WORLD BANK GROUP

SURGE
Sustainable Urban and Regional Development

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Economic Affairs SECO

Sustainable Cities Serbia:
Unlocking the transformational potential of cities for the green transition

JUNE 2023

SURGE
Sustainable Urban and Regional Development

Photo Credits

Shutterstock

Disclaimer

This report is part of the Green, Livable and Resilient Cities in Serbia: Strengthening Sustainable and Resilient Urban Development (ID: P176192) Serbia (Europe and Central Asia) which is funded through the Swiss State Secretariat for Economic Affairs (SECO). The contents of this document are the sole responsibility of its authors and should in no way be taken to reflect the official views of the World Bank Board of Executive Directors, or the governments they represent, including the Swiss State Secretariat for Economic Affairs (SECO) financing this Program. The findings, interpretations and conclusions expressed in this work do not necessarily reflect the views of the World Bank. The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgement on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries. Nothing herein shall constitute of be considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.

Contents

Acknowledgments

The preparation of the report was led by Axel E. N. Baeumler, Carli Venter, and Debashree Poddar with support from Pablo Vaggione. The report benefited from significant inputs from Giuseppe Rossitti, Olivera Antic, Igor Miscevic, Tamara Nikolic, Darko Milutin, William Dillinger, Olivera Jordanovic, Chandan Deuskar, Andres Chamorro, and Danielle Koelling. The report draws also on the compendium technical report Serbia Green, Livable and Resilient Cites developed by COWI and lead by Robin Bloch and Boris Zerjav. The editing of the report was handled by Reyna Alorro. The team is grateful for administrative support from Lisa Fonick Haworth and Nejme Kotere.

This report has been prepared under the guidance and supervision of Christoph Pusch (Practice Manager, Urban, Disaster Risk Management, Resilience and Land, Europe and Central Asia), and Nicola Pontera (Country Manager, Serbia). The team further received guidance from Ellen Hamilton (Lead Urban Specialist). Peer reviewers were Horacio Terraza (Lead Urban Specialist), Silpa Kaza, (Senior Urban Specialist), and Eric Dickson (Senior Urban Specialist).

The team is very grateful for the support of Djordje Milic (Deputy Minister, Ministry of Construction, Transport, and Infrastructure), Sinisa Trkulja (Advisor to the Minister of Construction, Transport, and Infrastructure), and Tijana Zivanovic (Advisor to the Minister of Construction, Transport, and Infrastructure) who provided overall guidance, comments, and access to underlying data throughout the project.

This report was supported by the Sustainable Urban and Regional Development program (SURGE), a World Bank Umbrella Multi-Donor Trust Fund financed by the Swiss State Secretariat for Economic Affairs (SECO).

Acronyms

CPI	Consumer price index
ECA	Europe and Central Asia
EDGAR	Emissions Database for Global Atmospheric Research
EU	European Union
GDP	Gross domestic product
GHG	Greenhouse gas
GHSL	Global Human Settlement Layer
GUP	General Urban Plan
GVA	Gross value added
IPCC	Intergovernmental Panel on Climate Change
LDP	Local Development Plan
LQ	Location quotient
LSG	Local Self-Government
NbS	Nature-based solutions
NDC	Nationally Determined Contribution
NSO	National Statistical Office
PDR	Plan of Detailed Regulation
PGR	Plan of General Regulation
PM	Particulate matter
RWMP	Regional Waste Management Plan
SUDS	Sustainable Urban Development Strategy
SPRS	Spatial Plan of the Republic of Serbia
SUMP	Sustainable Urban Mobility Plan
SWM	Solid waste management
WB	Western Balkan
WBCUTR	Western Balkans and Croatia Urbanization and Territorial Review
WDI	World Development Indicators

