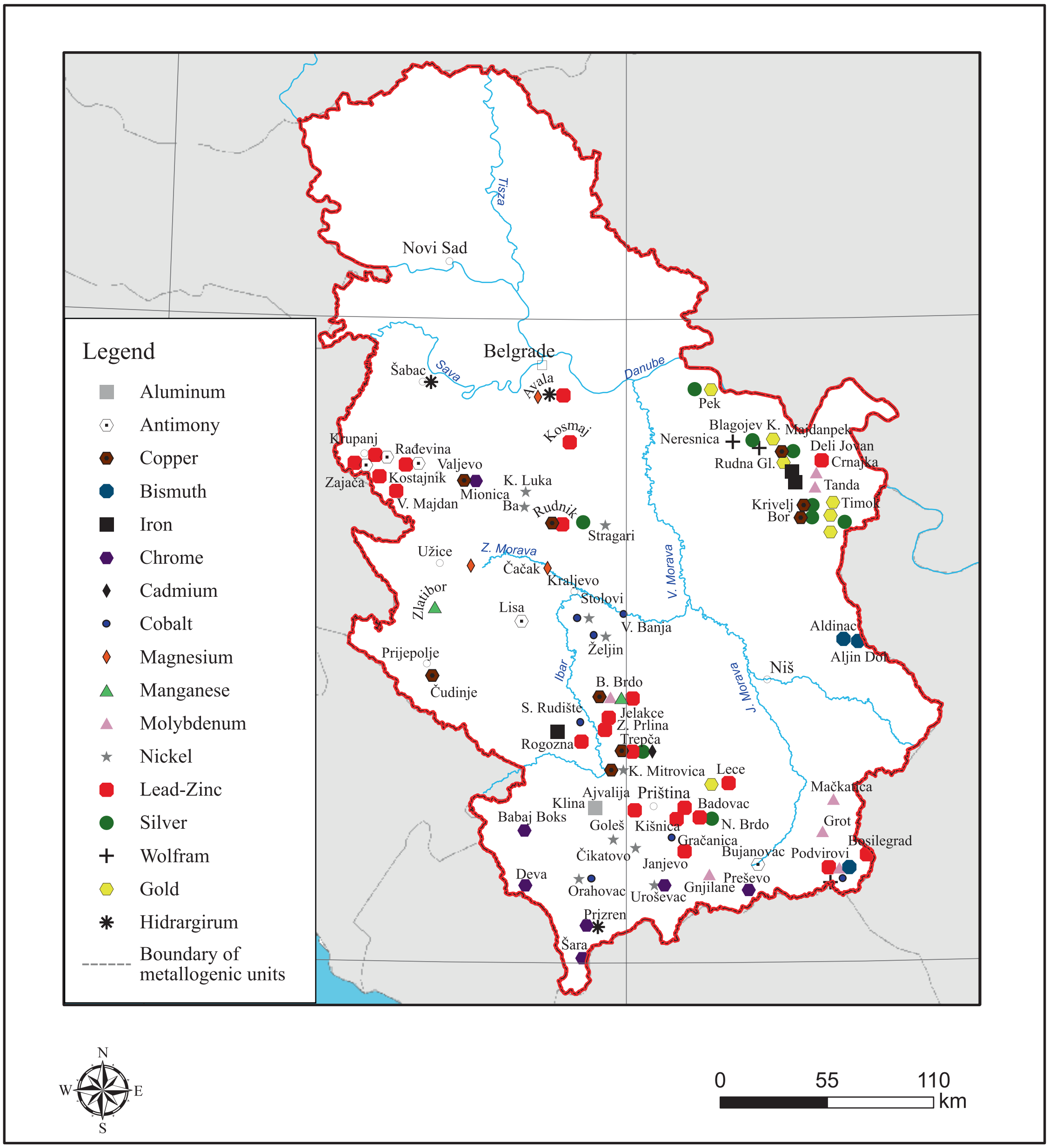



**Fig. 16.1** Overview of deposits of metallic mineral resources. (Reproduced from Jelenković and Mijatović 2014)

zinc silver and gold were mined, too), and in the easternmost part of Serbia (Bosilegrad) (Fig. 16.1).

*Gold* is the third the most mined metal in Serbia. Deposits of gold were explored in a few localities. The most of them consider porphyry and volcanogenic massive sulphide deposits in which gold accompanies copper (e.g. Timok igneous complex). Deposits of gold as the main component are notably less distributed (quartz-gold bearing deposits in Blagojev kamen in eastern Serbia and placer deposits accumulated by river flows in eastern Serbia (rivers Pek, Trgoviški Timok) (Janković et al. 1992).

Deposits of other metallic resources in Serbia are of relatively negligible economic importance (low ore quality, insufficiently explored, low reserves). However, the potential new geological surveys could lead to discovery of new deposits rich enough to be mined (Table 16.1). Currently several metals in lesser amount and in particular objects were extracted: antimony (western Serbia), nickel in Kosovo and Metohija regions along with a number of precious and rare metals as by-products (for example the lead processing releases bismuth, cadmium and silver (RMHK “Trepča”), copper refining results with gold and silver (RTB Bor and Majdanpek and the Lece mine), while the zinc refining derives cadmium (“Zorka” in Šabac, western Serbia)).

After the World War II, depending on the above-mentioned base metal deposits, as well as on account of the imported raw-materials from other republics (e.g. aluminium from Montenegro) a metallurgy sector started to develop and several industrial centres in Serbia were established: Bor in eastern Serbia (mining, refining and smelters of copper), Sevojno in western Serbia (rolling mills for copper and aluminium), Trepča in Kosovo and Metohija (excavation and refining, smelters of lead-zinc ore). Iron industry, however, could not be developed on the domestic ore (a low grade of metal in ores from the biggest deposits in the Kopaonik zone). In spite of it, the enterprise "Sartid" with steel plants in Smederevo (right bank of the Danube in central Serbia) was established, which completely depended on imported raw materials (Grčić 1994). Crises at the end of twentieth century in Serbian industry sector contributed significantly to already dreadful position of this company, which tried to sustain production during the first decades in twenty-first century by privatization of different strategic partners (see Chap. 14). At the moment, it is purchased by the Chinese company "HBIS GROUP" under the name "HBIS GROUP Iron Serbia & Steel" with headquarters in Smederevo and Šabac (production of white tins).

### 16.1.2 Non-metallic Mineral Resources and Industry

The primary importance of non-metallic resources in Serbia (according to the amount of reserves and production rate) includes magnesite, resources for cement industry, ceramics and fire-resistant clays, and natural stone aggregates. The rest of all numerable non-metallic deposits are classified in deposits of secondary and tertiary importance (Table 16.1). Exploitation of non-metallic minerals has been improved by the industrialization of the country and development of construction-building sector. A certain manufacturing capacities had been localized near some of these deposits. In spite difficult circumstances (dissection of refining capacities, impermanent geological explorations), the non-metal mining industry in Serbia used to grow three times faster than all other manufacturing industries after the World War II (Jelenković and Mijatović 2014). Serbia accounted for a 100% of ex-Yugoslavian production of magnesite, mica, white bauxite, flat grinded and isopan glass, and basic clays. However, persistent problems in Serbian economy and crises during 90s of the last century revealed negative impact on both exploration and exploitation of non-metallic mineral resources.

In Serbia, currently, 16 non-metallic resources are exploited at over 180 locations, although only 30 of them are assessed to be exploitable (Andrić 2010; Andrić et al. 2014; Vakanjac 1974). However, the exact data on mined non-metallic resources in Serbia are lacking. One of the main reasons is that manufactures of certain building materials (sand, gravel, lime, brick, tiles, ceramic, cement, technical-building and building-architectural stone, glass) seem replenished.

The most important non-metallic resource in Serbia is *magnesite.* The largest reserves of it are buried in western Zlatibor peridotite massif and in central part of Serbia (Kopaonik massif). Exploitation was particularly intensive after the World War II, but in the last two decades of the twentieth century, a rapid decline in production was recorded (the largest enterprise "Magnohrom" located in Kraljevo in western Serbia has been in continuous problems).

Next in significance are *resources for cement industry*, mainly clayey marls and marly limestones, which are distributed in several regions (in Vojvodina, in western, central and easternmost part of Serbia) (Jelenković and Mijatović 2014). It was estimated that the available reserves with present production rate will cover needs in Serbia for the next 20 years, but the existence of considerable reserves elsewhere in yet unknown sites is envisaged. Cement industry has been developed near cement marl deposits and the majority of it is under foreign capital: Beočin in Vojvodina (French company "Lafarge"), Novi Popovac near Paraćin in the valley of the Velika Morava river (Swiss company "Holcim"), and Kosjerić in the western Serbia (Greek company "Titan").

*Ceramic and fire-resistant clays* in Serbia are generally related to Neogene sediments. The largest known deposits of ceramic clays are placed in central Serbia, including Kosovo and Metohija region, while the most of the fire-resistant clay deposits are located in central Serbia. These deposits are the base for industry of building materials whose capacities are essentially concentrated in the area of Vojvodina (Novi Bečej, Kikinda), in central Serbia (Aranđelovac and its vicinity), and in the southern Serbia (Bujanovac, Vranje).

*Quartz sands* are accumulated in deposits of lacustrine sediments in the northwestern Serbia (deposits near Valjevo, and Kolubara coal basin), in western and eastern Serbia (Rgotina near Zaječar) and at several locations in central Serbia (vicinity of Mladenovac). The former quartz production in Serbia accounted for 50% of the total Yugoslavian production. The main centres of manufacturing glass were set up in Paraćin (central Serbia), Zaječar (eastern Serbia) and Pančevo (Vojvodina). Unfortunately, after a few unsuccessful privatizations, these capacities were almost coming toa a close. The significant non-metal resource is also *technical-building stone,* which is at the moment one of the most commonly explored and exploited resource at a number of sites in central Serbia.

The exploitation of other non-metals is reduced to distinct locations and notably lower production rates (deposits of feldspars in central and southern Serbia, bentonite (in mine of brown coal Bogovina in central Serbia), fire-resistant materials in western Serbia, including asbestos in central Serbia) (Praštalo 2014).

Geological exploration of non-metallic resources in the last two decades are predominantly carried out by foreign companies, and one of the most exceptional discoveries is attributed to discovery of the new lithium ore mineral – *jadarite*, in the western Serbia in watershed of the Jadar River. The early first estimations of reserves are more than promising, and this deposit has been already assigned one of the biggest in Europe and worldwide (researches over a ten years ago were done by the British-Australian corporation "Rio Tinto", which announced the incoming feasibility study and the possibility for opening a mine of lithium) (Ministarstvo rudarstva i energetike Republike Srbije 2015). Undoubtedly, the state will care for this potential, as well as for the other existing exploitation sites regarding rights, rate of production and environmental protection. That should be one of the most important future tasks of the Serbian mining industry.

## 16.2 The Energy Resources and Production

The energy sector in Serbia dominantly relies on fossil fuels, particularly coal. Lignite is of the highest share, over 95% in the proved reserves. Oil and natural gas hardly provide 10%, that is 20% of domestic needs, whereas the oil shales are still out of exploitation (oil shales make about 9% of the overall geological reserves) (Vlada Republike Srbije 2011). It needs to emphasize that all estimations regarding fossil fuel reserves and other energy resources should be accepted with doubt as geological research were not brought to the end (except for a coal in central Serbia, which reserves are able to supply energy base in Serbia until the end of twenty-first century).

The most important energy resource in Serbia is *coal.* Geological research of coal in Serbia have started in nineteenth century, and its exploitation, although of variable intensity, is still lasting (the most prominent intensity was during the half of the last century when open pit mining techniques were implemented) (Jovanović 2014). Considering the structure, the most abundant coal in Serbia is *soft brown coal (lignite)*, which is found in deposits of the Upper Miocene age: basin of Kosovo and Metohija (over 70% of total coal reserves), Kolubara basin (14%), Kostolac basin (3.3%) and the deposit Kovin (Ministarstvo rudarstva i energetike Republike Srbije 2019) (Fig. 16.2). Rest of the deposits are scattered in central Serbia, in watersheds of the Velika, Zapadna and Južna Morava rivers, and Mlava river. Only the coal in southwestern and eastern Serbia is considered hard brown coal (Fig. 16.2).

In terms of the depth of coal beds, the majority of deposits in Serbia consider mines of moderately exploitation depths (up to 500 m). Total reserves of brown coal in Serbia were estimated on 22.6 billion tons and of hard coal about 65 million tons (Kostić 2014). However, these estimations should be also taken in consideration with doubt as the economic valorization of coal reserves still was not complete and lignite deposits at Kosovo and Metohija remained insufficiently explored (Vlada Republike Srbije 2011).

After the World War II, coal deposits in Serbia were nationalized and since then constantly were increasing production (until 1990) (Babović et al. 2014). The state enterprises were established for the purpose of the exploitation, as well as for occasionally geological researches (at present, it is the public enterprise "Elektroprivreda Srbije" – "EPS""). Production of lignite is the highest, and largest quantity of it goes for supporting thermo energy capacities (thermoelectric plants of installed output power of 5171 MW) (Živanović et al. 2014). The most efficient lignite production in Serbia is taking place in two coal basins: Kolubara and Kostolac. The data on production in the basin Kosovo and Metohija is lacking.

*The mining basin Kolubara* covers the area of about 310 km$^2$, having well-determined geographical position and traffic connections. It is the largest producer of coal in Serbia (accounts for 70% of total coal production in Serbia) (Fig. 16.2). It works under the authority of the public enterprise "EPS" and every second kilowatt of electric energy, which is produced in Serbia, relies on coal from the Kolubara basin (the most important purchaser is thermoelectric plant TENT "Obrenovac" built in a close vicinity of the basin). It was estimated that under present production rate, the coal within this basin would be available by the next 50 years (Živanović et al. 2014). However, the future coal exploitation will require extensive labour and efforts to displace the adjacent cities, roads, railway Beograd-Bar, as well as intensive remediation of extended exploited fields.

*Kostolac coal basin* occupies larger area than the Kolubara basin, approaching to about 400 km$^2$, but is of lower quantity and intensity of exploitation (at the beginning of its work at the end of nineteenth century, it accounted for over than 90% of total coal production in Serbia) (Fig. 16.2). Exploitation is undertaken by open pit mining, but it should be emphasized that the coal beds on 50–80 m below the Danube's water level forced to introduce a new exploitation method, which became the technologically unique in the Balkan Peninsula, as well as in Europe (exploitation under the water). Thermoelectric plant "Kostolac" used the most of the coal production within this basin and it operates under the public enterprise "EPS".

Lignite reserves in the territory of the Kosovo and Metohija regions are generally concentrated within three basins: Kosovo, Metohija and Drenica, comprising more than 70% of the entire reserves of this fossil fuel in Serbia (about 14.2 billion tons). Conditions for exploitation in these basins are very suitable (average thickness of coal beds is

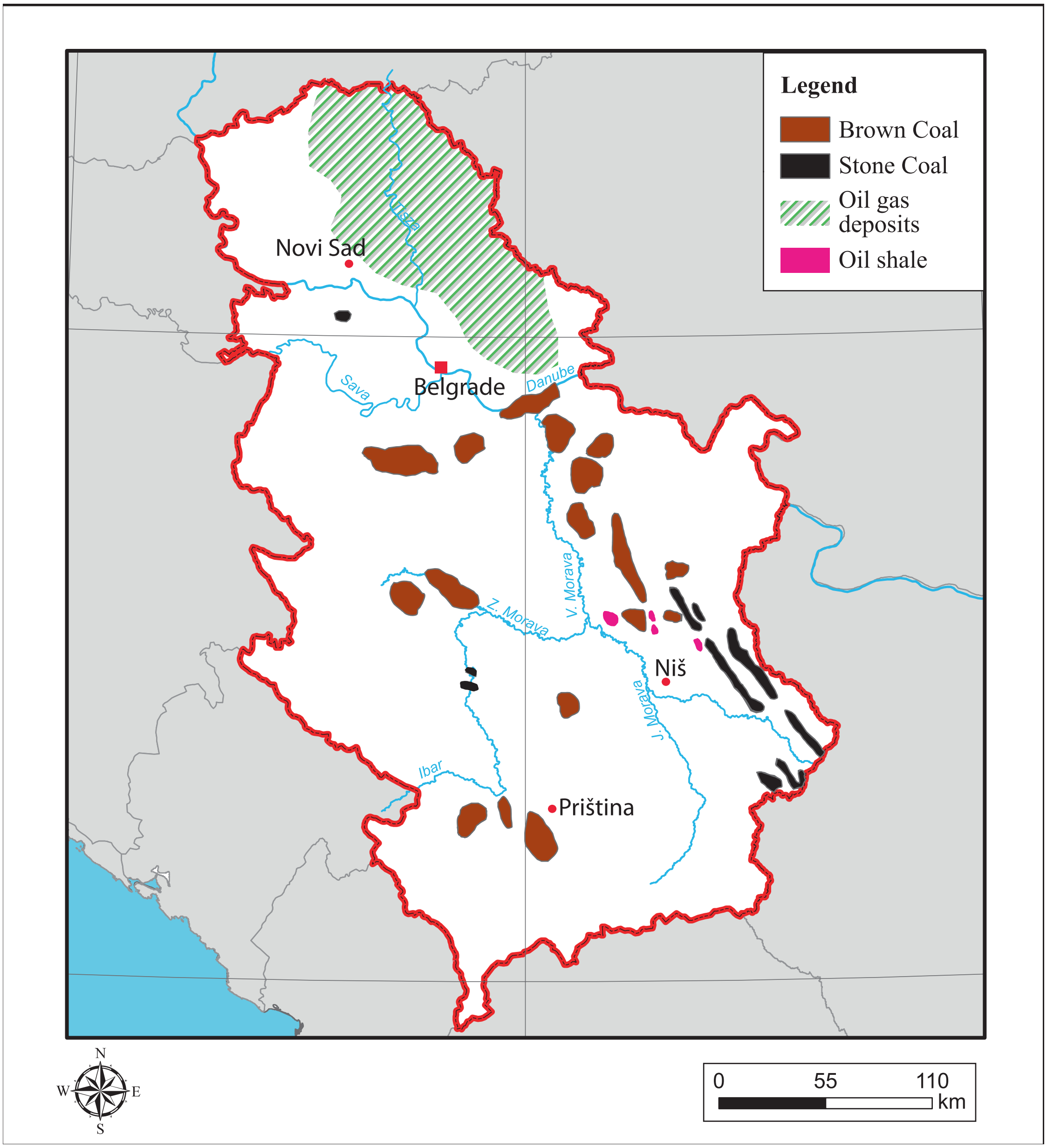



**Fig. 16.2** Energy resources in Serbia: fossil fuels deposits. (*Source*: authors' calculation based on data from the Ministry of Mining and Energy of the Republic of Serbia 2019)

41 m, and the maximal one is up to 110 m) (Živanović et al. 2014) (Fig. 16.2).

The largest coal basin in this region, as well as the largest in Serbia, is the *Kosovo basin* of the aerial extent about 5000 km$^2$. However, only its central part is coal-bearing. The exploitation of coal in this basin was undertaken by public enterprise "Open pits Kosovo – Obilić" included in the "EPS", and it lasted until 1999, when the United Nations peacekeeping forces entered this region. Afterwards the Serbian state authorities lost insight in production in this basin, and the ownership over the whole thermal-energetic complex at Kosovo and Metohija probably will be solved along with the status of this territory.

*The Metohija coal basin* covers the area of about 1700 km$^2$, but only 120 km$^2$ of it is explored (Živanović et al. 2014). The same is worthy for much smaller *Drenica coal basin,* which is squeezed between the two above-mentioned basins. There was no exploitation ever in these basins (the exploitation has never started as the Kosovo basin provided all domestic demands for coal).

Mines with underground exploitation of coal in Serbia are of notably smaller scale regarding reserves, as well as production rate (mines are governed by public enterprise PEU

"Resavica"). Hard coal in Serbia is currently exploited only in the Ibar basin (central Serbia) and in the mine Vrška Čuka (eastern Serbia) as a number of deposits are presumably exhausted (Jelenković and Mijatović 2014).

Although there is no exploitation, the deposits of the *oil shales* are of the particular importance. Deposits and occurrences of oil shales in Serbia are not studied enough, and reserves were proven only in the basin of the Južna Morava river (Aleksinac basin with the oil supply of 80 l/t and estimated reserves at 200 million tons kerogen (Vlada Republike Srbije 2011),and at Vranje basin (deposit Goč-Devotin) (Jelenković and Mijatović 2014; Aleksić and Kostić 2018; Kostić 2014a)) (Fig. 16.2). In other parts of the Serbia, deposits of only kerogen lower oil shales are detected.

*Oil–gas potentials in* Serbia are localized within the area of the Pannonian basin (Vojvodina) (Fig. 16.2), where were explored more than 90 boreholes conducted at over 260 deposits. Only one third is potential oil deposits, over 50% are potential resources for natural gas, and the rest represents a mixture of both (Jelenković and Mijatović 2014). Currently 63 are active fields with 666 drill holes (Ministarstvo rudarstva I energetike Republike Srbije 2019).

Geological research of oil and gas in Serbia practically were not employed before 1942. Research started upon Germans who bought all concessions for oil explorations in the Kingdom of Yugoslavia in 1939 (Jelenković and Mijatović 2014). After the World War II, the communist government renewed explorations in Vojvodina (the first drill holes in 1947), and later on in the central Serbia (Mačva and Čačak-Kraljevo basin), establishing the company "Naftagas" (named later "Naftna industrija Srbije - NIS"). In a meanwhile, the network for crude oil storage facilities and refinery capacities were built establishing suitable conditions for the development of energetic basis.

The same company has undertaken the explorations for oil and gas in the territory of present North Macedonia and Montenegro (coastline), as well as in Jordan, Tunisia, North Korea, China, and Algeria. In cooperation with international partners, the company was included in research in Gabon and Guinea (Dobrović et al. 2014). The overall explorations and the proceeded oil and gas exploitation in Serbia and abroad, as well as a major sales of petroleum products after privatization, received the Russian Company "Gazprom Neft" as the new owner (the company named "NIS Gazprom Neft"). This company also conducts research in the neighbouring countries, Bosnia and Herzegovina and Romania. Although the trade market of crude and refining oil products in Serbia is totally free, as being highly reliant on import, the prices depend on global market oil price, particularly on the oil type Ural. The company "NIS Gasprom Neft" shares 68% of large-scale trading and 35% of small-scale trading in Serbia (Vlada Republike Srbije 2011) including a network of shorter transmission lines in neighbouring countries: Romania, Bulgaria and Bosnia and Herzegovina.

Considering *natural gas*, gas deposits in Serbia satisfies only 20% of current domestic demands (deposits in Vojvodina, Fig. 16.2). Therefore, an import of this resource is inevitable (gas is mainly imported from Russia, indirectly over the company "Jugorosgas"). Currently, the gas transport is undertaken only over one pipeline, via gas pipeline Ukraine-Hungary. Attempts in providing stabile energy supply involved the extension of storage capacities in Banatski dvor in Vojvodina (to 700 million $m^3$ of gas) and the supplementary research for potential new storage-locations. Additionally, the alternative endows with gas along the other routes (transmission line "TurkStream", which is yet under construction, and which will deliver gas to Serbia from Russia again, running over the Black Sea, Turkey and Bulgaria). The deposit Banatski Dvor (Vojvodina) was transformed into the currently biggest underground gas storage in the region (established by two companies:the public enterprise "Serbiagas" and the company "Gasprom Germania", and under the authority of the "Serbiagas").

Petrochemical industry in Serbia was developed after the Second World War, and it is based on domestic and imported resources (this industry is now a part of the "NIS Gasprom Neft" company). Oil refining process is performed in two locations in Vojvodina (refines Pančevo and Novi Sad). The company "Gasprom Neft" exclusively produces the liquified gas and accompanying products while the company "Transnafta" is responsible for the oil and oil products transmission at law-determined prices in Serbia. Petroleum products are mostly sold by the company "NIS Gasprom Neft" and in lesser amounts upon other foreign companies, such as: "Lukoil-Beopetrol", "OMW Serbia", "EKO Serbia", "Intermol", "Petrol" and "AVIA", including a number of domestic branches.

### 16.2.1 Is There a Renewable Energy Option?

The potential of the renewable energy resources in Serbia is noticeable, but only a fifth part of the available potential resources has been exploited, out of which the most is the biomass consumption (particularly wood). The biggest current renewable energy potential is the hydro energy, geothermal energy and biomass resources, whereas the possibilities to implement solar and wind energy are less promising regarding quantity and limitation caused by climate conditions.

*Hydro energy potential* is the most used renewable energy resource for energy production in Serbia (total hydro energy potential of Serbia is 25,000 GWh/per year) (Vlada Republike Srbije 2011). Nonetheless, in terms of drainage river network, just a small number of water flows exceed hydro potential of 1000 GWh/yr. (Danube, Drina, Velika Morava, Lim and Ibar) (Filipović 1997). On the other side, in the hilly mountainous area in central Serbia, the smaller mountain streams that have been used mostly for population water supply show significant energy potential although this is ecologicaly very sensitive issue. The16 hydro power plants had been built up to now in Serbia, and they produce 10.5 TWh electric energy (installed capacity is 3000 MW). Along with smaller hydro power plants in average about 102 MW capacity, the hydro energy accounts for 24% in total production of electric energy (Ministarstvo rudarstva i energetike Republike Srbije 2019). The largest hydroelectric plant is "Đerdap I", which with the plant "Đerdap II" represent the largest producer of hydro energy in the southeast Europe (capacity 2192 MW). It is built on the Danube as a joint investment of Serbia and Romania. Usable potentials of hydro energy in Serbia are considerably higher revealing possibilities of constructing a small hydro energy plant in the last decade, particularly at the mountain river flows. However, the use of these potentials requires serious study concerning environmental impact due to multipurpose water use, inevitable changes in local habitats and climate changes.

Significant *geothermal resource* in Serbia, which attributes to insufficiently explored resources, occurs in abandoned and exhausted oil and gas boreholes in the territory of Vojvodina. Exploitation of geothermal energy actually begins in Vojvodina during 1970s (Stevanović 2014). However, considering the exploration rate and consumption quantity, the most valuable source of geothermal energy in Serbia is the spa Vranjska banja on the south of Serbia (the abundance of 80 l/s, temperature 92 °C). The most perspective geothermal resource is in Mačva in the northeast Serbia with the abundance of 170 l/s and average temperature about 70 °C.

Spatial water resources represent the thermal waters, which has been exploiting in 23 geothermal systems (Lazić and Milivojević 2014), having the largest application in balneology (59 spas in Serbia use thermal springs). According to current geological explorations, it is estimated that reserves of geothermal energy in Serbia are equivalent to thermal energy given by 550 million tons of oil (Lazić and Milivojević 2014).

Largely used source of renewable energy is *biomass* (biomass potential participates in the total renewable energy with 60%, whereas the largest part of it is biomass wood and agricultural biomass). Wood biomass is mainly exploited in the central Serbia, while the agricultural biomass is dominantly used in Vojvodina, although in negligible potential (about 2%) (Lazić and Milivojević 2014).

*Wind energy* in Serbia is of limited aerial distribution. It could be used in regions where periodical wind, such as košava is blowing (southern Banat in Vojvodina, eastern Serbia). These are the regions of the highest potential of the wind energy. Additional potential locations are eastern slopes of the mountain Kopaonik in the central Serbia, Zlatibor Mountain and the Pešter plateau in the western Serbia, as well as the mountain passes above 800 m (Vlada Republike Srbije 2011). However, the more systematic use of this renewable source is necessary to initiate the preparation of wind atlas for the territory of Serbia with clearly identified areas where wind farms will be of the highest economic potential (installed potential of wind capacities is 398 MW).

*Solar energy* is of much smaller implementation and potential although the territory of Serbia is exposed to Sun and of significantly higher sunny days than many of the European countries (1700 i 2200 hours per year). The usable potential of this resource in the electric energy generation depends most of all on technical possibilities of the electro power system in the country to accept this energy. Because of it, the use of solar energy is still in the development phase in Serbia (installed potential of solar power plants is only 9 MW).

Serbia currently has relatively good energy supply situation. However, the energy sector in Serbia is is under pressure by few challenges: relatively unfavourable participation of energy resources (currently in the primary energy production fossil fuels account for 81%, hydro potential with about 7%, biomass for 11%, while the all other resources participate with up to 1%, Ministarstvo rudarstva i energetike Republike Srbije 2019), low investments in technology and explorations, non-economic costs of electric energy, disparity between costs of energy and energy sources, irrational use of energy, organizing problems in managing in public enterprises with the "EPS"' as the biggest one, etc. In order to provide energy stabile system, Serbia needs to intensify construction of new energy facilities in the future as any delay could bring it in the import-depending position. Currently, the import energy dependency of Serbia is not so significant (around one third), but the sector of oil, oil derivates and natural gas has been highly import-dependant predominantly of one foreign partner. Serbia signed and ratified the Contract of the Energy Community Treaty through which it placed the basis for development of regional energy market and for its integration into energy market of the European Union as well. Priorities by 2030 are reconstruction of thermo energy plants (installed capacity of thermal energy plants is 4079 MW and with thermal-heating plants account in the total production of electric energy for 71%), the construction of new facilities based on coal and gas consumption, construction of reversible hydro energy plant "Bistrica" on the Lim river in the southwest Serbia, improvement of transmission and distribution energy network. All this is highly important if having in mind that the current production capacities in Serbia are minimally 25 years old and that the energy consumption increase is expecting in the following years. Additionally, the accession to the EU will require the implementation of several directives considering the energy sector too, among which the most important are the Directive 2001/80/E3 for reducing emission of polluted matters from huge heating facilities and the Directive 2010/75/EU on industry emissions for new projects and obligatory participation of renewable energy resources in final gross consumption.

## 16.3 Industry: The Legacy and the Future

After the Second World War, industry was regarded as the most important in the economic policy of Serbia, because the process of industrialization was considered the basis of transformation of the entire economic structure (see Chap. 14). The industrial production growth rates were on the rise well into the mid-1980s, when their values became exceptionally low (in the period 1981–1990, growth rate was 1%) (Savić 2017).

Modern Serbian industry is characterized by retrogression of most of the production capacities, high import of commodities, and unsatisfactory level of product and services' quality in comparison to the world standards. This situation reflected directly on the structure of the Serbian export, which was predominantly based on primary goods instead of on products of higher added value (see the Chap. 19). Today, the industrial base of Serbia consists of low added value products, while the needs for high-tech products are met mainly through import. Yet, in spite of it all, when observed by the structure of gross domestic product (GDP), industry in Serbia is still the most important economic activity (for the year 2018, the production industry sector had the highest share in GDP – 14.5%) (Republički zavod za statistiku 2020).

### 16.3.1 Serbian Industry in the First Decades of the Twenty-First Century

Political and economic events in the last decade of the twenty century (international embargo and NATO bombing) caused a sharp decline in the entire Serbian economy, and thereby industry as well (in the 1990–2000 period, industry had a negative average growth rate of 6.6%) (Vlada Republike Srbije 2006). The political changes of the year 2000 made the international position of Serbia more favourable and opened to the possibilities of recovering the Serbian economy. The industry sector rose the same year twice as high as the growth rate of the entire economy (11.1%), which was probably the consequence of the country rebuilding, higher investments, and launching the new production (Bošnjak 2002).

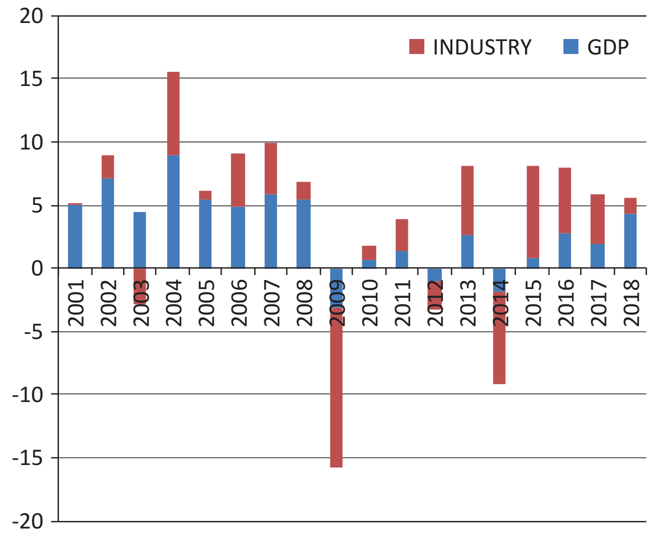



**Fig. 16.3** Industry and GDP growth rates in Serbia in the period 2001–2018. (*Source:* authors' calculation base on the data from Ministarstvo finnsija Republike Srbije 2019)

However, when the transition followed after 2000, the Serbian Government chose the model of development in which industry did not have so prominent role (Savić and Lutovac 2012). The average annual growth rate of the total industrial production in the period 2001–2018 was mostly low and amounted to just 1.15%, which was below the GDP growth rate of 3.09% (Ministarstvo finansija Republike Srbije 2019) (Fig. 16.3). This was the result of oscillations in industry growth rate year after year, which became more prominent in the period 2009–2018. The world economic crisis impacted the economic flows in Serbia as well (this impact was most evident in 2009), but the main reasons for such condition of the Serbian industry were the long-term negative trends (enormous import, very high growth of the services sector, and weakened industrial capacities). The negative short-term factors, such as the decline in the food and automotive industries also contributed to this condition.

The expectations that the market mechanism and free competition would start working all on their own were unrealistic, because a higher production by the privatized companies could not compensate the decrease in production caused by dysfunction of most of the other industrial capacities (Savić 2017). In addition, entrepreneurship was also developing inadequately, for it was not directed towards production sector, but mostly towards services. Undeveloped coordinating mechanisms for regulation of the country's economy were also causing additional problems, together with an inadequate and often non-existent industrial policy (no institutional frameworks for development of an innovative industrial sector, unproductive relationship between science, technology, organization, education and telecommunications with respect to production, and also incompetence of the companies to implement business and technological innovations, Jakopin 2011). All the attempts made with the purpose to change the attitude towards economic valorization of the innovations and their contribution to socio-economic development (such as privatization, rationalization, connecting and programming) were unsuccessful.

It is clear that the world economic crisis, which hit Serbia 2008–2009 represented a sort of demarcation line between the sequence of Serbia's seemingly successful economic growth and the period of poor economic results (Fig. 16.3). Although the statistics show partial recovery of industry and economy in 2010, this is above all the consequence of making comparisons based on the low staring points from the year before. Serbian industry became extremely sensitive to unfavourable effects of the second wave of the global crisis, especially due to slowing down of growth and financial difficulties in the Eurozone and also due to internal events (e.g. the floods in May 2014 only increased the negative growth rate of industrial production, which was −7.3% in that year, so a growth of investments of nearly 10% the following year and recovery of capacities led to the industrial production growth of 7.3% in the following year) (FREN 2016). Although the opposite was expected, the fiscal consolidation had a relative mild, but still negative effect on Serbian industry observed in the short run (see Chap. 14). Observed in the medium-term, the fiscal consolidation was one of the main factors of investments' growth in 2016 and also the reason why these effects also transferred to industry, but the chronic structural problems still were the main generators of the decline in industrial production. The industrial recovery is observable since 2015, and in the 2015–2018 period, the industrial production amounted to 4.42%.

The consequence of all the above-mentioned structural problems was a drastic decrease of the industry share in the structure of Serbian GDP when compared to the 1980s (at the turn of the twenty-first century, the industry share in the Serbian GDP was 44.5%, and 2008 it amounted to just 24.1%) (World Bank 2019). Serbia experienced deindustrialization, but it was nothing like the developed countries had experienced in the 1970s as the consequence of technological progress (Table 16.2).

As it usually accompanies the transitional processes, the employment in Serbian industry decreased after the year 2000 (in 1990, the industry hired 40% of the total employed workers, while 18 years later that number fell to 30.46%) (Statistical Office of the Republic of Serbia 2006, 2009).

A partial increase in the number of employees followed after the inflow of foreign direct investments and opening of new capacities, mostly due to the government help (system of subsidies) (Savić and Lutovac 2019). The government enforced laws that regulated how incentives were distributed (Vlada Republike Srbije 2016), in particular: a) Incentives for justified costs of gross salaries for new job positions related to the investment projects, and b) Incentives for justified investment costs of fixed assets. This type of government help is unsustainable for the future, and it will probably transform at the pace dictated by the process of accession to the European Union (EU). Generally speaking, the European Commission in the general recommends a decrease of the government help, and also a shift from the sector economy to achieving of horizontal goals related to employment, regional development, environmental protection, education, and research and development. Unlike EU, where the government help, on average, amounts to 0.6% of GDP, in Serbia it fluctuates between 2% and 3% of GDP (Komisija za kontrolu državne pomoći 2019). In this respect, Serbia should steadily decrease the levels of the government help in the following period.

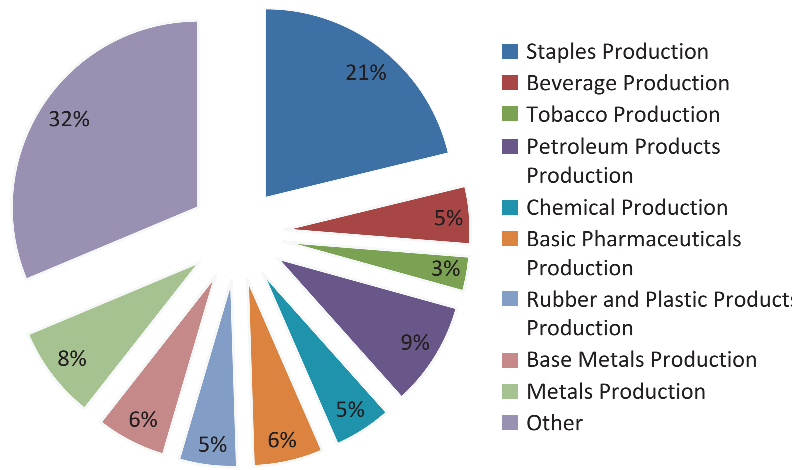
*Processing industry* makes the largest and the most important part of industrial production in Serbia. Its development in the first two decades of the twenty-first century accompanies the general tendency of the entire Serbian economy (mild recovery since the 1990s, downturn during the years of the world crisis, and variable growth rates in the years following the crisis). However, different dynamics of growth of individual industrial branches in this period has significantly changed the very structure of the processing industry (Fig. 16.4). The highest shares in the structure of processing industry as much as 60% of the total processing industry was staples, beverages, tobacco production, chemicals and chemical products manufacturing, and base metals and metal products manufacturing (FREN 2005).

**Table 16.2** Industry share in GDP in Serbia and other the countries in transition

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| Serbia | 30.8 | 29.4 | 27.7 | 27.0 | 25.4 | 24.5 | 24.4 | 23.5 | 24.1 |
| Slovakia | 32.2 | 31.5 | 30.9 | 31.6 | 32.4 | 32.1 | 34.8 | 34.1 | 34.4 |
| Slovenia | 30.6 | 30.6 | 30.1 | 30.4 | 30.4 | 29.9 | 30.3 | 30.8 | 29.9 |
| Poland | 28.9 | 27.5 | 26.7 | 27.5 | 29.0 | 28.8 | 29.0 | 29.0 | 29.1 |
| Hungary | 27.0 | 27.1 | 26.7 | 26.1 | 26.5 | 26.9 | 27.1 | 26.6 | 25.7 |
| Czech R. | 33.9 | 34.3 | 33.3 | 32.6 | 34.1 | 34.1 | 34.7 | 34.6 | 34.2 |

*Source:* World bank 2019

**Fig. 16.4** The structure of processing industry by individual activities, 2018. (*Source:* authors' calculations based on the data from the Statistical Office of the Republic of Serbia 2018)




### 16.3.2 Deindustrialization and the New Industrial Geography

The fast growth of base metals production in Serbia at the beginning of the twenty-first century followed soon after the largest Serbian production capacity for ferrous metallurgy – "Sartid" from Smederevo – was sold in 2003 to the American company "US Steel". After that the production of iron and steel in Serbia exploded by an incredible 65% in the period 2003–2005 (FREN 2005) (see Chap. 14). Traditional industrial branches, such as textile industry and leather and shoes industry, decreased their shares in the structure of processing industry during the period 2001–2009, while the share of chemical industry arose more than 10% (Vlada Republike Srbije 2011). All this influenced over industrial geography, too.

During the Yugoslav period, Serbian industry was located in several large industrial centres that were developed based on the socialist self-management system plans. Belgrade was one of the largest industrial centres (automotive, food, pharmaceutical industry, engineering, textile and military industry). On the other hand, the automotive industry was predominantly located in the central part of the country – the town of Kragujevac – and it connected Serbia with the Western producers: the company "Zastava automobile" (Kragujevac) produced car models licenced by the Italian manufacturer "Fiat". The companies "Ikarbus" (Belgrade) and "FAP" (Priboj in the western Serbia) produced busses licenced by the German companies "MAN" and "Swiss Saurer". Since this massive industry needed a wide scope of cooperation, it had suppliers from all over ex-Yugoslavia. In a very short time, these companies discovered that they could be expanded from domestic market and they started exporting, mainly to Western Europe. The importance of co-operants and also the need to connect with them, caused the forming of industrial clusters as early as 1970s and 1980s. In Serbia, these were automotive industry and military industry clusters founded in the towns of Priboj, Kragujevac and Kruševac (Central Serbia). Proportionally to the available resources regarding agricultural production and oil and gas deposits, Novi Sad – the capital of autonomous province of Vojvodina had developed: food industry, vehicles production ("Neobus"), chemical industry ("Albus") and petrochemical industry ("Naftna industrija Srbije" refinery). Besides the above-mentioned towns, chemical industry was also located in Šabac (north-westers Serbia), Leskovac (south Serbia) and Kruševac (central Serbia). To the north of the country, the town of Subotica was the industrial centre of textile, furniture, electrical, food and mechanical engineering industries.