Abstract

Serbia needs to unlock the potential of its cities to accelerate the country's transition to a more productive, greener and resilient growth model. Although urban areas are the driving force of the national economy, productivity has decreased in nearly all cities, and more acutely in Belgrade and other large urban areas. With a few exceptions, most cities have witnessed population decline and the national urban population is now roughly at the same level as it was in 1990. Numerous constraints reduce the productivity, livability and resilience of Serbia's cities, including insufficient access to quality services and infrastructure, mounting environmental challenges, and deficiencies in the urban planning and governance systems. These challenges are exacerbated by increasing disaster and climate change related risks. Serbia's accession to the European Union, the EU's Green Deal, and policy commitments by the central government in the areas of environmental management and climate change have created a favorable policy context. However, policy makers now must explicitly focus on translating higher level national objectives to the local level—with many of the key required actions to be taken in cities. The objective of this report is to highlight the centrality of the sustainability and climate resilience challenges Serbian cities are facing and to provide a framework for action in urban areas to support the country's green transition.

Executive Summary

Cities are the driving force of Serbia's economy and play a key role in the country's green transition

Serbian cities play a significant role in the country's economy, yet mounting challenges with respect to economic productivity, demographic changes, spatial growth and the environment prevent them from performing to their potential. Serbia's 28 cities account for approximately 60 percent of the country's total population and 74 percent of all jobs, while contributing an estimated 75 percent of the national gross value added (GVA). However, the country's largest cities are underperforming compared to smaller ones in terms of productivity, while productivity is stagnant in the smaller cities. Recent data based on night-time lights and population estimates show that, between 2014 to 2020, productivity has decreased in nearly all cities[1] and that the decline has been more pronounced in Belgrade and other large cities compared to small and medium sized cities.

Urban population has plateaued in Serbia and most cities are losing population. Due to a combination of the country's low fertility rate, an increasingly aging population and net migration outflows, Serbia's total population has been declining. However, with a high volume of internal rural to urban migration, Serbia's population is increasingly concentrating in urban areas. Despite this, urban population growth has plateaued, and Serbia's urban population is now roughly at the same level as it was in 1990. Most cities have witnessed overall demographic decline, with the exceptions of Belgrade, Novi Sad (one of four secondary cities) and Novi Pazar (a medium city). In general, medium and small cities are experiencing more rapid population decline than larger cities.

Despite declining populations, most cities are expanding their urban footprint. The majority of cities witnessed an expansion of their urban territory between 2000 and 2015. Among cities with a growing or stable population, Novi Sad and Novi Pazar are the only ones that show densification over time. Sprawling spatial patterns, with urban expansion primarily at city edges, impact livability, productivity and the environment. The expansion of built-up areas is happening mainly at the cost of agricultural land followed by green cover and conversion of water bodies to urban use, which could potentially have significant negative impacts on the environment and propagate climate mitigation and adaptation challenges. The expanding urban footprint of cities is putting pressure on local governments with limited capacities to extend urban services, while sprawling growth increases the carbon footprint of cities.

Serbia's cities are at a crossroads, requiring concerted action at the national and local level. The muted performance of cities is attributed to numerous constraints, including insufficient access to quality services and infrastructure, mounting environmental challenges, and deficiencies in the urban planning and governance systems. Furthermore, increasing disaster and climate change related risks threaten the sustainability of Serbia's cities, including their economic productivity.

European regional and national policies support a green transition for Serbia and provide an impetus and opportunity to address Serbia's urban challenges – with many of the key required actions to be taken at the city level. Regional policies include the EU's Green Deal, the Green Agenda for the Western Balkans and the Western Balkans Investment Framework. At the national level, the approval of Serbia's Sustainable Urban Development Strategy (SUDS) in 2019 and its associated Action Plan in 2021 marks the country's first time establishing a comprehensive and integrated program supporting the next stage of development of Serbian cities. With Serbia striving for EU accession, the country and its cities have a

unique opportunity to make progress on the green agenda. Supporting the regional and global climate agenda would strengthen Serbian cities to not only become greener and more resilient but would also enable cities to live up their role as engines of economic growth. The time is now for Serbia to take action to achieve greener and more resilient growth, and cities will need to be a central part of the solution, as many of the actions to be taken will take place at the local level.[2]

Improved services, climate action and disaster resilience are key to better urban performance

Serbia's environmental challenges are among the factors that reduce the livability and competitiveness of its cities and contribute to demographic shifts. The country records Europe's worst per capita performance in pollution-related deaths (175 per 100,000 inhabitants) and more than one third of the population lives in regions where the air contains at least one pollutant at levels deemed hazardous for human health.[3] Belgrade is regarded as one of the world's most polluted cities[4] and most of Serbia's other large cities are considered to have excessively polluted air based on national regulations.[5] In terms of urban services, untreated solid waste and wastewater continue to pollute the environment. Local solid waste management operators do not provide separate collection and sorting, and recycling in the country is very low.[6] Municipal water companies perform poorly with non-revenue water at 41 percent on average and limited wastewater treatment service provision. A reliance on non-renewable and polluting sources for heat and electricity, especially for urban households, also threatens the sustainability of Serbian cities.

A focus on cities is also crucial for the country to meet its emissions reduction targets since urban areas contribute 68 percent of national CO_2 emissions.[7,8] In 2022, Serbia revised its Nationally Determined Contribution (NDC) to a 33.3 percent GHG reduction by 2030.[9] Although still below the EU target of a 55 percent reduction by 2030, the target is a steep climb. On average, Serbian urban centers[10] have higher per capita emissions than the global average.[11] This is attributed to ageing urban public transport fleets, which contribute 25 percent of the country's total carbon emissions and to energy inefficient buildings, predominantly located in cities, which contribute around 20 percent of emissions.

Cities are increasingly vulnerable to extreme weather events and climate change impacts. Floods pose a significant risk to Serbian cities, resulting from a lack of risk-informed spatial and urban planning and limited capacity of drainage systems. Heatwaves and urban heat island effect pose additional risks in cities, with lack of adequate green space. Seismic risk is also prevalent in Serbian cities, especially threatening the significant share of older and illegally/informally built homes.

Disaster and climate-related risks demand a stronger resilience and adaptation agenda. Climate change is not sufficiently integrated into existing policies, plans and budget priorities at the local level, and, moreover, it is treated as a separate issue from disaster risk.[12] There is no comprehensive national level risk assessment and only a few cities have developed climate-informed local development plans. Insufficient information sharing and inadequate capacity to plan proactively are compounded by a general lack of awareness at both the national and local levels regarding climate change and resilience issues. A further limitation is the poor enforcement of existing laws and strategies, and lack of incentives for local action including the preventive maintenance of infrastructure.

Improved planning, land management, and investments are critical to enable a green transition

Serbia's planning system is unusually complex and needs to be retooled to effectively address sustainability and climate resilience. Local self-governments (LSGs) are required to develop a Spatial Plan, General Urban Plan (cities only), a Plan of General Regulation, a Plan of Detailed Regulation, and a Local Development Plan, which all impact land use. Multiple sector-specific plans add another layer of complexity to the system. The vast amount of required and optional planning documents overwhelms the capacity of most LSGs, hinders effective planning of cities and suggests the need to streamline Serbia's planning system to make it "fit for purpose", including based on meaningful public participation and linking it to strategic investment prioritization and decision making. Given the complexity of the planning system, integrating sustainability, climate and disaster-risk considerations remains a tall order and poses an additional capacity challenge for cities.

Local plans do not appropriately guide spatial development. Despite multiple planning instruments, vast areas are zoned for development, which promotes sprawl rather than compact development. Serbian cities are zoning more land for development on a per capita basis than other cities across Europe. Numerous reasons exist for zoning large areas for development: LSGs have followed this practice as an attempt to formalize and "integrate" informal settlements - illegally constructed residential buildings make up 49 percent of the total number of residential buildings in the country.[13] Furthermore, unresolved ownership issues associated with brownfield sites result in LSGs and developers favoring greenfield construction over infill development. Sprawling spatial patterns of cities in a context of population decline signals the limitations of the current urban planning and land management system.