The deindustrialization period in the 1990s resulted in closing of a large number of industrial capacities, even the very industrial centres throughout the country. In the years of recovery of the Serbian economy after the 2000, some of industrial branches were renewed (privatization), and new capacities were opened (investments). However, the rehabilitation of the old industrial centres, that had at least one large production capacity, was indeed slow and difficult to perform. In addition, new investments were "searching" for as favourable as possible factors for localization into their own productions, and when Serbia is concerned, this meant exploiting the cheap and relatively qualified work force. The sector of *small and medium-sized enterprises (SME)* was being more intensively developed (as of 2001, this sector attracted almost 10% of direct foreign investments in the country), and approximately 70 international companies invested more than 2.1 billion Euros and created over 40,000 job positions in this sector (Razvojna agencija Srbije 2019) (see Chap. 14). However, the importance of industry could not be reinstated by the investments in the SME alone. Due to this, numerous analyses using the methods of product space analyses (not just Serbian, but the ones in the region as well) have given recommendations that industrial investments should be directed towards the branches that enable inclusive and sustainable growth (OECD 2019). For Serbian economy, several branches with a *short-run* profit were identified: food industry, building materials industry and metallurgy (grinding and sowing machines, industrial lubricants and aluminium products were marked as the most perspective products). On the other hand, industrial branches with the most long-term potentials were identified: the mechanical engineering branches (automotive parts are the most relevant products with the long-term potentials concerning the value of export, while eight out of ten best export products are in the machines category). Following precisely such recommendations and also the desire to "revive"" some of the old industrial centres, one of the largest investment projects in Serbia industry was launched: the investment of the "FIAT" company into the old automotive industry centre – the town of Kragujevac. The company "FCA Serbia" was formed, and in 2014 it produced more than 100,000 pieces of the FIAT 500L type vehicle and generated almost 1.4 million Euros of turnover, taking the number one place on the list of the largest exporters in Serbia (Automotive industry Serbia 2019). The advantages of investing in *automotive industry* in Serbia were the tradition and knowledge, cost-effectiveness, logistic position and government support for investments in the industry, relatively low labour cost, low operating costs, solid infrastructure, possibilities for free trade and the lowest tax rates in Europe. This project also attracted a number of car parts manufacturers who built their factories in a specially designed park for suppliers in Kragujevac (chassis parts, electrical components, and cast engine parts productions within the companies such as "Adient", "Magneti Marelli", "Gruppo Proma" and "Sigit"). Today, automotive industry of Serbia contributes to the country's export in the amount of approximately 2.1 million dollars, and most of the car and automotive parts are exported to Germany, Montenegro and the United States. However, the world automotive industry crisis, and especially certain negative processes that several European car manufacturers faced, put the Serbian factory "FCA Srbija" into an unenviable position with still unclear future (the production of FIAT 500 L model is decreased, and the beginning of the new model production, which was announced at the very arrival of Italian company, is still being delayed).

The proof that Serbia has worked hard in the past two decades to establish a favourable business climate are substantial investments in industrial capacities, such as investments of the following companies: "Michelin" (reinvested in Serbia), "IGB", "Grammer", "Draexlmaier", "Leoni", "Yura", "Continental" and "Johnson Electric". However, most of these capacities are related to the production of components in which cheap labour is the key localization factor, while the capacities with technological innovations that would incite new production cycles in Serbian economy are rare.

As mentioned above, *food industry* is marked as one of the strongest branches of the Serbian economy that could produce significant feedback effects in a short period of time. Serbia is the largest exporter of food products among CEFTA countries (see Chap. 19). Traditional fruit production represents an enormous potential for the Serbian food industry (domestic raw materials and price competitiveness), and meat processing should not be neglected, having in mind that it still did not gain the full swing that should be expected considering the Serbia's potential in the agricultural sector (see Chap. 15). However, complying of the Serbian food industry with the EU standards certainly is and will be a significant challenge in the future.

The last but not the least important is the *software and ICT industry* (information and communications technology). The shortest description of Serbian IT market would be the following: enormous potential for growth at a small basis. Serbian IT industry is significantly more profitable than other industries (the profitability index of the IT sector per employee is 636% of the total profitability index of the Serbian economy) (Matijević and Šolaja 2018). This sector needs substantially less resources than other sectors, and the net assets per employee are close to 47% of the total net asset economy. This practically means that one employee in the IT sector with a half of average resources makes six times larger profit. In addition, the liquidity of Serbian IT companies is twice as high as the average liquidity in the economy, while debts and bank loans are at the level of 47% of the average. At the same time, Serbian IT companies have the largest gross profit – 150% of the Serbian average (Matijević and Šolaja 2018). There is also an important social factor of the IT sector development – greater possibility that the IT experts will stay in Serbia (Serbian IT industry absorbs the most part of the experts from this and similar fields).

In 2016, Serbian IT industry consisted of 2048 active companies, while their 21,514 employees represented 1.4% of the total work force (Matijević and Šolaja 2018). Employment grew by 10% comparing to the previous year, exclusively as the result of growth of the export-oriented IT companies. Each year, 200 new IT companies are registered in Serbia. However, 9 out of 10 largest IT companies are foreign companies, so the value-added chain closes outside of Serbia. The majority of the newly founded companies hires programmers oriented towards international IT market. The largest concentration of them is in Belgrade, followed by Niš and Novi Sad – the cities that have the densest concentrations of university institutions and scientific institutions.

Looking at the structure, the software subsector is dominant in Serbian IT industry with 1238 companies, which makes 60% of the total companies in IT industry, and they made more than 1.8 billion Euros of income in 2016. Based on the previous research, it is estimated that the income made from hardware, software, and IT services generates 75% of the ICT industry (almost 1.3 billion Euros), while the remaining 25% is generated from convergence and non-ICT products. The most part of the income, around 35%, is generated in the wholesale and the subsector of retail, followed by the subsector of software with 30% and the subsector of IT services with 28% (Matijević and Šolaja 2018). Yet, even with such potential and importance of the IT industry, Serbia still did not manage to develop this sector in the expected proportions. The biggest problem is that the Serbian IT sector is not dominated by creating new IT solutions oriented towards domestic economy, but mostly by hiring of relatively cheap educated workers in foreign companies that outsource a part of or their entire production to Serbia.

Although facing numerous problems, Serbian industry has the potential to join the regional and global supply chains, resting above all on four strategic sectors (agricultural products and staples industry, metal-processing industry, automotive industry and mechanical engineering sector with a regard to the IT sector). However, for any further development, Serbian economy will have to make some serious structural reforms.

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# 17 The Transport Sector in Serbia

Ivan Ratkaj


## Abstract

Serbia enjoys favourable geographic position at the crossroads of the main routes linking Central and Western Europe with the southeast of the continent and the Middle East. However, being on the outside borders of European Union, it has not fully benefitted from this geographic leverage. In this respect, the process of integration into the EU is of great importance, accompanied by international transport projects, ranging from pan-European corridors defined during the 1990s to the more recent extension of the trans-European transport network and the core network corridors to the Western Balkan region. These projects have highly influenced Serbia's transport policies, which aim to upgrade the national transport system according to EU standards and to achieve complete integration into the single European market. A commitment to these goals implies costly infrastructural investments and non-physical improvements in all transport modes, as well as in their efficient interconnectivity and interoperability being embodied in the growing relevance of intermodal transport flows. However, in a country with a relatively deteriorated transport infrastructure, such as Serbia, an excessive focus on the national transport system may worsen intraregional, socioeconomic disparities by neglecting local transport initiatives and the needs of deprived areas.



## Keywords

Transport corridors · Trans-European transport network · Transport investments · Infrastructure development · Transport integration · Transport policy



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Serbia's relevance in international transport, which should result from its favourable geographical position at the crossroads of the shortest transport routes from Central and Western Europe to the Middle East (Grčić and Ratkaj 2006), has been partially inhibited by the external borders of the European Union (EU) and the Schengen area. However, the enrolment process of integration into the EU requires Serbia to upgrade its transport system and to make it fully complementary and interoperable with the EU transport system, enabling it to experience more benefits of this geographic position. The relatively slow but steady improvement of Serbia's transport system started with political changes in 2000.

Of particular importance for Serbia has been the long-term project of pan-European transport corridors, defined in Crete in 1994 and amended in Helsinki in 1997 (at the second and third Pan-European Transport Conference, respectively; more information on the corridors is available in: European Commission 2000). This corridor project was further developed through the Transport Infrastructure Needs Assessment (TINA) process, designated to coordinate the progress of a transport network within the territories of EU candidate countries (European Commission 1999). Due to the EU enlargement process, most corridors became integral parts of the trans-European transport network (TEN-T) (Dionelis et al. 2008). Finally, within the framework of the Berlin diplomatic process and the Connectivity Agenda (European Commission 2015), the Western Balkans region, including Serbia, became part of the projected extension of the TEN-T core and comprehensive network in 2015. In order to strengthen the integration of the West Balkan region with the EU transport market through the establishment of common standards in terms of transport quality and efficiency, including the alignment of transport legislation, the European Commission has dedicated up to €1 billion to the Western Balkans Investment Framework (WBIF). The intention of this aid was to help connectivity investment projects and provide technical assistance in the transport and energy


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sectors for the period of 2014–2020, with the first connectivity grants being awarded in 2015 at the Vienna Summit (SEETO 2018). These integrative efforts resulted in the Treaty establishing Transport Community, signed by the EU and six regional partners in 2017 (Treaty 2017), as the successor of the Memorandum of Understanding on the Development of the South East Core Regional Transport Network and the South Eastern European Transport Observatory (SEETO) (Memorandum of Understanding 2004), with the aim of promoting cooperation between the states of the region in the transport sector and to support the development of a fully integrated transport network within the region, as well as between the region and the EU.

Two out of ten pan-European corridors pass through Serbia: corridor VII (Danube River) and corridor X, which starts in Salzburg and enters Serbia on the west via Ljubljana and Zagreb, passes through Belgrade, and leads southward via Niš to Skopje and Thessaloniki. This corridor has two branches: branch Xb, which links Belgrade and Novi Sad with Budapest; and branch Xc, leading from Niš to Sofia, and further, via corridor IV, towards Istanbul (Fig. 17.1).

However, while most of the pan-European corridors became part of the EU TEN-T, Serbia and some neighbouring countries lagged behind, failing to benefit from the initial integrative momentum and exploit the comparative advantages that came with the corridors project, mainly due to the complex intraregional political circumstances. This is particularly true for corridor X, designed as a potential backbone of the South Eastern European transport network. It lost its primacy in favour of the competitive corridor IV, which offers an alternative connection between Central and South East Europe, and further with the Middle East. The extension of the TEN-T network in Serbia includes, in addition to corridor X with its branches, seven routes for road transport and six routes for rail transport. The TEN-T network in Serbia also includes inland waterways, namely the Danube (pan-European corridor VII), Sava, and Tisa rivers with ports in Belgrade and Novi Sad, as well as airports in Belgrade, Niš, and Priština (Fig. 17.1).

It is expected that nodes on the TEN-T network in Serbia will gain advantages based on their improved transport services and accessibility. Particularly important is the location of the City of Belgrade, where three TEN-T core network corridors (CNCs) merge – the Mediterranean, Orient – East-Mediterranean, and Rhine-Danube corridors – connecting the pan-European corridor X with its branch Xb, TEN-T Route 4, and the Danube waterway (corridor VII). On the other hand, there is a vast area in Serbia, located outside of the transport axes that are prioritised by the international agendas, which experiences a severe lack of investment in

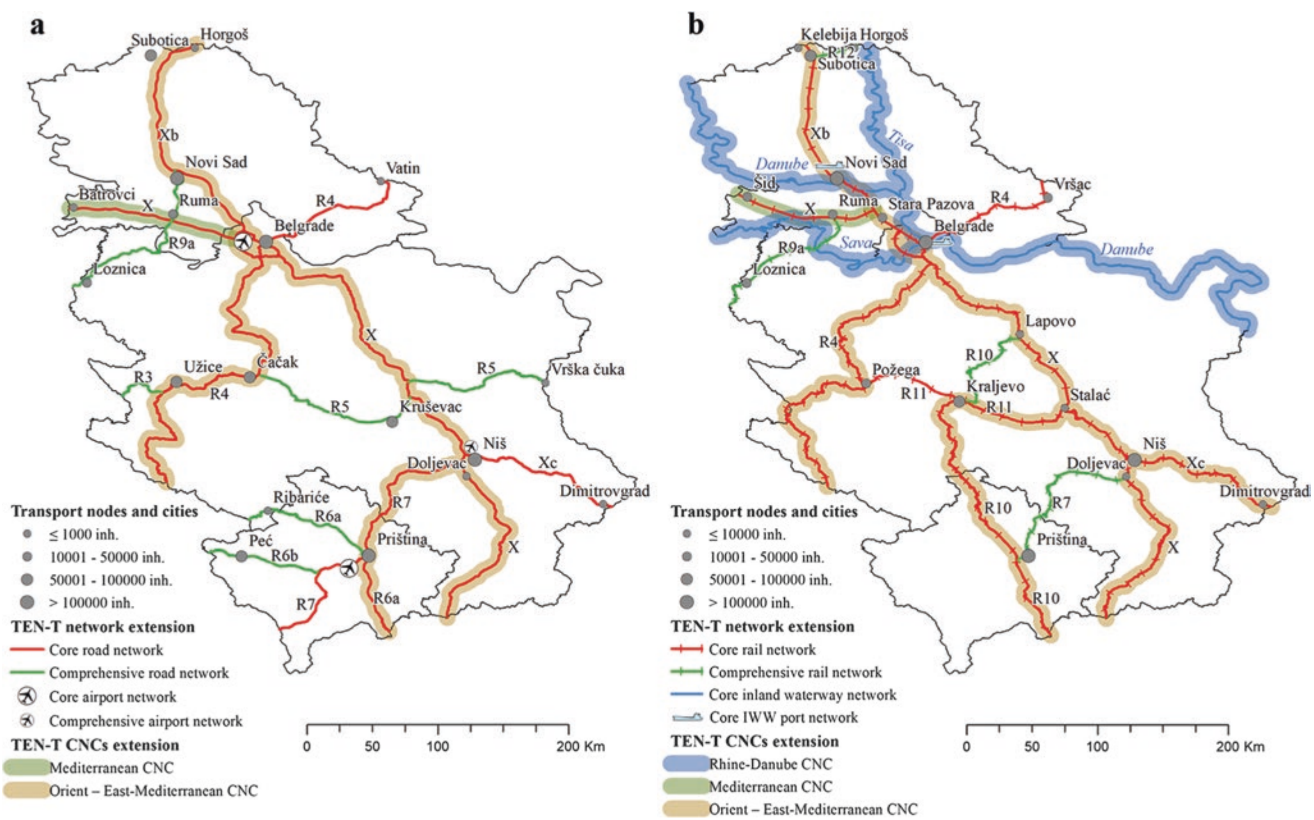


**Fig. 17.1** TEN-T core and comprehensive network extension in Serbia: (**a**) road and airport networks, (**b**) rail and waterway networks. (*Source*: author's calculation based on data from SEETO 2018, European Commission 2016)

transport infrastructure and services. This is reflected in low accessibility levels, accompanied with economic decay and depopulation. In order to stop the further decline of such disadvantaged areas, an altered approach in the national transport policy is required – policies that will alleviate Belgrade primacy and promote a more balanced, polycentric urban system by integrating transport networks of national (and international) importance with lower ranked networks that provide development opportunities for areas distanced from the main transport flows.

The indicative extension of the TEN-T in the Western Balkans stands as the framework for a large number of national transport strategies and projects in the region. The main issue Serbia has to deal with, in the framework of this international initiative, is not the density or total length of the transport infrastructure but its poor quality, which is the result of long period of neglect. However, solving transport bottlenecks in Serbia, as well as in the region, will not only involve costly physical (infrastructural) improvements. In order to eliminate bottlenecks and obstacles affecting transport system performance, significant non-physical improvements are also needed. These improvements require so-called soft measures, such as regulatory, institutional, and managerial changes, which are related to long border crossing times, transport safety, environmental protection, and other issues (El-Hefnawy et al. 2015).

## 17.1 Road Transport

Roads in Serbia are categorised, according to the criteria of importance, as national roads (I and II class) and municipal roads (providing local accessibility). Regarding road network density, Serbia meets EU standards. However, unsatisfactory pavements and other unfavourable technical attributes heavily influence the quality of road transport, especially on municipal roads, which comprise 66.3% of the total road network length in Serbia (44.239 km in 2017) (Republički zavod za statistiku 2019). Keeping in mind the fact that road transport is the dominant land transport mode, especially in passenger transport, as it represents 91.9% of total passenger-kilometres, the issue of the relatively outdated infrastructure is of particular importance. Since the 1990s, local administrations have been left with insufficient resources to maintain or upgrade the transport infrastructure, causing most of the sparsely populated rural areas to become increasingly isolated from the main urban centres. This problem is hard to address, not only because of limited financial resources, but also due to the unbalanced settlement distributions relating to the size and concentration of populations in several urban centres. Under the current economic circumstances, it is difficult to imagine providing adequate road infrastructure and transport services to all the small rural settlements (over 4500 in total), especially considering their spatial dispersion and often difficult terrain in Central Serbia. A low level of transport accessibility is frequently followed by a lack of other important public services and prosperity opportunities, pushing vast rural areas further into the vicious circle of depopulation and decay.

The volume of freight transport by road in Serbia in 2017 was 4980 million ton-kilometres, participating in inland freight transport with 55.4% (Statistical Office of the Republic of Serbia 2018a), in comparison to 76.7% in the EU (Eurostat 2017). Transit the importance of Serbia in freight transport (as well as in passenger transport) significantly declined with the accession of Romania and Bulgaria to the EU and the hastened construction of pan-European corridor IV. International road freight amounted to 4.9 million tons in 2017, and transit participated with only 48 thousand tons, or 1% (Republički zavod za statistiku 2019).

There are high transport flows, with over 15,000 average annual daily traffic (AADT), on pan-European corridor X with branch Xb and on some sectors on Route 4, particularly between major urban and economic centres and in the zone that strongly gravitates towards Belgrade (Fig. 17.2).

There is only one sector with AADT higher than 30,000, stretching from the Belgrade bypass road towards the southeast. High AADT observations largely correspond to the network of motorways. In 2017, there were 963 km of motorways in Serbia (Republički zavod za statistiku 2019), almost exclusively on corridor X. However, this indicator is rapidly changing, since it is in the Serbian transport development agenda to upgrade most of TEN-T network extensions to the motorway level. The accomplishment of this agenda will most likely result in increased traffic volumes on the main Serbian road arteries due to the releasing of infrastructurally supressed transport demand, but it may also contribute to more polycentric development, decreasing pressure on the Belgrade agglomeration area and strengthening the competitiveness of other urban centres.

During the past two decades, Serbia clearly prioritised the completion of motorway construction on all sectors on corridor X, along with branches Xb and Xc, which was finalised in 2019. Another prioritised, long-term project on corridor X is the completion of the Belgrade bypass, which is projected to happen in 2021. Upgrading corridor X to EU standards should facilitate domestic transport, as well as enhancing the role of Serbia in international flows and improve its accessibility to the EU market, generating opportunities for economic growth, mainly through FDI, whose location decisions are highly influenced by advanced transport infrastructure.

Additionally, in accordance with the EU and regional agendas and studies (European Commission 2015; El-Hefnawy et al. 2015), as well as with the general master plan for transport in Serbia (Italferr S.p.A. 2009), priority

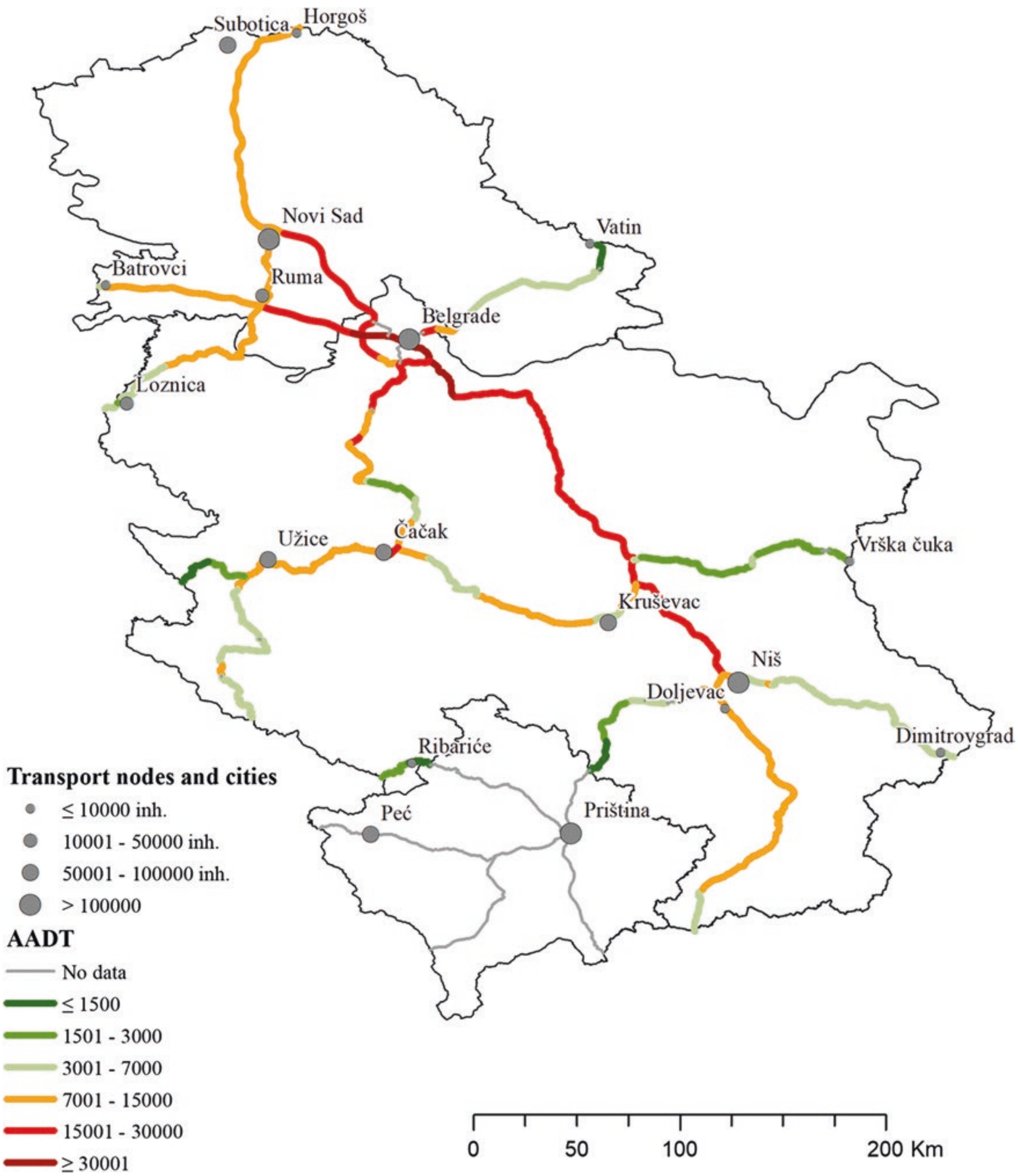


**Fig. 17.2** Average annual daily traffic (AADT) on the TEN-T indicative extension (road network), preliminary data for 2017. (*Source*: author's calculation based on data from Roads of Serbia 2017)

projects involve infrastructural investments in the Orient – East Mediterranean corridor and the indicative extension of the TEN-T core network (Fig. 17.1). Namely, this includes Route 4 (to be upgraded to the motorway level), which intersects corridor X in Belgrade and connects Serbia with the Romanian border and further with corridor IV to the east, and with Montenegrin port of Bar and the Adriatic Sea to the south-west, as well as Route 7 (to be upgraded to a half-profile motorway in the Serbian sector), starting on corridor X near Niš, running through Kosovo and Metohija, and Priština, to Lezhë on the Albanian seacoast. In addition, projects relating to TEN-T comprehensive links are being focused on, primarily on Route 5 (the construction of a motorway) in the Pojate – Preljina section, connecting corridor X and Route 4, as well as infrastructural improvements of Route 3 towards the border with Bosnia and Herzegovina, which should enable connection to the Vc corridor, Route 6b that connects Priština with Route 4 in Montenegro, and the construction of an expressway on Route 9a, stretching from Novi Sad and corridor Xb, crossing corridors X and Vc, to

Banja Luka in Bosnia and Herzegovina (SEETO 2018, European Commission 2018a). While some of the transport bottlenecks can be solved by the rehabilitation and improvement of existing roads, some need the construction of entirely new sectors.

However, complete upgrade of road transport also requires implementation of "soft measures". Existing road transport efficiency is significantly reduced by time-consuming and complex border procedures. It should be noted that long waiting times at the borders also increase the cost of road transport. Duplicated controls on drivers, passengers, and vehicles may be avoided through joint control, while it is also necessary to align customs legislation. Regarding road transport safety, particular efforts need to be made in Serbia. The number of road traffic fatalities in Serbia was 579 in 2017, or 82 per million inhabitants (Agencija za bezbednost saobraćaja 2018), while in the EU it was significantly lower – 49 per million inhabitants in 2017 (European Commission 2018b). Among the EU states, only Romania (98) and Bulgaria (96) had more fatalities than Serbia, while the lowest fatality rates were recorded in Sweden (25), the Netherlands (31), Denmark (32), Ireland (33), and Estonia (36). Unfortunately, there was no stable trend of decreasing numbers of fatalities during the last five years (Agencija za bezbednost saobraćaja 2018).

## 17.2 Rail Transport

The overall railway network length is satisfactory regarding the territorial size and population of Serbia. However, not all areas are covered equally by the railway network, as its density significantly decreases towards the southern parts of the country. In general, the Serbian railway system is in poor condition. Old and deteriorated tracks, combined with additional severe limits, such as the prevalence of one-track sectors, insufficient electrification, frequent intersections with roads, and mostly outdated rolling stock, eradicate most of the competitive advantages of this mode over road transport.

Out of 3764km, which is the total effective length of railway lines in Serbia (2017), 34% is electrified and only 8.6% is double-tracked (Republički zavod za statistiku 2019). While 53.7% of railways in the EU are electrified, this indicator varies significantly among states, ranging, in Serbia's neighbouring EU countries, from 71.2% in Bulgaria to 37.2% in Croatia and, in non-EU countries, from 89.3% in Montenegro to 0% in Albania (European Commission 2018c). An axle load of more than 20 tonnes is allowed on 48% of the Serbian railway, while maximum speeds exceeding 100km/h are only permitted on 34km of the network (speeds between 91 and 100km/h, which are close to the TEN-T standard, are allowed on 415km or 11.1% of the network) (Republički zavod za statistiku 2019). The only double-tracked and electrified railways are in corridor X, from Belgrade to the border with Croatia and from Velika Plana to Niš (with the exception of the Stalać–Đunis sector), but these tracks also have sections in bad condition, which can temporarily severely limit operational train speeds to 20km/h (Strategija 2008). The railway fleet is modest in numbers and quite old; 92.5% of the locomotives, 71.8% of the passenger cars and motor trains, and 83.1% of the freight cars were manufactured before 1990 (Republički zavod za statistiku 2019).

The total inland passenger transport (in passenger-km) of the railway was 8.1%, while its share of freight transport (in ton-km) was 36.6% in 2017 (Statistical Office of the Republic of Serbia 2018a). Regarding passenger transport, the railway is mainly used within national boundaries, since out of 5.6 million rail passengers, only 5.2% were on international journeys. International transport has a higher importance regarding freight, and out of 12.4 million tons of transported freight, 74.1% was being transported internationally (Republički zavod za statistiku 2019).

Railway transport in Serbia was completely under the jurisdiction of the single state-owned company *Železnice Srbije* until August 2015, when the Serbian government completed the process of unbundling this vertically integrated company into holding company, responsible mainly for engineering and technical consulting activities, with three subsidiaries: *Infrastruktura železnice Srbije* responsible for the management of national railway infrastructure; *Srbija kargo*, the national cargo railway company; and *Srbija voz*, the national passenger railway transport company. It is also important to note that Serbia started to adjust its railway transport to EU standards and adopted an policy of non-discriminatory access and usage in the infrastructure in 2018 (Zakon 2018).

In order to reach TEN-T standards by 2030, the complete core rail network in Serbia has to be electrified, to allow axle loads of 22.5 tonness, speeds of 100km/h, and 740m-long trains. It also has to be equipped with the European Railway Traffic Management System (ERTS), which is designed to replace different national train control and command systems and provide full interoperability across Europe.

One of the main disadvantages of the core rail network in Serbia is related to the number of tracks, since a large share of lines have a single track. However, this parameter (number of tracks), as well as maximum speeds allowed, does not imply a lack of interoperability between networks at the international level. The main interoperability issues involve differences in allowed maximum train lengths and maximum axle loads, as well as insufficient electrification and the absence of the ERTMS. These significantly increase travel times and costs, reducing the efficiency and comparative advantages of rail transport (European Commission 2017a).

Serbian railway transport efficiency is further endangered by delays in sectors with high (65–80%) or critically high (above 80%) capacity utilisation levels, as was indicated in the update of the Regional Balkans Infrastructure Study (REBIS) (El-Hefnawy et al. 2015). According to this study, most of capacity bottlenecks are found on a north-south axis, involving corridors Xb and X, from the Hungarian border to the north, through Novi Sad, Belgrade, and Niš, towards the border with North Macedonia to the south. The plan is to overcome these bottlenecks by constructing new two-tracked lines, or to modernise and construct of additional tracks. Some major infrastructural upgrading work on this axis has begun with funds provided by the European Bank for Reconstruction and Development (EBRD) and in cooperation with companies from China and Russia.

Serbia accepted the fact that it is in its strategic interests to modernise the entire railway corridor X and the Xb branch with successive upgrade projects, aiming to establish a double-tracked railway, with maximum operating speeds of 160km/h (Italferr S.p.A. 2009). The ongoing upgrade process of the Belgrade railway node in this corridor also requires a significant investment, with separate lines and terminals for freight and passenger transport, including the construction of a southern freight bypass towards Pančevo with a road-rail bridge over the Danube River. Other projects include the reconstruction and electrification of the single-track railway on corridor Xc, the reconstruction and modernisation of Route 9a (from Ruma to Loznica and the border with Bosnia and Herzegovina) (SEETO 2018), the successive modernisation of Route 4 with the section from Belgrade towards Montenegro being prioritised, and continuation of the construction of the railway between Valjevo and Loznica that will interconnect Route 9a and Route 4 (Fig. 17.1).

The benefits from expensive investments in transport infrastructure directed towards solving physical bottlenecks cannot be fully realised without other measures, including the implementation of interoperable IT systems, such as ERTMS, as well as the liberalisation of the rail transport market and the simplification and speeding-up of border-crossing procedures. Border-crossing measures for both passenger and freight transport should be improved through better communication and organisation, bilateral agreements, and the modernisation of equipment (European Commission 2017a).

## 17.3 Inland Waterway Transport

For landlocked countries such as Serbia, inland waterway transport is of particular importance. The total length of the inland waterway system in Serbia, at average water level, is approximately 1600km. Its main components are the international rivers Danube, Sava and Tisa (with a total length of 963km), as well as navigable canals within the hydro-system Danube-Tisa-Danube in Vojvodina (with a total length of 522km) (Republički zavod za statistiku 2019). There are twelve river ports, out of which nine are on the Danube, two on the Sava, and one on the Tisa. The indicative extension of the Rhine-Danube TEN-T core network corridor to the Western Balkans includes the waterways of the Danube (pan-European corridor VII), Sava, and Tisa rivers, and four ports, of which two are located in Serbia – the ports of Belgrade and Novi Sad (Fig. 17.1). These waterways and river ports are also identified as a core inland waterway extension of the TEN-T.

However, the usage of natural, hydrographical potential for transport purposes is at relatively low levels in Serbia, with large fluctuations between years. In 2017, inland waterway transport contributed to the total freight land transport (ton-kilometres) with slightly over 8%, compared to 11.1% in 2016 (Statistical Office of the Republic of Serbia 2018a). The most employed river port in Serbia in 2017 was the port of Smederevo on the Danube River (downstream from Belgrade), with over two million tons of throughput, as a result of the increased import of iron ore and coal for the needs of the steel mill in Smederevo (the throughput almost doubled in comparison to 2016) (Agencija za upravljanje lukama 2017).

Out of 1.4 million tonnes in inland waterway transport in 2017, 49.7% was domestic transport, 40.9% for import, and 9.2% was export, with insignificant transit volume (Republički zavod za statistiku 2019). According to the 2017 data, rock, grain, sand, clay and other products of mining and quarrying highly dominate the domestic transport, making up 90%. The imports are almost exclusively composed of a single good: the iron ore, making up 95.7%. On the other hand, export numbers are more balanced, with 37.2% of black metallurgy products, 29.4% of nitric compounds and mineral fertilisers, 20.1% of grain, and 9% of rock, gravel, sand, clay and other products of mining and quarrying (Republički zavod za statistiku 2019). In general, the nature and volume of inland waterway freight transport in Serbia are defined by several industrial centres on the Danube, such as the steel mill in Smederevo, plants for the production of nitric compounds and mineral fertilisers in Prahovo (east Serbia) and Pančevo (near Belgrade), petrochemical plants in Pančevo and Novi Sad, and a cement factory in Beočin (Vojvodina). The advantages of waterborne transport are also enjoyed by gravel pits in the vicinity of waterways and well-developed grain production in the Pannonian plain.

Container transport on Serbian inland waterways as well as on the whole Danube River is of marginal significance. Attempts to establish container lines from Constanta in Romania to the ports in Austria have failed, as they are uncompetitive compared to rail transport, mostly because the critical container volumes could not be reached, with frequent empty journeys in one direction. This issue is additionally stressed by the low density of container terminals on the Danube and unreliable fairway conditions (European Commission 2017b). However, this does not prove that the advantages of cost-efficient inland waterway transport cannot be realised by encouraging the development of intermodal transport, with modern, equipped ports as the transhipment points in transport chains, connected to roads and railways and capable of handling different types of freight, from bulk and general cargo to containers.

Passenger transport on Serbian inland waterways is underdeveloped, although it shows a slight but steady increase, which, however, cannot compete with that in sectors between Passau and Budapest (e.g. there were 7606 ship dockings with 709,185 passengers processed at ports in Vienna in 2018; Via Donau 2019). Out of five passenger terminals in Serbia, the most active in 2018 were those in Belgrade (587 dockings with 81,155 passengers), Novi Sad (347 dockings with 46,490 passengers) and Donji Milanovac (143 dockings with 20,335 passengers) (Agencija za upravljanje lukama 2018).

In order to reach the EU TEN-T corridor standards, among other technical criteria, it is necessary for the waterways to be of minimum class IV. This requirement is met on the Danube (sectors of class VII and class VIc) and Tisa (class IV) rivers, while the Sava waterway is of low class – varying on different sectors from Va to only III. In order to improve inland waterway transport in Serbia, river training and dredging works on critical sectors are defined as priority projects on both the Sava and the Danube Rivers. In addition, the Iron Gate navigation locks, between Serbia and Romania, are identified as bottlenecks that need capital rehabilitation and upgrades (European Commission 2017b). It is also necessary to improve ports' infrastructure and equipment at most river ports in Serbia, particularly in the ports of Belgrade and Novi Sad, as core nodes in TEN-T network that also require increased capacity according to the economic growth projections (El-Hefnawy et al. 2015). However, the location of the Belgrade port is inconvenient since it is situated in an urban, congested area, which hinders its further growth and development. Because of this, there is an ongoing project to gradually transfer those port activities into a new location with increased accessibility.

"Soft measures" that are required by the TEN-T standards involve the implementation of River Information Services (RIS), which is absent on the Tisa River. Additionally, similar to road and railway transport, inland waterway transport is aggravated by administrative procedures that cause extensive border waiting times.

## 17.4 Air Transport

Although there are about 80 registered airports, heliodromes, and airfields in Serbia, only a few have commercial significance. "Nikola Tesla" airport in Belgrade and Priština airport are part of the indicative TEN-T core airport network, while "Constantine the Great" in Niš is recognised as a comprehensive node. All three airports serve international flights, with Belgrade airport playing a dominant role. The National Carrier is "Air Serbia"; the state owns 51%, while 49% of ownership was bought in 2013 by "Etihad Airways", the national carrier from United Arab Emirates.

Belgrade acts as one of the main hubs for the region regarding air transport, and there is a tendency to strengthen this position by increasing services to other airports in the region and connecting them with Europe and the rest of the world. In combination with two other dominating hubs, Vienna and Istanbul, it captures about 15% of all passenger transfer traffic originating from the region (SEETO 2018). In 2018, the number of flights at the Belgrade airport was 58,859, with more than 5 million passengers (5,343,420) and nearly 20 million tonnes of cargo (19,758,366) (Airport Nikola Tesla Belgrade 2017). Niš airport is used by two low-cost companies and one national airline offering flights to eleven destinations in Europe. It recorded 1477 flights with 331,582 passengers and 2,542,960 tonnes of cargo in 2017 (Nis Constantine the Great Airport 2017). It is worth noting that Belgrade airport already uses 100% of its declared capacity, which was foreseen for 2030 in a moderate/high economic growth scenario performed by the REBIS updated study (El-Hefnawy et al. 2015). This is one of the reasons why Belgrade airport was given under concession to the French company "Vinci Airport". This company is expected to make capital investments into the airport's development, while Niš airport is currently owned[1] and operated by the state. However, with the capacity utilisation of 85–90%, they plan to expand the passenger terminal and aircraft parking apron and to construct a new rapid runway at the Niš airport (SEETO 2018). The main infrastructure limit at the Priština airport is its relatively short runaway, since its capacity utilisation was at only 28% in 2016 (1,404,775 passengers and 1008 tonnes; European Commission 2017a).

The intention of the Serbian government is to increase the number of commercial airports with primarily regional importance by converting former military airports into civil ones. The most recent example is Airport Morava, near Kraljevo, which opened in June 2019.

[1] It was property of the City of Niš until 2018.

## 17.5 Intermodality

One of the main gaps between the Serbian and EU transport systems and policies involve rather rudimentary levels of intermodality, multimodality, and logistic infrastructure in Serbia. There are many factors for this: insufficient investment into infrastructure and the equipment of existing terminals that could provide transhipment and other accompanied services in intermodal chains; low levels of implementation of information technology; unsatisfactory maintenance and slow upgrades of transport networks (especially the railway network); an insufficient concentration of transport volumes at designated terminals; weak planning processes; and the lack of policy that would promote this type of transport. The Spatial plan of the Republic of Serbia (Zakon 2010) suggests the development of three international terminals and logistic centres, in Belgrade, Novi Sad and Niš, while Priština is recognised as a centre of national importance. According to the Western Balkan Intermodal Study – Final Report (City Net Scientific Research Center 2016), there are 26 multimodal facilities that may act as potential terminals or logistics centres in Serbia, out of which one is located in Kosovo and Metohija. However, based on TEU equipment, TEU storage capacity, and realised container traffic, only nine of them have the attributes of intermodal terminals.

The largest volume of intermodal transport operates through "Railway intermodal transport – ŽIT" in Belgrade. Although data on container traffic is scarce, it is estimated that throughput in this terminal from the period 2004 to 2014 was about 30,000 TEU/year, slowly declining from 31,000 TEU in 2006 to 28,000 TEU in 2013, which is approximately 50–60% of its capacity (in comparison to 109,000 TEU in Durres, with the largest TEU traffic in the region; City Net Scientific Research Center 2016). However, one of the major transport projects in Serbia, scheduled to start in 2019, is the construction of a new road-rail terminal in Batajnica, in the outskirts of Belgrade. It is large industrial and service area, at the crossroads of major international transport routes, with freeway and electrified railway connections, and with an initial capacity of 80,000 TEU/year, which can be increased according to demand. Container transhipment in Donje Dobrevo for the period 2009–2014 was estimated to be less than 2000 TEU/year, with a relatively high capacity utilisation of 60–70%, mainly due to poor equipment and inadequate storage capacities (City Net Scientific Research Center 2016). Additionally, although it is situated on the indicative core TEN-T railway route 10, this line is not electrified (European Commission 2017a). With adequate infrastructural projects and "soft measures", there is potential for a significant increase in intermodal transport in Serbia, which was between 60,000 and 65,000 TEU/year for the period 2004–2014 (City Net Scientific Research Center 2016). The most prominent increase is expected at the containerisation level, which might be further encouraged by defining intermodal transport as an activity of special economic importance, accompanied by incentives through legislative and regulatory measures (European Commission 2017a).

## 17.6 Telecommunications

Within both the European and worldwide visions of future development, broadband networks with speed of 30 Mbps or above have been considered a fundamental aspect of infrastructure (Strategija 2014), with the Internet penetrating all parts of economy and society, and transforming people's everyday lives.

Serbia only entered the process of the liberalisation of the telecommunications market in 2005, with the end of the monopoly that the public enterprise "Telekom Srbija" enjoyed in infrastructure and services. In the same year, the Serbian Government founded the Regulatory agency for electronic communications and postal services (RATEL) with the aim to organise and improve the telecommunication sector in accordance with the best European practices (Strategija 2006). However, despite liberalisation, "Telekom Srbija" remained the main supplier of telecommunication capacities and access (with 86.0% market share of fixed network operators in terms of fixed lines, 44.8% market share in terms of number of users of mobile services,[2] and 44.2% market share in terms of fixed broadband subscribers in 2017) (RATEL 2018).

In Serbia, 72.9% of households have internet access in 2018, out of which only 0.4% use dial-up connections, while 72.5% have some type of broadband access, marking a significant increase of 10.6% in comparison to the previous year. Among households with internet access, 51.2% have wired broadband access based on DSL (ADSL) systems, while 42.5% have cable internet access. In 2018, 92.6% of the population used mobile phones, which was the same share as in 2017, indicating market saturation (Statistical Office of the Republic of Serbia 2018b). Furthermore, the same saturation is shown by the number of mobile phone subscriptions per 100 inhabitants, which accounted for 97.6 in 2018, and has been gradually declining since 2011, when it was 113.6 subscriptions per 100 inhabitants. This indicator is significantly lower in comparison to the EU average in 2018 of 122.1 subscriptions (World Bank 2018).

According to the Statistical Office of the Republic of Serbia (2018b), 73.4% of the population are considered internet users (persons who used the internet during the

[2]However, Telenor has the highest revenue from mobile services.

interval of the last three months). About 37% of internet users employ services offered by e-government, mostly to obtain relevant information from institutions' websites (35.5%) to download (21.7%) and to submit forms (15.9%). The economy is very dependent on the internet, as 99.8% of enterprises in Serbia have internet access, mostly broadband (98.8%), and 82.6% of them have websites. Out of the enterprises with broadband access, fast internet (30–100 Mbps) is present in 25.8% and ultrafast (over 100 Mbps) in 7.1% (Statistical Office of the Republic of Serbia 2018b).