Urban sprawl escalates investment costs and inhibits climate resilient development. Considering the cross-cutting nature of climate action and city sustainability, investment costs are high. For example, in the water and sanitation sector alone, it is estimated that EUR 5 billion in investments would be required to achieve full compliance with EU standards. In the solid waste management sector, investments of nearly EUR 1 billion would be required to comply with existing waste framework and landfill directives.[14] However, with cities not actively planning for the demographic transition or curtailing urban sprawl, infrastructure investments may not be right-sized, leading to higher investment, operations and maintenance costs. At current levels of capital spending, it will take decades for Serbian cities to become more livable and resilient to disasters and climate change.

To deliver on the green agenda, Serbia will need to recast the focus to cities

Cities in Serbia are key to fulfilling the country's sustainability and climate goals – the time is now to unlock their potential. The transition to a more productive, greener and resilient growth model would help unleash Serbia's economic development potential and decouple it from environmental degradation. However, to support the country's green growth trajectory, the Government of Serbia needs to address the compounding challenges its cities face in a more targeted manner. While progress has been made in terms of national level policies to support the green agenda, critical action needed at the local level is lagging. Serbia's accession to the European Union, the EU's Green Deal, and policy commitments by the central government in the areas of environmental management and climate change have created a favorable policy context; however, policy makers now must explicitly focus on translating higher level national objectives to actions at the local level.

The World Bank's recent Western Balkans and Croatia Urbanization and Territorial Review[15] (WBCUTR) can provide a useful framework to approach the development of policies and investments for Serbian cities to become more sustainable and climate resilient. The WBCUTR advocates for *concentrating* resources on leading city-regions to drive national growth and support secondary cities to become growth centers; *connecting* people and places to opportunities by linking high-level policy aims with actions that make an impact on the ground; and *capacitating* local governments by strengthening financial and technical expertise and improving local planning, coordination, and governance. In short, the WBCUTR applies a "Concentrate-Connect-Capacitate" framework.

Building on this framework, this report offers a series of high-level recommendations for Serbian cities to drive the country's transition to more productive, greener and resilient growth. Through a diagnostic analysis of urbanization in Serbia, the report advocates for a stronger focus on cities as the key agents for the country's green transition and urges policymakers to deploy spatially targeted policies. Drawing on the demographic and economic trends observed in Serbian cities, measures would need to support managing agglomeration to increase productivity, improve livability and perform well environmentally, and to right-size investments for cities experiencing population decline. To this end, policymakers can deploy the Concentrate-Connect-Capacitate framework:

- **Concentrate** – by deploying a spatially differentiated approach to cities based on the demographic and economic trends and needs of each city to enable right-sizing policies and investments in urban infrastructure and services. For the few cities that are increasing in population and have the potential to develop as regional growth centers, interventions would address productivity constraints at an agglomeration level while supporting decarbonization and compact spatial development. For the majority of cities that are declining in population, targeted measures would improve livability and inclusivity to accommodate ageing in place, improving accessibility of buildings, public spaces, and public transport services, and providing social services. At a system of cities level, measures would target the potential growth pole areas, including along key transport corridors.

- **Connect -** by enabling the linkage between high-level policy aims with actions that translate to results at the local level. Improving the planning system to support improved city sustainability and resilience requires making connections at various levels, for example, between national and local administrations, across adjacent jurisdictions to synchronize land use decisions, and across the system of spatial, urban and sectoral planning instruments, regulations, incentives and permits so that they coherently and unequivocally promote compact urban development and discourage expansion in fringe areas. Climate and disaster resilience aspects would be connected to all elements of the planning system. Measures that connect sectors would contribute to improving productivity and to implementing integrated solutions for improved sustainability and resilience. Recommended measures would also leverage connectivity along transport corridors and through digital infrastructure for territorial development.