With the expansion of wireless communication and services, it is important to keep in mind the fact that the spectrum of radio frequencies is a limited resource, the usage of which has to be adequately managed. The increasing demand for wireless access also does not diminish the importance of fibre optic networks, which are more stable since they are less sensitive to electromagnetic interference (Strategija 2014). The state-owned fibre optic networks in Serbia are generally underutilised and fragmented, given that different public institutions and organisations developed separated telecommunication systems for their needs only. There is a requirement to integrate these systems in order to establish efficient e-government and offer more quality services to citizens. At the same time, there is a need to attract investors for the projects to spread and enlarge the capacities of the fibre optic networks to increase supply and market competitiveness, which will consequently reduce their costs (Strategija 2014).

Strategies regarding telecommunications in Serbia stress the need to increase the pace of the process of building fibre optic capacities along major transport routes in sectors where it is missing, as well as in urban areas in which it is underdeveloped. In addition, broadband networks and services are recognised as the means for more balanced intra- and inter-regional development. In order to overcome deep economic and social spatial disparities, state and local authorities accepted a plan to focus on the introduction of broadband access in less developed municipalities and regions, and rural areas with poor transport infrastructure, regardless of the potential absence of commercial interest for such activities (Strategija 2014). However, despite a rather positive pace of development and distribution of ICTs in Serbia, it still has a relatively low digital economy and society index (DESI)[3], with only two EU countries, Greece and Romania, lagging behind (RATEL 2018).

[3]DESI is composed of five components/dimensions: connectivity; human capital; use of the Internet; integration of digital technology by businesses; and digital public services.

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# Services: Finance, Trade and Tourism

18

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**Abstract**

In Serbia, the services cover around 57% share in the total country's GDP (2018) and more than 55% of the total workforce. By observing these data, Serbia can be categorized among the countries that survived the transition period by transforming its economy towards tertiary industries. However, the industrialization process in Serbia was not the consequence of the economic development, but the result of a destructive process at the end of the last century. The country's recovery after the year 2000 and the implemented economic policy resulted with a strengthening of the service sector (trade, banking sector and tourism). At the same time, this sector, primarily under the influence of foreign investments, was rapidly changing primarily in the financial sector, and starting from 2011 these changes were observable in trade industries, too. Although Serbia doesn't have mass tourism generators considering its landlocked position and relief, tourism based on the MICE, City Break, spa and mountains is on the constant rise for the last 15 years. However, diverse cultural heritage still isn't enough interpreted in a right way in the Serbian tourism offer.

**Keywords**

Banks · Euroization/dollarization · Deposits · Bank loans · Retail · Wholesale · Tourism · Cultural heritage

## 18.1 Financial Sector

Financial sector in Serbia is moderately developed. Financial and insurance activities made 3% of the country's GDP and contributed by 3.5% to country's gross value added (GVA) in 2018. It employed 2.13% of the total number of employed, which, on average, earned monthly two times more than the country's average salary (Statistical Office of the Republic of Serbia 2018a, b). Financial sector assets account for 82.6% of the country's GDP (National Bank of Serbia 2019b). In the largest euro area economies, the ratio in 2018 was: 401.6% in Germany, 432% in France, 287.2% in Italy and 279.6% in Spain. Financial companies contributed by 4.5% to GVA (Eurostat 2018) in Eurozone and 2.9% of the total employed persons who worked in the Financial sector (Eurostat 2019a, b).

The financial sector in Serbia consists of traditional financial institutions (banks, financial leasing companies, insurance companies, voluntary pension funds, the securities sector and other sectors that perform related activities), but the banking sector is the most developed (Fig. 18.1).

Almost all assets of the Serbian financial sector are concentrated in banks (it is almost impossible to acquire capital elsewhere except in the bank). That is the typical structure of a not highly developed financial system. In EU, non-bank financial institutions control almost the same volume of assets like banks (the value of assets under the control of banks was 43.35 trillion euros at the end of 2018) (European Banking Federation 2019) and non-bank financial institutions controlled 41.9 trillion euro of assets (European Systemic Risk Board 2019). In neighbouring countries like Croatia and Romania, the share of banks in total financial sector assets is around three quarters and it is slightly lowering (Croatian National Bank 2018; National Bank of Romania 2018).

Similar to other countries in the region (Eastern Europe), the banking sector in Serbia is characterized by a relatively small size, focus on traditional banking activities, high con-

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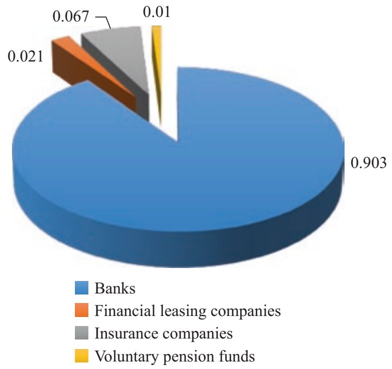


**Fig. 18.1** The structure of the financial sector in Serbia, 2018. (*Source:* Authors' calculation based on data from the National Bank of Serbia 2019b)

centration and high share of foreign capital. It is interesting to compare the bank assets to GDP ratio in the region (a comprehensive measure of a banking sector and financial depth size which is linked to long-term economic growth and poverty reduction). While in the EU the ratio of bank assets to GDP was 273% in 2018, in the region it ranges from 51, 4% in Romania to 117% in Croatia. (Eurostat 2019a, b; European Banking Federation 2019). The share of foreign banks varies from the lowest 72% in North Macedonia to 90% in Croatia National Bank of the Republic of Macedonia (2019); Croatian National Bank (2018).

Following the banking reform, which began in 2001, the number of banks in Serbia significantly dropped (from 86 banks in early 2001). This process was predominantly attached to the domestically owned banks, usually in a poor condition (illiquid, insolvent and with a very low profitability) and it included different methods (some of them lost the license to work, some were recapitalized, sold or merged with others). It is expected to continue in the future, because there is a considerable growth potential within the bank credit sector (the level of bank credit to the private sector as the percentage of GDP was around 43% in 2018 in Serbia (compared to 158% in the EU)) (National Bank of Serbia (2019b); European Banking Federation 2019). This is an important segment in the economic policy because credit finances the production, consumption and capital formation, which increase economic activity. So, access to finance, availability of credit and costs of service are all key to financial and economic development.

In 2019, 26 banks operated in Serbia (National Bank of Serbia 2019b). Considering the amount of balance sheet assets, credits and deposits, the five largest banks present more than a half of the Serbian banking sector, and the first 10 banks 80% (National Bank of Serbia 2019b). The majority (19) were in foreign ownership (similar to the neighbouring countries). Foreign banks control more than three quarters of bank assets in Serbia, with the domination of the banks from Italy, Austria and Hungary. There are seven banks in domestic ownership, and four are state owned which present the residue of the previous system. The private domestic bank assets are very modest, with the share of 7.3% (and have an increasing tendency in the last few years). Since privatization of the third largest bank in Serbia "Komercijalna banka", which is in state ownership, is underway, this unfavourable structure will be changed in the next period, depending on the nationality of the future buyer. It might happen that the foreign capital will control more than 85% of Serbian banking sector and thus financial market as well.

Although financial crisis stroke Serbian banks significantly – profitability reached negative levels in 2013, they have been steadily recovering since then, with an ROA (return on assets) of 2.07% and an ROE (return on equity) of 10.66%, at the end of September 2018 (Banks in Eurozone made profit as measured by the ROA of 0.45% and the ROE of 6.88%, European Central Bank 2018; National Bank of Serbia 2018a, b). The structure of profit indicates that a bank's business model in Serbia is oriented towards traditional banking activities (credit and deposit business and payment services) with significant profit returns. However, bank customers in Serbia pay higher interest rates for loans, and banks charge high commissions and fees on payment services.

Serbia is a highly euroized economy as a result of previous economic developments (Serbian people in general hold much of their financial wealth in foreign assets and use it for different money functions, although dinar is the domestic currency). Although the rate of inflation in Serbia significantly dropped since the hyperinflation period when the German mark was predominantly used (1993–1994) and the current inflation rate is 1.9% (National Bank of Serbia 2019b), the euro is still widely used. High level of euroization is obvious when considering the currency structure of bank deposits and loans (Fig. 18.2).

Only a third of bank deposits are in the national currency (dinars), and they are mostly current accounts. The rest of the deposits are in foreign currency, mostly euro. Since bank liabilities are denominated in foreign currency, the banks try to decrease exposure by using foreign exchange (FX) clauses – borrowers' monthly payments are expressed in euros, but paid in dinars at the current exchange rate. So, currency risk still exists in the system and it is shifted to those that are the least protected from it – firms and households. A vast majority of them have revenues in dinars, so every dinar depreciation means the rise in costs of loan servicing. Thus, a higher dinar depreciation could bring too high debt repayment burden and eventually default in debt payment.

Financial crisis caused significant dinar depreciation that started at the end of 2008. At the same time, nonperforming

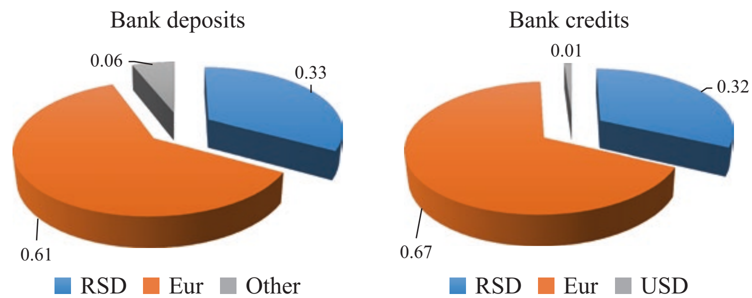


**Fig. 18.2** Currency structure of bank credits and deposits. (*Source:* Authors' calculation based on data from National Bank of Serbia 2018a)

loans (NPLs) rose from around 5% to around 23% (in 2014) (National Bank of Serbia 2014). This means that almost every fourth bank loan in Serbia was in default. And a majority of them were granted to companies that suffered from revenues' decrease and costs' increase (only 15% was the share of households in NPLs). The highest NPL was observed in sectors such as: construction, real estate and education, manufacturing and trade, since they were the most affected by the crisis.

Prior to the crisis, there was credit boom, after the foreign capital flooded the Serbian financial market in search of higher profits. Domestic sources were not nearly enough to finance the "hunger" for financial resources. At the same time, there were no sufficient investments in production, and especially export oriented, which would generate future sources for debt repayments. The financial crisis in 2008 showed that this was not sustainable in the long run. Structural problems of Serbian economy additionally prolonged the crisis. On the other side, although NPLs were very high, they didn't jeopardize financial stability due to the very high level of bank capital. The capital adequacy ratio was around 20% (even increased to almost 23% – in June 2018, National Bank of Serbia 2018a), while the regulatory minimum was 12%. Another important characteristic of the Serbian banking sector is the very unfavourable maturity structure of deposits (Fig. 18.3).

Short-term deposits are not a "healthy" basis to finance investment and housing loans and it also shows that there is a significant mistrust in domestic currency and inflation level. The majority of deposits – three quarters are sight or deposits up to 3 months' maturity, while the share of deposits with the maturity higher than 1 year is very small, only 7% (National Bank of Serbia 2019b). On the other side, three quarters of credits are with the maturity longer than 1 year. At the same time, only 6.4% of household savings are in dinars, and only 14% of household deposits are with maturity longer than 1 year (National Bank of Serbia 2019b).

Other financial institutions in Serbia are very modestly developed. This sector consists of insurance companies, pension funds, financial leasing sector and investment funds.

The level of insurance development in Serbia is far below European average. There were 16 insurance and 4 reinsurance undertakings in Serbia in 2018 and the market is dominated by foreign capital (three quarters of total capital of the sector have foreign ownership, mostly from Austria, Netherlands and Italy). More than 50% of premiums in both non-life and life market is concentrated in two companies, and the first five control 79% of the insurance market (National Bank of Serbia, 2018c). This is similar to Bulgaria, Romania and Montenegro, but significantly below the average for Central and Eastern European countries (Serbia is ranked 63rd in the world according to insurance density, out of 88 ranked countries) (Swiss Re 2019).

Asset of pension funds is only 1% of the total financial sector assets in Serbia. Serbia still has pay-as-you-go (PAYG) pension system and doesn't have mandatory PRIVATE pension funds, like some countries in the region (Croatia, Bulgaria) (National Bank of Serbia 2018b). Pension contributions of current employees finance pension payments to current pensioners. Unfortunately, the demographic ageing process poses serious financial threats to the PAYG system in whole Europe, and in Serbia it is even worse because of the intensive depopulation process. The countries in the region have already made some improvements in their pension systems: Croatia and Bulgaria have mandatory private pension funds since 2002 and North Macedonia since 2006. Serbia needs to reform its pension system and increase reliance on private pension funds. Total investments of pension funds in Serbia are only 0.8% of GDP (OECD 2018), while in EMU, this ratio was 21.3% (European Central Bank 2017). The current market of voluntary pension funds (VPFs) in Serbia consists of four companies that manage seven VPFs, one custody bank and five agent banks. The largest fund holds 40% of the sector assets, and the four largest funds hold 95% of the market share (National Bank of Serbia 2018b). The VPFs invest dominantly in government bonds (83.3%). The main obstacles for faster development of pension funds sector are underdeveloped financial market, inadequate management of government finances and high operating costs of private pension management companies.

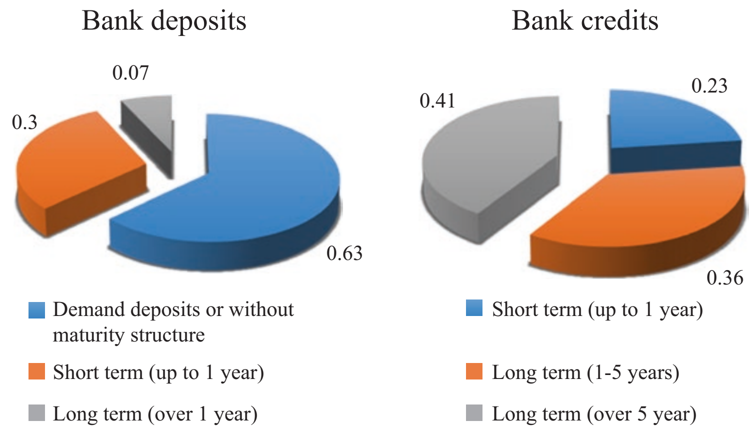


**Fig. 18.3** Maturity structure of bank deposits and credits. (*Source:* Authors' calculation based on data from National Bank of Serbia 2019b)

The financial leasing sector in Serbia consists of 17 lessors, out of which 14 were founded by the banks. Four lessors control around 65% of assets in this sector. Lessors are financed mostly by borrowings, while capital is only 11.1% of liabilities. The most important are long-term foreign loans, almost 67% of total liabilities. Financial leasing was used mostly for the purchase of freight vehicles, minibuses and buses (40.3%) and passenger vehicles (36%) (National Bank of Serbia 2019b). Generally, the sector has good profitability and high solvency, but was severely hit by the financial crisis.

Investment funds have been existing in Serbia since 2007, and there are six investment fund management companies that manage 18 open-end investment funds. The market concentration is very high, three funds (that are part of banking groups) dominate with an 88% of share in the capital. This sector in Serbia is still underdeveloped with the investment fund assets' share of only 1% in GDP. For comparison's sake, there are 130 investment funds in Croatia with assets to GDP ratio of 6.1%, 108 investment funds in Romania with assets of above 2.5% of GDP (See News-Business Intelligence for Southeast Europe 2018) and 121 investment funds in Bulgaria with assets of 3.6% of GDP (Radio Bulgaria 2018).

## 18.2 Characteristics and Structure of Trade

Trade is very important for the economy of the Republic of Serbia. For many years, about 10% of the national GDP and just over 10% of gross value added (GVA) have been generated in the trade sector (Petković et al. 2015). At the same time, about 17% of the total number of employees nationwide are employed in the trade sector (Statistical Office of the Republic of Serbia 2018c).

The development of trade in the Republic of Serbia was quite different from other former socialist countries that had undergone the process of economic transition. Within ex-Yugoslavia, trade was at a higher level than the other former socialist countries. The supply of goods was of better quality, trade formats were more modern and logistics systems were more developed.

Wholesale businesses became numerous, and large wholesalers were dominant over retailers. Producers, alongside wholesalers, played a leading role in marketing channels.

After 2000, there were changes in the structure of Serbian trade. Retail intensifies and strengthens. The influx of strong foreign retailers has contributed significantly to this trend. The consequence of these processes is the current structure of trade in Serbia, which is more similar to those of developed countries. However, further modernization is needed in order to increase efficiency of the entire market.

Legislation and strategic policy on the national level are constantly being improved and aligned with EU standards.

### 18.2.1 Retail in Serbia

Retail is key to developing efficient trade and markets. In Serbia, retail has undergone major structural changes in the last thirty years. The socialist system was dominated by large and medium-sized enterprises, regardless of whether it was the fast-moving consumer goods (FMCG) sector or specialized retail. The 1990s led to a significant fragmentation of the retail sector, with most of the socially owned retail businesses failing, with the emergence of small, independent individually owned retail stores on the market. Unlike other transition economies, whose retail, especially FMCG segment, was significantly internationalized during the transition, this was not the case with Serbia. Due to the poor political and economic situation, Serbia was not interesting to large international retailers

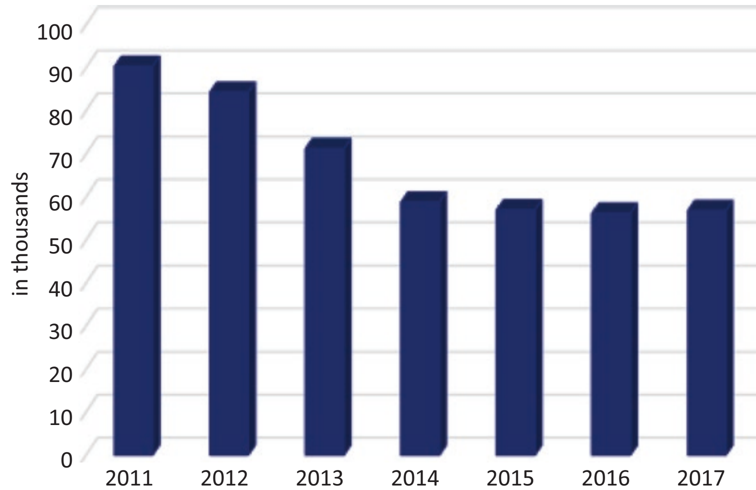


**Fig. 18.4** Number of retail stores in the Republic of Serbia. (*Source:* Authors' calculation based on data from Statistical Office of the Republic of Serbia 2018b)

during the first transitional period in the 1990s (Lovreta et al. 2013).

The shy arrivals of foreign retailers began in 2002, but it wasn''t until 2011 that one of the world's leading retailers (Delhaize Group) entered the Serbian market through the acquisition of Serbia's largest retailer. This entry was a turning poivnt in the development of Serbian retail, as it attracted other large players to Serbian market wide, not only in the FMCG sector.

Retail in Serbia nowadays is in a significantly better position within marketing channels than it was 15 years ago. However, it still lags behind, compared to retailers in developed countries. Its main features are:

1. *Integration and Concentration* – In most retail segments (FMCG, pharmacies, clothing stores, etc.), there are few market leaders, mainly retail chains, that dominate the market. At the local level, there are also a number of regional or local retailers that are important in their micro-environments, as well as a large number of individual retailers that have one or a couple of stores. These trends are also present in specialized stores, including those sectors that have resisted the most (i.e. pharmaceutical marketing channels). However, the level of concentration in Serbian retail is, generally speaking, still significantly lower than in developed countries, despite the trend in decreasing number of retail stores (Fig. 18.4).
2. *Changes in the retail format structure* – Changes in the retail format structure have drastically improved in the post 2000 period. Nowadays, there are a large number of modern supermarkets and hypermarkets in Serbia, especially in city centres. Hypermarkets have been intensively developing until few years ago when the growth was slowed, due to customer shopping trends. Modern supermarkets, superets and smaller neighbourhood shops have gained prominence. With the entry of Lidl into the Serbian market, the discount format also gained prominence. New retail formats based on total self-service in Serbia have not yet come to life. Serbia's retail sector is still dominated by small retail stores, where the average selling space in the FMCG sector is 195 $m^2$ (Competition Protection Commission 2018), and in most other retail sectors these numbers are significantly smaller. However, compared to the earlier phases, the average size was significantly increased (in 2010, the average size of a retail store was 44.64 $m^2$) (Petković et al. 2015).
3. *Uneven development of the retail network* – In large cities, the retail network is oversized, while smaller cities and less developed regions lack modern retail formats (Stojkovic et al. 2018).
4. *Lagging behind in terms of business process digitalization in Serbian retail and trade in general* – Customer relationship management (CRM) is still used seldom in Serbia, big data are in their infantile stage, while the digitalization of logistics processes also needs to be improved. Digitalization, big data and CRM characterize modern retail in the world (Berman and Evans 2018).
5. *Omnichannel retailing in Serbia exists only in theory* (Stojkovic et al. 2016) – Although the introduction and development of e-commerce has taken place (including the mobile and social component), it is still in its initial phase with significant initiatives to improve e-commerce in Serbia.
6. *The own brand in Serbian retail* – The importance of *the own brand in Serbian retail is increasing,* although it is still significantly lower than in well-developed retail markets where they have a significant role (Levy and Weitz 2013). For largest retailers, the private brand amounts to

more than 20% of total turnover, although this figure is generally below 10% in the FMCG sector in Serbia.

7. *Changes occurring in consumer behaviour* – Changes occurring in consumer behaviour are poorly monitored and studied in Serbian retail, and this is often diminished to copying practices implemented by retailers in developed European economies. Trends, such as healthy eating, the creation of specialized private lables (PLs) for customer segments with special needs (diabetic, gluten allergic, etc.), are present, but not nearly as well as in developed countries. At the same time, consumers in Serbia do not put a lot of emphasis on these trends.
8. *Sustainability* – Sustainability is an area that is just starting in Serbian retail. The key reason is the lack of consumer interest.

### 18.2.2 Wholesale in Serbia

Almost three times less workers were employed in the wholesale in Serbia than in retail (2017). However, wholesale turnover was just over EUR 20 billion, which is significantly more than EUR 12 billion achieved in retail turnover (Statistical Office of the Republic of Serbia 2018c).

As in the rest of the world, the importance of wholesale in Serbia has been declining over the last 20 years (Lovreta et al. 2019). Traditional wholesalers are losing their position in marketing channels. More and more wholesale functions are being taken over by manufacturers and, above all, large retailers. However, wholesalers who have succeeded in improving logistic efficiency have retained and even improved their business performances. There are examples of wholesalers performing vertical integration forward and entering retail. Also, many wholesalers performed vertical integration backwards and entered the manufacturing sphere. Top wholesalers in Serbia have expanded their businesses to neighbouring countries, while there are also examples of expansions into the African market.

Wholesale has also been significantly modernized over the last 20 years, but the level of technological development is still much lower than in developed countries. Modern storage capacities and advanced information systems are still lacking (it is expected that the digitization of business activities could significantly improve this segment).

### 18.2.3 E-commerce in Serbia

According to the composite B2C index for e-commerce of the United Nations Conference on Trade and Development (UNCTAD), Serbia ranks 41st out of 151 ranked countries. The aforementioned index is based on four indicators: internet usage, number of secure servers, credit card penetration and delivery services. The index value is positively correlated with the number of Internet customers (UNCTAD 2018).

It should be emphasized that the infrastructure required for the development of e-commerce in Serbia is at a significantly higher level of development than it was 10 years ago. The Internet infrastructure in Serbia is quite solid and out of four million Internet users, 72.5% have broadband internet connection (Statistical Office of the Republic of Serbia 2018c). Regulatory infrastructure has been substantially improved and in 2019, a new Law on Electronic Commerce was adopted. The infrastructure for internet payments is higher than it was a few years ago and the fees charged by e-payment providers are significantly lower than they were charged earlier. Further development of payment infrastructure and logistics is needed, although there are several specialized courier services covering the whole of Serbia.

The volume of B2C e-commerce in the Republic of Serbia is lagging, compared to the countries with the highest level of development.

In the Republic of Serbia, the number of internet users is approximated at four million, and the average e-tail expenditure per internet user is 72.2 EUR, which is 10 times less than in the EU (Statista, 2019). One of the main reasons for such a low level of e-commerce development lies in the lack of trust of Serbian consumers towards this type of trading. The omnichannel strategy is virtually non-existent for retailers in Serbia. Information systems are not yet sufficiently developed (for example, it is very rare for a product purchased online to be returned to the store if the consumer has objections). In the future, a more intensive development of e-commerce in Serbia is expected, since it has become the focus of state authorities through the proclaimed digitalization strategies.

## 18.3 Serbian Tourism and Cultural Heritage

### 18.3.1 Tourism Industry and Tourist Destinations

Tourism is not a priority branch of the Serbian economy which shows the share in the country's gross domestic product (GDP) of 1.8% (Strategija razvoja turizma Republike Srbije za period 2016–2025, 2015). On the other hand, the data on the turnover from tourism show that this industry has been recording significant and constant growth year after year (Fig. 18.5).

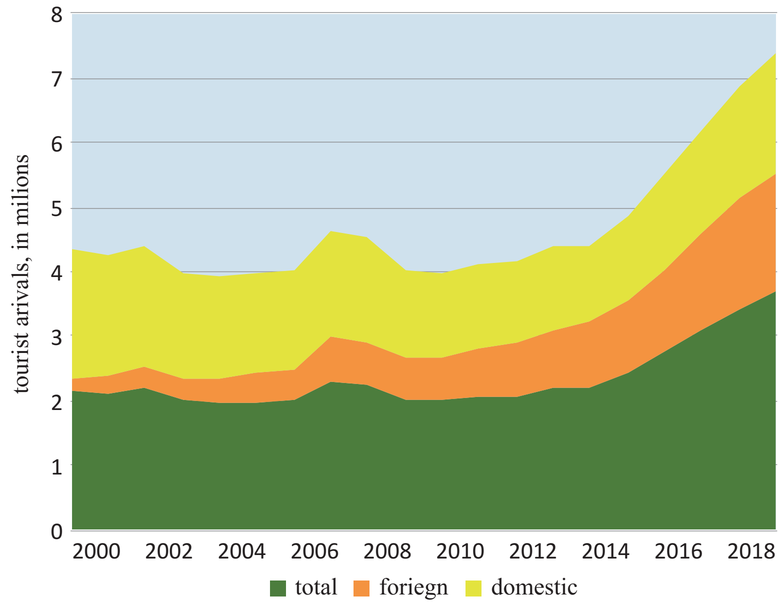


**Fig. 18.5** Touristic arrivals, 2000–2019. (Source: *Authors' calculation based on data from Statistical Office of the Republic of Serbia 2018b)*

**Table 18.1** Tourism turnover in Serbia, 2012–2019

| | Arrivals | | | | | | Share of total arrivals in Serbia (%) | |
|---|---|---|---|---|---|---|---|---|
| Year | Total | Index | Domestic | Index | Foreign | Index | Domestic | Foreign |
| 2012 | 2,079,643 | 101.0 | 1,269,676 | 97.0 | 809,967 | 106.0 | 61.1 | 38.9 |
| 2013 | 2,192,435 | 105.4 | 1,270,667 | 100.1 | 921,768 | 113.8 | 58.0 | 42.0 |
| 2014 | 2,192,268 | 100.0 | 1,163,536 | 91.6 | 1,028,732 | 111.6 | 53.1 | 46.9 |
| 2015 | 2,437,165 | 111.2 | 1,304,944 | 112.2 | 1,132,221 | 110.1 | 53.5 | 46.5 |
| 2016 | 2,753,591 | 113.0 | 1,472,165 | 112.8 | 1,281,426 | 113.2 | 53.5 | 46.5 |
| 2017 | 3,085,866 | 112.1 | 1,588,693 | 107.9 | 1,497,173 | 116.8 | 51.5 | 48.5 |
| 2018 | 3,430,522 | 111.2 | 1,720,008 | 108.3 | 1,710,514 | 114.2 | 50.1 | 49.9 |
| 2019 | 3,689,983 | 107.6 | 1,843,432 | 107.2 | 1,846,551 | 108.0 | 50.0 | 50.0 |

*Source:* Republički zavod za statistiku 2019b and Statistički godišnjak Republike Srbije 2019a

This is in part the consequence of a low starting position, and in part the results of the government efforts to increase the total capacities of the sector and thus better realize the available tourism potentials. When observing the tourism turnover, which amounted to 3.7 million of tourist arrivals (Republički zavod za statistiku 2019c), Serbia is among the tertiary destinations of the European touristic macroregion, together with other Eastern European countries. The rise in the tourism turnover is constant: in 2019, Serbia had 6% more tourists compared to the previous year, and the data for December 2019 show that 15% more tourists had visited Serbia than in 2018 (Republički zavod za statistiku 2019c) (Table 18.1).

Observed by the tourists' structure, the constant rise in foreign tourists' share in the total tourism turnover is noticeable (in 2019, there was an equal number of domestic and foreign tourists). By all means, the interest of foreign tourists for tourism destinations in Serbia is on the rise, but we must take into consideration the fact that Serbia is also a large market for outgoing tourism, peaking in the summer period when Serbian citizens travel on vacations, predominantly to Greece (59% of the outgoing tourists), Turkey (about 7%) and Montenegro (about 5%) (Republički zavod za statistiku 2019b).

The average length of the foreign tourists' stay in Serbia is 2.8 days, while it is somewhat longer for the domestic tourists. This is one of the performance indicators that could improve in future, because this indicator is directly proportional to the earned income based on the tourist spending (the expected tourism turnover in 2019 is about 1.4 billion Euros).

The structure of the foreign tourists in Serbia shows that the largest number of tourists comes from China (in the first 9 months of 2019, more than 129,000 tourists from China visited Serbia, which puts China at the top of this list). The tourists from the region follow closely, above all Bosnia and

**Fig. 18.6** Belgrade panorama from Sava River. (Photo by D. Bosnić)

Herzegovina (113,000), than it comes Turkey (98,000) and Germany (95,000). This unexpected domination of Chinese tourists is the consequence of the low starting base of the tourist arrivals from China in the previous years, but also of the liberalization of the visa regime with China, introduction of direct flights, and an intensive economic and cultural cooperation between our two countries. Traditional markets of the neighbouring countries are still positioned very high (besides Bosnia and Herzegovina, a significant number of tourists also come from Slovenia, North Macedonia, Bulgaria and Croatia).

The most visited tourist destination in Serbia is its capital, *Belgrade* (Fig. 18.6). More than one million tourists visit Belgrade each year, and these are predominantly foreign tourists, mainly businesspeople and low-budget leisure tourists. Despite its dominant rank when observed by attendance, Belgrade's tourism potential is still not fully capitalized (e.g. in cultural heritage). Also, in the segment of the most developed products (MICE and City Break), there is still enough room for further development and capitalization through the increase of the tourism income.

After Belgrade, the second and third attendance rates are observed in *Serbian spas*, with over 10% increase in visits in 2019. The most visited spas are Vrnjačaka Banja in western Serbia and Sokobanja in eastern Serbia, with more than 100,000 tourists each. Spas are at the top of the list with respect to the number of overnight stays of 27.2% (Republički zavod za statistiku 2019a). This result is predominantly generated by domestic tourists (high domestic tourists' attendance in Serbian spas is the consequence of the use of healthcare services in the spas' rehabilitation-convalescent centres built in the period after the World War II that still are exploited, mainly through the obligatory healthcare insurance system). A possible increase of the foreign tourists' share in spas (in 2018, only 8.6% were foreign tourists) will depend on how quickly the quality tourism offer will be created (dealing with all sorts of legal issues, privatization of spa business facilities and creation of a suitable marketing strategy for each individual spa). The fourth in rank by the tourist arrival level in Serbia are the *mountains* (mountains are the second on the list with respect to the number of overnight stays, with approximately 23.3% share in the total number of overnight stays) (Republički zavod za statistiku 2019a).

The most frequently visited mountains are *Kopaonik* (2017 m) in the central Serbia and *Zlatibor* (1496 m) in the western part of the country (Fig. 18.7), while in the past ten years a significant effort has been made in order to develope the third mountain tourism destination – *Stara Planina* (2168 m) at the east of the county, near the border with Bulgaria (Fig. 18.8).

Kopaonik is considered the mountain with the most developed ski tourism product in Serbia (the ski season lasts from December to April), but it still does not have a complete year-round touristic offer, despite the fact that National Park Kopaonik extends across considerable area (see Chap. 20). On the other hand, the mountain Zlatibor, which is significantly lower than Kopaonik, does not gerate the mass ski tourism because of the inability to keep the snow cover, as well as because of the terrain configuration, but it is still the most visited mountain in Serbia. Zlatibor has developed the year-round touristic offer, with the most integrated tourism product when compared to the other destinations in the country. With the construction of the highway in the next few years and with activation of a regional airport in its vicinity, this destination will increase its accessibility, which could prove important for an even greater increase of foreign tourists' arrivals.

Besides Belgrade, as far as the cities are concerned, *Novi Sad* – the capital of the autonomous province of Vojvodina – has been experiencing a continuous growth in the last few years, and its flag product is one of the most popular European music festivals, "Exit" (about 8.1% of the total turnover are foreign tourists who belonged to this destination).

**Fig. 18.7** Zlatibor – ski track on Tornik. (Photograph by D. Bosnić)

**Fig. 18.8** Stara Planina – ski tourism. (Photograph by D. Bosnić)

By all means, the year 2021 will be especially important for the city's tourism, because of its status as the European Capital of Culture in 2021.

The Serbian tourism offer is in part predisposed by its position – physical-geographical characteristics (relief, climate, waters) and its cultural-historical heritage. However, this offer is far more the result of the state actions through economic policy instruments and by creating the conditions for tourism sector development. In the past two decades, much has been done to elevate the accessibility of destinations all over Serbia, primarily by the building of a traffic infrastructure (see Chap. 17), as well as by enhancing the visibility of Serbia as a destination for foreign markets (promotional activities). At the same time, the government has tried, by means of the available planning and financial instruments, to create the conditions for more intensive investments in the tourism, primarily in the hospitality sector (at some destinations, such as Belgrade, Novi Sad, Zlatibor and Kopaonik, the offer of different categories of accommodation is constantly increasing, whereby about 35% of the total accommodation capacities in Serbia are hotel capacities) (Republički zavod za statistiku 2019b). However, creation of an adequate managerial structure in tourism sector is perhaps the weakest hoop, especially in the lower spatial levels (regions, municipalities). Currently, a National Tourism Organization of Serbia operates at the national level and promotes Serbia as a destination to the foreign markets, while the lower spatial levels of management such as regional level are still underdeveloped there are local tourist organizations at the municipality level). The legal regulatory bodies have recognized the need for regional connection of the destinations and for establishing a destination management organization (DMO) by expanding the destinations outside the municipal territorial organization. However, application of this concept is still not noticeable in practice (the Regional West Serbia Tourism Organization is a good example, but the old managerial structure still dominates the rest of the country, with tourist organizations at the municipality level that usually didn't founded on the tourism potential or on the achieved tourism turnover).

Although Serbian tourism in general has constantly been growing in the last two decades with a slight slowdown in the years of economic crisis (2007–2009), the tourism income has been growing more slowly compared to the forecast given in the Tourism Development Strategy of the Republic of Serbia by the year 2020 (the estimate was that by 2020, the tourism income will exceed 2 billion dollars, Vlada Republike Srbije 2015). Attracting more tourists would, in part, be the solution to this problem. However, an excessive tourism turnover at a destination could jeopardize its sustainability in the long run, and that is why it is necessary to work more on the extension of tourists' stays at the destinations and increase their spending. In order to get there, the tourism offered at the destinations must be more clearly profiled and better structured with clearly defined tourism products, whereby the tourist interpretation would become one of the key elements.

Serbia is a landlocked country, of a predominantly highland relief, but with no high mountain regions such as Alpes, and it is situated in a mild continental climate zone. As such, it cannot compete with the destinations of massive 3S (sun, sea and sand) tourism, or with the destinations of mountain ski tourism (Kopaonik is currently the only developed ski tourism destination in the country). Therefore, it is necessary to shape the Serbian tourism potentials into such a product offer that will attract a tourism market which will satisfy their tourism needs to the maximum by visiting Serbian destinations. Naturally, in this sense, the tourism products that Serbia has strategically chosen as its high priority products still remain the framework of its tourism offer: *MICE and business travel* (related not only to the cities of Belgrade and Novi Sad but also more increasingly to the mountain locations and spa towns, since MICE is recognized as a tourism product that significantly increases income from tourism), *mountain tourism* with a year-round offer (Kopaonik, Zlatibor, Stara planina), *City Break* (Beograd and Novi Sad as two most frequented destinations), and *Spa & Wellness tourism* (highly unused potentials of Serbian spas). Other tourism products (of medium priority or of prioritized value added) rely on the elements of natural heritage, starting with geo-heritage, protected natural areas, and developed hydrographical network (see Chaps. 6 and 9), as well as on a highly diverse cultural heritage. Numerous destinations across Serbia could offer a wide toursim offer such as products of special interest, cruising on the Danube, natural tourism and rural tourism. On the other hand, it seems that the cultural heritage is insufficiently valorized for the tourism in most of Serbian destinations. Often cultural heritage is relatively poor interpretated, and the potentials for constructing a culture tourism as a product is simply not enough recognized (e.g. thematic routes, cultural heritage tourism products).

### 18.3.2 Cultural Heritage – A Potential of Serbian Tourism?

The central position at the Balkan Peninsula put Serbia into the very centre of movements of people and goods through the centuries, both from the west and north-west to the southeast of Europe, and vice versa. Throughout history, Serbian territory was the main stage of various political, military, economic and cultural influences. By "building the house at the middle of the road", Serbs were aware of the instability which they had to constantly live under and build their country. But at the same time they were able to aquire the diverse elements of European and Asian peoples' culture into their own. This is visible in a unique and extraordinary mosaic of cultural heritage of Serbia that is still neither fully studied nor properly interpreted to the public.

The Balkans was the main corridor for the migrations of people as far back as prehistoric times, when the people from Southwest Asia intensively inhabited the spaces of Europe (see Chap. 2). Besides the traces of primitive human societies, over time, people started founding permanent settlements at the territory of modern Serbia, and many archaeological sites from Mesolithic and Neolithic periods testify to this (see Chap. 2). Serbia represents a true prehistoric treasury that is still insufficiently researched. The archaeologist discoveries are mostly presented in the museums' exhibitions and at the arranged archeological localities, such as the archaeological site of one of the oldest Neolithic settlements in Europe, Lepenski Vir, located at the right bank of the Danube river (Fig. 18.9).

A far more formidable archaeological material includes the period of the Roman rule over the Balkans (see Chap. 3) (Petrović 2019). The imperial palace Felix Romuliana near the town of Zaječar in Eastern Serbia is a masterpiece of the Roman architecture (Fig. 3.2). It was built by the Roman

**Fig. 18.9** Lepenski Vir, the archaeological site. (Photo by D. Bosnić)

**Fig. 18.10** Mosaic Dionysius – The Imperial palace Felix Romuliana. (Archaeological Institute)

**Fig. 18.11** Mediana, River God Naissus. (Archaeological Institute)

Emperor Gaius Galerius to honour his mother, Romula. Like the Diocletian's Palace in Split, Croatia, the Galerius's Palace was surrounded with high walls and protected with mighty towers, but its special value lies in the magnificent mosaics, marbles, sculptures and fountains it is decorated with (Fig. 18.10). What remained of the Galerius's Palace is well preserved, and it was put on the UNESCO World Heritage Sites List.

Another large imperial palace from the Roman period at the territory of Serbia is Mediana, near the present-day city of Niš in South Serbia. It was built by the great Roman Emperor Constantine the Great, with beautiful mosaics and sculptures as decorations (Fig. 18.11), and it is assumed that it covered the area of approximately 6000 m$^2$. The works on the excavation of this palace are still in progress and, so far, only a small portion of it is presented to the public.

Through significant excavation works at the Sirmium archaeological site (the present-day town of Sremska Mitrovica in the Srem District in the autonomous province of Vojvodina), it has been determined that there is yet another imperial palace there. But since the town Sremska Mitrovica has developed over the most part of this locality,


**Fig. 18.12** Archaeological park "Viminacium": (**a**) Amphitheatre, (**b**) Domus – Scientific Research Center and Resort and (**c**) Viminacium Limes Park

excavation works progress slowly and they are limited by the fact that, for now, it is impossible to move the entire town for the sake of these excavations. Although not in the range of imperial palaces, Viminacium locality at the right bank of the Danube river, downstream from Belgrade, represents one of the best conserved and interpreted Roman archaeological sites in Serbia and it is presented as Archaeological Park "Viminacium" (Fig. 18.12). This is one of the Roman forts at the Danube border (Limes), which over time gained the status of a city within the Roman Empire and developed into an important military and economy centre of the Roman Empire on the Balkans (see Chap. 3).

The historical facts prove that some rich economic, cultural and even political activities were taking place at the territory of the present-day Serbia during the Roman period, but archaeological excavations have still not been intensified enough (it is believed that the remains of the Trajan's Road and Bridge on the Roman Limes lies at the Danube banks, the *Šarkamen* – site which is believed to be another imperial palace, and the locality *Justiniana Prima* near the town of Lebane at the south of Serbia is one of the biggest and the most important Byzantine cities in Balkans founded by the Byzantine Emperor Justinian the Great in the fourth century).

**Fig. 18.13** Studenica Monastery in the Raška area, Southwest Serbia (UNESCO site). (Reproduced from Popović and Vojvodić 2016)

**Fig. 18.14** Gračanica Monastery (Kosovo and Metohija), UNESCO site. (Reproduced from Popović and Vojvodić 2016)

**Fig. 18.15** Dečani Monastery (Kosovo and Metohija), UNESCO site. (Photo by Monastery Dečani)

The mediaeval period is the most important segment of the cultural heritage of Serbi and it is characterized in the Serbian culture and spiritual tradition by several centuries' long practice of leaving endowments. This tradition originated during the rule of Nemanjić dynasty and it is evident in *numerous monasteries and churches*. There have been several epochs in the development of Serbian ecclesiastical art, with characteristic architectural features, as well as with picturesque characteristics of painting programmes and styles, many of them under the UNESCO programme protection: (a) *Raška School of Serbian art* (monasteries Studenica (Fig. 18.13), Žiča, Mileševa, Gradac and Sopoćani); (b) *the Age of Nemanjić dynasty kings* (Milutin, Stefan Dečanski and Emperor Dušan), when the Serbian state was gravitating southwards, at the expense of the Byzantine Empire, and when Kosovo and Metohija became the political and spiritual centres of Serbia (the church Our Lady of Ljeviš in Prizren, Banjska Monastery, the church in Staro Nagoričino, Gračanica Monastery (Fig. 18.14), Dečani Monastery (Fig. 18.15), Monastery of Holy Archangels near Prizren); and c) *the last epoque of independence, the age of Serbian principality and despotate*, when endowments were built in the northern parts of the Balkan Peninsula still unconquered by the Ottomans (monasteries Lazarica, Ravanica, Manasija (Fig. 18.16), Kalenić and Ljubostinja).