- **Capacitate** – by providing LSGs with the required competencies to deliver on their role as key agents in the green transition. This includes strengthening technical capacity to implement sustainable land use, infrastructure planning, and strategic economic development planning, and the ability to apply an agglomeration-level approach with functional urban areas as the unit of analysis and decision making. Capacity strengthening is also needed for developing and implementing disaster and climate risk-informed plans and for implementing improved participatory planning processes. These measures would be integrated with enhancing the

financial capacities of LSGs to increase resources for needed capital investments. This would entail building the capacity of LSGs to identify and prepare bankable projects, and developing financial aptitudes to increase local revenues, including property tax reform and tariff adjustments.

	Recommendations
Concentrate	- Adopt a spatially differentiated approach for developing targeted policies and identifying investment needs based on the demographic and economic trends and needs of each city - Strengthen the cities with potential to develop as regional growth centers or poles, which can also become decarbonization champions - Explicitly account for demographic decline and plan for shrinking and aging cities, through right-sizing infrastructure systems and supporting investments to age-in-place - Improve planning practices to foster compact urban development and control sprawl across all cities, especially in medium and small cities - Develop a cross-sectoral portfolio prioritizing infrastructure investments that contribute to increased productivity, improved livability and climate resilience
Connect	- Explicitly link the national level green growth and climate policy objectives to city specific action at the local level - Streamline the planning system to make it “fit for purpose” to address the overwhelming complexity in the current planning system - Support horizontal and vertical coordination across different tiers of government and sectors to synchronize land use decisions, improve planning effectiveness and improve sustainability results - Update approaches to connect and improve urban planning practices related to zoning for built-up areas, unregulated spatial extension, and informal housing - Leverage connectivity along transport corridors and through digital infrastructure for territorial development
Capacitate	- Strengthen technical capacities of LSGs in reliable and regular data collection, in the coordination of land use, infrastructure planning, and strategic economic development planning, and the ability to utilize the functional urban area approach for planning and investment decisions - Strengthen institutional capacities for developing and implementing disaster and climate risk-informed plans, for engaging public participation in the plan development - Strengthen financial capacities of LSGs to prepare bankable projects and increase resources for needed capital investments

1. Urbanization in Serbia and the importance of cities

1.1 Introduction

1. Serbia's cities[i] are vital to national economic growth and have a key role to play in supporting the implementation of the country's green transition. Home to 64 percent of the population and 74 percent of all jobs, urban areas are economic hubs in Serbia. As a result, not only is a large proportion of the country's greenhouse gas (GHG) emissions attributable to cities—above 65 percent—but also, the impacts of climate change, including among others flooding, heat waves and wildfires are disproportionately borne by cities. Urban growth patterns across Serbian cities have been putting significant pressure on government resources, and gaps in urban development and planning capacities—together with poor quality of urban services (e.g., water supply and sanitation, solid waste management, urban transport and energy services)—have also impeded cities from realizing their potential and are contributing to negative environmental and public health impacts. Serbian cities, rather than playing an active role in steering national green transition and climate goals, may be detracting from it. Given their importance, cities will need to be part of the solution to both lower Serbia's carbon footprint as well as to secure the country's economic growth trajectory.

2. Urbanization in Serbia is at a critical juncture and Serbia's development trajectory, including potential benefits of EU accession, depends on the extent to which Serbian cities can attract and retain people and firms. Urban areas in Serbia are already declining in population. It remains to be seen whether in coming years the urban population trend can be reversed. On one hand, rural to urban migration can increase the concentration of people in cities and incentivize job growth. On the other hand, the rapidly aging population and migration to other countries can result in a decline of the working age population in cities and a loss of spatial concentration required to avail agglomeration benefits. Serbia is also striving for EU accession which is likely playing a crucial role in its urban demography and economy. Potential EU accession for Western Balkan nations has been largely regarded as favorable to their economies, as it has been for Croatia. But a positive outcome of accession is not guaranteed and to a great extent depends on how attractive and competitive cities are. Analysis in the Western Balkans and Croatia Urbanization Review[16] showed that increased integration with the EU is also likely to decrease the population of Serbian metro areas due to the decreased cost of mobility. If Serbian cities fail to make themselves more attractive through improved livability, as mobility increases (as a result of EU accession) the consequent dispersion of population would likely result in economic losses across the country. To keep benefitting from agglomeration and to continue to drive economic growth, it is essential for Serbian cities to retain their residents and make themselves more attractive to people and firms.

3. Regional and national policies provide an impetus and opportunity to address Serbia's urban challenges – with many of the key required actions to be taken at the subnational level. Regional policies include the EU's Green Deal, the Green Agenda for the Western Balkans and the Western Balkans Investment Framework. At the national level, the approval of Serbia's Sustainable Urban Development Strategy (SUDS) in 2019 and its associated Action Plan in 2021 marks the country's first time establishing a comprehensive and integrated program supporting the next stage of development of Serbian cities. With Serbia striving for EU accession, the country and its cities have a unique opportunity to make inroads in this important agenda. Supporting the regional and global climate agenda through implementing SUDS

[i] The term "cities" has a unique definition in the case of Serbia. Definitions relating to the urban network and the spatial unit of analysis for this report are presented in Annex 1.

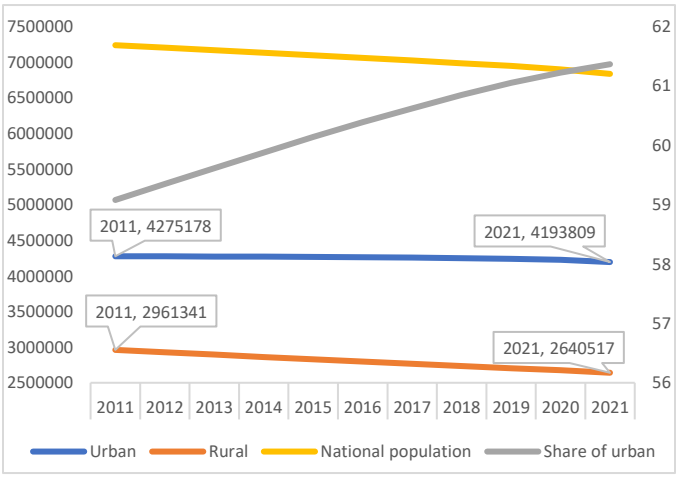
would strengthen Serbian cities to not only become greener and more resilient but would also enable cities to live up their role as engines of economic growth.

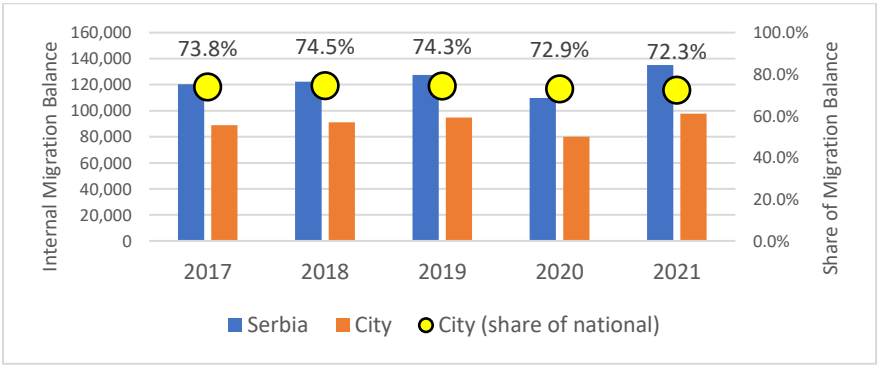
1.2 Demographic trends: a declining and aging population is relocating within Serbia

1.2.1 Serbia's population is declining but is increasingly concentrating in urban areas

4. Serbia's population[17] has been declining primarily due to unfavorable demographic trends that are reinforced by net migration at the national level. Between the last two census periods, the national population fell approximately by 7 percent from 7.2 million in 2011 to 6.7 million in 2022.[18] This decline is not likely to stop any time soon due to a combination of the country's low fertility rate,[19] an increasingly aging population (see section 1.2.4) and net migration outflows.