A prominent place among the Serbian monasteries belongs to the Patriarchate of Peć whose founders were the heads of the Serbian church (see the Chap. 3, Fig. 3.9). The practice of building new churches and monasteries and restoring the old ones did not stop even in the period of the Ottoman rule, and especially after the Patriarchate of Peć was rebuilt in 1557 (see Chap. 3). This practice acquired a particular form in the monasteries of Fruška Gora that were founded at the territory of the Habsburg Monarchy (monasteries Krušedol (Fig. 18.17), Hopovo, Remeta and Vrdnik).

**Fig. 18.16** Manasija Monastery. (Reproduced from Popović and Vojvodić 2016)

What is especially valuable in Serbian medieval cultural heritage is its *fresco painting*. Serbian fresco painting preserved the largest number of portraits of historical figures at the entire cultural territory of the former Byzantine Empire. It is an extraordinary gallery of portraits, created in the period from the thirteenth to the fifteenth century, and even later, at the time of the Ottoman rule. It includes the portraits of the rulers and members of their families, aristocrats of dif-

**Fig. 18.17** Krušedol Monastery (Vojvodina). (Photo by D. Bosnić)

**Fig. 18.18** Studenica Monastery, Crucifixion of Christ. (Photo by D. Bosnić)

**Fig. 18.19** Studenica Monastery, King's Church, Portrait of the King Milutin. (Photo by D. Bosnić)

**Fig. 18.20** Mileševa Monastery, Myrrhbearers Mother of God, Apostles. (Photo by D. Bosnić)

**Fig. 18.21** Sopoćani Monastery Dormition at the Christ's Grave, The White Angel. (Photo by D. Bosnić)

ferent ranks, high church heads and prominent Orthodox priors. In some cases, the portraits have individual characteristics, which are rarely found in the mediaeval art, while their costumes, insignias and jewellery depict the protagonists' precise place in social hierarchy.

Serbian monumental thirteenth century art of painting also includes some unique masterpieces, the works of the most prominent artists of their time in the Byzantine Empire. Along with the frescos in the monasteries of Studenica (Figs. 18.18 and 18.19), Žiča and Mileševa (Fig. 18.20) and in the Church of the Apostles in the Patriarchate of Peć, the paintings in Sopoćani Monastery also hold an important place (UNESCO Heritage Site) (Fig. 18.21). Saints with elegant, peaceful physiognomies and unhurried gesticulations are painted in wide strokes of pastel colours, with a rare feeling for the beauty of matter and form. Monumental in their appearance and infused with Hellenistic and metropolis-like spirit, these paintings testify about the ability of the Serbian society to adopt and cultivate the art of the highest rank. In the church paintings from the last epoch of Serbian art, Morava School, the holy warriors had a very distinguished place (Fig. 18.22). They are presented at the prominent places inside the temples, right before the eyes of the believers, which is well illustrated in the examples from the Ravanica, Kalenić and Manasija Monasteries. Such choice of saints is in accord with the spirit and the needs of those particular times when, due to being exposed to an ever-larger danger from the Ottomans, the help was expected from the celestial army. The representations of the holy warriors are extremely picturesque, owing to minutely depicted costumes

**Fig. 18.22** Manasija Monastery, The Saint-Warriors. (Reproduced from Popović and Vojvodić 2016)

and weapons, which are in many cases the reproductions of the real fifteenth century warrior equipment.

If the Serbian mediaeval monasteries are the most characteristic element of the Serbian ecclesiastical culture, then the *fortresses* are by all means the most typical example of the Serbian secular architecture. Witnesses to the days long gone and to highly unstable relationships between the peoples of Balkans, forts were erected along both the border zones and around more important settlements and centres within the country. Just few fortresses in the southern parts of Serbia remained preserved, dating from the times of Nemanjić state (e.g. Novo Brdo in Kosovo and Metohija (see Chap. 3, Fig. 3.6) or Stari Ras in southwestern Serbia whose remnants are under the protection of the UNESCO). In the northern parts of the country, along the Danube river, however, many fortresses are in a much better condition (from the point where the Danube river enters Serbia until the point where it exits it, there are remnants of 12 fortresses of different times of origin, size and degrees of preservation). At the territory of the autonomous province of Vojvodina, one of the oldest fortresses in Serbia is Bač Fortress (1338–1342), currently under reconstruction, and Petrovaradin Fortress in Novi Sad (1692–1790), one of the biggest fortresses in Serbia (it was built on the remnants of the former mediaeval fort as one of the best achievements of the baroque military architecture) (Fig. 18.23). Kalemegdan Fortress is located in Belgrade, above the confluence of the rivers Sava and Danube and it was erected on the remnants of the Roman second century fort. During the Middle Ages, it was rebuilt, and it was expanded after it was severely damaged in Ottoman–Habsburg wars.

Downstream along the Danube river, there are remains of yet another two magnificent fortresses: Smederevo Fortress, erected in the fifteenth century as a unique type of fortress in Serbian architecture (see Chap. 3, Fig. 3.7), and Golubac Fortress, dating from the Middle Ages, with a striking position (at the Iron Gates gorge on the Danube), which is today completely reconstructed as the centre of the tourism area that is developing around it (Fig. 18.24) (Vuković et al. 2017).

Through the UNESCO's programme of protection and promotion of cultural heritage, the Serbian cultural heritage has significantly increased its "visibility" and recognizability in a wider, world context. Besides the above-mentioned structures of ecclesiastical architecture and art and the Roman heritage, this list includes the mediaeval tombstones (*stećci*) and also the examples of intangible cultural heritage, such as *kolo* (traditional folk circle dance with music) and *slava* (Serbian Orthodox Christian tradition of the ritual annual veneration of the family's patron saint). The UNESCO's Memory of the World Programme presents Serbia through the archive of the famous scientist Nikola Tesla (The Nikola Tesla Museum keeps the scientist's original and personal legacy) and through *Miroslav's Gospel* (a manuscript gospel book written on parchment in the Serbian recension of the Old Church Slavonic). The objects of the vernacular architecture, although still not under the protection of the world cultural heritage, are unique in Serbia and they contribute to the overall impression foreign tourists aquire visiting Serbia (e.g. Rajačke Pivnice near the town of Negotin in

**Fig. 18.23** Petrovaradin Fortress in Novi Sad, Vojvodina. (Photo by D. Bosnić)

**Fig. 18.24** Golubac Fortress at the Iron Gates gorge on the Danube River. (Tvrdjava Golubački grad d.o.o)

**Fig. 18.25** Rajačke Pivnice near Negotin in east Serbia. (Photo by D. Bosnić)

east Serbia is a unique example of vernacular architecture in viticulture (Fig. 18.25), or the old village of Sirogojno in Zlatibor as an outdoor ethnographic museum, Fig. 18.26).

Most of the material movables from different periods are kept in the displays and storages of different museums across Serbia, while the National Museum of Serbia in Belgrade keeps the largest and the most valuable collection. The collection of foreign art consists of 1100 paintings and sculptures, mainly by European artists, in the chronological range from the fourteenth to the twentieth century, among which are famous artists such as Tintoretto, Bosch, Bruegel, Rubens, Van Gogh, Mondani, Monet, Degas, Gauguin, Picasso, Chagall, etc.

Diversity in the cultural heritage of Serbia offers a great potential for the shaping of cultural heritage tourism products. In this respect, the first steps have been made by creating thematic tourist routes (the “Roman Emperors and the Danube Wine Route”, a project implemented by the Danube

**Fig. 18.26** Sirogojno, an outdoor ethnographic museum in Zlatibor mountain. (Photo by D. Bosnić)

Competence Centre (DCC), aiming to create a well-rounded touristic offer based on the cultural-historical heritage, natural environment and active tourism with the river Danube as a well-integrated tourism destination), or the emergence of particular organizations such as the Cluster of Cultural Routes – the network of organizations, institutions, companies and educational institutions from Serbia, Croatia and Slovenia, with the aim to develop cultural routes in the region (Tesla Ways, the cultural route which is in the process of certification in the European Council, or Dragon Routes).

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# Serbia Internationally: International Trade and Integrations

# 19

Predrag Bjelić and Ivana Popović Petrović

**Abstract**

Serbia has re-emerged as a subject of international trade in 2006 after a long period of economic sanctions and trade isolation. Its trade with the world is under the potential and its exports include low-processed products. The main trade partners of Serbia include the European Union (EU), other signatories of the Revised Central European Free Trade Agreement (CEFTA 2006) and the Russian Federation. But the EU also dominates as the main FDI investor in Serbia. Concerning regional trade integration, Serbia is a member of CEFTA 2006 integration that represents a free trade area in the Western Balkans. Serbia also aspires to become a member of the EU and is in the accession process. At present, 16 chapters are opened for negotiation out of 35 in total. The World Trade Organization is the main global trade institution, but Serbia is not a member yet and this has a significant impact on its treatment in global trade relations.

**Keywords**

Foreign direct investment (FDI) · Trade balance · Merchandise trade · Commercial services · European Union · CEFTA 2006

From the exporter of industrial products within mutual country during the 1980s, after a turbulent last decade of the twentieth century, Serbia became the exporter of raw materials, especially agricultural products in the present day. The most important import market for export products of Serbia is the European single market, that is, the European Union. Because of that, the Serbian foreign policy directed towards the EU membership seems as a logic foreign trade strategy (Bjelic 2018). Presently, it is in the process of aligning its regulation with EU rules and standards holding the status of the EU country-candidate.

## 19.1 Serbia's Foreign Trade

Serbia's position in international trade is a result of its economy size and structure as well as its geographical position. It was ranked at the 50th position on the World Trade Organization (WTO) list of leading exporters in world merchandise trade for 2017, with a share of only 0.1% (Table 19.1). The export value in 2017 was 17 billion USD, while the import value was 22 billion USD, implying further continuation of the chronicle trade deficit. According to the statistics of the world merchandise import, Serbia holds the 46th position with the share of 0.2% (WTO 2018b). If we observe the EU members individually, Serbia is ranked at the 71st position, concerning the merchandise export and at the 69th position, concerning the merchandise import (WTO 2018a).

However, in comparison with other Western Balkan economies, Serbia is the only one positioned at the leading 50 world exporters' list. As an exporter of commercial services, Serbia achieved a high rank, at the 50th position, similar to the 53rd position as an importer (WTO 2018a).

One of the major structural problems of Serbian economy is a chronicle trade deficit concerning the merchandise trade. The Serbia's merchandise trade balance recorded a deficit, starting from 2000, with the rising trend until 2009, when a large decrease of imports was registered (Fig. 19.1).

The export has also recorded a decrease in 2009, caused by the economic crisis, but this decrease was not as intensive as a decrease in imports (Statistical Office of Republic of Serbia 2017). That situation provoked a significant reduction in permanent trade deficit after the economic crisis and the gap between exports and imports has been steadily decreas-

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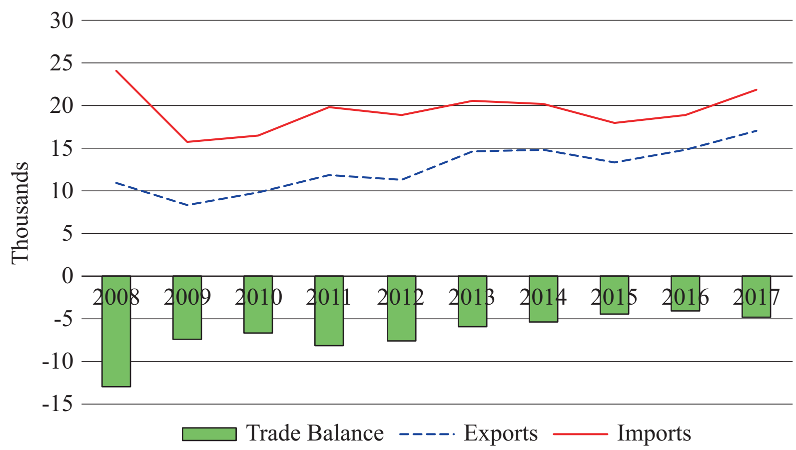
**Table 19.1** Leading exporters and importers in world merchandise trade (excluding intra-EU (28) trade), 2017 (Billion dollars and percentage)

| Exporters | Value | Share | Annual percentage change | *Rank* | Importers | Value | Share | Annual percentage change |
|---|---|---|---|---|---|---|---|---|
| China | 2263 | 16.2 | 8 | *1* | USA | 2410 | 16.9 | 7 |
| Extra-EU (28) exports | 2122 | 15.2 | 10 | *2* | Extra-EU (28) imports | 2097 | 14.7 | 11 |
| USA | 1547 | 11.1 | 7 | *3* | China | 1842 | 12.9 | 16 |
| Japan | 698 | 5.0 | 8 | *4* | Japan | 672 | 4.7 | 11 |
| | | | | … | | | | |
| | | | | *46* | *Serbia* | *22* | *0.2* | *16* |
| *Serbia* | *17* | *0.1* | *14* | *50* | Lebanese Rep. | 20 | 0.1 | 3 |
| Total first 50 | 13,530 | 97.0 | – | | Total first 50 | 13,625 | 95.7 | |
| World excluding EU intra-trade | 13,949 | 100. | 11 | | World excluding EU intra-trade | 14,243 | 100.0 | 11 |

*Source:* WTO (2018b)

**Fig. 19.1** Serbian merchandise trade, 2008–2017, in mil. USD*. (*Source:* Authors' calculation based on data from Statistical Office of the Republic of Serbia 2018. *Revised values for 2014)




ing. With fewer exceptions, in 2011 and 2012, further deficit reduction continued (Statistical Office of Republic of Serbia 2018). On the contrary, trade balance in commercial services is a constant surplus in Serbian economy. That surplus contributes significantly to the total trade deficit decrease (Table 19.2).

**Table 19.2** Trade in commercial services, 2017

| **Commercial services *exports* (mil. USD)** | ***5950*** | |
|---|---|---|
| | **(%)** | **Value (million USD)** |
| Transport | 22.6 | 1345 |
| Travel | 22.6 | 1345 |
| Goods-related services | 6.1 | 365 |
| Other commercial services | 48.7 | 2895 |
| **Commercial services *imports* (mil. USD)** | ***4853*** | |
| | **(%)** | **Value (million USD)** |
| Transport | 26.3 | 1277 |
| Travel | 28.5 | 1382 |
| Goods-related services | 2 | 98 |
| Other commercial services | 43.2 | 2096 |
| Share in world total exports (%) | 0.11 | |
| Share in world total imports (%) | 0.10 | |

*Source*: WTO (2018a)

Trade surplus in services was almost permanent during that period, with an exception, expressed in the appearance of a trade deficit, during 2006–2008 (Bjelić 2018). Serbia's share in the world total exports of commercial services was 0.11%, similar to the share in world merchandise exports. However, Serbian share in the world total imports of commercial services was two times lower than Serbia's share in world merchandise imports. Concerning the world merchandise trade, Serbia is a prominent importer, while as regards the trade in commercial services, Serbia is an important exporter. The product structure of Serbian merchandise trade is observed in two categories: agricultural and non-agricultural products. Serbia shows a permanent surplus in agricultural products' trade. Export categories as fruits and nuts and maize have a very dominant share in the structure of agricultural trade, approximately 12% and 10%, in 2017, respectively. They are followed with the share of 7% for cigars and approximately 4% for apples, pears and quinces and sunflower seeds, individually (WTO 2018a). Serbia is also an important exporter of raspberries, which are one of the top five Serbian exporting products. The most dominant categories in agricultural imports of Serbia in 2017 were unmanufactured tobacco, with the share of about 7% and coffee, with approximately 5%, then swine meat and chocolate with almost 4%, individually (WTO 2018a).

Serbia's top exported non-agricultural products in 2017 were motor cars with the value of 1058 million USD and insulated electric conductors with the value of 939 million USD (approximately 8% and 7% share), as well as pneumatic tyres, electric motors and generators and iron products. The most dominant categories in non-agricultural imports of Serbia in 2017 were petroleum oils, with the value of 936 million USD and parts for motor vehicles, with the value of 841 million USD (share about 5% each), followed by medicaments and motor cars (WTO 2018a).

Serbia trades with both developed and developing countries, but the share of developed countries' trade is much higher. It is mostly oriented towards European and Asian markets for its exports, while the trade with other regions and countries varies from time to time (Statistical Office of the Republic of Serbia 2017). Modest trade is carried out with both the African and American markets, where the most relevant partner is USA. EU is the most important Serbian trade partner, with the high share of 54% of the EU in Serbian export and 56% of the EU in Serbian import (2016).

Among the EU member countries, Serbia trades the most with Italy and Germany, with the high valued Serbian exports of more than 2 billion USD, each (Fig. 19.2).

Among other EU countries with a high value of Serbian exports, mostly are countries regionally close, as Romania, with the export value of more than 800 million USD, continuously during the last decade; Bulgaria, value of even 665 million USD in 2017; Hungary, with 618 million USD in 2017; and Croatia, with the export value of 620 million USD in 2017 (Statistical Office of the Republic of Serbia 2017). Towards these countries, Serbia has oriented high values of its exports of: motor cars, maize, apples, raspberries and rubber tyres, clothing accessories and footwear. The most dominant market for Serbian imports is also the EU market. Serbia imports from Germany value approximately more than 2 billion USD (2774 million USD, 2017). At the second position is Italy with the value of 2207 million USD, in 2017, and the third partner is the Russian Federation, followed by Turkey and others.

Among the products that Serbia imports, the highest share by values is taken up by parts and accessories of the motor vehicles and petroleum oils and medicaments. The second place in Serbian trade is taken up by the CEFTA 2006 region where the bulk of trade is performed with Bosnia and Herzegovina (trade surplus), Montenegro, North Macedonia

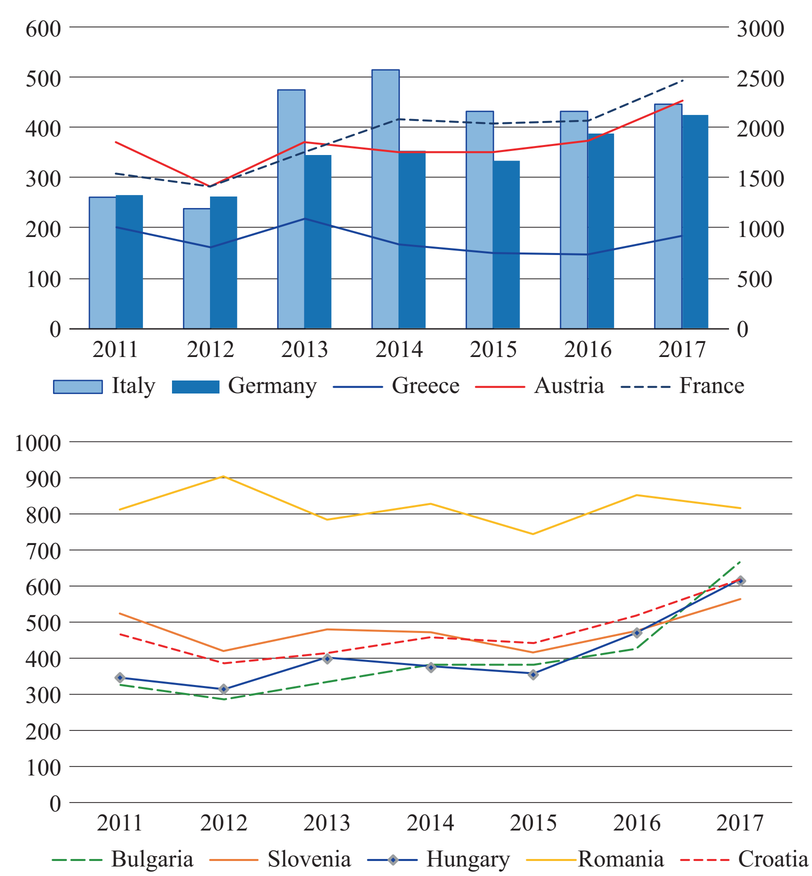



**Fig. 19.2** Trade in goods between Serbia and the EU, 2011–2017 (mill. USD). (*Source:* Authors' calculation based on data from: Statistical Office of the Republic of Serbia 2014 and Statistical Office of the Republic of Serbia, Statistical Yearbook of the Republic of Serbia 2017)

and Kosovo, while the trade volume is very modest with Albania and Moldavia. At the third position on Serbian exports, after the EU and CEFTA 2006, is the Russian Federation, with the amount of Serbian exports up to one billion USD in 2017. As Serbia imports oil and gas from the Russian Federation, the Russian Federation was at the second place of Serbian import, with a share in the interval of 7.8–11.4%. The important partner is also Turkey, which together with the Russian Federation takes up a significant amount of Serbian exports. Important Serbian trade partners also include: United Arab Emirates (UAE), Egypt and Algeria. (Statistical Office of the Republic of Serbia 2014, Statistical Office of the Republic of Serbia 2017 and Statistical Office of the Republic of Serbia 2018). It is interesting that there was a significant increase in imports from Kazakhstan during the 2011–2016 as a direct result of a free trade agreement.

## 19.2 Foreign Direct Investments

Transnational companies, establishing their own branches through foreign direct investments (FDIs), play an important part in national economy development. During the past two decades, the FDI flows to Serbia came from many sides. The most numerous investors came from countries of the EU: Netherlands, Austria, Luxembourg, Germany, Italy, Slovenia, Greece, Cyprus and France (Table 19.3). Companies from these countries, with the EU origin, are the most important investment partners of Serbia. These companies had a very high share of 77.3% in the total number of foreign affiliates in Serbia in 2015, with more than 2000 affiliates (Bjelić and Milovanović 2018).

Besides the EU, other investors mostly come from Russia, with the highest rank of partners in 2010 and 2012. During the last few years, the role of Switzerland and United Arab Emirates has increased.

Foreign direct investments in Serbian economy, during last decade, were mostly oriented towards sector of the light-industry. At the second position was the sector of finance, which has attracted approximately 23% of the FDI, while the sector of agriculture attracted only about 2% of FDI (Bjelić and Milovanović 2018).

These investments are linked to the trade regime improvements through Stabilization and Association Agreement, making both factors (investments and trade regime) very important for the Serbian integration process` improvement. That way, Serbian economy becomes a part of the system of global value chains. Investors, once entering Serbian economy, automatically become like recommendations for other, new investors. But all inflows during the last decades entail investment outflows in future, as well. The proper level of FDI should not be interpreted as the only source of economic development or as the substitute for domestic investments which are insufficient anyway. Besides the expected foreign inflows, there is also an expectation of increase in domestic public and private investments as the important source of development (Ratkaj et al. 2020).

## 19.3 Economic Integrations

Serbian involvement in trade integrations could be observed through two dimensions: regional trade organizations and multilateral trade organizations. The first dimension includes not only regional trade initiatives, like the Central European Free Trade Agreement (CEFTA) and Black Sea Economic Cooperation (BSEC) but also Serbian integration into the European Union (EU). The second dimension includes membership in all international institutions that affect international trade, such as World Trade Organization (WTO) and the United Nations (UN) agencies, but also other organizations, like the International Commodity Bodies, etc.

**Table 19.3** The top five foreign direct investment origin countries for Serbia, 2010–2017 (mill. EUR)

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Russian Fed. 216.2 | Luxembourg 885.1 | Russian Fed. 232.5 | Netherlands 379.8 | Netherlands 372.7 | Netherlands 361.7 | Netherlands 341.8 | Netherlands 542.7 |
| Slovenia 180.4 | Austria 613.2 | Austria 168.9 | Russian Fed. 189.7 | Switzerland 139.1 | Austria 352.5 | Switzerland 234.6 | Austria 248.7 |
| Cyprus 108.7 | Russian Fed. 488.5 | Netherlands 153.5 | Austria 151.8 | Austria 119.2 | Luxembourg 172.3 | Luxembourg 232.9 | Italy 195.6 |
| France 107.7 | Netherlands 215.5 | Luxembourg 134.5 | Luxembourg 102.7 | Italy 101.1 | Italy 144.9 | Austria 232.4 | Germany 185.4 |
| Germany 103.5 | Germany 198.7 | France 131.4 | France 99.3 | Greece 89.7 | UAE 120.5 | Germany 179.6 | Russian Fed. 170.4 |
| Total FDI | | | | | | | |
| 1278.4 | 3544.5 | 1008.8 | 1547.9 | 1500.5 | 2114 | 2126.9 | 2.548,1 |

*Source:* National Bank of Serbia 2019

The region of Southeast Europe was outside the mainstream regional trade integration due to the regional conflicts during the 1990s. Because of that, the idea of regional integration in the South-eastern Europe (SEE) came externally, from the EU. Since all the countries in the region aspire to become a part of the EU, one of the conditions of the EU membership is a development of intra-regional cooperation in the region. Since the process of becoming a EU member is a lengthy process that can even take decades, the candidate countries could benefit from the regional trade integrations, at first place the CEFTA.

The original CEFTA was established in December 1992 by Poland, Hungary and Czech and Slovak Federative Republic with an aim to establish free trade among the parties. This agreement was not only an economic but also a political alliance of countries on their road to the EU (CEFTA integration helped them to consolidate political democracy and free-market system). The CEFTA agreement established a free trade area between its signatories for 40% of the industrial products exchanged. For the rest of industrial products, the liberalization was postponed until 1998 when the free trade area in CEFTA was completed for industrial products. The agricultural product liberalization was not so effective and referred to only around 20% of these products exchanged between participating countries (Bjelić 2018). Since there were potential new members in Poznań, the Declaration was adopted in November 1994 setting the conditions for CEFTA membership:

- Candidate country must have concluded free trade agreements with all CEFTA parties.
- Candidate country must have concluded a EU association agreement with clear reference to future membership.
- Candidate country must be a World Trade Organization member.

CEFTA was later extended to include Slovenia, in 1996, Romania, in 1997, Bulgaria, in 1999, Croatia, in 2003 and North Macedonia, in 2006 (Fig. 19.3). But with the EU membership, many parties have left CEFTA since EU represents a highly integrated trade block with the Common Trade Policy (CTP) which excludes membership in some other regional trade groupings.

But in 2006 CEFTA was reanimated with the inclusion of SEE economies that with Romania, Bulgaria and Croatia formed a ‘new’ CEFTA. The CEFTA was revised (CEFTA 2006) and the new membership criteria were adopted by the Zagreb Declaration in 2005.

The change in CEFTA accession criteria enabled other South-East European countries to become members (CEFTA 2018). The members of this revised CEFTA in 2006 were not only Romania and Bulgaria, until January 2007, Croatia, until June 2013, but also North Macedonia, Albania, Bosnia and Herzegovina, Montenegro, Serbia and later Republic of Moldova. The CEFTA 2006 signed the United Nations Interim Administration Mission in Kosovo (UNMIK) in the name of the customs territory of Kosovo.

Serbia is one of the most developed CEFTA 2006 parties with the largest economy in the region with the significant surplus in trade in goods with CEFTA 2006 parties. The exports of Serbia are rising significantly after the signing of the revised CEFTA Agreement in 2006, but in 2009, this export recorded a fall, due to the global economic crisis (Fig. 19.4). Serbian import from CEFTA 2006 parties was stable until 2013 when it dropped significantly when Croatia left the integration.

The most important trade partners of Serbia from CEFTA 2006 signatories include not only Bosnia and Herzegovina, Montenegro and Croatia (before it left the CEFTA 2006 in 2013), but also Kosovo and North Macedonia (Bjelić and Dragutinović-Mitrović 2018). Bosnia increased imports from Serbia, compared to the previous period, since before 2013 Croatia was the dominant partner. Concerning the CEFTA 2006, the highest level of Serbian imports comes from Bosnia and Herzegovina, with approximately, 500 mill USD, per year. This example points to the positive effects of regional trade agreements, which open the door to an obvious increase of intra-regional trade.

The structure of CEFTA trade shows that the most dominant products are from the food and live animals’ category, with the value of over 700 million USD (Statistical Office of the Republic of Serbia). It has a continuously high share of this category in Serbian exports to CEFTA 2006. Other important product categories include: manufactured goods with a value of over 500 million USD, machinery and transport equipment, with a value of about 400 million USD and chemical products, with a value of more than 300 million USD (Fig. 19.5).

Serbia imports from CEFTA 2006 signatories mostly manufactured goods, classified chiefly by materials, with the value of about 250 million USD, continuously during the last decade. Mineral fuels, lubricants and related materials are also dominant category in the structure of Serbian merchandise imports from CEFTA 2006, with the value of approximately 200 million USD (Statistical Office of the Republic of Serbia 2018).

CEFTA 2006 is a free trade area that allows free trade in goods between signatories of this agreement. The deepening of CEFTA 2006 is envisaged in the Regional Economic Area (REA) multiannual action plan adopted in 2018. Serbia ratified the CEFTA Additional Protocol 5 on Trade Facilitation to the CEFTA in September 2018. However, the adoption of Additional Protocol 6 on Trade in Services is delayed due to disputes in the region connected with the introduction of high tariffs by Kosovo to Serbia and Bosnia and Herzegovina.

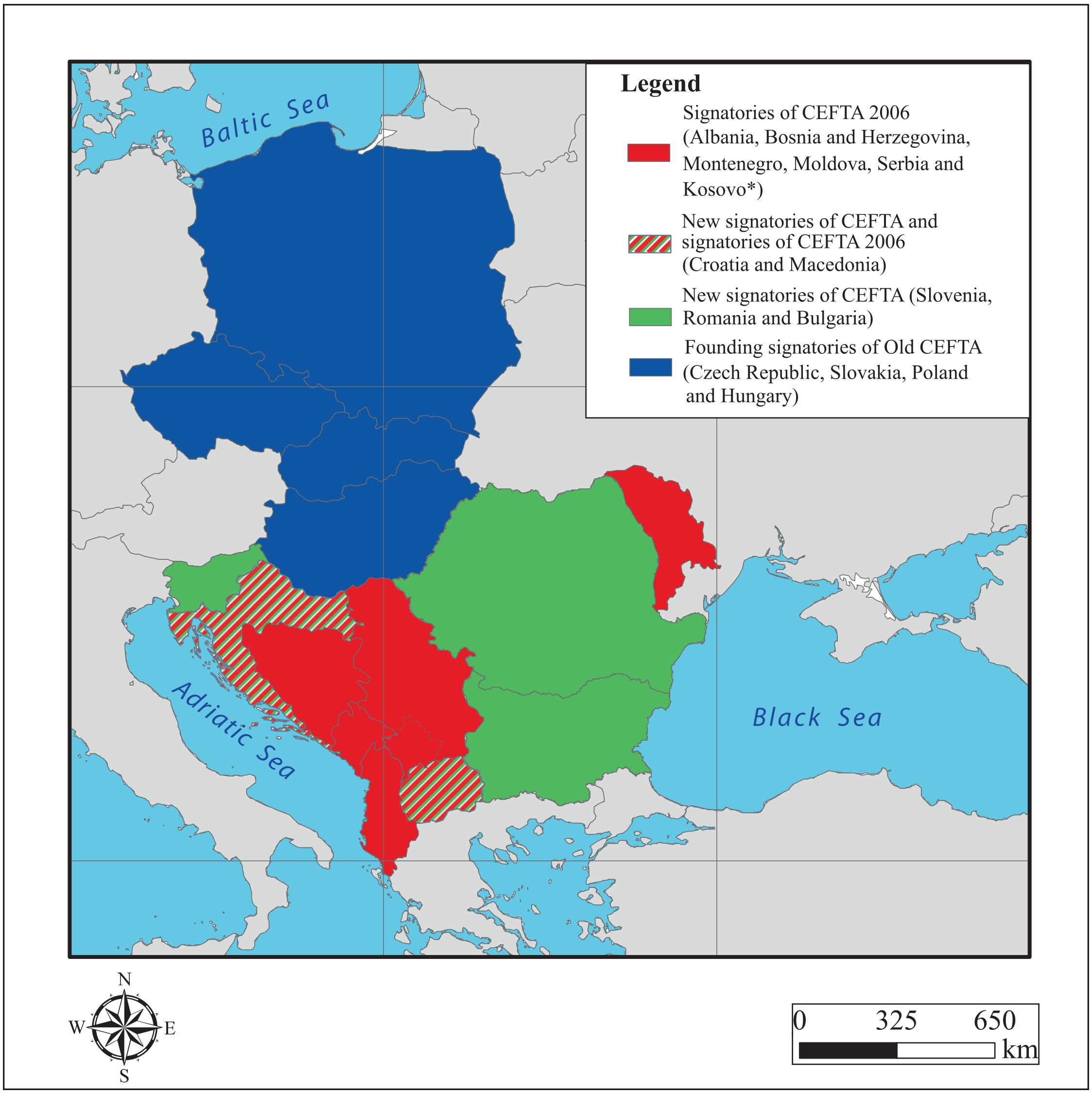



**Fig. 19.3** Map of CEFTA contracting parties

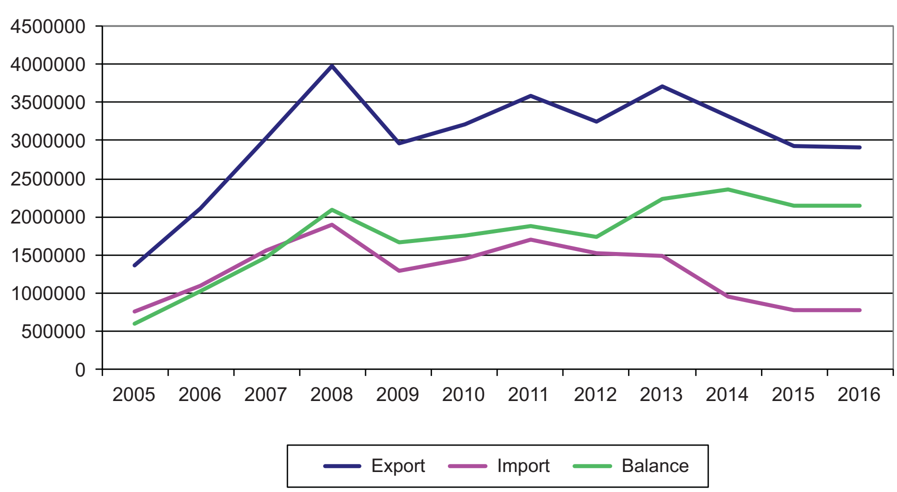



**Fig. 19.4** Serbia trade in goods with the CEFTA 2006 (2005–2016) (000 USD). (*Source:* Authors' calculation based on data from the Statistical Office of the Republic of Serbia and Chamber of Commerce and Industry of Serbia data for trade with Kosovo 2018)

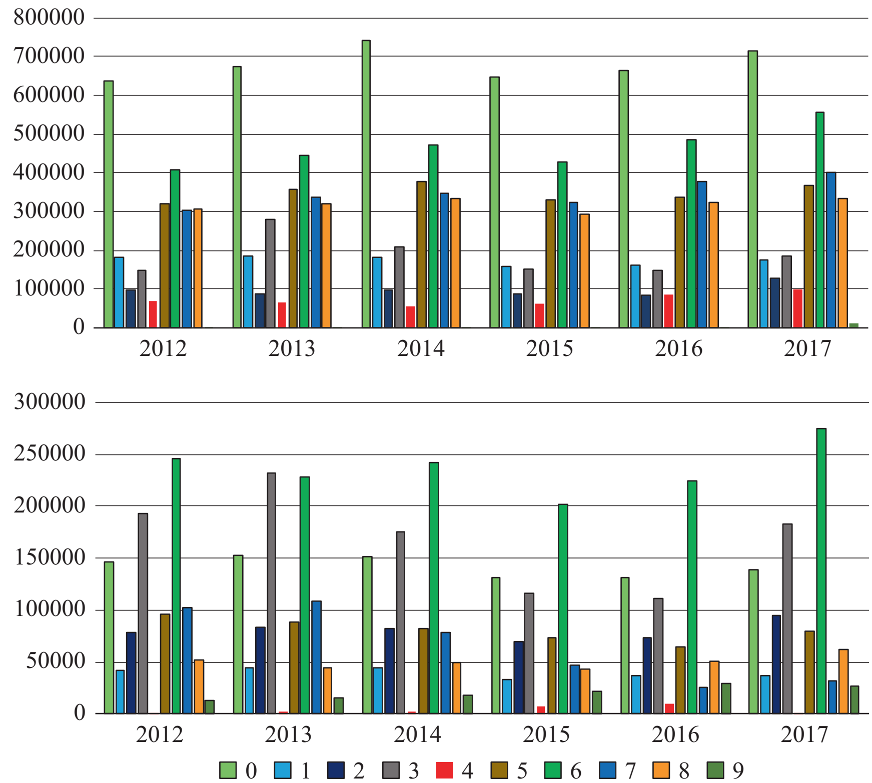



**Fig. 19.5** Exports and imports of goods, Serbia-CEFTA 2006, by sections of the Standard International Trade Classification (SITC), rev.4, 2012–2017. (*Source*: Authors' calculation based on data from Statistical Office of the Republic of Serbia 2018)

Serbia has proposed the negotiations on Additional Protocol 7 on Dispute Settlement in CEFTA 2006.

Serbia is also a member of the Black Sea Economic Cooperation (BSEC) that represents another regional integration established in 1992 in Istanbul. From 1999, the BSEC acquired international legal identity and was transformed into a full-fledged regional economic organization that gathered 12 Member States: Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Serbia, Turkey and Ukraine. Today, the BSEC serves as a forum for cooperation in a wide range of areas for its members and one of these areas is trade. But there are no trade preferences exchanged between the members of the organization, so BSEC remains a trade promotional organization rather than the regional trade integration like CEFTA 2006 or others.

Although Serbia is small economy, the membership in the international trade organizations is quite important. Serbia is still not a member of the most important global economic institution in the area of international trade – World Trade Organization (WTO). Socialist Federal Republic of Yugoslavia (SFRY) has been the only socialist country to be a Contracting party of the General Agreement on Tariffs and Trade (GATT) since 1966. It was very active in this principal trade legal instrument that regulated trade in the Western Block. This was very beneficial for SFRY trade since it traded significantly with both Western and Eastern Blocks of countries. With the dissolution of SFRY, the Federal Republic of Yugoslavia (FRY) tried to insist on the continuity with the SFRY and submitted its first application to WTO membership in 1996. But legal continuity was not possible without agreement with state successors of SFRY. Finally, FRY submitted its new application for WTO membership as a new party, without insisting on the continuity with SFRY, in 2000 recalling the Article XII of the Agreement establishing the WTO (Bjelić 2018). In February 2001, the WTO General Council established the Working Party for FRY accession to the WTO. Unfortunately, in the meantime this accession faced the obstacle of existing three customs unions, instead of a single FRY market. Another application for WTO membership was submitted in 2004 and Serbia, as well as Montenegro, applied as a separate party for the WTO membership. (Bjelić 2002). The Memorandum on the Foreign Trade Regime of Serbia was submitted in 2005 giving detailed information on Serbia's foreign trade system. Until 2019, the Working Party had 13 meetings, with the last meeting held in 2013. Serbia has made an offer of concessions for goods, including agricultural products, and services in 2006. Many of the bilateral accords on the regulation of Serbia's WTO membership have been concluded but negotiations are still open with some WTO members, like Ukraine, Brazil, United States of America and the Russian Federation. The membership in WTO is very important for Serbia also because the European Union insists that candidate countries for a EU membership must first be WTO members (Bjelić 2015). In its negotiations with the EU for the full membership, Serbia has opened Chapter 30 on international economic relations, but this chapter cannot be closed without Serbia's membership in the WTO. Not just that, Serbia has to be a member on the date of the closing of Chapter 30, but it has to have a significant track record in the WTO membership.

## 19.4 European Union and Serbia

Serbia has shaped its foreign policy towards becoming member of the European Union (EU) and perceives CEFTA 2006 integration as transitory and temporary regional integration. This strategic orientation is influenced by the fact that EU is a dominant trade partner of Serbia, since it accounts for approximately 60% of Serbia trade, not only by both exports and imports but also by its geostrategic position in the current global political relations. With such intensity of trade exchange between EU and Serbia, trade theories suggest that most benefits will be achieved with Serbia's integration into this trade block.

The candidate status Serbia had obtained in March 2012. At that moment, it was obvious that Serbia had a long period of EU legislative harmonization in front. During that negotiation process, until May 2019, Serbia had opened 16 out of 35 chapters, with a two of them, provisionally closed – Chapter 25: Science and Research, and Chapter 26: Education and culture (European Commission, Internet). Besides the fulfilment of the expected economic criteria and aligning its legislation with the EU acquis, there are many other challenges, decelerating the negotiating process.

Observing the trade flows between the EU and Serbia from 2000 onwards, it can be noted that the trade exchange was very small at the beginning but had risen very dynamically, especially after 2003 when the EU started to apply special asymmetrical trade preferences towards Serbia and other Western Balkan economies (ATMs) (Fig. 19.6). This rose both exports and imports of Serbia to the EU until 2008, after which a sharp fall occurred due to the world economic crisis (Popović-Petrović and Bjelić 2018).

The rise of trade flows with the EU from 2013 is influenced by the fact that Croatia joined the EU that year in June, with which Serbia had significant trade within CEFTA. On the other hand, the slight fall in trade with the EU in 2015 coincides with the full application of Stabilization and Association Agreement (SAA) between Serbia and the EU, the agreement that introduces symmetry in trade relations between Serbia and the EU.

The trade regime is an important stimulus for trade exchange, especially in the EU accession process (Dragutinović-Mitrović and Bjelić 2015). However, the more positive effects Serbia had achieved during the first stages of its EU integration, when asymmetric trade preferences were applied, than in the later stages when SAA came into effect introducing symmetry, when no significant impact occurred. The reason for this was the low internationally competitive position of Western Balkan economies in comparison to the EU as their main partners (Bjelić and Milovanović 2018). There is a permanent deficit in Serbia's trade with the EU (Fig. 19.6). This is to be expected since the EU member countries are much more developed and diverse economies compared to the economy of Serbia. But since 2008, the deficit is lowering and the gap between imports and exports is closing. In 2017, the deficit in Serbia's trade with the EU was below 10% of the total trade between Serbia and the EU in that year. The decrease of deficit is due to the World economic crisis as well as rising industrial exports of Serbia starting from 2013.

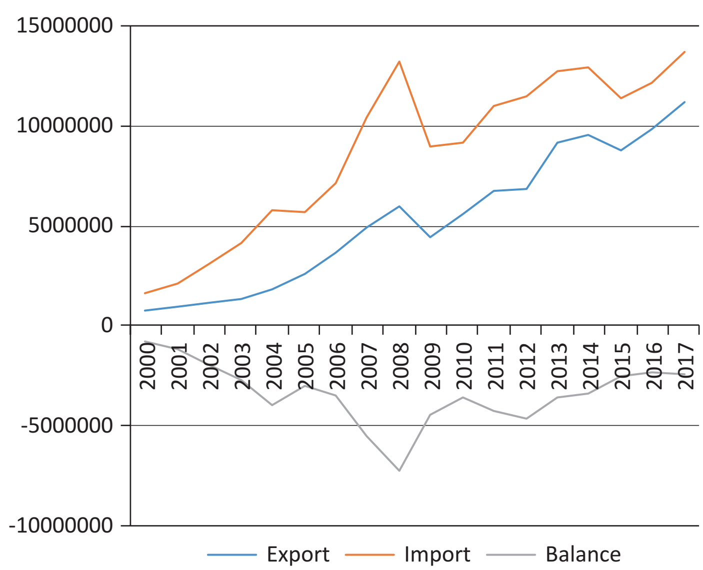



**Fig. 19.6** Serbia's trade in goods with the EU 2000–2017, 000 USD. (*Source:* Authors' calculations based on data from Statistical Office of the Republic of Serbia 2018)

During the last decades, trade relations between Serbia and the EU have been improved by unilaterally introduced measures, as Autonomous Trade Measures (ATMs) in 2000, by the EU. This phase in the development of trade relations brought to Serbia a tariff-free and quota-free access to the market of the EU, with the exception for some sensitive products, such as meat, vine and sugar (Bjelić and Milovanović 2018). These measures had a positive impact on the increase of trade between Serbia and the EU. That period of significant rise of trade was noticeable, especially until 2008. Although these measures gave some benefits for Western Balkan economies, they have been unilateral and limited by time, until they regulate trade by a formal agreement. The process of regulation met the new moment in 2009, with the bilateral trade agreement SAA. This Agreement implied further implementation of the ATM, with the opening of Serbian market for EU products in the transitional period of 6 years. It was an agreement that introduced symmetry in the trade regime, with the aim to form a free trade zone between Serbia and the EU. However, the ATMs impacted the trade increase more significantly than the introduction of symmetry.

When Serbia becomes a member of the EU, it will have to renounce its membership in CEFTA 2006 Regional Trade Integration as well as other trade agreements that are not in full compliance with the EU Common Trade Policy (CTP). These agreements include all bilateral free trade agreements that Serbia concluded over the years. One of these agreements is the free trade agreement between the Eurasian Economic Union, signed in 2019, that consolidates three previous free trade agreements, with the Russian Federation concluded in 2000, but also with Belarus and Kazakhstan, and with the inclusion of two new economies – Armenia and Kyrgyzstan. Serbia has also concluded free trade agreements with Turkey and European Free trade Association (EFTA) that include Norway, Island, Switzerland and Lichtenstein.

Serbia's accession process to the full EU membership is mostly about regulating trade relations with this trade block, but is also preparing Serbia for the future membership in the Block. From an economical point of view, this includes fulfilment of economic criteria for membership, as well as preparation for a future integration in the EU Customs Union as well as Single EU market. The EU accession for Serbia is also a highly political and legal meter. The EU Commission has made many comments on the lack of rule of law and need for juridical reform as well as the lack of fight against corruption. One of the biggest obstacles to Serbia's EU accession is the need for 'normalisation of relations with Kosovo' and this request is contained in Chapter 35. Serbia continues to endorse the global strategy for the European Union's foreign and security policy, and during the period from the beginning of March 2018 until the end of February 2019, Serbia aligned, when invited, with 46 out of 87 relevant High Representative declarations on behalf of the EU and Council decisions, representing an alignment rate of around 53%. Serbia continued not to align with the EU restrictive measures related, inter alia, to Russia and Venezuela (EU Commission 2019).

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# Part V

# Regional Development and Specificities

Vladimir Nikitović and Emilija Manić

# 20 Environmental Issues in Serbia: Pollution and Nature Conservation

Vladimir Stojanović, Milana Pantelić, and Stevan Savić

**Abstract**

Serbia is facing several serious environmental problems which are strongly related to its historic legacy of a centrally planned economy and insufficient investments in the ecological-related projects. It is facing the serious air pollution in the major cities (category III), low level of the wastewater from utility and industrial sources (that less than 15%), an inadequate waste management with a small percentage of recycling, as well as the degradation and pollution of the quality soil which is one of the key natural resources in Serbia. On the other hand, its rich and diverse natural heritage has been under the nature conservation process started from 1948 when The Institute for Nature Conservation of Serbia was established. The protected areas in Serbia currently cover 662,435 ha with two areas on the UNESCO MaB list included as biosphere reserves: Golija-Studenica and Bačko Podunavlje and five national parks.

**Keywords**

Environment · Air pollution · Water supply · Soil erosion · Nature protection · National parks · Biosphere reserves

## 20.1 Main Ecological Issues

Many of Serbia's environmental problems are strongly related to its historic legacy of a centrally planned economy. A focus on heavy industrialization created inefficient and wasteful natural resources use. Due to the economic collapse in the 1990s, necessary environmental investments to prevent pollution and build infrastructure for water, sanitation and solid waste, were not undertaken. Despite ongoing reform efforts, Serbia still faces with serious environmental problems.

General causes of the environmental problems in Serbia include: poor integration of environmental policies with economic and other sectoral policies, insufficient institutional capacity, ineffective monitoring and reporting systems, inefficient environmental enforcement due to legal gaps and inconsistencies, poor inspection supervision and long court procedure, insufficient and ineffective environmental financing, limited use of economic policy instruments, low environmental awareness, insufficient environmental education and inadequate public participation in decision making (Government of the Republic of Serbia 2007). The high levels of pollution, like air-pollution in some areas, poor drinking water quality and other environment-related problems, in Serbia have large negative health effects. Weak data make it difficult to estimate the exact magnitude of these effects.

### 20.1.1 Air Quality Conditions

Generally speaking, the air over the entire Serbia is clean or *slightly polluted (category I)*. However, the air quality of the largest cities mostly belonged to category III, based on *suspended particles* $PM_{10}$ *or* $PM_{2.5}$: Subotica, Sremska Mitrovica and Pančevo in Province of Vojvodina (Northern Serbia), the capital Belgrade, then Smederevo, Kragujevac, Valjevo, Užice, Kraljevo, and Niš in Central Serbia. According to SEPA (2019a), the main pollutants in Serbia are outdated technology, the low level of energy efficiency, the lack of gas purification solutions in the industrial and energy sectors, the use of poor-quality heating fuel, as well as poor quality motor vehicles.

In 2017, excessive concentrations of *sulphur dioxide* ($SO_2$) (above 500 µg/m$^3$) were recorded in Bor, mostly from the industry (see Chap. 16), while the *nitrogen dioxide* ($NO_2$)

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E. Manić et al. (eds.), *The Geography of Serbia*, World Regional Geography Book Series,
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(above 400 μg/m$^3$) was recorded in concentrations harmful to health in the cities of Belgrade and Niš, mostly from the industry and traffic activities. *Ozone pollution* (public announcements for levels above 180 μg/m$^3$, and public warnings for concentrations above 240 μg/m$^3$ in three consecutive hours) occurred in July in Belgrade, and on the territory of Vojvodina (Pančevo and Subotica). In Subotica, there was an increase in concentration in 1 h, in Belgrade up to 7 h and in Pančevo up to 5 h (SEPA 2018a). The ozone pollution is the result of combination of a higher concentration of particles in the air as well as a high air temperature. Therefore, ozone pollution occurred often in the largest cities in Serbia during the summer periods.

In 2018, 77% of cases with the polluted air (polluted air higher than category I) are based on suspended particles $PM_{10}$, and the ozone (O3) pollution has a value of 19% of cases. Contrary to this, nitrogen dioxide ($NO_2$) contributes with 2%, and sulphur dioxide ($SO_2$) and carbon monoxide (CO) contribute with 1%, respectively (SEPA 2019b).

According to the monitoring system, the $PM_{10}$ has the main role in air pollution in Serbia and based on regulations the threshold value is 35. In 2018, the cities with the highest number of days with exceeded threshold value of $PM_{10}$ were Valjevo (170 days), Užice (154) and Smederevo-downtown (146) in Central Serbia as well as Belgrade (132). Analysing more in details, the highest $PM_{10}$ values occur during the winter season. The cities with the highest number of days with exceeded threshold value of $PM_{10}$ in the last winter were Valjevo (151 days), Užice (140) and Kraljevo (96) in west Serbia, Sremska Mitrovica (104) in Vojvodina and Smederevo-downtown (89) in the northern part of central Serbia (SEPA 2019b). The cities of Bor (east Serbia) and Belgrade still have problems with excessive concentrations of sulphur dioxide ($SO_2$) and nitrogen dioxide ($NO_2$) in some periods of the year. The cities such as Smederevo, Subotica, Valjevo, Užice, Kraljevo, Kosijerić (west Serbia) and Kragujevac have had air pollution categories II or III for the past 3–6 years, based on suspended particles. On the other hand, the cities such as Novi Sad and Niš (southern Serbia) have air category I, and it is a better situation compared with previous years (SEPA 2019b).

The Agency for Environmental Protection is in charge of continuous air quality monitoring in Serbia. But since 2011 the reliability and the availability of air quality measuring stations have been decreasing constantly (SEPA 2019a). In 2018 the number of stations for air quality monitoring decreased from 39 to 33. Also, since 2011 the number of installed analysers for $SO_2$, $NO_2$, CO, $O_3$, and $PM_{10}$, with operational capacities of 94% decreased to 65% in 2012, 72% in 2013, 30% in 2014, 25% in 2015, 23% in 2016, and 22% in 2017, but increased in 2018 to 48% (SEPA 2019a). This situation with a very variable monitoring network could provide misleading information about the real air quality, particularly in bigger cities. For instance, based on these monitoring issues, the category of air quality in urban areas of Novi Sad and Niš could be questionable, and must be analysed with caution.

According to the legal framework, the air quality plans have to be implemented in situations when the air quality in urban areas belongs to category III of air quality index (over polluted air). This is also the case when the environmental capacity is endangered, or when there is constant air pollution in a certain area. However, local governments find it very difficult to apply such actions, due to the lack of local capacity for the effective preparation and implementation of the designated plans. Hence, government institutions do not have the capacity to influence the improvement of the situation independently (Koalicija et al. 2018).

With the aim of further air quality improvement in Serbia, it is necessary to take certain steps: i) determine the air quality strategy, which is necessary for implementing adequate measures based on the monitoring results and analysis (e.g. according to the annual and monthly reports of the Agency for Environmental Protection, no assessments are conducted and no measures are deployed regarding the air quality); ii) adopt standards for regulating low-power combustion used in households, as well as for regulating the efficiency of hard fuel combustion in order to reduce current emissions; iii) improve the network for air quality monitoring and provide stable financial resources for the national network maintenance; iv) strengthen the local network for air quality monitoring with the aim of better visibility and public data accessibility at the level of cities and local self-government.

### 20.1.2 Water Quality Conditions

Serbia is a country which does not lack water resources (see the Chap. 6). It has sufficient quantities of water to meet the requirements but only if used rationally and protected from pollution. The largest percentage (over 90%) of all available water resources in Serbia are transit waters flowing into the country via the Danube, Sava, Tisza and other watercourses, while less than 10% originate from the territory of Serbia.

Water supply in Serbia can be assessed as satisfactory to good. Surface and groundwater are used for water supply. Groundwater supplies 75% of water requirements mostly to households and industry, while surface water accounts for about 25% (Veljković and Jovičić 2015). Most of the Serbian population has access to the public water supply system (86.9%) (Statistical Office of the Republic of Serbia 2018) (Fig. 20.1). In terms of water quantities, the area of Šumadija is endangered, whereas most of the region of Vojvodina is under the threat because of the excess exploitation of groundwater. Regarding the quality of drinking water, Vojvodina has the biggest problems (Northern Serbia) as well as the

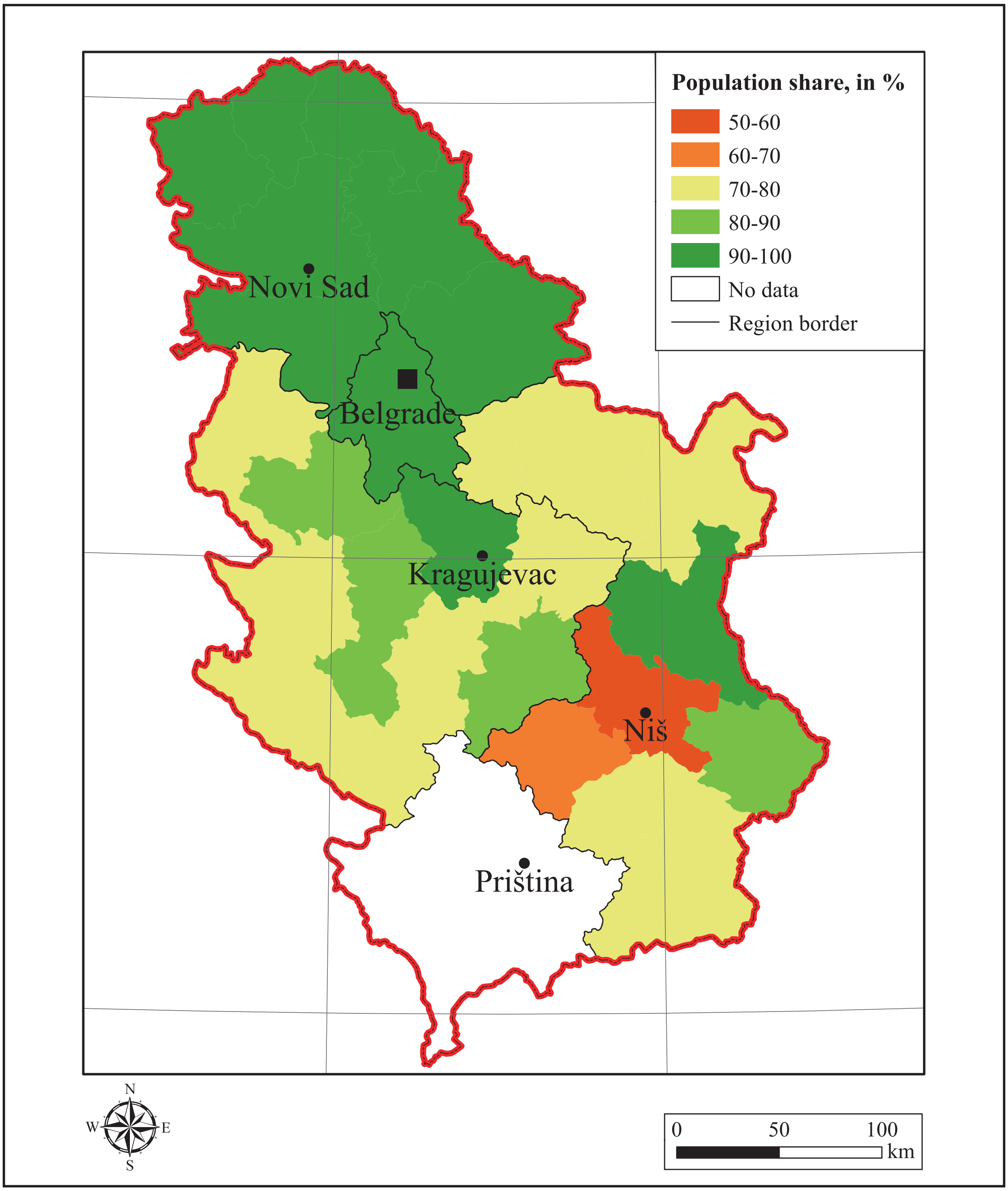


**Fig. 20.1** Population connected to a public water supply. (*Source:* authors' calculation based on data from the Statistical Office of the Republic of Serbia 2018)

catchment area of the Zapadna (Western Serbia), Južna (Southeastern Serbia) and Velika Morava Rivers (Central Serbia) (Urošev et al. 2017).

The average specific water consumption in Serbia is close to the EU average (200 l/capita/day) (UNDP 2006) and it accounts for around 148 l/capita/day (Urošev et al. 2017). At the same time, the industrial sector is largely conducted by their own systems for collecting and transporting water (Government of the Republic of Serbia 2008a).

*Untreated wastewater* continues to be a major source of pollution of both surface and groundwater (in the EU more than 80% of municipal wastewater is treated, whereas in Serbia that is the case with less than 15%, with a large number of households in rural areas not even being connected to the sewer system). Generally speaking, groundwater quality is not at the satisfactory level in Serbia. The great proportion of this water is used for the water supply, especially in Vojvodina, but a great deal of it is polluted by natural organic materials, arsenic, natrium, boron, iron, manganese, ammonia, etc. (Dalmacija et al. 2015). The most frequent source of this pollution are households and the industry. Unfortunately, it is not much brighter situation with surface water either. Only 3% of stream and river water bodies were characterized by good ecological status in Serbia (SEPA 2018b). Most of the mountainous water streams are clean (i.e. smaller rivers in the southwest of the country such as rivers Rzav, Studenica and Moravica in west Serbia).

The most challenging aspect considering the water quality of Serbian rivers is the untreated wastewater. Water streams near large urban centres are polluted mostly by wastewater (the Južna Morava in Southeastern Serbia, the Timok in Eastern Serbia, the Ibar in Central Serbia and Krivaja, Bosut and some sections of the Danube-Tisza-Danube system (DTD) in Vojvodina). One of the biggest ecological problem in Serbia is the pollution of Veliki Bački Canal (part of the DTD system) (Pantelić et al. 2016), which has been officially declared a "*black ecological spot"* in the Danube catchment area (Pantelić et al. 2017). The pollution of the canal water is of organic origin and the result of a long-term release of industrial wastewater (Pantelić et al. 2012). Due to increased pollution, the levels of oxygen have been depleted and organic materials degraded in anaerobic conditions, when toxic materials and gases are released (hydrogen sulphide, methane and ammonia), endangering flora and fauna of these water streams. In addition to very poor water quality, sediment is another great problem of Veliki Bački Canal (Stojanović et al. 2014), with larger quantities of heavy metals being registered (Rajić et al. 2011). Apart from Veliki Bački Canal, the list of the "Ten Worst" water courses in Serbia includes the rivers Borska and Krivaljska (in Eastern Serbia), Nadel Canal, the Plovni Begej River, Kikindski Canal, and the Zlatica River (in Vojvodina), the Nišava River, the Blatašnica River, the Jablanica River and the Južna Morava River (in Southeastern Serbia) (Veljković and Jovičić 2015). This list suggests that the smaller water recipients (water courses and canals) are under the biggest threat. All water courses feature a high level of anthropogenic pollution (Gradić et al. 2015; Marinković et al. 2014). A specific example is the Borska River in Eastern Serbia which receives part of the water from the mines that is polluted by the copper ions and suspended particles, as well as the nearer Krivaljska Reka which receives wastewater from flotation and open-pit mining, polluted by heavy metals, copper ions and iron in high concentrations (Bogdanović et al. 2013).

Bigger rivers with their stronger self-purification capacity are less polluted (e.g. the water quality of the river Danube is better when flowing out of Serbia) (Takić et al. 2012). This does not mean that anti-pollution measures are implemented more effectively, but that the lack of water quality protection measures is less obvious. The pollution of the large rivers and large river basin areas within the Danube River Catchment Area is quite big and the water quality is unsatisfactory with a dominant moderate and poor ecological status (bad ecological status was determined at 17% of water bodies) (SEPA 2018b). Similar water quality was found in the water bodies of the right tributaries of Đerdap sector in the Eastern Serbia – the Timok River (22% of water bodies are in poor ecological status) (SEPA 2018b). On the other hand, most of the streams and rivers in western and central Serbia is characterized by higher water quality (SEPA 2018b). Since the largest part of the Serbian territory belongs to the Danube catchment area (the Black Sea catchment area) which has been declared a sensitive region, Serbia, after joining the EU, will be obliged to provide an appropriate level of communal wastewater treatment required for such regions (Government of the Republic of Serbia 2016).

The anthropogenic factor is the most dominant factor in the water pollution (Pantelić et al. 2015). The largest water source polluters are the household sewage system and the industrial plants. The wastewater treatment in the Serbian settlements (wastewater treatment plants – WWTP) is at the low level compared to European standards (Fig. 20.2).

The sewage infrastructure is moderately built which bring Serbia to the very back of the European list in terms of wastewater treatment. Namely, sewage network is accessible to about 62% of the population (Fig. 20.3), whereas less than 15% of the population have access to some form of wastewater treatment (SEPA 2019b).

In general, the biggest problem considering water pollution is the fact that most of the wastewater from settlements is released into the recipients without any treatment. There are some improvements during the past two decades (in the settlements with more than 2000 residents, more than 50 wastewater plants were built, out of which 32 are operating: the smaller number operates according to projected criteria, whereas the others operate with the efficiency which is far below the projected one) (Government of the Republic of Serbia 2016).

Regarding the industry sector, there is no pre-treatment of industrial wastewater. The largest part of polluters does not submit their reports regularly to the National Register of Pollution Sources (Agency for Environmental Protection), and those who do usually send incomplete data. Consequently, it is not possible to reliably quantify industrial pressure (Government of the Republic of Serbia 2016).

Surface and groundwater monitoring in compliance with the Water Framework Directive (WFD) requirements is being carried out partially in Serbia. This segment has been improved in the past few years, but it needs to be strengthened even more. Conducting surface water status monitoring in Serbia is characterized by two opposing options. On the

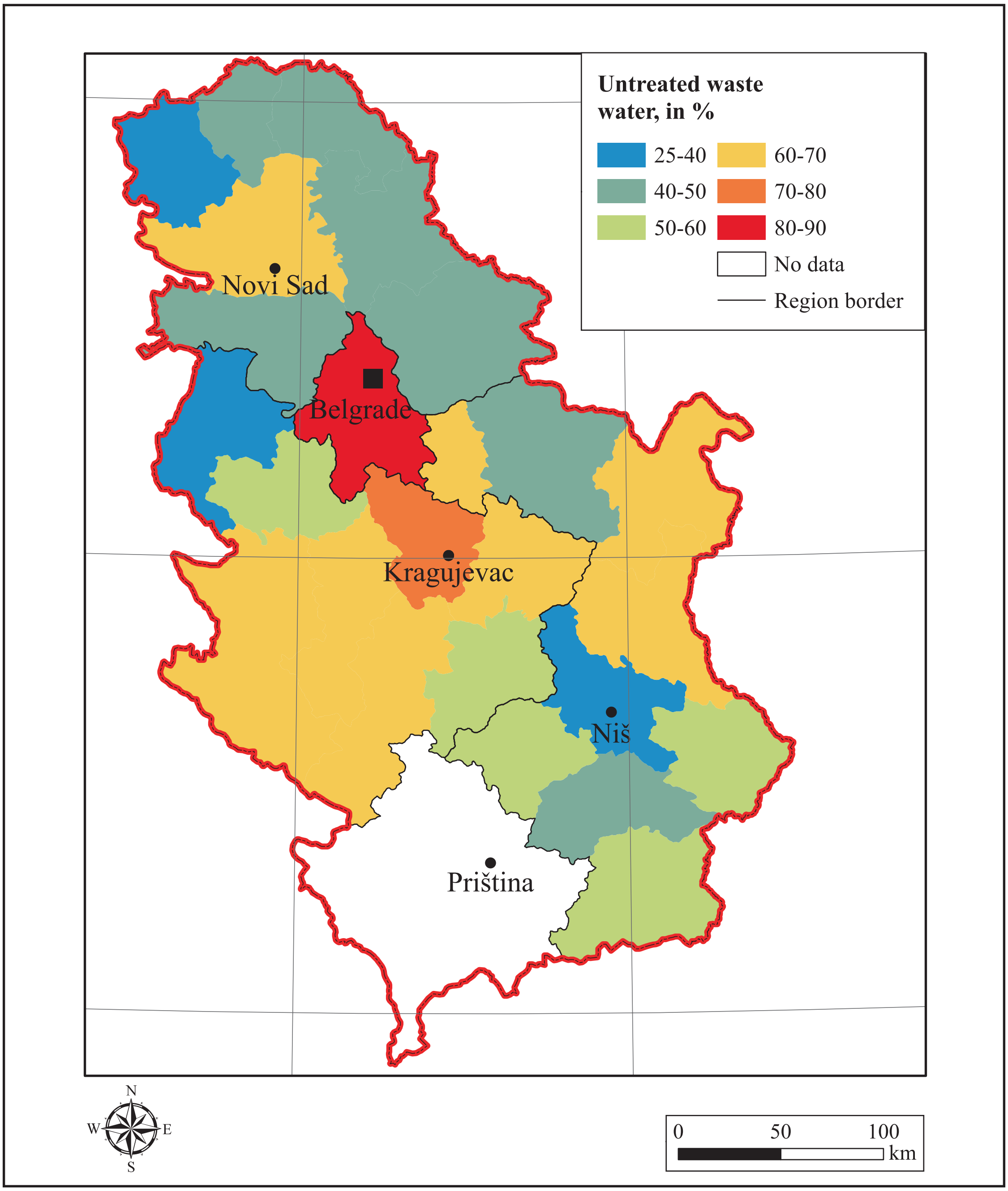


**Fig. 20.2** Untreated wastewater by areas. (*Source:* authors' calculation based on data from the Statistical Office of the Republic of Serbia 2018)

one hand, since the beginning of 2012, the budget and expert capacities for water monitoring have decreased. On the other hand, laboratory equipment obtained mainly from IPA funds has provided quality elements for monitoring the status according to WFD criteria. This paradoxical situation causes great problems for the implementation of adequate monitoring (SEPA 2018b).

When Serbia started the harmonization with the EU regulative within environmental issues, the water regulative was the first one – Water Management Strategy of the Republic of Serbia 2016–2034 (Government of the Republic of Serbia 2016), after which Law on Waters with amendments (2016) were launched with the accompanying by-laws, which were all together in a partial compliance with the Water Framework Directive 2000/60/EC. However, the implementation of the EU directives still is not complete, and their full implementation will take several more years (e.g. an Action Plan with implementation measures and

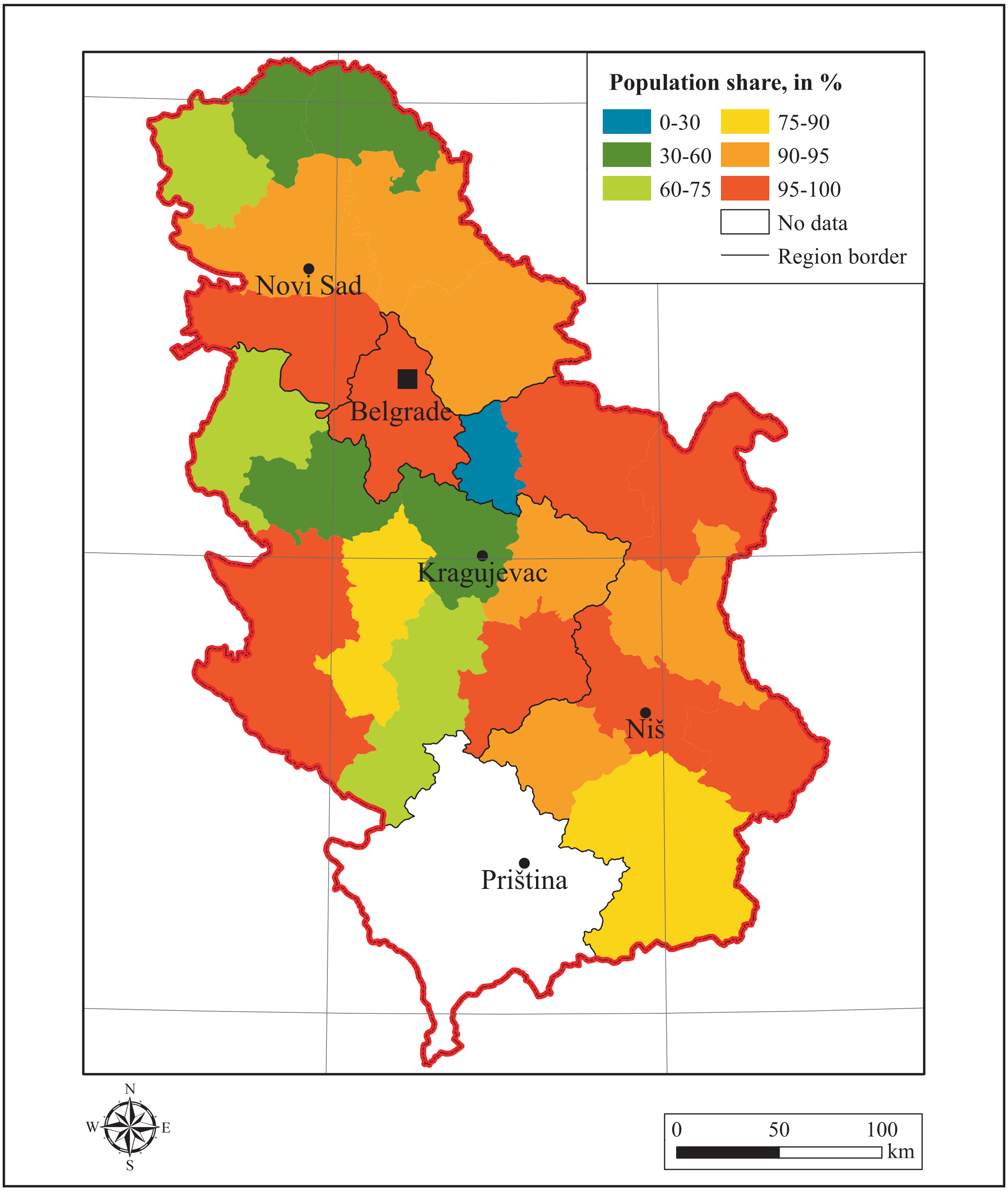


**Fig. 20.3** Population connected to public sewage system. (*Source:* authors' calculation based on data from the Statistical Office of the Republic of Serbia 2018)

activities of the Strategy still hasn't been adopted). Without protection measures, the situation with water pollution in Serbia will worsen in the future. The latest European Commission reports about Serbia (2018) on progress in the field of environmental protection highlight that the degree of alignment with EU standards in the field of water quality is at an intermediate level (European Commission 2018) so Serbia supposed to make greater efforts in order to meet all the requirements necessary for the EU accession process.

### 20.1.3 Soil Pollution and Waste Management

Serbia has diversified pedological cover with many different soil types all around its territory (see Chap. 15). The plough land and gardens make up around 79% of the total arable land (Government of the Republic of Serbia 2008b) and the soil quality of this arable land is satisfactory. However, there is around 33% of the land that is moderate to highly degrade. During the past 15 years, the agricultural land was reduced by 10.6%, whereas the proportion of arable agricultural land was reduced by 10% (Government of the Republic of Serbia 2008b).

The main factors of soil degradation are: the erosion process affecting around 80% of agricultural land, then landslides, local sources of pollution and reduction of organic matter. In addition to the main factors of soil degradation, significant sources of soil pollution in Serbia are urbanization, mining activity, power plants and traffic facilities, water erosion, aeolian erosion, increased salinity, nutrient losses, chemical pollution from bio-industrial sources, mechanical soil compaction during heavy machinery tillage, water saturation of land, floods, fertility loss, etc.

The systematic monitoring of the soil quality in Serbia is based on the use of indicators to determine the negative impacts on the soil, and to monitor the conditions, measures and activities conducted with the purpose of diminishing such impacts and raising the quality levels of the soil and the environment (SEPA 2017). It is based on the Regulation on the Systematic Soil Quality Monitoring Programme, which is harmonized with the recommendations given in the proposal for a Soil Framework Directive (SEPA 2018c).

According to SEPA (2017), polluted soils exist within the sites that are extremely polluted, which can be harmful to health to a larger or smaller extent, so it is necessary to remediate them (Filipović and Obradović-Arsić 2014).

These are the areas with intensive industrial activities, inadequately regulated waste disposal sites, mineral extraction, army storage sites and areas where accidental events or soil pollution occurred. There are 423 identified sites which include potentially contaminated and contaminated sites. The biggest part in the total number of these sites belongs to the public communal landfills – around 40% (SEPA 2017). In the vicinity of the public communal landfills, established values for soil have been exceeded with mostly high concentrations of cadmium, lead, nickel, zinc, copper, chromium, mercury and arsenic (SEPA 2017). Maximum permissible concentrations (MPC) of dangerous and harmful materials in the soil were registered in several administrative areas in Southeastern Serbia (Nišava, Pirot, Toplica, Jablanica, Zaječar and Rasina) (Ristić and Marijanović 2006). In these districts, the excess of MPC was registered for six chemical elements (arsenic, chromium, copper, nickel, lead and fluorine). The excess values of MPC in the analysed areas were the highest for the fluorine, which was present at about 60% of the total analyzed sites (Ristić and Marijanović 2006). Various products which are directly added to the soil, such as phosphate fertilizers, limestone and pesticides, are the primary source of soil pollution with these metals. On the other hand, monitoring the level of chemical pollution of the soil is mostly conducted in the big cities. Exceeding limit values occurred with the maximum percentages for cadmium, copper, cobalt, mercury and nickel in the locations near busy roads, in the vicinity of business and commercial areas and on the agricultural soil (SEPA 2017).

There are a lot of environmental issues which the state has to think about. But one of the biggest is *inadequate waste management*. It could be said that Serbia has an underdeveloped system of waste management. Some progress has been achieved during the past decade, but there is still a lot of room for improvement.

According to the Serbian National Polluter Source Register, in 2017 there was a total of 11,477,614 tons of waste (SEPA 2018c). This amount includes all types of waste, and has been the largest since 2007. This is due to an increase of industrial production as well as the quantities of waste generated in thermal power plants and the companies whose activity is the production of raw iron, steel and ferroalloy (the largest amount of this waste is from thermal processes and amounts, around 71%).

There has been some progress in the hazardous waste management (the share of this waste in the total amount of waste was less than 0.7% while during the period 2011–2017 it ranged from 0.6% to 1.2%) (SEPA 2018c). In the 2018, some improvement has been achieved within Municipal Solid Waste (MSW) management, too. The average collection rate in 2017 was about 83.7%, which is almost 7% higher when compared to 2011 (77%) (SEPA 2018c). However, about 2.15 million tons of MSW that was generated in Serbia in 2017 encompasses 0.84 kg/cap/day (306.6 kg/cap/year), which is still quite lower that EU average (1.33 kg/cap/day (486 kg/cap/year)) (Eurostat 2019).

According to Eurostat (2019), municipal waste generation totals vary considerably, ranging from 272 kg per capita in Romania to 781 kg per capita in Denmark in 2017. These variations reflect differences in consumption patterns and economic wealth, but also depend on how municipal waste is collected and managed. In Serbia, segregated collection of MSW has not been established yet, even though informal sectors as well as collective operators are collecting recyclable packaging waste.

The predominant method for MSW management is *landfilling*. Unfortunately, in addition to official landfills, waste is often disposed of at *dumpsites*. It is estimated that there are over 3600 waste disposal sites in Serbia. Most of them (75%) are very small dumpsites with less than 1000 $m^3$ of waste volume, and only 1.5% of them are large landfills (vol. over 100,000 $m^3$) (Stanisavljević et al. 2012). In general, municipal solid waste management systems are characterized by high landfilling rates at low gross domestic product levels, and low landfilling rates at high gross domestic product levels (Vujić et al. 2015). For example, in Croatia in 2011 (before joining the EU) there were more than 3000 dumpsites, while in a much bigger country, such as Romania, there were only 1500 dumpsites (World Bank 2011).

National Waste Management Strategy for the Period 2010–2019 set a very ambitious goal to construct 26 regional centres for waste management, and to close all other landfills and dumpsites (Government of the Republic of Serbia 2008b). Regional centres should have sanitary landfills, composting facilities, transfer stations, recycling facilities, etc. At the moment (2019), there are 10 regional centres for waste management in Serbia, and three additional ones are under construction. For now, there is a recyclable waste separation facility in cities such as Novi Sad (in Vojvodina), Užice (in Western Serbia), Jagodina (in Central Serbia) and Leskovac (in Southern Serbia) (Ministry of Construction, Transport and Infrastructure 2020). However, less than 5% of municipal solid waste is recycled. On the other hand, there is a certain progress when it comes to packaging waste recycling, which is 57% according to SEPA (2019c).

Serbia is facing a huge challenge in terms of developing adequate infrastructure for waste management according to European standards (Pavićević and Stamenović 2005), especially within the context of the EU accession process (Vujić and Milovanović 2012). A significant progress has been achieved in developing a legal framework for waste management which is harmonized with the EU legislation as well as to a large number of other documents (Vujić et al. 2017). However, the implementation process is much slower than expected.

One of the reasons is the lack of adequate waste disposal infrastructure, resulting in soil pollution, surface water and groundwater pollution, frequent joint disposal of municipal and hazardous waste. The lack of data on composition and waste streams, the absence of waste management system, the lack of storage facilities, hazardous waste treatment and disposal, the inadequate treatment of medical waste, slaughter industry waste, are also the factors that have huge environmental consequences. On the other hand, the operational costs and therefore the planned investments must be affordable for the local community. The candidate status for the EU membership demands serious reforms and investments in the waste management. According to the experience of other countries during their EU accession process and taking into account current environment challenges in Serbia, the Chap. 27 (Environment and Climate Change Policy of the EU) in the Serbian negotiation process with the EU is going to be the most challenging one, and probably the one with the highest costs.

## 20.2 Nature Conservation

The nature of Serbia is characterized by a rich natural heritage comprising various geological, geomorphological, hydrological, pedological and biological characteristics. It is the result of great genetic, species and eco-system diversity. Vascular flora of the Balkan Peninsula is estimated at about 8000 species, which amounts to 33–35% of the entire flora (see the Chap. 8). The most important and the most preserved segments of the natural heritage have been declared as protected areas. According to the implemented measures of the institutional nature conservation lasting for more than six decades, the protected areas in Serbia currently cover 662,435 ha (Institute for Nature Conservation of Serbia 2019).

The beginnings of nature conservation in Serbia date back far into the past – the fourteenth century. Later in the nineteenth century, the first area to be protected on the territory of Serbia was *Obedska Bara* (southern part of Vojvodina), which was put under protection only 2 years after the Yellowstone in the USA in 1874 (Lazić et al. 2008). However, the institutionalization of the nature conservation process in Serbia started from 1948 when The Institute for Nature Conservation of Serbia was established. Before that, a series of theoretical and practical problems were resolved by virtue of numerous institutions: The Nature Museum, The Institute of Ecology and Biogeography, The Biological Group of the Faculty of Sciences (a part of the Faculty of Philosophy at the time), The Faculty of Forestry, The Faculty of Agriculture and The Faculty of Veterinary. The first Act on Protecting Landscapes referred to the protection of *Ostrozub Reserve* (Southeastern Serbia), and the first decision made by the Institute was the Decision on Protecting *Waterfalls Velika Ripaljka and Mala Ripaljka* on Ozren Mountain (Eastern Serbia) in 1949. These two decisions were symbolic, and practically mark one of the basic rules of ecology – the unity of animate and inanimate world (Janković 1998).

The Law on Nature Conservation distinguishes and explains the terminology of landscape, landscape elements and landscape diversity, whereas the Law on Spatial Planning of the Republic of Serbia establishes the policies of protection, planning and managing the landscapes of the country. According to the Law on Nature Conservation (2016), the areas with outstanding geological, biological, eco-system or landscape diversity can be declared as protected areas of public interest. The following protected area management categories have been established: strict nature reserve, special nature reserve, national park, natural monument, protected habitat, landscape with outstanding features and nature park. Under protection there are 461 protected areas: five national parks, 17 nature parks, 20 landscapes of outstanding nature, 68 nature reserves, 310 natural monuments, three protected habitats and 38 areas of cultural and historic importance which are protected according to the previous Law on Environmental Protection and the Law on Cultural Monuments Protection (Miljanović et al. 2017).

The initiative for declaring a protected area can be submitted by the stakeholders involved in nature conservation: the national authorities, autonomous province, municipalities and cities; protected area management facilities, legal persons, entrepreneurs and physical persons, anyone using natural resources, expert and scientific organizations or non-governmental organizations. The proposal of the Declared Protected Area Act is based on the scientific or expert study known as *conservation study*, which determines the values of the area, proposes ways of protection and management in the area. The protected area is governed by the *protected area authority,* which is, depending on the category, appointed by the respective administrative body of the Republic, province or local self-government. The protected area authority has to adopt a management plan usually for the period of 10 years. The *management plan* defines the ways of conducting the conservation, usage and management of the protected area, as well as the guidelines for development.

In the Spatial Plan of the Republic of Serbia (2010–2014 – 2021) there are two distinguished landscapes on the macro-regional level: (1) Vojvodina-Pannonian Plain-Danube Basin macro-region and (2) Central Serbia – Balkan macro-region. Within these macro-regions, there are landscape features that define landscapes at the regional and local level. The primary goals of the protection, regulation and development of landscapes in Serbia are high quality and adequately used landscapes, spatially regulated rural and urban settlements pleasant to stay or live in, with developed identity based on appreciation and promotion of natural and cultural values.

The entire territory of Serbia comprises of 5 national parks (Table 20.1).

*Fruška Gora National Park* is the first declared national park in Serbia and it covers the low mountain massif with the same name (539 m), which looks dominant when compared with the surrounding lowland terrain of the southern parts of the Pannonian Plain (Vojvodina). Geological and paleontological research shows that it is a rich resource of natural history (plenty of plant and animal fossils), and it is like "a mirror of the geological past". The flora of Fruška Gora includes 1500 plant species, with 1000 of them being within the national park boundary zone. Many of them are relict, and over 50 species are on the list of natural rarities of Serbia, such as: spurge-laurel (*Prunus fruticosa*), Hungarian hawthorn (*Crataegus nigra*) and many others. Vegetation is mainly made of mixed forests covering over 90% of the total area. Along the perimeter of the National Park, there are 17 Serbian Orthodox monasteries built at the end of the fifteenth century and during the sixteenth century (Amidžić 2005).