Figure 1. (a) Demographic shifts in Serbia between 2011 and 2021 (b) Internal migration within Serbia to cities





Source: National Statistical Office, 2022

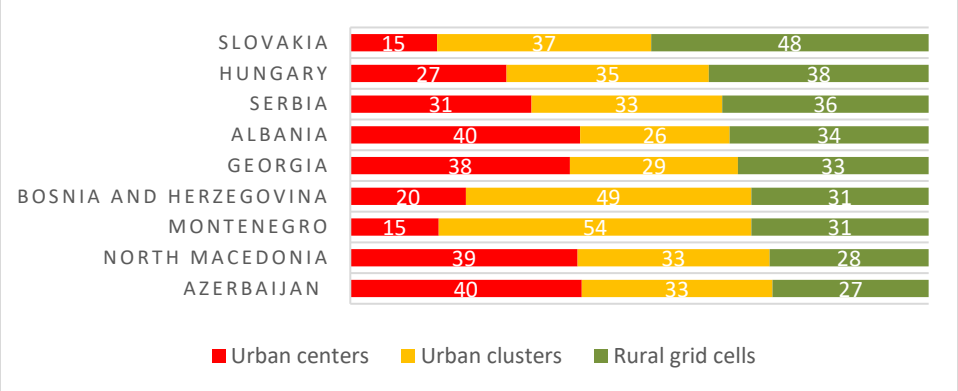
5. Despite overall population decline, Serbia's population is increasingly concentrating in urban areas. The population decline at the national level is reflected across both urban and rural areas in Serbia—albeit at significantly differing paces. Figure 1a shows that while both urban and rural populations have declined in absolute terms between 2011 and 2021, Serbia's rural population shrank almost ten times faster at the average annual rate of -1.14 percent as compared to its urban population which declined at an average annual rate of -0.19 percent. During this period, the urban share of the country's

population has increased by roughly two percentage points. This positive trend in urbanization underpins the increasing concentration of people in urban areas and can be attributed to the rapidly declining rural population. In addition, the continued high volume of internal rural to urban migration further emphasizes the urban concentration of the population. Similar to preceding years, in 2021, cities accounted for 72 percent of all destinations for internal migrants (see Figure 1b).[20]

6. Although the share of Serbia's urban population is increasing, the slow pace of growth indicates that urbanization in Serbia is plateauing. Urban population growth has been increasingly slower since the collapse of Yugoslavia and has been constantly falling since 2011 at an average yearly rate of -0.32 percent. In recent years, Serbia witnessed one of largest declines in urban population in Europe, with the country's urban population now roughly at the same level as it was in 1990. Other countries have seen their urban population continuously shrinking over the last two decades (for example, Bulgaria) or have faced alternating periods of urban growth and decline (such as Croatia, Georgia, Hungary). Serbia's current share of urban population (56.65 percent in 2021) has plateaued almost 20 percentage points below the European Union's (75.19 percent) and also lower than the combined average urbanization rate of other non-high-income countries in the Europe and Central Asia (ECA) region (68.17 percent).[21]

7. While administrative data suggests urbanization has plateaued at below 60 percent, urban population estimates, based on the *degree of urbanization* approach, show a higher level of urbanization for Serbia, close to 64 percent. According to this approach (described in Annex 2), in 2015, the share of total population in Serbia residing in areas classified as urban is around 64 percent (see Figure 2). This percentage is higher than that noted by World Development Indicators (WDI) or Serbia's National Statistical Office (NSO). It is unlikely that Serbia has experienced significant changes in its urbanization level since 2015, considering the steady decline in urban population growth and minimal increases in urbanization as documented by the Global Human Settlement Layer (GHSL) in previous years.[22] Although estimations based on the degree of urbanization approach indicate Serbia is more urbanized than some EU countries, Serbia still registers a lower urban population share than in other Western Balkan (WB) countries and ECA comparator countries like Georgia and Azerbaijan as shown in Figure 2.