**Table 20.1** National parks in Serbia

| National park | Area (ha) | Designation year |
|---|---|---|
| Fruška Gora | 25,393 | 1960 |
| Đerdap | 63,000 | 1974 |
| Tara | 19,200 | 1981 |
| Kopaonik | 11,809 | 1981 |
| Šar Mountains | 39,000 | 1993 |

*Source*: Institute for Nature Conservation of Serbia 2019

*Đerdap National Park* is the biggest one in Serbia with the deepest and the most beautiful gorges in Europe (the Iron Gates) and it represents a structure of numerous straits and structural basins (East Serbia, the Danube River) (Fig. 20.4). Complex morphological and dynamic paleo-geographical changes in this part of Europe determined the wider area of the gorge as a unique European refugium, providing the existence of numerous species in the Ice Ages.

In the territory of the National Park, there are 13 species of tertiary relicts including common walnut (*Juglans regia*), common lilac (*Syringa vulgaris*), and yew (*Taxus baccata*). The National Park is a habitat for over 150 bird species (Amidžić 2007).

*Tara National Park* comprises the largest area of the mountain Tara in Western Serbia (Fig. 20.5). The geographical area of the National Park is bordered by the canyon of the river Drina to the north-west (border to Bosnia and Herzegovina).

Out of 1000 species of vascular flora, Serbian spruce or *Pančićeva Omorika* (*Picea omorica*) is of special importance as an endemic species (living fossil) which was first described scientifically by a biologist Josif Pančić (see the Chap. 8). The deep canyons in the National Park and the preserved vegetation represent an ideal habitat for numerous animal species, especially Serbian grasshopper or *Pančićev Skakavac* (*Pyrrgomorphella serbica*) (Amidžić 2005).

*Kopaonik National Park* comprises the highest (Pančić Peak – 2017 m) and at the same time the most beautiful part of the massif and the mountain of the same name, along the administrative line between Central Serbia and Kosovo (Fig. 20.6). The relief of the mountain is complex and dynamic. In the winter months, Kopaonik is covered with heavy snow cover. Numerous brooks run down the mountain slopes.

The flora of Kopaonik is made of 1500 species, out of which 91 are endemic species. The most interesting ones are three endemic species: a type of houseleek called *kopaonička čuvarkuća* (*Sempervivum kopaonikensis*), a type of violet called *kopaonička ljubičica* (*Viola kopaonikensis*) and a type of bitter cress called *Pančićeva režuha* (*Cardamine pancicii*) (Amidžić 2007). Kopaonik is, at the same time, one of the most important tourist destinations in Serbia, mainly because of the favourable conditions for the development of winter skiing tourism (see the Chap. 18) (Fig. 20.6). Unfortunately, the volume of constructed tourist infrastructure has changed the natural values of protected area (Stojanović 2011).

*Šar Mountains National Park* stretches along northern and north-western parts of the massif of the same name and it is positioned in the southern Serbia (Kosovo and Metohija), along with North Macedonian and Albanian territory. This mountain belongs to Šar – Pindus mountain system. The

**Fig. 20.4** Iron Gates gorge on the Danube River within Djerdap National Park. (Photo by D. Bosnić)

**Fig. 20.5** Tara National Park with Zaovine lake. (Photo by D. Bosnić)

relief of the Šar Mountains is dominated by glacial forms. Numerous cirques, which were formed by massive glacial erosions in the Ice Ages, today are filled by lakes known as *mountain eyes* (Fig. 20.7).

The mountain features about 2000 plant species. The most important are Tertiary and glacial relicts, 332 endemic species and 20 local endemic species. Šar Mountains National Park with 147 butterfly species is the richest in Europe (Amidžić 2005).

In Serbia, there are two areas on the UNESCO MaB list included as biosphere reserves: Golija-Studenica (2001) and Bačko Podunavlje (2017).

*Golija-Studenica Biosphere Reserve* is located in the southwest of Serbia, where it encompasses the massif of Golija (1833 m) and covers the area of 53,804 ha.

Golija is the mountain covered with thick forests, some of which have characteristics of the primal forest. Southern mountain slopes are covered with meadows and grazing

**Fig. 20.6** Kopaonik National Park. (Photo by V. Stojanović)

**Fig. 20.7** Šar Mountains National Park with Livadičko Lake. (Photo by D. Bosnić)

areas. Special natural value is attributed to peatland surrounded by thick forests of spruce. The flora of Golija has over 900 plant species. Its flora includes endemic and relict species with special significance. Greek maple (*Acer heldreichii*) stands out among important natural rarities, representing a landmark in the flora of Golija. The mountain Golija is protected as Nature Park according to the national Law on Nature Conservation, for the purpose of preserving valuable forest ecosystems, diverse and beautiful landscapes, as well as for its cultural heritage (Studenica Monastery is on the UNESCO World Heritage List) (UNESCO 2019). Golija-Studenica Biosphere Reserve is inhabited by 6600 residents within 42 dispersed rural communities. In this region, cattle farming is a traditional activity, in addition to collecting wood forest products such as fungi and medicinal plants.

*Bačko Podunavlje Biosphere Reserve* is located in the peripheral north-western part of Serbia (Vojvodina). This territory has an extremely bordering position, because of it borders with Hungary to the north and with Croatia to the west and south. It covers the area of 176,635 ha and comprises three interconnected zones: core (11,242 ha), buffer zone (45,744 ha) and transition area (119,649 ha) (Stojanović 2018). Landscape features of the Bačko Podunavlje Biosphere Reserve territory are conditioned by the meandering of the Danube. In the alluvial plain, the lowest relief form of the region, there is a great number of abandoned distributaries, lakes and ponds. They are intersected with marsh, meadow or forest vegetation, as well as forest plantations. The forests within this area are the remnants of once

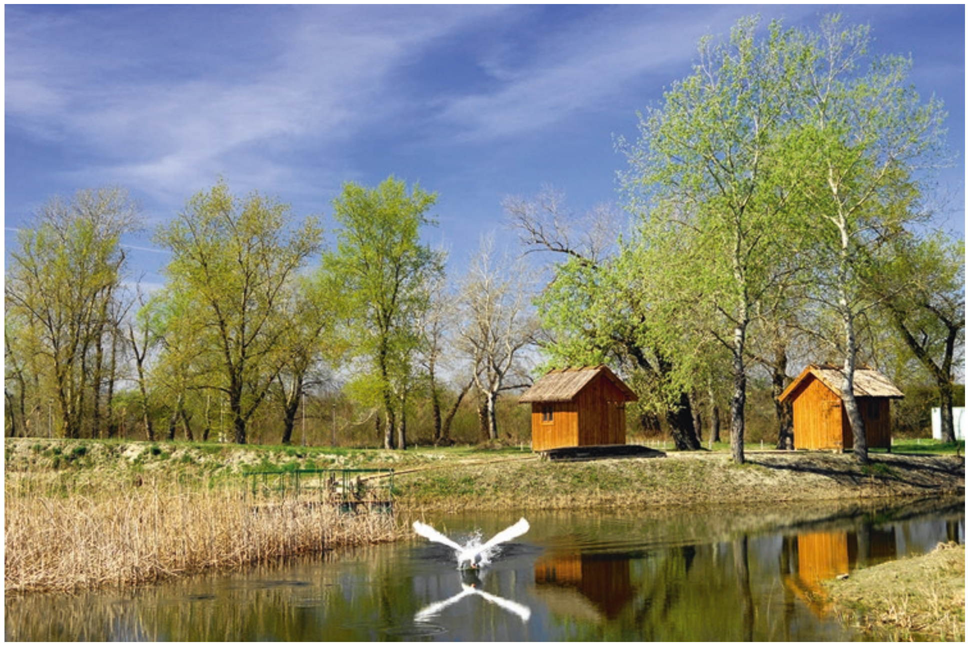

**Fig. 20.8** Bačko Podunavlje Biosphere Reserve. (Photo by V. Stojanović)

vast forest region which was under the impact and control of the flood waves from the Danube (Fig. 20.8).

According to the 2011 Census, the area of Bačko Podunavlje Biosphere Reserve has a population of 147,405 in 26 settlements. Ethnic structure of the population is extremely diverse (Serbs, Hungarians, Croatians) and this is one of the main demographic and cultural distinctive features of the entire region (Stojanović 2018).

Bačko Podunavlje Biosphere Reserve is connected to the bordering protected areas of Hungary (Danube-Drava National Park) and Croatia (Kopački Rit Nature Park), which are part of cross-border Mura-Drava-Danube Biosphere Reserve. It is interconnected, via neighbouring countries, with 700 kilometres long ecological corridor along the rivers of Mura, Drava and Danube, encompassing parts of the territories of five states (Austria, Slovenia, Croatia, Hungary and Serbia). Based on the numerous initiatives, which appeared in the past 20 years, it is expected that the corridor will be declared as a unique cross-border biosphere reserve in the future. Its borders will include the landscapes along the three rivers, which are colloquially known as the Amazon of Europe.

After obtaining its independence in 2006, Serbia informed the Ramsar Secretariat that it was willing to proceed with its rights and responsibilities regarding international agreements, which were signed while Serbia was a federal part of the former country (Ramsar 2019). Ten *Ramsar sites* were declared on the territory of Serbia, out of which eight are situated in the region of Vojvodina, its northern province (Table 20.2).

**Table 20.2** Ramsar sites in Serbia

| Ramsar site | Area (ha) | Designation year |
|---|---|---|
| Ludaš Lake | 593 | 1977 |
| Gornje Podunavlje | 22,480 | 2007 |
| Slano Kopovo | 976 | 1977 |
| Stari Begej-Carska Bara | 1,767 | 1996 |
| Koviljsko-petrovaradinski Rit | 8,292 | 2012 |
| Zasavica | 1,913 | 2008 |
| Labudovo Okno | 3,733 | 2006 |
| Obedska Bara | 17,501 | 1977 |
| Peštersko Polje | 3,455 | 2006 |
| Vlasina | 3,209 | 2007 |

*Source:* Ramsar Convention of Wetlands (2019)

The wetlands are the result of complex geographical features, first of all, geology, relief and pedology factors (Lazić et al. 2008). Wetlands are important for the preservation of the mosaic of habitats, which is characterized by the high diversity of species. Ten protected sites are inscribed on the Ramsar List of Wetlands of International Importance, but there are more sites that can also meet the Ramsar Criteria (Panjković and Stojnić 2011).

*Ludaš Lake* (Vojvodina) is located in the contact zone of sandy and loess formations. The complexity of its landscape features has caused the emergence and survival of various types of habitats in the relatively small space: water habitats (ponds and lakes), marshes, meadows, salt marshes and steppes. There is a variety of plants and animals, and its main feature is the rich bird population.

**Fig. 20.9** Koviljsko-Petrovaradinski Rit. (Photo by V. Stojanović)

*Gornje Podunavlje* (Vojvodina) encompasses a valuable natural landscape of river distributaries, ponds and marshes which follow the river stream of the Danube in the length of about 36 km. In terms of natural characteristic, it represents a unique landscape together with Kopački Rit (Croatia) and Gemenc (Hungary) (Stojanović and Savić 2013).

*Slano Kopovo* is a meander of the river Tisza (Vojvodina) and one of the most important bird habitats in Serbia (Vigh et al. 2012). The meander and its surroundings area represent a unique example of saline habitats (alkaline steppes).

*Stari Begej-Carska Bara* is located in the alluvial plain of the rivers Begej and Tisza (Vojvodina). Before the construction of the flood defensive embankment systems, the area was exposed to river floods. The complete landscape and ecological values are determined by numerous oxbow lakes, ponds, lakes and fishponds. The most important and dominant water surfaces are Carska Bara and Stari Begej (Stojanović et al. 2012). The biotope diversity on this relatively small area affects the diversity of the living creatures, including numerous species of fish, birds, plants, reptiles and mammals.

*Koviljsko-Petrovaradinski Rit* is the Ramsar Site which keeps a well-preserved mosaic of old riverbeds, alluvial elevations, meanders, canals, ponds, wet meadows, pastures and forests along the Danube banks (Vojvodina) (Fig. 20.9). This alluvial area is regularly flooded during the high water levels, so the river regime is one of the dominant ecological factors.

*Zasavica* is the Ramsar Site including the ecosystems along the banks of the river Sava, with a dominant river Zasavica and its tributary Batar (Vojvodina). Along the strip of aquatic and marsh ecosystems, numerous wet meadows and forests are stretching (Stojanović et al. 2018).

*Labudovo Okno* covers the banks of the river Danube with surrounding landscapes, including the banks of the river Nera (Vojvodina). The Danube in this sector is slowing down, has a higher water level, thus flooding the lower riverbank terrains and the final southern rim of Deliblato Sands. Riverbank marshes affect the presence of diverse aquatic communities, as well as other communities typical for wetlands of this type (Puzović et al. 2014; Stojanović et al. 2018).

*Obedska Bara* has many features of a unique wetland habitat in low alluvial terrains of the river Sava, whose natural values are determined by numerous ponds, oxbow lakes and wet meadows (Vojvodina). As an ancient meander of the river Sava, Obedska Bara is extremely important for numerous species of bird marshes (Stojanović 2005).

Only two sites that belong to Ramsar protected areas are out of Vojvodina: Peštersko Polje in southwest Serbia and Vlasina in the southeast part of the country.

*Peštersko Polje* represents well-preserved mountainous peatland. The river and lake Boroštica represent its most important hydrological forms and the reason for the formation of the wetland habitats.

*Vlasina* comprises Vlasina Lake, its rugged banks, wet meadows, peatland and the valley of the river Vlasina (Fig. 20.10). Before the formation of this artificial accumulation, this entire region was the biggest peatland in the Balkans and one of the biggest in Europe. Floating peatland islands on the lake represent wet habitats for the boreal plants in southern Europe.

**Fig. 20.10** Vlasina Lake. (Photo by D. Bosnić)

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# 21 Development Challenges Faced by Cities in Serbia

Nikola Krunić, Aleksandra Gajić, and Dragutin Tošić

**Abstract**

The cities in Serbia are a heterogeneous system of settlements of various demographic size, economic development and functional capacity, resulting from different predispositions for development in a specific geographic and socio-historical context. This chapter considers cities as urban centres which are hubs of their local government units that have a central function in their spheres of influence. Although this is not congruent with the concept of a city defined by multiple relevant laws, it aptly reflects the cities in Serbia; however, that is not the subject of this discussion. This debate examines the system of settlements in a specific territory from the perspective of urban geography, with urban systems or networks of settlements at different levels of development, but all of which have at least one central settlement, along with other surrounding subordinate settlements. This approach to urban systems enables a comprehensive view of the cause-and-effect relationships that define each urban system, namely their space, population and activities, and it avoids incomplete views by focusing on just some aspects of urban development. Finally, this approach has also been used in the long practice of spatial planning in Serbia.

**Keywords**

Agglomerations · Central functions · Functional capacity · Polarization · Polycentricity · Urban system

The need to understand the mechanisms of urban system development has a long-standing tradition in Serbian urban geography, which is certainly rooted in the so-called "Yugoslav school of urban geography". Over the decades, numerous points of view have been formed in an attempt to understand the process of urban development in former Yugoslavia, and in Serbia. It is possible to conditionally identify four of these approaches, which developed in succession, and lean on one another (Tošić 2012).

The first approach is based on the model of a "central place" in which geographical and economic aspects play the main role, giving this concept a regional component. The central place in the region is formed under the influence of economic development (mainly driven by industry), which also predefines the development of its central functions. Through its developed economy and the strength of its central functions, the central place supports the urbanization of its surroundings, creating a regional system of spatially and functionally connected settlements – an urban region.

The second approach recognizes the need for mutual distinction between previously identified urban regions, by separating their spheres of influence. Besides the actual space and connections, here it is also important to understand the flows of people, particularly movements of the workforce, whether they are permanent – relocation, or occasional – seasonal and daily migration. This approach has very often been used in research and studies for the purposes of spatial planning. Links between economic development (i.e. the early stages of industrialization), urbanization and the population, that is, links between economic and social development, are presented horizontally – as concentration of the population in urban centres – economic centres, and vertically – as distribution of the population by economic activity. These horizontal-vertical migration dynamics caused by human activity are a key indicator of the spatial and functional relationships occurring in a region and between regions.

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The third approach focuses on the hierarchy of urban regions and urban systems. In fact, considerable differences have been found between regions with regard to the population dynamics, the hierarchy of development and functions, their spatial range, etc. Thus, urban systems are heterogeneous in terms of demographic size and capacity, economic strength, level of development of their functions and range of their influence. Consequently, a distinction can be made between isolated urban regions, interconnected urban regions, and regions that agglomerate into a complex system of centres and sub-centres, which gradually become a metropolitan area.

Finally, the fourth approach attempts to understand the phenomena and processes occurring within urban centres and urban regions as a consequence of suburbanization and de-urbanization. There has been a growing interest in examining the mechanisms relating to changes in land use, changes in population density and intensity of built-up areas, changes in the distribution of labour centres, etc.

The development of cities in Serbia today faces numerous challenges. Among them, the most significant is depopulation and the reduction of their functional capacities. Depopulation is a problem that occurs not only when the number of inhabitants declines, but also because of the dwindling quality of workforce, an ageing population, a low fertility rate and others. A new component of Serbia's further depopulation is the rising emigration of the highest-quality workforce, which has been recognized as one of the greatest national challenges. There is a cause-and-effect relationship between the reduction in the number and spatial range of urban centre functions and the decline in the influence of urban centres on their surroundings. Favourable for the development of cities in Serbia are the growing links between them and the development of infrastructure, as well as the nascent process of re-industrialization. Notable internal problems within cities are the usurpation of public space, substandard quality of living and municipal infrastructure, social segregation, and sometimes even gentrification. The global challenges affecting the European region are gradually gaining significance with regard to urban centres in Serbia, while internal and country-specific challenges are becoming less important.

## 21.1 Development of the Urban Systems

To understand the current level of development in urban centres in Serbia, along with the prospects and challenges for their future development, it is crucial to look at the factors and processes that influenced their emergence and evolution. The second half of the twentieth century saw the most significant demographic, socio-economic and spatial changes within Serbia's urban system, which drastically altered its structure, spatial organization and land use. Those changes were particularly dramatic in the 1960s and 1970s. They were caused by the planned industrialization of Yugoslavia, which was accompanied by a corresponding urbanization and deagrarization policy (see Chap. 14). These three processes – industrialization, urbanization and deagrarization – acted in synergy to fundamentally alter the socio-economic structure of the overall population and, by extension, the structure of the urban centres.

During the early stages of industrialization, in the wake of the Second World War, profound changes in the demographic and socio-economic structure of the population began, accompanied by corresponding spatial changes and their consequences. The most drastic changes were caused by the following processes: 1. colonization of Vojvodina by the population from so-called "passive regions" – the least developed and war-ravaged areas of today's countries of Croatia, Bosnia and Herzegovina and, to a lesser extent, Montenegro; 2. agrarian reform that limited the agricultural estates of households to just 10 ha; 3. The exclusive incentivization of industrial production over agriculture; 4. the forced development of cities and accompanying neglect of villages; 5. infrastructural development; 6. intensified demographic transition – reduced birth and mortality rates; 7. the introduction of mandatory primary education; and 8. significant changes to the traditional way of living.

Demographic transition intensified gradually until the 1960s, only to drastically accelerate afterwards and exhibit traits of spontaneity (Derić et al. 2003). It was in this period that cities, as future industrial centres, became the hotspots of development and population concentration. Due to the selective migration of young working- and reproductive-age individuals from villages to cities, positive population trends in most villages diminished and quickly thereafter became negative. This combination of negative population growth and a negative migration rate brought about the depopulation of rural areas with the character of a "demographic exodus". Concentration of the population and related functions in urban centres and the demographic decline of rural areas caused by the combination of out-migration and decline in population growth led to changes in the demographic size of settlements, in particular the "demographic degradation" of villages (Tošić et al., 2009). This created the basis for the deep polarization of Serbian territory, first in the direction north-south, and then east-west.

The demographic degradation of settlements is attested by the differentiation between types of settlements or corresponding territorial units (urban and rural areas) according to international census recommendations related to the 2011 census, which defined villages as settlements with less than 2000 inhabitants (Table 21.1).

In 1991, group of settlements with less than 2000 inhabitants included 89% of all settlements in Serbia (not including

**Table 21.1** Changes in the demographic size of settlements in Serbia[a] between census years

| Category by population | Number of settlements | | | Total population | | |
|---|---|---|---|---|---|---|
| | 1991 | 2002 | 2011 | 1991 | 2002 | 2011 |
| >1,000,000 | 1 | 1 | 1 | 1,168,454 | 1,119,523 | 1,166,763 |
| 100,000–250,000 | 4 | 3 | 3 | 602,708 | 511,502 | 565,797 |
| 10,000–99,999 | 80 | 81 | 76 | 2,125,845 | 2,267,044 | 2,199,919 |
| 2000–9999 | 430 | 404 | 358 | 1,656,253 | 1,587,428 | 1,440,088 |
| <2000 | 4,178 | 4,217 | 4,271 | 2,269,535 | 2,012,385 | 1,814,295 |
| Total | 4,693 | 4,706 | 4,709 | 7,822,795 | 7,498,001 | 7,186,862 |

[a]Excluding the data for the region of Kosovo and Metohija. *Source:* SORS 2013; authors' calculation

the region of Kosovo and Metohija), with 29% of the permanent population living there, while in 2011 it included 91% of settlements, covering 25% of the total population (Table 21.1). On the other hand, there is a notable lack of cities with more than 100,000 inhabitants, especially those with 500,000 inhabitants, which should serve as the basis of a polycentric system and mitigate the negative polarization effect of the city of Belgrade (the capital). The number of those urban centres is declining, now presented only by Novi Sad, Niš and Kragujevac. These are also the only centres, apart from Belgrade, not experiencing a decrease of their population on account of constant migration inflows.

Given the significantly faster pace and spontaneity of demographic and social changes in the 1970s and 1980s, economic activities became more extensive than intensive (Derić et al., 2003), which would result in dramatic social shifts in Serbia during the breakup of Yugoslavia, and remain one of the problems behind the low competitiveness of the domestic economy today.

Changes in economic development impact the spatial and professional mobility of the population, and also affect the demographic and economic structures of the population in urban centres. Thus, changes in the structure of the economy with relatively regular trends (the "development stage" model) directly alter the structures of the workforce, that is, the economically active population. Industrialization, therefore, as opposed to agriculture, which had the greatest impact on the development of urban centres and the transformation of society as a whole, required a new form of spatial organization. For this reason, the population concentrated around the nodes of industrial activities – urban centres. Influenced by those centres, urbanization drove the transition of the majority of the workforce from agriculture to industry and other activities, which also caused extensive socio-demographic changes.

As a consequence of economic development, the professional and educational structure of the population changed. This is a good indicator of the quality of the population, that is, the workforce. The workforce supply depends on the qualifications and education of the economically active population, which directly affects decisions on the choice of location for economic activities and applied technologies. The higher the quality of the workforce, the more advanced the production processes and competitive activities (see Chap. 10).

To understand contemporary intensive spatial and functional changes in urban centres and their surroundings (so-called "city regions"), after the completion of demographic transition, the significance of spatial and demographic indicators of population movements grows. These indicators are: changes in population density, concentration/polarization of settlement functions, redistribution of the population, characteristics of daily migration and structure of population activities (Vojković 2002).

Therefore, in the settlement network, the growth of cities (of uneven intensity) accelerated, and functional and hierarchical relations appeared among them. The initial effects of industry on the concentration of the population, particularly its qualified and educated segments, encourages (through "circular cumulative causality") the development and concentration of other functions in cities, further increasing their functional capacity and, in turn, overall development. In the initial stage of the spatial and functional transformation of the settlement network, urban functions concentrate in cities, and in the following stage, which corresponds to the development of tertiary and quaternary activities, the strengthening of urban life shifts to settlements close to the city, which constitutes the start of suburbanization. In Serbia, the impact of large cities on their surroundings (the metropolization stage) began in the late 1960s, then medium-sized cities started to transform their surroundings in the 1970s, and small cities did not assume this role until the 1980s. Due to a lack of construction space, as well as insufficiently developed public services, and the municipal and technical infrastructure and suprastructure in city cores, suburban villages became the destination of immigrants. This led to the intense demographic growth of these villages, accompanied by the construction of substandard housing and utilities. Suburban villages experienced near-instant socio-economic transformation, seen as a reduction in the number of people engaging in agriculture as a share of the total and active population, and an increase in the number of households with non-agricultural and mixed sources of income.

In the initial stage of concentration of the population, only urban centres had a more or less polyfunctional character, whereas other settlements were monofunctional, with the majority of the active population engaged in primary activities, mainly within their own households. Villages initially had no developed central functions, but they later functionally transformed under the direct or indirect influence of the overall development and diversification of urban centre functions (Tošić and Krunić 2005). The functional differentiation of settlement networks and the diversification of settlement functions in those networks occur in conditions of greater employment in non-agricultural activities, and the public and social infrastructure facilities gradually evolve and become dispersed in rural areas (Grčić 1999).

Analysis of migration flows found that: as the city centre grows and its functional development increases, so does the incoming population, and the share of interregional migration rises, while the share of intraregional migration decreases, leading to a higher share of migration to cities (Vojković 2002).

To summarize, the processes of urbanization, deagrarization and industrialization have had a decisive impact on urban centres and space in Serbia, with various effects. The greatest transformations in space played out where the sudden development of industry and the resulting deagrarization drove people to change their way of life, both in the suburban areas of large city centres and in peripheral mountainous areas. The consequences of this transformation were on the one hand intense depopulation and the demographic ageing of the population in rural settlements and, more recently, in small city centres, and on the other, the concentration of the population in a declining number of regional centres and agglomeration areas (Fig. 21.1). Polarization reached very high levels by 2010, making Serbia one of the countries with the greatest regional disparity in Europe, with the differences in development at a ratio of 1:7 between regions, and over 1:30 between local government units (Vujošević et al., 2012) (see Chap. 23).

## 21.2 Urban Systems: Contemporary Processes

The main characteristics of the development of urban centres, urban areas, regions and the overall settlement system in Serbia are also typical of other European countries, particularly those with a similar context of social development. Based on research conducted by ESPON (2005), it may be concluded that the level of polycentricity has dropped in all European countries over the last two decades. The reason for this is the greater availability of large centres for undeveloped areas, as well as economic development and population growth in large metropolitan areas. It is estimated that the drop in polycentricity will continue in the future, as indicated by all transport policy scenarios considered by ESPON. New EU member states (which joined the EU after 2005) initially experienced more favourable polycentric development than the EU "core", but polycentricity declined faster in new member states, with centralization notably accelerating (ESPON 2005).

Urban systems in former socialist countries that are now EU member states share similar characteristics with the development of Serbia's urban system with regard to socio-economic transformation, indicating greater polarization and accelerated development of the centre-periphery structure (Krunić 2012). Recent studies of the socio-economic transformation of the population in Croatia point to significant changes, with greater social segregation of the urban population and broader differences in socio-economic status due to the transition from a socialist to a post-socialist country. This can be seen in the deepening of the income gap and the rise in unemployment (Prelogović 2004). The level of urbanization in the settlements surrounding city centres is increasing, and rural settlements are becoming isolated and completely functionally dependent on the centres. The decentralization of the residential function is stronger than the decentralization of the labour function, leading to higher mobility of the population and a resulting increase in traffic congestion (Bašić 2004, 2005; Ilić and Toskić 2004; Sić 2007). Similar trends can also be seen in Slovenia: the concentration of capital, know-how, workplaces, a high-quality workforce, infrastructure, etc. in large cities; the specialization of production and tertiarization of the economy; regional centralization; and increased social segregation (Ravbar 1997; Pak 2004; Rebernik 2004, 2010). The modernization of the transport infrastructure in Slovenia resulted in major discussions regarding the aspirations for the rapid economic development of the country and its actual implementation (Uršič 2012), which was most pronounced in large urban centres (Rebernik 2010). The period of transition resulted in an increase in the use of cars, thereby reducing the role of city centres and the capacity to develop sustainable housing (Uršič 2012). In the Ljubljana urban region, accelerated suburbanization contributed to some parts of the city deteriorating, and broadening socio-spatial differentiation (Pichler-Milanović 2014). In Romania, regional disparities were intensified after joining the EU. The majority of the former direct investments inflowing to Bucharest caused massive emigration of the working-age population to more developed EU states, and out-migration from deindustrialized cities to rural areas (Benedek 2006; Ianos 2010). In recent years, there have been attempts to restructure the urban system of Romania, with the main problems linked to the hypertrophic capital city and the need to strengthen the hierarchy and functional relations of other cities and settlements (Mitrică et al., 2014). Economic, social and spatial transformation of the city and urban regions in

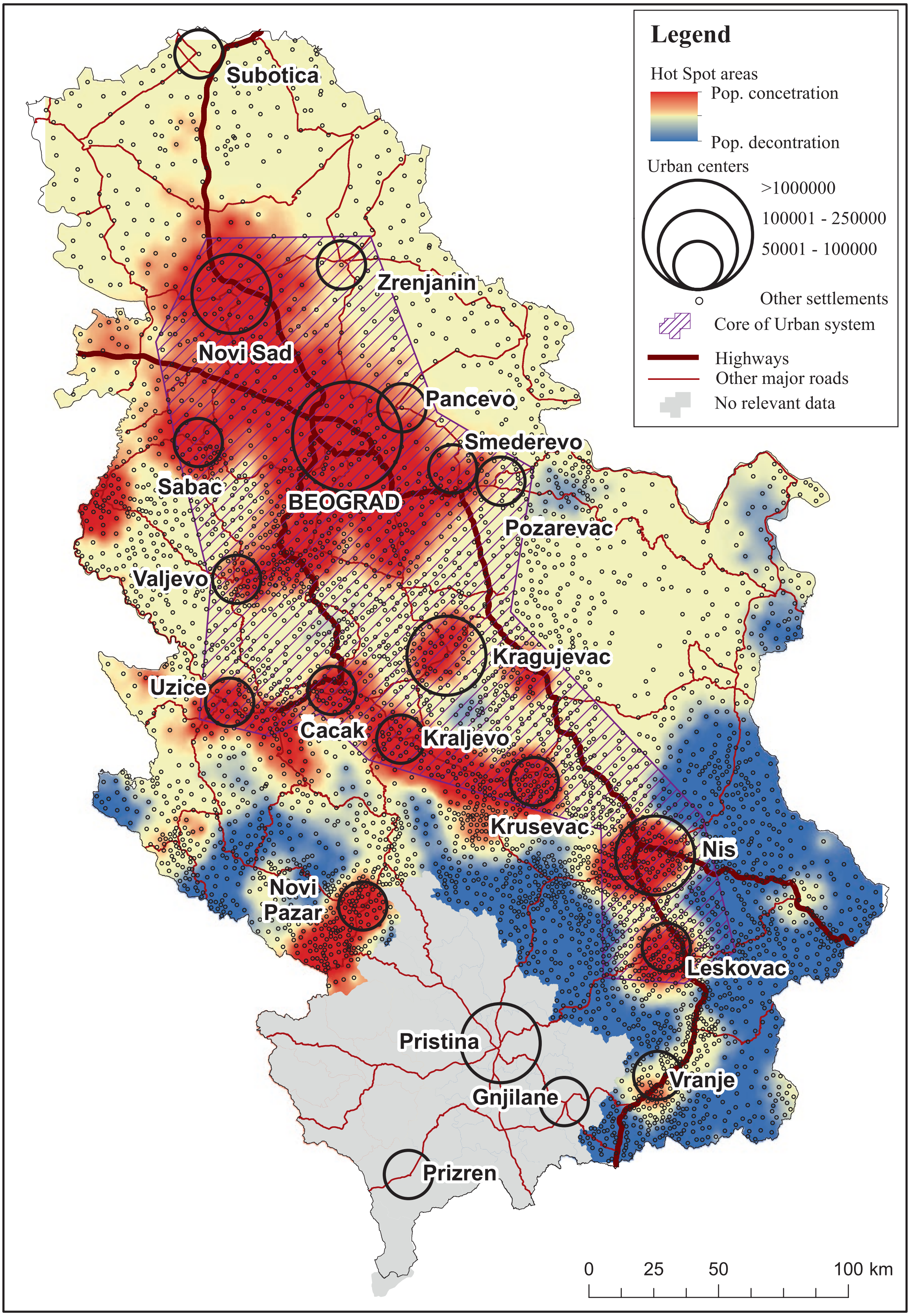


**Fig. 21.1** Urban system of Serbia – Hot spot analysis of the 1981–2011 population change

*Source*: authors' calculation based on SORS (2013) According to the 2011 Census of population in Serbia (excluding the region of Kosovo and Metohija), the structure of settlements is dominated by those with less than 500 inhabitants (around 63% of the total settlements), followed by settlements with 500–1000 inhabitants (around 18%), which means that over 80% of the observed number of settlements have less than a thousand inhabitants. However, in those settlements reside only 16% of the total population of Serbia (excluding Kosovo and Metohija), while on the other hand, the urban core of the city of Belgrade alone has over one million inhabitants, with the same share of the total country's population. The population is also concentrated around main transport corridors, especially those leading to urban centres.

Poland are practically identical to those in other former socialist countries (Lisowski 2004). There are several notable periods of demographic changes and the development of migration in Polish cities (Śleszyński 2016): (a) 1989–1995, a period of robust restructuring of the labour market, which included structural unemployment and a reduction in total employment, lowered internal migration and supported emigration, (b) 1995–2004, a period with intense polarization, with a new group of several leading agglomerations headed by Warsaw, c) the post-2004 period, characterized by greater polarization, a decline in migration resources and the diversification of cities in terms of their attractiveness as places to live and work, and intensification of the internal processes of deconcentration. It can be seen that greater immigration from abroad may be a factor to consider in future changes to the population structure in cities. Particularly interesting for Serbia is a comment by Parysek (2004, p 115), who believes that, due to broad differences in the economic potential of Poland and the developed part of the EU, the development of its metropolitan areas will depend more on external than internal factors: "The future of Szczecin will be decided in Berlin, while that of Lublin will be determined by the economic and political situation in Ukraine, Belarus and Russia".

Through an overview of numerous studies on urban centres in Serbia, taking into account the conclusion that those centres and their spheres of influence have different significance with regard to their population and function, and that they were created in different physical-geographical conditions and cultural and historical context of development, the conclusions on their contemporary features can still be generalized (according to Krunić 2005; Krunić and Tošić 2007).

The spatial distribution of cities is largely conditioned by their physical-geographical features. Newer research points to the link between the spatial distribution of the population, average elevation and the level of construction of settlements (Krunić et al., 2015; Gajić and Krunić 2015). In terms of city distribution by elevation, there are some regularities, with municipalities and cities with lower-than-average elevation having a higher level of construction. Thus, the highest level of construction can be found in settlements in the region of Belgrade (the capital), the region of Vojvodina, the city of Niš and cities along the Velika Morava River. Cities with the lowest level of construction are located in southeast Serbia, which is a predominantly mountainous area. There is a distinct correlation between population distribution and the level of construction, whereby urban areas with a high population density have a higher level of construction, which supports the assessment that cities in Serbia are still relatively compact (Krunić et al., 2015; Krunić et al., 2018).

Changes in the use of land are certainly the greatest in the city of Belgrade. According to available data, around 22% of the total territory of the City of Belgrade (over 710 km$^2$) is covered by anthropogenic/artificial land cover (CLMS 2016). Compared to the same data from 2006, the greatest changes from natural to artificial cover occurred on the outskirts of the city core, that is, in suburban areas. The highest average population density in the city of Belgrade (measured as the share of the total population of settlements in comparison to the constructed area) in 2012 was noted in the central municipalities (195 per hectare), while the lowest population density was recorded in peripheral municipalities of the city (only 13 per hectare) (Krunić and Gajić 2016).

The greatest functional transformation occurred in central and peri-urban zones of urban centres. The city most often becomes the predominant service centre, and settlements in the peri-urban zone gain the attributes of industrial centres. These processes indicate the economic transformation of municipalities and cities from predominantly agrarian to industrial and service types. The number of settlements with diversified functions is increasing. Urban centres are specialized in the tertiary sector, whereas the secondary sector is relocated to suburban settlements, within the commuting zone. However, the organization of transport and the residential function are not adapting to these changes quickly enough.

In general, in the geospace of Serbia, the following structures are recognized, which were formed by the mutual effect of urban regions and the transport and links established between them (Fig. 21.1). The primary areas of agglomeration and intensive spatial and functional links are the valleys or corridors of the most important rivers in Serbia – the middle part of the Danube flow in Serbia, along with the valleys of the Velika Morava, Zapadna Morava and Južna Morava rivers. These areas also separate the urban systems in Serbia into highly concentrated systems and systems on the periphery. The latter are more threatened by depopulation, are less developed economically, and are not well connected. Based on this predisposition and spatial differentiation, a hierarchy of urban centres with spheres of influence has been established. It should be noted that the established hierarchical relations are also a consequence of the significance of the centres in the territorial and administrative system of Serbia (Tošić 2000; Derić et al., 2003; Tošić et al., 2009):

*The metropolitan area of Belgrade and Novi Sad* with numerous sub-centres of various ranks. The creation of the metropolitan area began with the extremely rapid development and spreading of Belgrade, which first became an agglomeration on its own, before joining with the Novi Sad agglomeration that was formed in a similar manner. This polycentric area has the greatest potential for development based on its high functional capacity, significant demographic capacity, excellent transport connection and solid infrastructure. It is a complex and dynamic system of urban settlements with a high degree of functional and spatial/

morphological connection, and a multi-layered hierarchy which has the potential to become the hub of the metropolitan region in this part of Europe.

*Agglomerations* – morphologically, spatially and functionally linked centres with considerable functional capacity and good transport connections. However, their demographic capacity is threatened by the metropolitan area of Belgrade and Novi Sad. They were created by the further growth of regional urban systems and the spreading of spatial and functional impacts between regional, sub-regional and local centres. Agglomerations have the character of functional urban areas and may be found around the cities of Novi Sad and Niš, and by linking the cities in the Zapadna Morava river valley (Užice, Čačak, Kraljevo and Kruševac) (Fig. 21.1).

*Regional centres* – relatively isolated urban centres with multiple functions and a wide territorial influence. They are located in the surroundings of several small urban settlements and many rural settlements, with insufficient infrastructure and a modest demographic capacity. These centres were formed from industrial centres that were growth hubs and even development hubs in the 1980s. After a difficult period of restructuring, deindustrialization and overall social crisis (in the 1990s and 2000s), they gradually recovered, retaining a certain industrial capacity, and became centres for services and industry. These centres influence the socio-economic transformation of the population of the surrounding settlements and carry out functional integration by means of their established daily urban systems, giving them the character of nodal regions. These include Subotica (in the very north of the country), Kragujevac (the middle part), Leskovac (the south) and others.

*Sub-regional and local centres* – centres of supralocal/local functions with modest spheres of influence and insufficient infrastructure connection to regional centres. Their demographic capacity is threatened. They are located in predominantly rural surroundings, and were created as a result of the local concentration of the population and functions in small municipal centres, which, owing to the location of industry, transformed from craft, trade and administrative centres to urban-type settlements with the modest function of centres. Until the 1980s, they grew through migration, mostly from villages in the vicinity. The functional capacities of these urban centres were unable to attract many migrants (population in the surrounding areas who had abandoned their jobs in agriculture), who moved to other regional centres for that reason. Most urban centres in Serbia belong to this group; they are severely threatened by depopulation and the lack of a workforce, which will reflect negatively on their functional capacity which is already modest as it is.

Therefore, if we apply a high degree of generalization, four levels can be recognized in the hierarchy of urban centres in Serbia. Still, trends point to a further deterioration of this structure. Taking into account the fact that cities with over 100,000 inhabitants have a sufficient demographic and functional capacity for self-sustainability, apart from Belgrade, there are only three of them in Serbia with less than 8% of the total population (excluding the region of Kosovo and Metohija) according to the 2011 Census. If urban centres with over 50,000 inhabitants were considered self-sustainable, which is difficult to achieve, there would be only 13 more of them (accounting for only 12% of the total population).

## 21.3 Prospects for the Development of Cities

Despite the plans for the development of urban systems laid out in two national and multiple regional spatial plans, negative trends continue, which manifest today as the increased polarization of the territory of Serbia into developed centres, mostly large cities, and the increasingly undeveloped periphery – almost all small urban/municipal centres and all villages.

The reasons behind the continued polarization are not merely linked to the geographic and morphological characteristics of settlements, nor to the numerous intraurban challenges of development – instead, these reasons predominantly concern the increasingly uneven and unbalanced distribution of urban centre functions and the weakening of their demographic capacity. The development of its functions indicates the position of an urban centre in the administrative and territorial hierarchy of centres, as well as its role as a centre of labour and its infrastructure connectedness and availability. One of the main reasons behind the territorial imbalance of functions is the centralization of administration, that is, the system of centralized decision making in almost all spheres of public life.

The spatial disproportion of functions is seen in the increase in their number in only a few – the most important – urban centres in Serbia and the considerable decrease in the functional capacity of a large number of the remaining urban/municipal centres. Declarative measures, such as redefining municipal centres as cities, along with other administrative measures, have had no significant impact on the development of these urban centres and their intense influence on the surroundings. The reduction in the functional capacity and territorial influence of those functions has led to the inability of the population to satisfy its needs, leading people to move to other places, that is, abroad. Population decline in itself is not a huge problem, as much as the deterioration of the socio-economic structure is a problem, which results in settlements losing their competitive workforce due to their weakened functions.

The deterioration of labour functions in Serbian settlements owing to deindustrialization has been further exacerbated by the loss of functions of public and other services – by a prescribed streamlining of the distribution of courts, schools, health centres, etc., with the main and exclusive motive of economic efficiency. The streamlining was conducted without thorough analyses of the consequences in terms of denying citizens the right to equal availability to the public and other services. A large majority of municipal centres now only have an administrative function. This is related to the streamlining of public enterprises, which are centralized, with head offices in Belgrade or, rarely, another macro-regional centre.

Finally, the causes behind the polarization of the territory of Serbia to only a few centres and a huge periphery are not only internal, but rather Serbia is becoming increasingly affected by foreign investments, given that they are mostly attracted by more competitive centres – those with developed functions, excellent infrastructure connections, a young and educated workforce, and so on.

## 21.4 Future Development of the Cities

Most urban centres in Serbia are facing the challenges of depopulation and decline in their functional capacity, manifesting in space through the shrinking of their spheres of influence and weakening of the relationships between cities and the settlements surrounding them. Local centres are finding it increasingly more difficult to satisfy the needs of the surrounding settlements, and their role is assumed by more distant centres. These processes will remain a challenge for the development of urban centres in Serbia in the near future, particularly bearing in mind that (mainly economic) global trends are not conducive to the development of polycentric urban systems, instead favouring polarization.

The development of urban systems must thus be based on the further development of functions that strengthen the demographic capacity, especially in terms of workforce quality, improvement of infrastructure, and the use of geographic position for functional specialization and competitiveness. The urban centre with functionally dependent surroundings must be the main structural unit of spatial organization and an instrument for managing territorial development.

The structure of centres with the principles of hierarchy and subsidiarity will need to be retained for the future development of urban centres in Serbia. Urban centres have a role as development centres which integrate the surrounding territories.

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# 22 Rural Areas and Rural Economy in Serbia

Marija Drobnjaković, Žaklina Stojanović, and Sonja Josipović

**Abstract**

Serbian rural areas are represented through the prism of the heterogeneity of their geographical and socio-economic features. It is difficult to strictly define the rural area and settlement in Serbia due to the mosaic structure of rural settlements' network. This chapter introduced rural areas as a network of the non-urban settlements, at the same time offering an overview of varieties in defining Serbian rural areas, which are still matter of consensus. The different pace of development, variety of potentials and spatial dispersion of socio-economic processes led to developmental inequalities in rural areas and expressed polarization in many rural attributes (morphology, population distribution, settlement network, economic structure, etc.). It conditionally divides the whole territory on "inhabited, vital north and empty, non-vital south". This argument is justified by observation of the two distinctive processes on rural areas: intensive depopulation and rapid deagrarization, as well by the quality of rural environment based on the evaluation of the outdoor amenities. Such "polarized Serbian rurality" offers a simple but relevant understanding of the development trends and real state of rural areas in Serbia.

**Keywords**

Rural areas · Polarization · Depopulation · Deagrarization · Outdoor amenities · Rural economy

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## 22.1 Rurality and Rural Areas

The definition of rurality and the delimitation of rural areas are not only a starting point for all rural studies and development programmes but also a process that is encumbered with numerous inconsistencies. The differences in determination of rural areas arise mainly from various approaches, subjectivity of researchers' needs and relativity in different temporal and social frameworks. Concerning the concepts of interpretation and definition of the rurality, a discussion among authors arose, moving on the line of denying rurality (Hoggart et al. 1995; Cloke 2006; Gülümser et al. 2007) to the practical need to overcome anti-development attitudes (Zlatić 1993; Šiljković 2014). At the same time, it is difficult to define rural areas and to conduct their socio-cultural and functional delimitation. The rural analysis is usually linked to an adequate spatial unit (Defilipps 2005), and the term rural area is introduced as its established territorial designation.

The establishment and harmonization of the definition of the rurality and the rural areas usually take place within national territories. The rural area of Serbia is characterized by an imbalance in the level and dynamics of the development processes, and the complexity of geographical and socio-economic factors has caused the mosaic of the types of settlements. The unclear position of the rural issues in a developmental policies and strategic documents of the country, as well as the confusion arising from understanding the term rural and village, resulting from different scientific approaches and the used indicators, have led to the lack of a strict definition of the village and rural areas in Serbia. In official documents, differences in the definition and their terminological designation are evident. For example, in the Strategy of Agricultural Development of Serbia (GRS 2005), rural regions are defined based on a share of the labour force in agriculture and the total population density; according to the National Program for Rural Development of Serbia (GRS 2011), rural areas are presented as all the settled territories, except for cities established by administrative criteria; while the Spatial Plan of the Republic of Serbia (GRS 2010) distinguishes rural regions, as a spatial macro-units, on the basis of similar structural features, common developmental problems and generally achieved level of development.

Defining rural areas in Serbia and neighbouring countries is a matter of consensus and discourse on the line of profession and official attitudes. The coverage of rural areas in the region varies depending on the settlement or the area-based approach being applied. There is a certain analogy in the successor states of the former Yugoslavia with a predominantly dichotomous approach, as a relic of formerly used methodology of national statistics. Similar approach, with the priority on the delimitation of urban settlements, is met in all official definitions in the region. The approximate level of rurality is registered: transitional and rural settlements account for 98% in Croatia (Ostroški 2011), 97% of non-urban settlements have been administratively declared in Slovenia (Kušar 2013), 79% in Hungary (Perger et al. 2016), 81% of the municipalities are rural in Bulgaria (Toneva 2008), 89.2% of settlements in Romania (Rusu and Florian 2003) and 87% in Macedonia (Jakimovski 2002).

The rural area in Serbia is dominantly delimited and defined to the dichotomous approach and its determination and analysis is based on statistically measurable data of the Statistical Office of the Republic of Serbia (SORS). Viewed through the prism of the SORS methodology, rural areas include non-urban settlements labelled as other, and the notion of rural, village and rural settlements is not known. According to the 2011 Census, in the territory of Serbia, without data for Kosovo and Metohija, there were a total of 4.721 settlements, of which the other are 4.542. In this regard, even 96.2% of Serbia is rural, and it is inhabited by 40.4% of the total population.

The notion of rural areas in Serbia has recently been introduced in official documents dealing with rural issue. According to the recommendations of the OECD (1994) methodology (population density up to 150 inh./km$^2$), even 93% of the territory of Serbia could be characterized as a rural. A similar level of rurality was registered in the countries in the region – Croatia 88.7% (Lukić 2012), Bosnia and Herzegovina (B&H) 81.5% (Meredith 2007), Slovenia 70.4% (OECD 2018), Romania 99% (Rusu and Florian 2003) except Hungary where it is lower with 58% (OECD 2018). However, the average population density of Serbia is about 93 inh./km$^2$, and the indicative threshold seems too high, which is in line with the basic criticism of this approach. It is more appropriate, with respect to the other European standards, to shift the limit to 100 inh./km$^2$ (EU Commission 1997), when Serbia's rural area makes up 88% of the territory.

If the rural space is observed exclusively as a residual to urban, then the criteria for determining the urbanity can also be used to determine the rurality. Such a concept was applied in a special segment of the planning of national territory (GRS 2010), where the share of urban and agricultural population in total is taken as the starting point, according to which 63.7% of Serbia can be characterized as a rural.

Even a science, despite the tradition of a rural research two centuries old, has no concrete answer to the question of what constitutes a rural area in Serbia. Rurality is observed in Serbian scholar literature through a concept of the rural settlement, but it is treated in a variety of ways: from identification with the village, the rural community and the particular way of life (Stojanov 1996; Babić 2000); through the individual agricultural holding (Radmanović 1999) to the final instance where it represents a residual to urban (Bogdanov 2007; Radmanović 1999). Stamenković and Bačević (1992) noted as many as 94 definitions in use. The traditional definition of village is abandoned or amended, and the contemporary scholar circles have applied a more complex approach and consult a set of indicators from the official European documents (Meredith 2006; Nikolić and Živanović 2006; Efstratoglou et al. 2007; Njegovan et al. 2008; Martinović and Ratkaj 2015; Drobnjaković 2019), and depending on the purpose of research, there are significant differences in the delimitation of the rural areas. In this regard, the definition, selection of criteria and the adequate terminology regarding rural areas in Serbia proved to be a difficult task for which a simple and concrete solution cannot be given.

## 22.2 Polarized Rural Reality

The formation and development of settlements in the rural area of Serbia is difficult to follow. This is contributed by scarce of scientific literature, the obsolescence of cadastral books, the poor material and socio-cultural condition of the village, as well as the lack of interest in dealing with this issue. The first rural settlements in the territory of the Serbia are known even in the medieval period. But, the initial knowledge and the information about them are available from various travel books, historical literature and biographies (Šabanović 1967; Karadžić Stefanović 1969; Milićević 1876; Karić 1887; Novaković 1891; Vujić 1901), while the scientific basis for the study of the village and the rural area of Serbia was funded at the end of the nineteenth and the beginning of the twentieth century (Cvijić 1902, 1922). Serious attempts for improvement of the conditions of rural life and the enlightenment of the people are related to the late 1920s, while the post-war period brought significant progress, but still was not systemic, continuous and supported by the national ideology.

The rural area, the circumstances for its development and the rural population have generally been marginalized in the past several decades (Vujičić and Đorđević 2002; Bogdanov 2007), and policies related to rural issues were incoherent, insufficiently tolerant, sector oriented and with secondary character (Stojanov 1996; Todorović and Drobnjaković 2010). Such an attitude, the influence of improperly directed and controlled development and spatial dispersion of socio-economic processes, contributed to the decline in the vitality of rural areas, with a clearly expressed polarization of potentials, a disbalanced dynamics of development and the concentration of numerous problems.

### 22.2.1 Polarization of the Spatial Elements of Rural Settlements

Spatial elements of the development of settlements in rural areas have been the longest studied and scientifically founded in Serbia. They start from descriptive, through anthropogeographical and physical-geographical observations, to the introduction of measurable parameters that provide a more complete spatial representation of the rural area in Serbia. Spatial development, basic morphological forms of rural settlements and the legitimacy of their spatial distribution were established at the beginning of the XX century (Cvijić 1902, 1922), and subsequently identified new transformed, transitional varieties (Kojić and Simonović 1975; Stamenković and Bačević 1992). The basic spatial elements of the settlement's development in the rural area of Serbia are retained in the original or less altered form, indicating the strength of the geographical conditions (configuration of the terrain and position), social factors (occupation and way of life) and historical circumstances that determined their formation and genesis.

The naturally and socially shaped and differentiated basic morphological types of settlements on rural area indicate some specificities of the individual regional units, points to various developmental processes and their spatial and social organization.

In the morphological sense, the polarization of Serbia is evident: 1) a developed and spatially regulated part north of the Sava and the Danube and 2) a miscontrolled and spontaneously formed and organized system of rural settlements south to the mentioned hydrographic border. A differentiation of the settlement type on the mentioned spatial entities is determined by the morphology of the terrain and the pace of development, but it is actually a historical heritage that represents the product of two different concepts of the territorial organization (Fig. 22.1).

To the north of the Sava and the Danube, on the territory of today's province of Vojvodina, the formation and planned development of the settlement network took place under the aegis of the Austro-Hungarian monarchy. Although natural conditions determined the location and toponyms of the settlements, spatial organization and the formation of settlements with the orthogonal basis are a reflection of the planned organized actions according to the Austro-Hungarian settlement model in the eighteenth and nineteenth centuries (Kojić 1973). On the other hand, settlements in the area south of the Sava and the Danube developed within a specific historical context that was largely shaped by the rule of the Ottoman Empire. Different specific forms of the settlement have been developed, which represent the response of the local population to the influence of the Turkish authorities. In this space, we encounter the mosaic structure of spatial forms of settlements: (1) from the scattered settlements in the southwest, (2) the transitional forms in Šumadija, (3) the gathered villages with cross-road pattern in Mačva (4) to the completely compacted settlement type in the south and east of the country (Fig. 22.1). This principle of morphological differentiation of rural settlements has been inherited and established as the backbone of today's territorial and regional organization of the rural area in Serbia.

A quantified representation of the network of rural settlements in the territory of Serbia also points to differences in their spatial structure and dynamics of developmental processes. We encounter the densest settlements' network in the rural area of Šumadija and West Serbia region (ŠWS) and the South and East Serbia region (SES), determined by the large number of settlements with relatively small area and distances between settlements (Table 22.1). That is a consequence of the frequent division of family's holdings or compacting of villages in favourable area for settlement. On the other hand, the settlements' network in Vojvodina region is characterized by the lowest density caused by a smaller number of settlements with the largest average area size and distance between the settlements, analogous to the configuration of the terrain and planned organization of settlements. The dispersive character of the settlements' network in the rural area of Serbia is evident, which indicates a fair disbalance with the pronounced process of polarization in the whole territory and within certain regions. The most prominent one is in the rural area of the Belgrade region and SES region (Table 22.1) due to the heterogeneity of the observed types of settlements and distinct local centres. On the other hand, the dispersion of the settlements' network is lower in the Vojvodina region due to a homogeneity of settlements in shape and size, and in the ŠWS region where it is caused by a balanced distribution of the population in non-urban settlements.

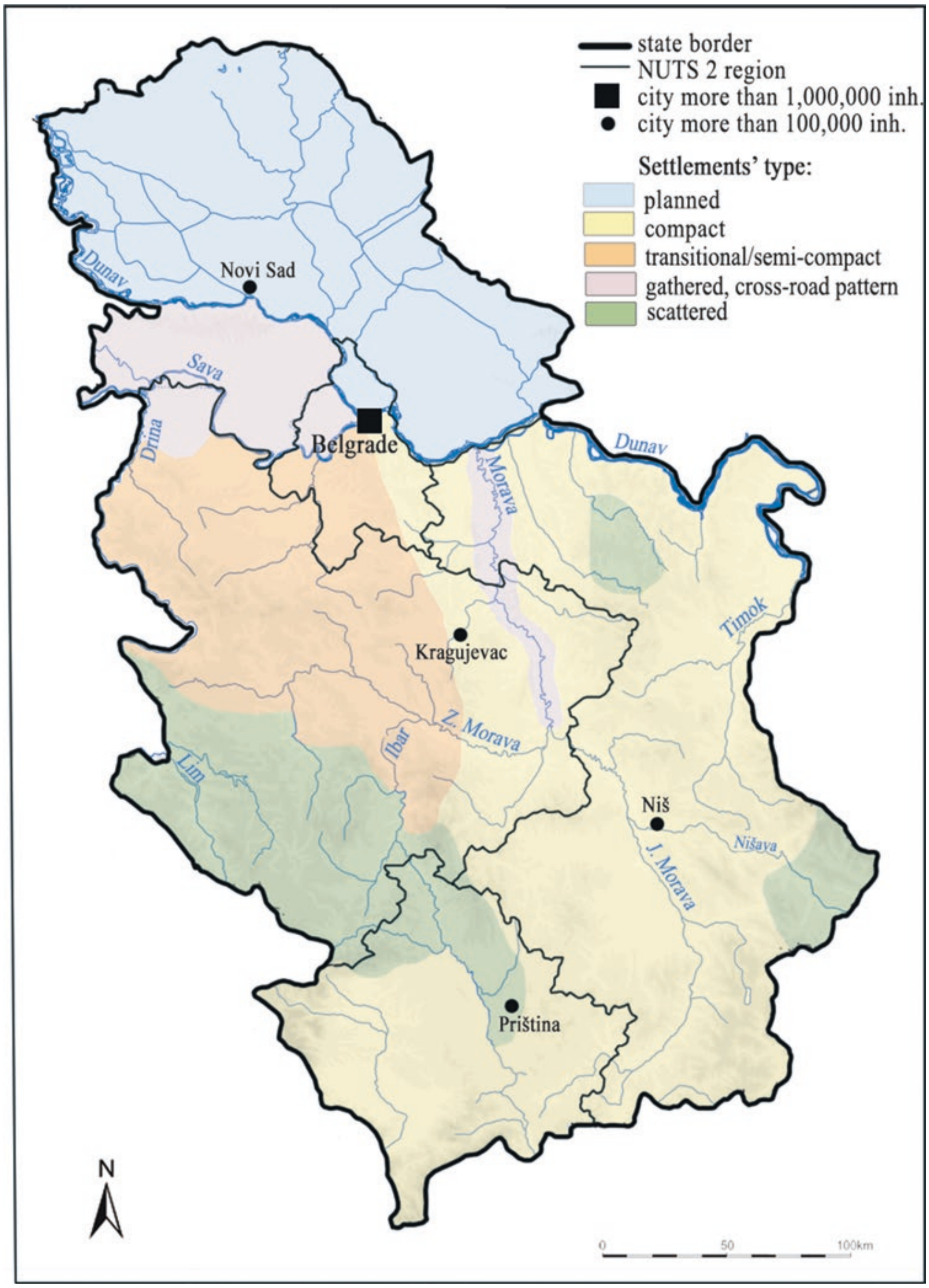



**Fig. 22.1** Spatial distribution of settlement types in the twentieth century. (Source of data: Cvijić 1922)

**Table 22.1** Indicators of the spatial development of the rural settlements' network by regions in 2011

| Indicator/Region | Serbia | Belgrade | Vojvodina | Šumadija and West Serbia | South and East Serbia |
|---|---|---|---|---|---|
| Average territory size | 15.4 | 17.9 | 40.7 | 12.5 | 13.0 |
| Average settlement density | 6.5 | 5.6 | 2.5 | 8.0 | 7.7 |
| Average settlement distance | 3.9 | 4.2 | 6.4 | 3.5 | 3.6 |
| Coefficient of dispersion | 1.8 | 1.5 | 1.1 | 1.3 | 1.5 |

*Source*: Authors' calculation based on data: RGA (2012); SORS (2012)

### 22.2.2 Polarization of the Demographic Element of Rural Settlements

Population size of the settlements and distribution of the population were examined in order to present the structure and evolution of rural settlements, the dynamics and concentration of development processes in the rural area. The trend of fragmentation of the settlements' network is recorded in 1953–2011 due to the continuous decrease in their population size. This is a consequence of long-term discharge of traditional demographic reservoirs (Vojković et al. 2009), especially in the 1960s and 1970s, when the initial phase of urbanization and industrialization takes place.

The majority of settlements in the rural area of Serbia are small (up to 500 inhabitants) and medium (500–1000 inhabitants) by population size. Trend of declining the size of demographically larger settlements is evident from 1953 to 2011, as well as domination of the category of small ones. Distinct fluctuations in the observed period were noted that lead to increasing the number of settlements in the groups with lower population size values. The causes that lead to this continuous settlements' network fragmentation are intensive outmigration, unfavourable population age structure and the negative natural increase, and some other that represents a wider socio-economic and political context: the inconsistency regarding the criteria for differentiation of settlements, transformation from rural to transitional and urban settlement type, functional restructuring, morphological expansion and marginalization of rural areas (Drobnjaković and Spalević 2017).

Settlements in the rural area of Serbia are medium sized with an average of 652 inhabitants according to the 2011 Census. However, distribution of average settlement size across regions clearly indicates the population polarization (Fig. 22.2), which is a result of historical flows, administrative organization, favouring the development and resources utilization of particular spatial units.

The Belgrade region is characterized by the largest settlements, mostly suburban and transitional by type. This fact illustrates the direction of a rural migration outflows and difference of convenience of living conditions in Belgrade region and other parts of country. Only in this region of Serbia, the average population size of the settlement is increasing (Fig. 22.2). On the other hand, the smallest rural settlements are registered in the SES region (381) and ŠWS region (518), as a product of inherited concept of territorial organization and model of the family communities, specific historical context, predominantly hilly-mountain terrain and strong migration outflows in the previous period. The Vojvodina region has "big villages", analogous to its historical and economic conditions in evolution and planned organization of settlements' network, but since the 1960s it has recorded a significant demographic dropout.

The evident polarization and inequalities of a spatial distribution of the population show the observation of the population density. Evaluation of this indicator in the 1961–2011 period lead to identification of some concentration zones of population and activities, and zones of depressive development and depopulation in rural area. Distribution of the population in the rural area of Serbia during the period of initial urbanization in the 1960s was fairly even, since the share of densely and sparsely populated settlements were almost the same, about 4%. Rural

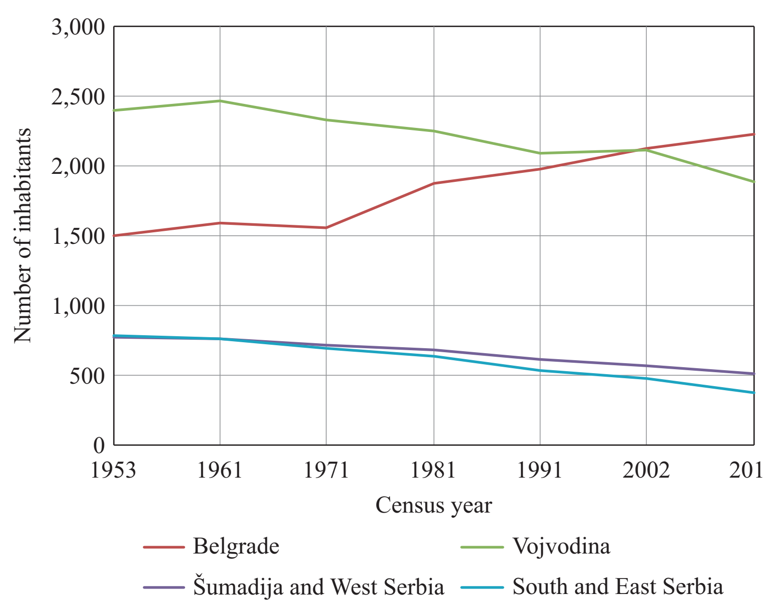



**Fig. 22.2** The average size of settlements in Serbia by regions 1953–2011. (Source of data: SORS 2014)

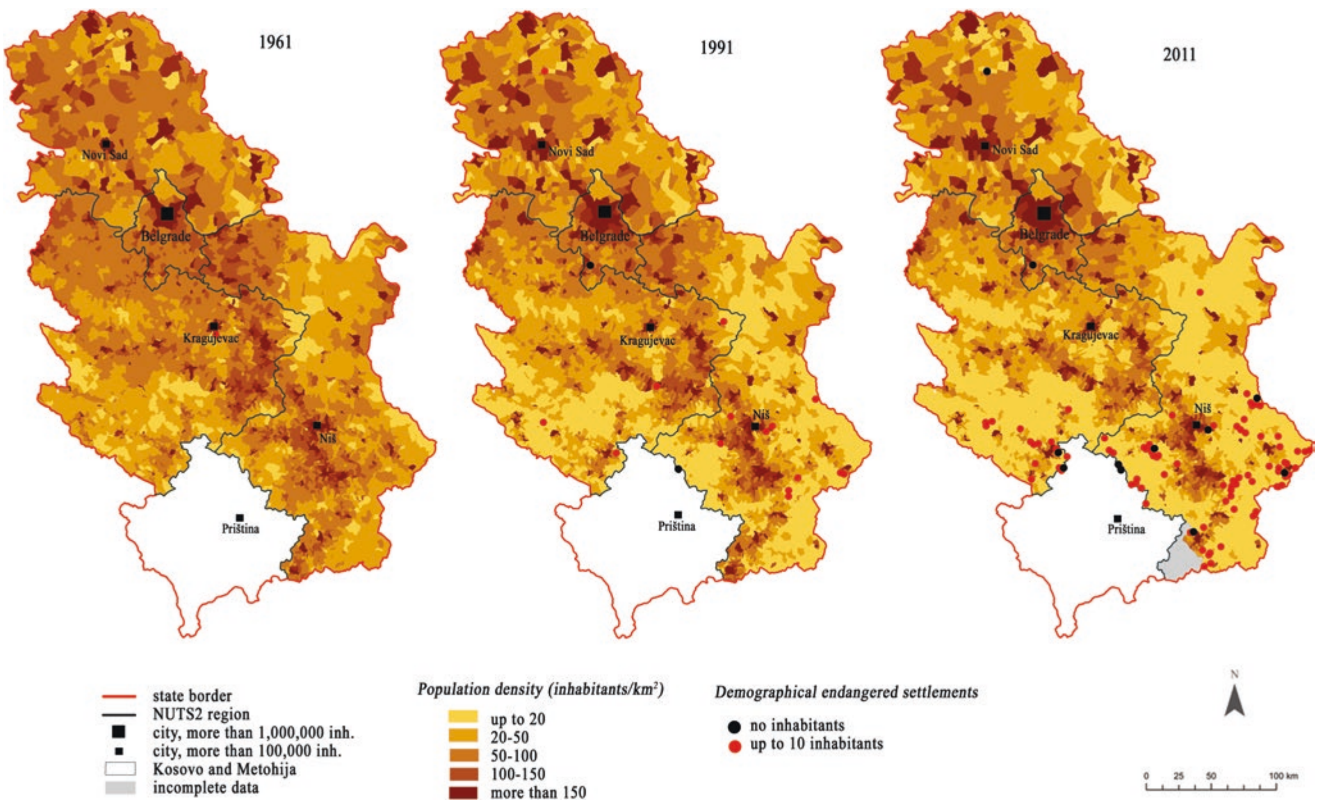



**Fig. 22.3** Changes in the population density and the shrinkage of rural settlements according to three Censuses – 1961, 1991 and 2011. (Reproduced from Drobnjaković and Spalević 2017)

settlements in 1961 accounted for 92% based on the OECD methodology (less than 150 inh./km$^2$). However, the country was mostly (73%) less populated with 20–100 inhabitants / km$^2$. In 1991, when the consequences of improperly directed urbanization and industrialization processes became visible, the number of rural settlements slightly decreased to 91% in the observed 30-year period. Spatial disparities were expressed due to spontaneous forming of the demographic expansion zone on one side, represented by peri-urban belts and development axes, and the depopulation zone in peripheral rural parts of the SES region, on the other side (Fig. 22.3) (see Chap. 21). The number of sparsely (up to 20 inh./km$^2$) and rarely populated settlements (20–50 inh./km$^2$) rapidly increased between 1961 and 1991, when it covered more than half of the rural area in Serbia. This imbalanced spatial and population development of the country had negative instances visible in the current population-spatial distribution, according to the 2011 Census, with marked polarization to the "inhabited north and empty south". The depopulation zone (up to 20 inh./km$^2$) has been extended to almost the entire southern part of the country, including 34% of the settlements, which with rarely populated areas make up about two-thirds of the demographically endangered rural area. The zones of somewhat higher population density are concentrated along the traffic corridors and in the vicinity of large cities.

## 22.3 Depopulation and Deagrarization as a Cause and Effect of the Polarized Rural Area

The different pace of development and the spatial dispersion of socio-economic processes led to a developmental inequality in rural areas, presented by dynamic population growth and propulsive transformation of settlements close to urban areas, on the one hand, and by depressive rural transformations with repressive changes in the population structure and the diminished possibilities for sustainability and development of rural settlements, on the other. Disbalance and crisis in the development of rural areas are reflected in almost all its segments: from the difficulties in renewing and disturbing the population structure, the tendency of constant outmigration, through the pauperization of infrastructure and rural economy, abandonment of rural areas and agricultural land, to final devastation of the village as a human community and collective (Stojanov 1996; Drobnjaković 2019).

As a reflection of differences in the dynamic and trends of development on rural areas, two distinct processes were observed: 1) depopulation, as a cause and a product of the unfavourable developmental trends, and 2) deagrarization, as a final result of the transformations in economic sector, structural social changes in general and the strength of rural labour force. The spatial manifestation of these processes on

Serbian rural area indicates high regional inequalities and distinct polarization of the country.

### 22.3.1 Spreading of Depopulation

The depopulation is observed through the above-mentioned spatial distribution of the population, which indicates the favourability degree of the overall conditions for settling certain areas, the occurrence of population shrinkage area and the vitality degree of rural areas in general. According to these rural attributes, the depopulation zones are recognized.

Rural areas in Serbia are characterized generally by unfavourable demographic trends, reflected through population loss, negative natural increase, unmanaged and uncontrolled migration outflows from rural to urban area and deteriorated age population structure. Serbian rural areas are affected by the significant population decline in the 1961–2011 period. The rural population decreased by 1.417.213 inhabitants, which is about 32.8%. Only in the last inter-census 2002–2011 period, the total population in the rural area has decreased by 10.9% and, in 2011, accounts for 40.9% of the total population. This rapid decline leads to the depopulation of certain regions caused by the outmigration and the component of natural population change.

The negative natural change in the rural area has been registered since 1989. Furthermore, during the inter-census period 2002–2011, no live births have been recorded in 22.3% of rural settlements (Drobnjaković 2019). The total fertility rate has fallen well below the level needed for the replacement of generations, which caused the depopulation (Đurđev and Arsenović 2015). Although the negative natural change is characteristic of the vast majority of population in Serbia, particularly in its rural area, certain regional imbalances are noticed (see Chap. 10). Another important factor for the rural population decline is continuous migration from rural to urban areas. Yet, this type of migration decreased in the 2002–2011 inter-census period compared with previous decades due to declining demographic potential of rural settlements and the collapse of most industrial centres in the country (see Chap. 12).

Rapid population decline and unfavourable socio-economic circumstances, like the economic transition, crisis of the agriculture and deprivation of the agricultural holdings, etc., led to the shrinking of rural areas, especially mountainous one. The demographic unsustainability and vulnerability of certain rural areas are expressive, and depopulation becomes a striking feature of many rural areas in Serbia. Over the past 30 years, almost half of all municipalities in Serbia have been affected by the process of intensive population shrinkage (Drobnjaković 2019). Abandoned settlements become a reality for many parts of Serbia. According to the 2011 Census, there were 11 settlements without permanent inhabitants. Since the demographically empty area could be considered as a rarely populated area with up to 10 inhabitants, the number of such abandoned settlements increased to 86 in 2011. Strong concentration of these settlements is in the southeast, which makes them demographically most vulnerable areas and shrinking rural region (Fig. 22.3). SES region is a remarkably outmigration one, which makes it unique in Serbia, where the intensive population decline was actually a product of the migration component (Nikitović et al. 2015). The region had experienced the largest decrease in the rural population, where only in the 2002–2011 period the population decreased by as much as 19% (Bogdanov and Babović 2015).

Apart from depopulation, unfavourable demographic trends induced population ageing. The average age of the rural population in 2011 was 43.5 years, which is above the average of total (42.2) and urban population (40.9). Concerning this indicator, a clear regional imbalance is also evident. The oldest population was registered in the peripheral and remote rural settlements in southern, eastern and south-western parts of Serbia. According to the 2011 Census, 337 rural settlements had no inhabitants under the age of 15, and in 18 settlements the entire population was elderly (Drobnjaković 2019).

The senilization of rural areas affected their vitality. Based on the vitality index, expressed as a relation between population aged 20–39 and elderly above 65 (NUI Maynoot 2000; Estratoglou et al. 2007), three categories of rural settlements could be identified:

(1) 48.3% settlements that show certain demographic vitality (index values above 1).
(2) 48.6% non-vital settlements that have a larger number of elderly (index value under 1).
(3) 3.2% settlements small by population size were identified, for which it was not possible to determine the vitality index due to the lack of population aged 20–39. They are considered demographically endangered, at the edge of extinction.

In this regard, the vitality index of rural areas in 2011 illustrates a clear regional imbalance (Fig. 22.4). Figuratively speaking, the rural area of Serbia is divided into a "vital north and a non-viable south". The vitality zones are identified north of the Sava and the Danube and along the developmental traffic axes and the valleys, while moving to the south and the border area of the country, vitality gradually decreases and the elderly prevails.

### 22.3.2 The Rapid Deagrarization

The long-standing institutional marginalization of agricultural production has also helped the intensive process of deagrarization. The degradation of agriculture as an occupation, the rural way of life and the status of peasants have contrib-

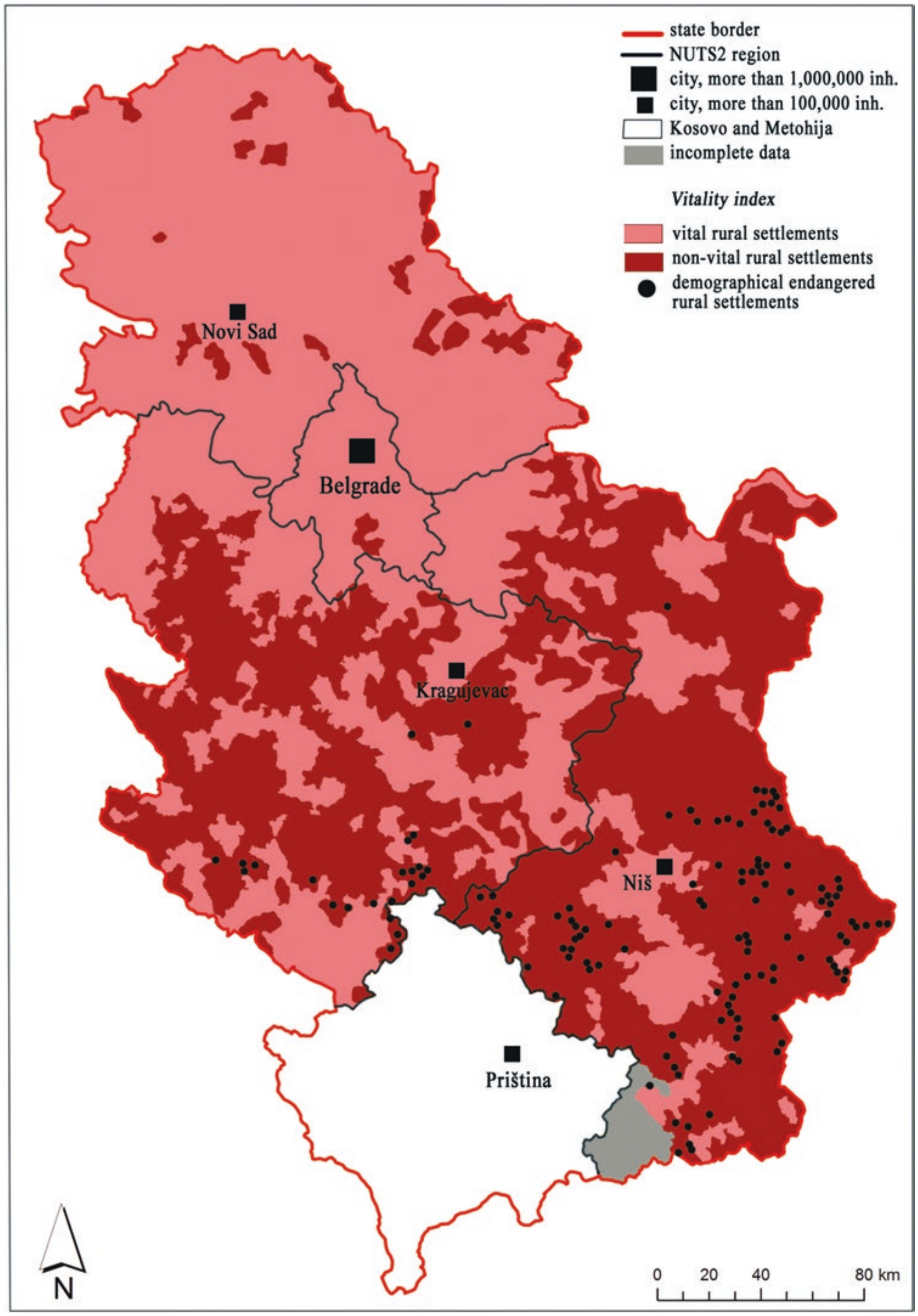



**Fig. 22.4** Vitality index, 2011 Census. (Source of data: SORS 2012)

uted to the etymological-geographical and socio-cultural factors in the form of ideological political incentives (Nemanjić 1996; Mitrović 1996; Todorović and Drobnjaković 2010). In such conditions, the rural economy in 2012 was still mostly based on agriculture, with 34.2% of the active rural population engaged, which has an intense and market-oriented character only in some traditional agriculture areas (Cvijanović et al. 2014). It is difficult to monitor the changes in scope of the agricultural population contingent due to the changes in the Census methodology, but the deagrarization process in Serbia is evident (Fig. 22.5).

The decline in the agricultural population has been registered since 1953, with the first wave of post-war changes and with a peak in 1971–1981, when one of the fastest exoduses in European economic history was recorded (Todorović and Drobnjaković 2010). According to Mitrović's (2015) estimation for the inter-census period 2002–2011, the deagrarization process was reflected through the reduction in agricultural population by 325,564 people, which is about 60% decrease and shows regional inequalities. The most pronounced process of the deagrarization in this period was recorded in the Belgrade region, where the agricultural pop-

**Fig. 22.5** Decrease in agricultural population. (Source of data: Bogdanov and Babović 2014)

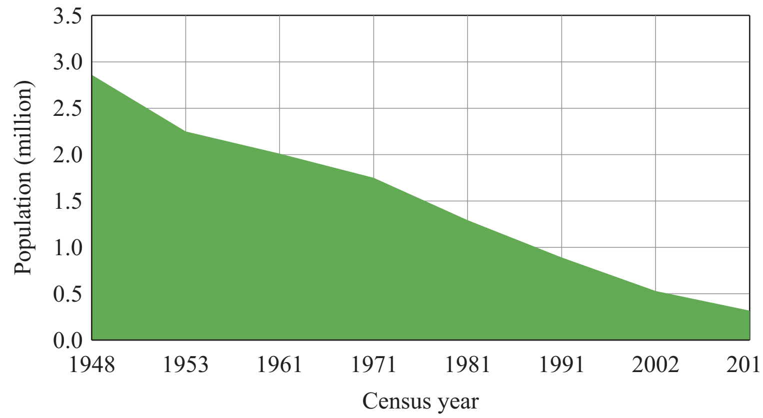
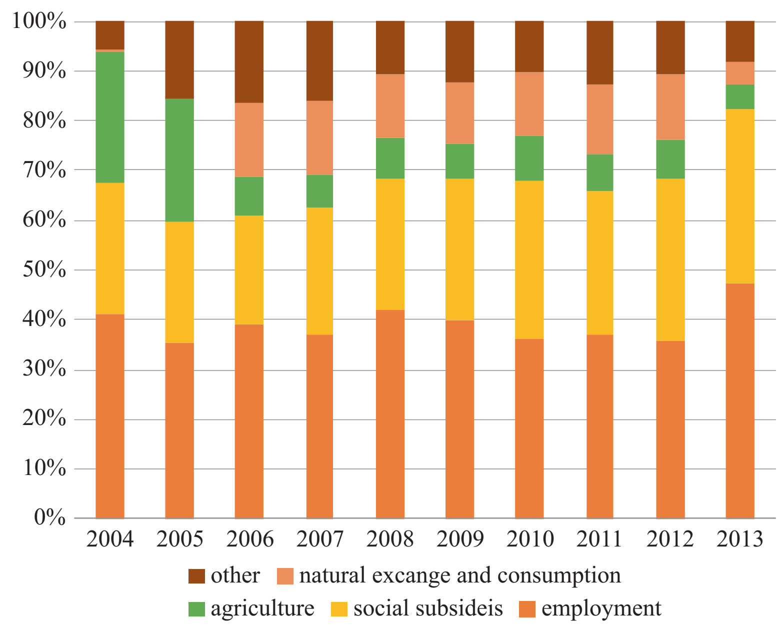



**Fig. 22.6** Rural households in Serbia according to source of income. (Source of data: Bogdanov and Babović 2014)




ulation represents only 0.8% of the total population, but the fastest dynamic was registered in the ŠWS region (from 21.6% to 11.9%).

Some of the indicators of the intensity and scope of the deagrarization process are the abandonment of agricultural land and the declining importance of agriculture in the source of income of the rural households. The Census of the agriculture conducted in 2012 recorded about 8% of unused agricultural land. The most vulnerable areas in this regard are in the southeast, where in some municipalities the share of abandoned agricultural land exceeds 30 and even 40%. According to Cartwright and Drobnjaković (2014), the primary causes of the abandonment of agricultural land are analogous to the state of the rural area in Serbia:

1. Unfavourable demographic conditions that caused reduction in the labour contingent and deteriorated the age structure of the holders of the agricultural households, where 33% are elderly and only 4.8% youth (Bogdanov and Babović 2014).
2. Poor educational structure, which was presented by 60% of holders of the agricultural holding with knowledge based on experience and 4.7% educated in agriculture (Bogdanov and Babović 2014).
3. Unfavourable size and structure of the agricultural holdings, which are expressed through the distinct fragmentation. In 2012, on average 47% of the agricultural holdings in Serbia is up to 2 ha plot size (see Chap. 15).

Considering the source of income of the households on rural areas in 2012, only 6.6% were generated from the agriculture. The agriculture significantly reduces participation in total income of the agricultural households, from 27% to 5% between 2004 and 2013, while the importance of the other non-profit and marginal sources of income on the rural areas arises (Fig. 22.6). This indicator has characteristics of a regional imbalance, too. In the Vojvodina region, the majority of households generate income from agricultural production, the ŠWS region has a significant share of households that are engaged in other profitable activities, which is the basis of their economic sustainability, while in the Belgrade region the largest number of holdings with income from non-agricultural activities is recorded (Bogdanov and Babović 2014).

## 22.4 Outdoor Amenities and Rural Economy Development

Rural areas with rich outdoor amenities have experienced economic growth due to successful demographic, economic and social transformation all over the world. The outdoor amenities have an increasingly important role for a modern rural development. They are often considered the good approximation of quality of life in rural areas. Additionally, the reverse migration patterns (from urban to rural areas) are largely shaped by the site-specific characteristics of rural environment. Due to the development of information and communication technologies and changing people's preferences, the demand for rural amenities is growing and managing them is becoming a priority at the national, regional and local level in Serbia.

Outdoor amenities are recognized as the new key drivers of local economic growth and development. They have big influence over the growth of rural population and their employment, mostly through tourism-based industries and service and retail industries (OECD 1999; McGranahan 1999; McGranahan 2008; Henderson and McDaniel 2009; McGranahan et al. 2010). Beale and Johnson (1998) and Deller et al. (2001) found that, besides natural amenities, the developed recreational infrastructure is also strongly associated with population, employment and income growth rates of rural areas. Goe and Green (2005) identified outdoor amenities (especially the level of warm weather and outdoor recreation amenities) as key pull factors which induce the in-migration of permanent or seasonal residents and contribute to the employment and income growth.

Outdoor amenities can be defined as the specific qualities of local physical environment that make a particular rural area attractive for living and for recreational and retirement activities (Deller et al. 2001). They are often defined as "the potential value of nonproduction aspects of the rural environment" (Pezzini and Wojan 2002). In the developed countries, people move to these areas in order to improve the quality of life for them and their families. Outdoor amenities contribute to the development of tourism as well, as industries in which educated, talented and creative individuals work. In the developed economies, a large number of businesses located in rich outdoor amenity rural areas belong to the service sector (computer programming, data processing and other computer services, engineering services, legal services, banking and financial services, insurance, accounting, audit and bookkeeping services, etc.).

There are two main groups of outdoor amenities: *natural* and *recreational* outdoor amenities, and most of rural outdoor amenities are public goods whose main characteristics include: *non-producibility*, *non-tradability* and *high income elasticity of demand* (Marcouiller and Clendenning 2005).

In order to identify the specific characteristics of rural environment in Serbia, the outdoor amenity index was developed by using the summary index approach for identifying rural amenities (Josipović 2018). The total amenity value of each rural area in Serbia, as a proxy of the demand for rural amenities, was estimated by using the data on housing prices and income per capita. The total amenity value of each rural area was estimated by the residual from the ordinary least squares regression of the average house price on the average income per capita. The higher the value of the residual marks, the better overall living conditions. The methodology that was used in empirical studies for estimating the economic value of rural amenities is explained in detail in Beale and Johnson (1998), McGranahan (1999), Deller et al. (2001), Glaeser et al. (2001), McGranahan (2008), McGranahan et al. (2010) and Josipović (2018). The summary, composite index was constructed by using four measures of natural and two measures of recreational outdoor amenities in Serbia as they have a significant and positive effect on the total amenity value of rural areas in Serbia (Josipović 2018):

(1) *Temperature gap between winter and summer* – Based on the data of the Republic Hydrometeorological Service of Serbia, the temperature gap is measured through the gain in temperature between the average temperature in January and the average temperature in July.
(2) *Topographic variation* – Based on the data of the Military Geographical Institute, it is measured by the topography scale (1–4) consisting of four types of land formation: lowland relief, low mountain relief, mid-mountain relief and high mountain relief.
(3) *Water resources* – Based on the data of the "Jaroslav Černi" Institute for the Development of Water Resources in Serbia, available water resources within the area are measured as the per cent of the territory of rural area under rivers, ponds and lakes.
(4) *Forest area* – Based on data of the Statistical Office of the Republic of Serbia, available forest resources are measured as the per cent of territory of the rural area under forests.

The two used measures of recreational (built) outdoor amenities of rural areas in Serbia include:

(1) *Opportunity for outdoor recreation activities* – Based on the data of the Statistical Office of the Republic of Serbia, the supply of different recreational activities for residents and tourists is measured through the share of the number of employees in restaurants and hotels in the total number of employees.
(2) *Developed transport infrastructure* – Based on the data of the Statistical Office of the Republic of Serbia, it is

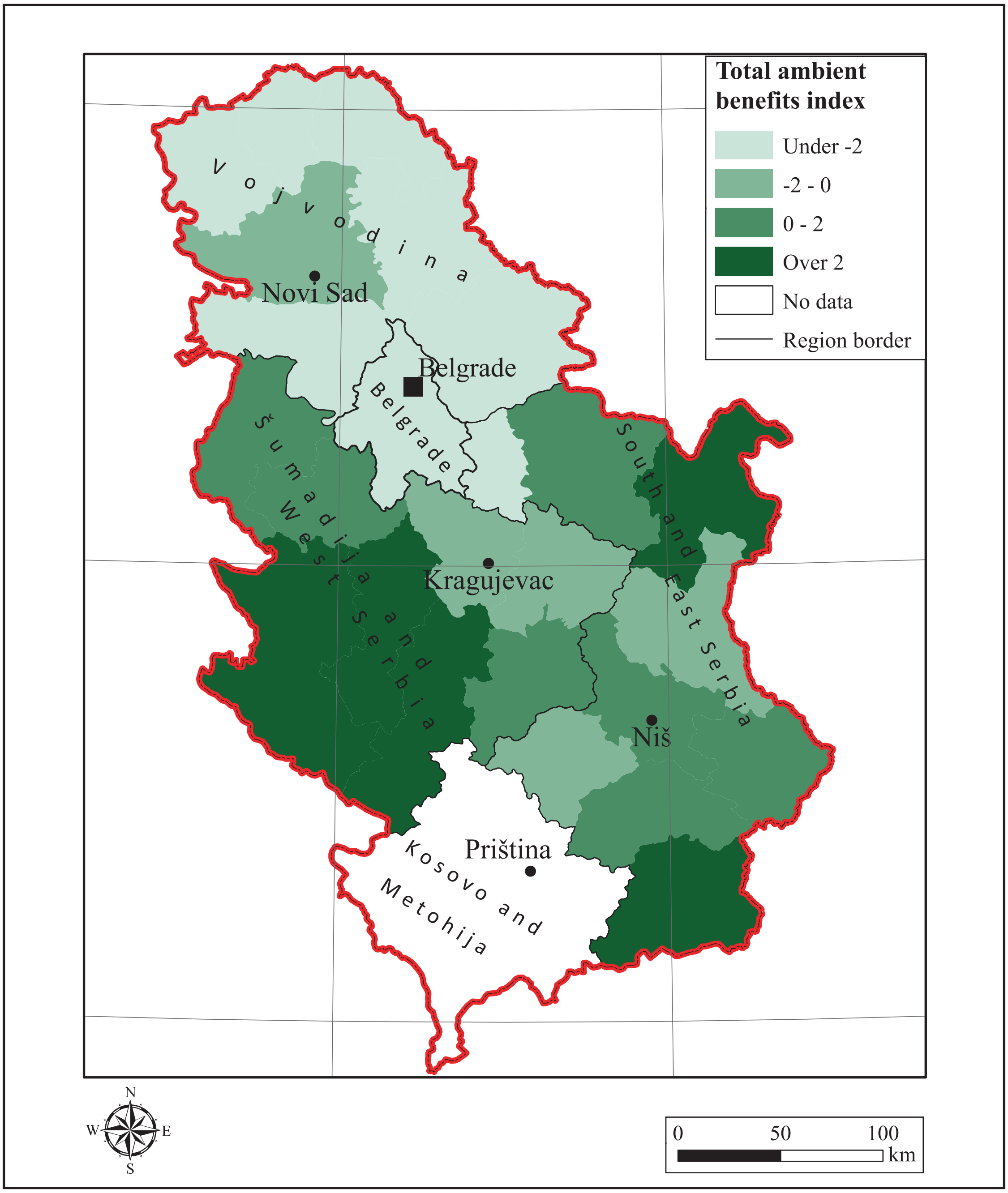



**Fig. 22.7** Rural areas in Serbia according to the outdoor amenity index

measured through the construction of modern transport infrastructure in each rural area.

The outdoor amenity index in Serbia reflects the quality of rural environment that people prefer for living and recreation. However, the calculation of rural areas outdoor amenity index in Serbia is only the first necessary step in developing an adequate amenity-based strategy for sustainable rural development whose main goals are as follows: increasing the efficiency of utilization of rural resources, protection and preservation of the rural environment and sustainable land management and biodiversity protection.

Based on the calculated value of the developed outdoor amenity index (OAI), totally five rural areas with high OAI are identified. Three of them are concentrated and located in the west and southwest Serbia (the Region of Šumadija and West Serbia), while two areas are located in the South and East Serbia region. Two out of three areas in the southwest Serbia have the highest OAI (over 7) in the country (Fig. 22.7). Generally, mountain topography with diverse mountain streams and rivers and specific climate enable site-

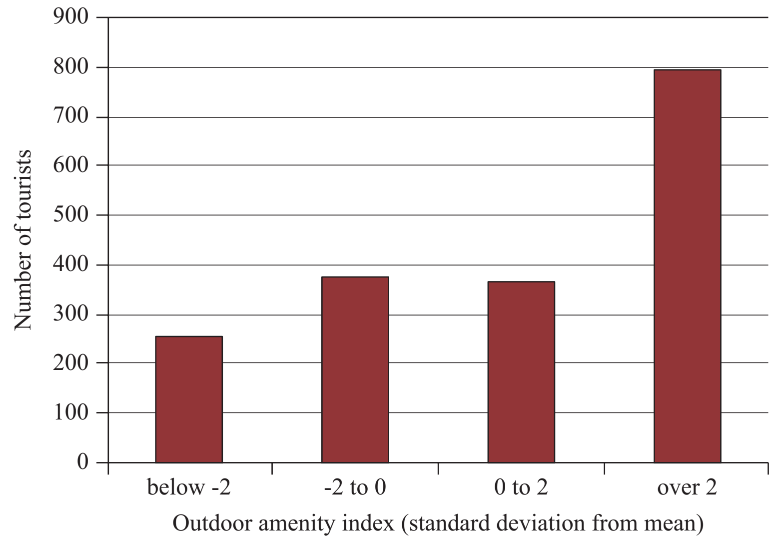



**Fig. 22.8** Average annual number of tourists by outdoor amenity level, 2008–2017. (*Source:* Authors' calculation based on data from Statistical Office of the Republic of Serbia)

specific qualities of the high outdoor amenities. This provides various recreational activity opportunities, and the development of transport infrastructure will only increase the overall potentials of these areas.

Rural areas with OAI below -2 can be identified as low outdoor amenity rural areas. Only one of them does not belong to the Vojvodina region, though represents the adjacent area to it. The one area at the very north of Serbia has the lowest OAI (below -5) in the country. Unlike the high outdoor amenity areas, these rural areas are characterized by a continental climate, lowland relief (which covers over 90% of their territory) and low forest resources (which cover about 5% of their territory).

According to Marcouiller et al. (2004), natural and built amenities are positively associated with the development of tourism and the outdoor recreation sector. We used the average annual number of tourists (domestic and foreign) as an indicator of the demand for outdoor amenities and leisure activities (Fig. 22.8). The highest indicator value is registered in the group of high OAI areas. Two mountainous districts in the western Serbia are the most scenic and recreational rural areas with the highest demand for outdoor amenities. They use their amenities as the high-quality input for tourism development.

A lot of researchers have theoretically explained and empirically confirmed the hypothesis that the value of outdoor amenities is capitalized in the housing prices, which are higher in the areas with rich outdoor amenities (Roback 1982; Blomquist et al. 1988; Glaeser et al. 2001; Wu and Gopinath 2008; Hand et al. 2008). The value of a pleasant environment for living and recreation is reflected in the existence of differences in housing prices between areas with and without outdoor amenities. The difference in the average annual housing price is significant between NUTS 3 regions ranked at the top and at the bottom of OAI (the areas with higher OAI in Serbia showed higher housing prices than average annual rate during the 2008–2018 and vice versa). These results are consistent with the empirical studies of Hand et al. (2008), Wu and Gopinath (2008) and Deller (2009), who link the rural amenities with housing development. Due to high preferences towards the areas rich in natural, scenic and recreational amenities, the demand for housing is higher, reflecting the higher housing prices in these areas compared with other rural areas.

## 22.5 The Rural Economy Structure – Current State and Perspectives

The level of rural economy development is usually measured by the gross value added (GVA) in Serbia. The rural economy structure in Serbia is heavily influenced by its proximity to the nearest urban centres (Bogdanov and Stojanović 2006). The best economic performance, measured by total GVA, is registered in the areas whose centre is also the centre of the Vojvodina region and the second largest city in Serbia – Novi Sad. The same stands for the centres of the two south regions – Šumadija and West Serbia (Kragujevac, the fourth largest city) and South and East Serbia (Niš, the third largest city). The markets of large cities in the country are extremely important for creation of sufficient demand towards rural communities' products. It is also important to notice that regions with high outdoor amenities are positioned just in the middle of our scale based on the total regional GVA. Simply, the urban and rural economies are strongly interdependent.

Additionally, the GVA structure is taken into consideration (GVA by sectors – from primary consisted of agriculture, forestry and water management, to quaternary devoted to different public services).

Besides the fact that rural areas in Serbia are recognized as peripheral, assumed to be subservient to the core (urban) areas, there are some territories that also create its own economy based on the internal, endogenous specificities. Most of them are identified as rural areas with high outdoor amenities. An exceptional opportunity for development of the secondary and tertiary sectors in the rural areas is recorded in the Region of Šumadija and Western Serbia. The producers in this region have managed to create added value bound to be spent through the overall high-quality tourist offer.

The rural area with the highest total GVA has recorded the lowest primary sector share. The highest level of the so-called agrarian rurality is attributed to the district at the very north of the region of Vojvodina as well. This region is particularly suitable for intensive agricultural production. All regions, without any assumption, record important share of state created services in total GVA. The quaternary sector plays an extremely important role in the rural communities in the south and the south-west of the country (Stojanović 2007; Rikalović et al. 2012).

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In general, the rural area of Serbia is burdened with numerous structural problems, with an evident spatial imbalance in developmental processes and resources distribution (Drobnjaković et al. 2015). Each regional unit is distinguished by the specificities in the organization of settlements' network in rural area, their demographic and economic features. There is a clearly expressed polarization in the developed, vital and inhabited north and the underdeveloped, demographically endangered south of the country.

Two northern regions distinguish from other rural parts of Serbia. The one is a rural area of the Vojvodina region, as a traditional agrarian area, characterized by the network of "large villages", homogeneous in their shape and size, with a certain demographical vitality. Second is the region of the Belgrade, which is shaped under the influence of the capital and affected by the greatest transformations. Rural area of this region is characterized by dense settlements' network, mosaic structured, favourable demographic characteristics, pronounced vitality and densely populated, but with imbalanced population distribution, which provide existence mostly outside of agricultural activities.

The area south of the Sava and the Danube line is exposed to numerous spontaneously emerging and difficult-to-solve problems that caused the depressive development and depopulation of rural areas. The most endangered are small by area and population size rural settlements of the South and East Serbia region, which are affected by strong migration outflows, deteriorated population structure, population ageing and shrinking rural area due to the pronounced economic weakening, which caused the most intensive abandonment of the agricultural land and agriculture as an occupation.

In this regard, planning the development of a highly differentiated rural areas in Serbia, adequate valorization of potentials and solving dominant problems require approaching carefully, with respect to regional and local specificities, to these rural issues.

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# 23 Regional Disparities in Serbia

Dejan Molnar

**Abstract**

Serbia is a country with emphasized regional disparities that have been increased in recent years. Territorial differences that exist in Serbia are among the largest in Europe. Nevertheless, regionalization and regional policy issues do not have an appropriate place in domestic public policies. One of the consequences of neglecting this issue is that Serbia uses European funds insufficiently, in order to ensure a balanced regional development. Occasional and discordant activities aimed at supporting the development of underdeveloped areas provide only sporadic and insufficiently sustainable results. It is especially interesting to see the inter-regional (between NUTS 2) and intra-regional (between NUTS 3 within NUTS 2) disparities, considering demographic and economic regional differences and using such indicators which can show the extent of regional disparities in Serbia. It is undoubtedly indicated that regional policy in Serbia needs fast reaffirmation. In doing so, the focus should be on the EU's Cohesion Policy, in particular from the point of view of its mechanisms and measures that are aimed at reducing regional inequalities.

**Keywords**

Regionalization · Inter- and intra-regional disparities · Regional policy · EU Cohesion Policy

All the efforts made so far have not yielded the expected results in terms of reducing regional disparities in Serbia and intensifying the development of less developed parts of the country.

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Today Serbia is a country with huge territorial differences, among the largest in Europe, both between and within the regions of NUTS 2 level. If one looks at the gross domestic product (GDP) per capita index, it can be observed that our most developed NUTS 2 level region (Belgrade region) is 2.64 times more developed than the least developed NUTS 2 level region (South and East Serbia region). However, the essence of the uneven Serbian territorial development is in pronounced and growing inequality within our NUTS 2 regions. Intra-regional disparities are higher than those existing between regions.

The reasons for such disparities in Serbia are numerous and complex, but one of the main is inherited territorial organization from earlier times (see Chap. 4). The territorial organization provides a framework through which different economic policy measures are conducted in order to balance future country development. There is no question that Serbian territorial organization needs to be redefined considering the contemporary circumstances and challenges of modern society.

Current regional development policy in Serbia is dominantly based on several aspects: a faster development of least developed areas/municipalities, predominantly orientated on economic factors in development, sporadic and uncoordinated activities and an inadequate institutional and organizational infrastructure. Inherited regional disparities are additionally increased during the period of transition. Also, there are large disparities within the regions, that is, between developed and undeveloped areas and municipalities within the same region and these disparities increase on lower spatial levels. This confirms the fact that there are multi-dimensional and multi-layered regional imbalances in Serbia.

At the beginning of the twenty-first century, Serbia faced distinct and growing trends in regional disparities in almost all segments of socio-economic development. Sporadic and inappropriate measures that were taken in order to diminish these disparities were the result of a desire to solve aggra-


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vated problems in a short term. However, these problems are of a long-term character and solving them requires continuous and consistent programmes, which are usually implemented over the course of several decades.

Current regional disparities are the result of many factors over the previous period. Large regional inequalities have been inherited from the former SFRY (Socialistic Federal Republic of Yugoslavia), as a result of inadequate regionalization and regional policy conducted during several decades, up to the end of 1990s. The decades-long understanding of regional development policy as financial support for less developed regions and areas has left its consequences until today. In public policy still dominates *top-down* development model, instead of *bottom-up* approach. Regional development continues to rely on a redistributive mechanism, rather than on policy of strengthening local and endogenous development potentials. However, since 2000, the functioning of the market mechanism has deepened the inherited regional inequalities. Besides, the lack of an adequate institutional framework and inadequate understanding of regional development are just some of the reasons why the realized investments during last two decades do not give a higher result in terms of the overall economic growth rate of the country and its spatial uniformity.

## 23.1 Current Institutional Framework for Regional Development

The Republic of Serbia has so-called asymmetric regionalization (see the Chap. 4). Two NUTS 2 regions belonging to the Serbia-North (Belgrade and Vojvodina region) have their own regional institutions and administrative bodies, while this does not apply to the NUTS 2 regions located in the Serbia-South area (Šumadija and West Serbia, South and East Serbia, Kosovo and Metohija) (Fig. 23.1).

In order to make some progress in decreasing regional inequalities, but more to fulfil EU demands in accession process, certain steps had been made by passing the Regional Development Strategy of the Republic of Serbia 2007–2012 (Vlada Republike Srbije 2007) and the Law on Regional Development from 2009, with certain amendments in 2010 and 2015 (Vlada Republike Srbije 2015). Taking into account criteria applied in EU member states, Serbia introduced additional classification of national territory which does not correspond entirely to administrative divisions of the country (NUTS classification) (Fig. 23.1). Serbia has been divided into two macro-regions of NUTS 1 level: Serbia-North and Serbia-South, and into five regions of NUTS 2 level (Table 23.1). Regions of NUTS 2 level are further divided on NUTS 3 level sub-regions (areas), and these areas consist of LAU level areas – the cities and municipalities.

This classification did not resolve the very complex issue of the territorial organization neither it diminished existing regional disparities. On the contrary, taking into account the last governmental organization, the question of regional development in Serbia has been more “downgraded” (degraded) to the level of competence of the Minister without Portfolio. This is not a logical step, knowing that regional disparities in Serbia are among the largest in Europe and that is one of the biggest challenges for every government (Manic et al. 2012, 2017). At the same time, it is one of the most important issues for Serbia in the accession process to the EU (Chap. 22 on negotiations relates specifically to regional development). The direct consequence of such neglecting is the insufficient use of the European Union funds designed for these purposes – Serbia has poorly developed mechanism within the regional level (NUTS2 or NUTS3) for applying to EU funds through different project considering the regional development issues.

## 23.2 How Big the Disparities Are?

Serbia is lagging behind the EU average in many economic and social aspects which additionally contribute to the already big regional disparities within the national territory.

According to GDP per capita (PPP), Serbia is at around 39% of the EU average, and the Serbian most developed region, Belgrade, is at 65% of the EU average. The Vojvodina region is at the national average, while the Šumadija and West Serbia region and South and East Serbia region are at 27% and 25% of national average, respectively, in 2017 (SORS 2019). However, the overall South-East Europe area (SEE) is lagging behind the EU by about 50% of the EU average GDP per capita. For example, Bulgaria is at 45% and Romania at 54% of the EU-28 average (Table 23.2).

However, regional disparities within countries are different. The ratio between the most developed and the least developed region at the NUTS 2 level is larger in Serbia 2.7:1, while in Slovenia it is 1.4:1 and Croatia 1.1:1 (the worst situation is in Romania 3.9:1 and Slovakia 3.5:1) (Ministarstvo ekonomije Vlade Republike Srbije 2014).

Comparing each Serbian NUTS 2 region to the EU average, it could be concluded that all of them belong to the first group of EU regions, that is, to the group of the less developed regions according to the criteria of Cohesion Policy (Eurostat 2018) (Table 23.2).

Two-thirds of the national GDP in Serbia were created in the northern part of the country (Serbia North). Over 40% of GDP is generated in the Belgrade region, while Vojvodina region contributes to the national GDP by about 27% (Statistical Office of the Republic of Serbia 2018)

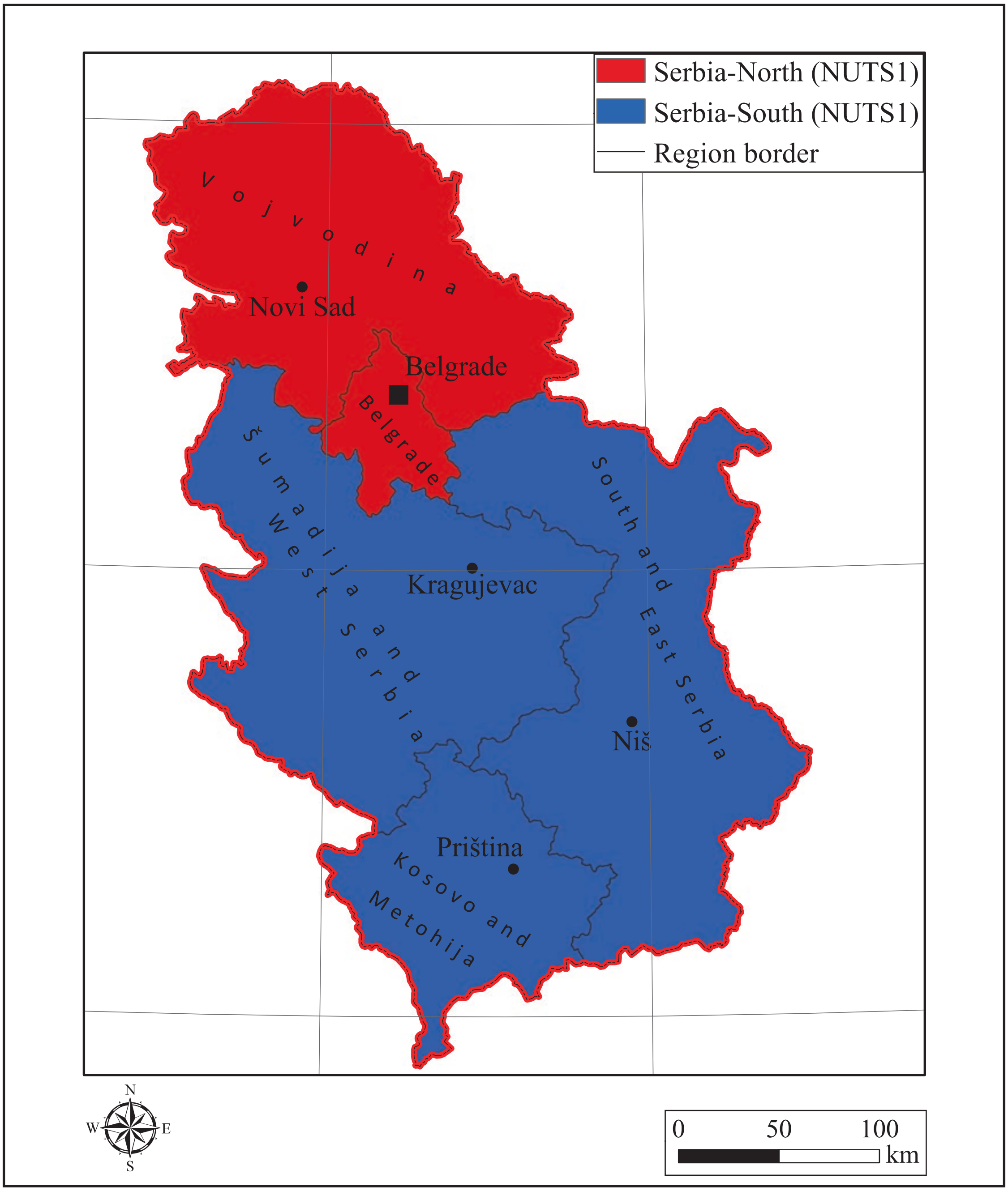


**Fig. 23.1** The NUTS classification of the Republic of Serbia (NUTS1 and NUTS2)

**Table 23.1** Serbian NUTS 2 regions – selected indicators

| Region | Surface area (km$^2$) | | Population, 2017 | | GDP per capita (in 000), 2016 | Regional share in national GDP (%), 2017 | Registered employment (in 000), 2017 | | Net monthly income of employees, 2017 (in EUR) |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % | Number | % | | | Number | % | |
| Belgrade | 3,234 | 3.65 | 1,687,132 | 24.03 | 8,392 | 40.40 | 692 | 33.54 | 501 |
| Vojvodina | 21,614 | 24.42 | 1,871,515 | 26.66 | 4,950 | 26.50 | 525 | 25.45 | 385 |
| Šumadija and West Serbia | 26,493 | 29.94 | 1,941,130 | 27.65 | 3,592 | 19.20 | 486 | 23.56 | 334 |
| South and East Serbia | 26,248 | 29.66 | 1,521,081 | 21.67 | 3,267 | 13.80 | 360 | 17.45 | 345 |
| Kosovo and Metohija | 10,910 | 12.33 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |

Source: Statistical Office of the Republic of Serbia (2018)

(Table 23.1). All this implies that the northern Serbia is considerably more developed than the southern, which produced typical "North-South" polarization in the country. Namely, Serbia-North occupies about one-third of the total area of Serbia, while it generates more than two-thirds of national GDP (Table 23.1).

However, the territorial disparities in Serbia are much more obvious at the lower spatial level, at NUTS 3 (areas) and LAU levels (local administrative units, i.e. municipalities). Among the observed countries during the period 2001–2016, Serbia has the highest average value of the coefficient of variation (CV) for the gross value added (GVA) (2.33) at the NUTS 3 level (Table 23.3).

This indicates that the main problem with territorial disparities in Serbia is inside the NUTS 2 regions (between NUTS 3 level), that is, on the lower levels of territorial organization. Dividing coefficient of variation for NUTS 3 level with a coefficient of variation for NUTS 2 level we get an approximation of intra-regional economic inequalities (i.e. between NUTS 3 inside individual NUTS 2) for the country. Serbia has by far the highest ratio of CVs (6.35) in comparison with EU countries (Table 23.3).

It is possible to analyse the regional disparities by cumulative change in territorial disparities (both for NUTS 2 and NUTS 3 level), measured by coefficient of variation and comparing 2 years (for Serbia it was comparison of 2016 and 2001). The value of CV index higher than 100 shows an increase in disparities and the value of CV index lower than 100 shows that disparities are lower in 2016 than in 2001.

Considering the 2001–2016 period, Serbia had the highest cumulative increase in regional disparities (CV index 182.6) at NUTS 2 level in comparison with selected EU countries as well as one of the highest cumulative increase in disparities between NUTS 3 level (CV index 115.04) (Table 23.4).

One possible reason and explanation for such huge increase in disparities among NUTS 2 regions in Serbia dur-

**Table 23.2** Gross domestic product per capita (by purchasing power) in EU member state and Serbia, the NUTS 2 level, EU28 = 100

| Country | National level | The richest region | The poorest region | Regional ratio |
|---|---|---|---|---|
| Bulgaria | 45 | 72 | 30 | 2.4 |
| Czechia | 82 | 173 | 62 | 2.8 |
| Hungary | 66 | 108 | 40 | 2.7 |
| Poland | 67 | 107 | 48 | 2.2 |
| Romania | 54 | 131 | 34 | 3.9 |
| Slovakia | 75 | 184 | 52 | 3.5 |
| Slovenia | 82 | 97 | 68 | 1.4 |
| Croatia | 61 | 62 | 61 | 1.1 |
| **Serbia** | **35** | **60** | **22** | **2.7** |

Source: Ministry of Economy (2014), p 1

**Table 23.3** Coefficient of variation of GDP (NUTS 2) and GVA (NUTS 3) for EU and Serbia, average values (2001–2016)[a] and NUTS 3/NUTS 2 CV ratio

| | GVA CV average value NUTS 3 | GDP CV average value NUTS 2 | GVA CV NUTS 3/NUTS 2 |
|---|---|---|---|
| Slovakia | 0.44 | 0.20 | 2.17 |
| Denmark | 0.57 | 0.53 | 1.07 |
| Czechia | 0.77 | 0.39 | 1.96 |
| United Kingdom | 0.83 | 0.67 | 1.25 |
| Norway | 0.90 | 0.58 | 1.56 |
| Netherlands | 1.06 | 0.82 | 1.29 |
| Poland | 1.07 | 1.01 | 1.06 |
| France | 1.29 | 0.98 | 1.31 |
| Romania | 1.35 | 0.38 | 3.55 |
| Sweden | 1.45 | 0.66 | 2.21 |
| Italy | 1.45 | 0.99 | 1.46 |
| Belgium | 1.46 | 0.60 | 2.41 |
| Greece | 1.47 | 1.55 | 0.95 |
| Hungary | 1.51 | 0.58 | 2.58 |
| Germany | 1.53 | 0.69 | 2.23 |
| Austria | 1.56 | 0.64 | 2.42 |
| Finland | 1.56 | 0.59 | 2.64 |
| Spain | 1.73 | 0.96 | 1.80 |
| Bulgaria | 1.78 | 0.76 | 2.34 |
| Portugal | 1.88 | 0.92 | 2.06 |
| Serbia | 2.33 | 0.37 | 6.35 |

Source: author's calculations based on Eurostat 2019 and SORS 2016

[a]For NUTS 2 level there are available data for gross domestic product (GDP) and for NUTS 3 level only for gross value added (GVA) (Eurostat 2019)

ing observed period (2001–2016) could be the sectoral structure of gross value added (GVA). Activities such as information and communication, finance and insurance, public administration, innovation and technical activities are highly concentrated in the region of Belgrade comparing with the southern regions (from 77% to 66% of the total employee in Belgrade to only 4–6% in South and East Serbia region) (SORS 2019).

These data imply that the huge regional disparities at NUTS 2 level exist also within demographic structure and dynamics, especially considering the education structure and related areas (Table 23.5).

The Belgrade region shows extremely high concentration of high educated people as well as the research and development (R&D) institutions and investments. This indicates that the higher education sector is highly concentrated in the capital which naturally pulled the concentration of the research institution, too, as well as the innovations and R&D investments (more than half of total R&D organizations and researchers are located in Belgrade, almost two-thirds of total national investments in R&D and highest investment rate in R&D sector).

Consequently, the employment and average (net) salary are the highest in Belgrade region, meaning that living standard and quality of life are highest in the capital. This further attract more and more key development resources (Table 23.6).

Such inter- and intra-regional disparities have significant demographic effects. Positive demographic growth also has South Bačka area (6.4%) beside the City of Belgrade (7.6%). But it must be mentioned here that the cities inside of the areas are the real attractive points for the internal migrations not the area itself. The migration flows are strongest towards the big cities such as Belgrade, Novi Sad and Niš. Of course, the biggest absolute number of the migrants is in Belgrade which produce strong polarization of the national territory with one biggest development pole as the primary city – the capital Belgrade (see the Chap. 21). Only four other cities have positive trend of population growth, becoming that way the small “development poles” inside of their areas or the regions (Table 23.7).

These unfavourable demographic effects reinforce regional disparities. Due to the lack of human capital, chances for the less developed territorial units to foster their growth enough to catch up with the more developed regions get even smaller. This self-reinforcing process, if not mitigated by strong policy reaction, will lead to significant adverse social and economic consequences in the future (Molnar and Jandrić 2019). This further indicates a monocentric development pattern in Serbia (Molnar 2018).

Belgrade region has the largest number of inhabitants (23.8% of the total population); it takes 39.8% of the total Serbian GDP, 33.33% of total employment and 38.8% in realized investments in new fixed assets (SORS 2017). Similarly, the standard of living (measured by GDP per capita) in Belgrade was 66.8% higher than the national average in 2016 and productivity in Belgrade region was about 1.2 times higher than the national average, even though this dif-

**Table 23.4** GDP (for NUTS 2) and GVA (for NUTS 3) coefficient of variation dynamics for selected EU countries and Serbia (2001–2016)

| | GVA CV index (2001 = 100) NUTS 3 | GDP CV index (2001 = 100) NUTS 2 |
|---|---|---|
| Austria | 94.10 | 94.14 |
| Belgium | 97.48 | 98.88 |
| Portugal | 97.61 | 98.26 |
| Germany | 98.85 | 95.71 |
| Norway | 101.66 | 101.07 |
| Greece | 102.82 | 106.23 |
| Spain | 103.02 | 102.85 |
| France | 104.07 | 97.58 |
| Finland | 104.69 | 104.42 |
| Hungary | 105.78 | 100.80 |
| Italy | 105.85 | 104.33 |
| Poland | 107.81 | 107.49 |
| Sweden | 110.34 | 115.55 |
| Netherlands | 111.61 | 102.68 |
| Czechia | 113.08 | 117.57 |
| Denmark | 113.18 | 113.52 |
| United Kingdom | 114.68 | 113.67 |
| Serbia | 115.05 | 182.60 |
| Slovakia | 128.55 | 112.03 |
| Romania | 132.47 | 170.81 |
| Bulgaria | 146.38 | 153.71 |

Source: author’s calculations based on Eurostat 2019 and SORS 2016

**Table 23.5** Regional distribution of education and R&D, 2017

| Region | Persons finished high education, 2017 (%) | Organization % | Investments in R&D % | Total investments in R&D / regional GDP, 2016 (%) Non-financial sector | State sector | High education sector |
|---|---|---|---|---|---|---|
| Belgrade | 54.13 | 59.64 | 66.5 | 0.55 | 0.5 | 0.48 |
| Vojvodina | 22.75 | 16.79 | 26.5 | 0.47 | 0.17 | 0.4 |
| Šumadija and West Serbia | 10.87 | 12.14 | 3.2 | 0 | 0 | 0.1 |
| South and East Serbia | 12.25 | 11.43 | 3.8 | 0.07 | 0.01 | 0.18 |

Source: SORS (2018)

**Table 23.6** Regional aspect of employment and average net salary in Serbia and population change, 2017

| Region | Registered employment (in 000) | | Net monthly income of employees (in EUR) | Cumulative population change, % (2000–2016) |
|---|---|---|---|---|
| | Number | % | | |
| Belgrade | 692 | 33.54 | 501 | +7.91 |
| Vojvodina | 525 | 25.45 | 385 | −8.35 |
| Šumadija and West Serbia | 486 | 23.56 | 334 | −10.49 |
| South and East Serbia | 360 | 17.45 | 345 | −14.85 |

Source: SORS (2018)

**Table 23.7** Change in number of inhabitants in selected cities (> 100,000 inhabitants), 2000–2016

| Region | City | Absolute change (2002–2016) | Cumulative % change in the number of inhabitants (2002–2016) |
|---|---|---|---|
| Belgrade | Belgrade | 107,838 | 6.84 |
| Vojvodina | Novi Sad | 54,206 | 18.11 |
| | Subotica | −10,070 | −6.79 |
| | Zrenjanin | −13,352 | −10.11 |
| | Pančevo | −6,291 | −4.95 |
| Šumadija and West Serbia | Kragujevac | 2,566 | 1.46 |
| | Kruševac | −7,737 | −5.89 |
| | Kraljevo | −985 | −0.81 |
| | Šabac | −10,479 | −8.53 |
| | Čacak | −5,275 | −4.51 |
| South and East Serbia | Niš | 6,482 | 2.59 |
| | Leskovac | −18,120 | −11.60 |
| | Smederevo | −4,822 | −4.39 |

Source: Molnar and Jandrić (2019)

ference is not as pronounced as in the other European capitals (SORS 2017).

Monocentric development pattern means that Belgrade is the strongest magnet for all relevant resources, compared with other city centres in Serbia. Comparing the population size of Serbian cities, it is obvious that the capital (Belgrade) in 2016 was as much as 4.7 times higher than in Novi Sad (the second largest city in Serbia) and 6.5 times higher than in Niš (the third largest city in the country). In such ambient, private investors will never choose less developed areas as destinations for their investments, which leads further to significantly worsened life conditions and the living standard, and the acceleration of the migration flows towards Belgrade and Novi Sad, or even abroad.

In this regard, the fact that the policy makers in Serbia do not give adequate importance to the spatial (regional) aspect of development is particularly worrying (Rikalović and Molnar 2018).

**Table 23.8** Coefficient of variation for selected economic indicators – between and within NUTS 2 regions

| | Between NUTS 2 regions | Within NUTS 2 regions (between NUTS 3 districts) | | |
|---|---|---|---|---|
| | | Vojvodina | Šumadija and West Serbia | South and East Serbia |
| Investment rate, 2016 | 0.177 | 0.290 | 0.513 | 0.317 |
| Investments per employee, 2016 | 0.366 | 0.360 | 0.529 | 0.480 |
| Average wage, per employed person, 2016 | 0.190 | 0.092 | 0.052 | 0.120 |
| Gross value added 2016 | 0.440 | 0.891 | 0.263 | 0.599 |
| GVA per capita, 2016 | 0.464 | 0.197 | 0.201 | 0.276 |
| Employed persons per 1000 inhabitants, 2016 | 0.270 | 0.136 | 0.088 | 0.098 |
| Unemployed persons per 1000 inhabitants, 2016 | 0.290 | 0.188 | 0.210 | 0.311 |

Source: authors' calculations based on data from the SORS (2017, 2018)

How complex and challenging this problem of uneven development is could be seen on the example of Vojvodina region, northern Serbian province and one of the NUTS 2 regions. It consists of seven NUTS 3 level units, named areas. There is a significant concentration of economic activity in the South Bačka area with its centre based in Novi Sad. The South Bačka area is the only one in Serbia, next to the city of Belgrade, which has a level of development above the national average – in 2017, the GDP per capita was 23.6% (SORS 2019). On the other hand, remaining six NUTS 3 areas within Vojvodina have level of development measured by GDP p.c. below republic average (West Bačka by 20.8%, South Banat by 11.4%, North Banat by 20.5%, Middle Banat by 13.7%, North Bačka by 8.4% and Srem by 6.2%). This illustrates that the spatial differences within Vojvodina are even greater than the inequalities that exist within other two regions (Šumadija and West Serbia, and South and East Serbia) (Table 23.8). This is supported by the coefficient of variation within Vojvodina: for example, the GVA in 2016 among Vojvodina districts is 89% (in other regions in Serbia they are lower, 26% and 60%); and according to the number of employees per 1000 inhabitants (2016), the GVA is 14% in Vojvodina, while it is around 9–10% in the other two regions.

In the absence of an active regional development policy, market forces tighten regional inequalities in the case of small, underdeveloped transition country such as Serbia. This leads to deepening the gap between the most and the least developed areas over the time. The Belgrade region and some parts of Vojvodina region attract most of the new investments, they focus on knowledge, educated workforce, innovative activities and other important development resources. On the other hand, less developed areas in the South are entering a “vicious circle” of inequality and, without adequate support in the form of well-focused regional policies, continue to lose crucial resources and are lagging behind. Unless something is done as soon as possible, additional spatial stratification can be expected.

## 23.3 How to Improve the Regional Policy?

In order to achieve more balanced regional development, it is necessary, first, to institutionalize regional policy in three of its basic segments: (a) introducing appropriate regionalization (and sub-regionalization) of the country, (b) establishing of regional development institutions and (c) securing financial resources from appropriate sources for financing regional development, as well as adequate non-financial support.

Adequate regional development policy requires coordination of all institutions involved in various aspects of spatial development. Adequate coordination is most necessary in the area of planning and utilization of financial resources, especially when it comes from EU pre-accession funds. In Serbia, it is necessary to institutionalize regional development as a concept of joint action of different levels of government (national, regional, sub-regional and local), which essentially means adopting an integrative approach to overall and even regional development. In that way, regional development should not be seen as a sectoral policy, but rather a territorial aspect of the overall macro-economic policy.

One of the aims of the state policy must be better utilization of existing resources. In this respect, access to regional development should be based to a much greater extent on endogenous regional growth. It is necessary to create such regional development measures and policies that will support growth in all regions (not just in the less developed ones). For their part, regions should independently seek new sources of growth by mobilizing local resources and funds in a more creative way, with the aim of reaping their specific comparative advantages without over-reliance on national transfers and grants. This way, the aim of regional policy is to encourage all localities to develop their own growth potential, primarily on the basis of their internal, endogenous potential (territorial capital).

When it comes to regional policy measures in the coming period in Serbia, it is believed that the most appropriate model would be the so-called place-based concept, whose main features are based on tailoring interventions to specific territorial circumstances and their spatial connections, as well as on mobilizing and gathering knowledge and benefits of local actors. The approach suggests a new role for local and regional development policy makers in the sense that they are expected to facilitate and foster connection, networking and cooperation between actors, both micro-economic entities and territories. Funds should not be directed directly to one beneficiary, but projects should be devised and funded that will have the desired effect on the wider community through the cooperation of as many actors as possible.

Given the current regionalization in Serbia, the fact that the number of NUTS 2 regions is unlikely to change (a small number of relatively large regions will remain for a country like Serbia), and for the aforementioned contemporary (integrative and holistic) development approach, more attention is needed to promote the role of the sub-regional levels in the following years (NUTS 3 level). These areas can play an important role in the process of more balanced territorial development (Molnar and Manić 2018). Some of the basic recommendations in planning regional development should be taken into consideration (Rikalović and Molnar 2018):

- Adopt a strategic document for regional development – a National Plan for Regional Development (NPRD) for the next (at least) 10 years.
- Follow the direction from “competitive” (redistributive) towards the “generic” (endogenous) concept of regional development.
- Encourage endogenous regional growth.
- Speed up the opening of Chap. 22 on EU Accession.
- Coordinated cooperation of all related institutions – an integrative approach.
- Strengthen the “regional perspective” of sectoral institutions/line ministries.
- Gradual functional and fiscal decentralization in order to strengthen the capacity of local governments.
- Inter-municipal cooperation (especially through networks and other forms of association).
- Redefine the sub-regional level (NUTS 3) and their role in regional policy.
- Delegate more responsibilities related to economic development to NUTS 3 level.
- Promote local economic development (LED).
- Continuous adaptation of Eurostat’s domestic statistics with regard to the formation of quality databases for regional policy and scientific and professional research in the field of regional issues.

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