Figure 2. Percent share of areas classified as urban and rural in Serbia and ECA comparator countries



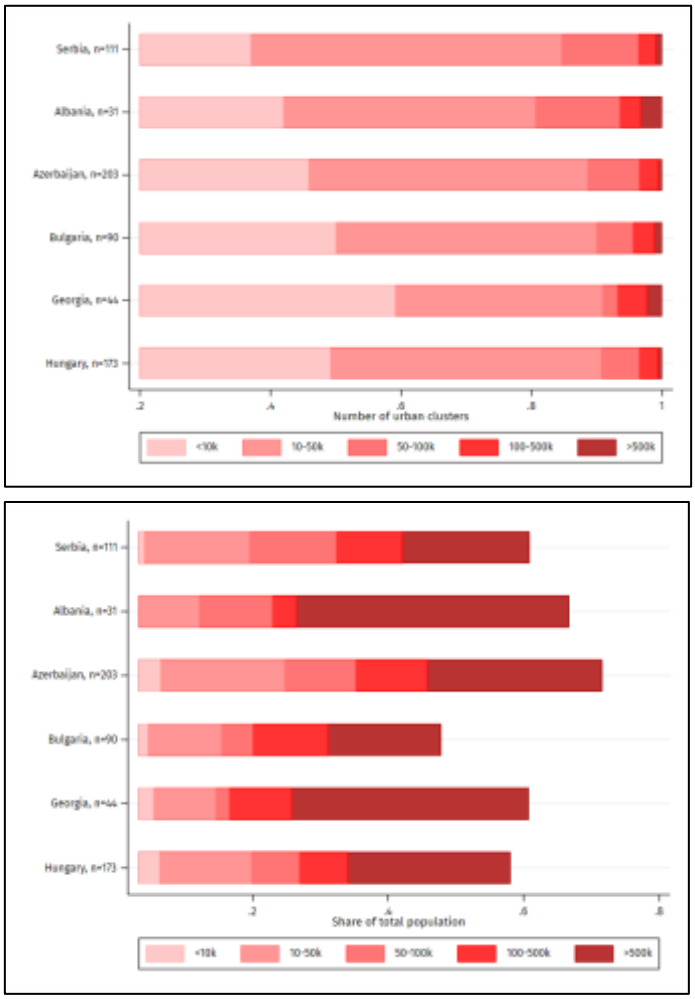
Source: GHSL, European Commission, 2015.

1.2.2 Serbia's urban system is characterized by fewer large cities compared to other countries

8. Belgrade is by far the largest city and the only city in the country that surpasses one million residents. Belgrade's population is 1,382,045 according to the NSO (2021). Amongst the four secondary

cities (with population over 100,000), the next largest city, Novi Sad, has a significantly smaller population than Belgrade, with 298,469 residents. Niš commands the third largest population, with 183,202 residents, followed by Kragujevac (147,786) and Subotica (101,920 residents). See Annex 2 for the estimated populations of Serbian cities.[23]

Figure 3. Serbia and European comparators. (a) Number of urban clusters, (b) Share of total population



Source: Authors' elaboration based on 2020 GHS population data (European Commission, Joint Research Centre, 2022)

9. However, the majority of Serbia's urban population resides in smaller cities rather than Belgrade or other large cities. Using the global definition of "urban clusters" (see Annex 2), the largest Serbian cities (population over 100,000) command a relatively lower share of the country total population. A look at the distribution of city sizes of Serbia and comparator countries (Figure 3a) shows Serbia has a relatively smaller proportion of towns below 10,000, but a comparatively higher number of small cities (having populations between 10,000 and 50,000). Larger cities of more than 100,000 are only a small fraction of the total, similarly to Azerbaijan and Hungary. Figure 3b shows that Serbia, along with Bulgaria, has the lowest share of total population living in the largest cities. Conversely, Albania and Georgia which have been urbanizing relatively faster, have a larger concentration of population in larger cities. Despite Belgrade accounting for just below 20 percent of total population, it hosts a lower share of the population than the primate city in most comparators.[24]

1.2.2 Most Serbian cities are losing population, with smaller cities declining rapidly

10. Within urban areas, only a few cities have witnessed population growth: Belgrade, Novi Sad and Novi Pazar. (See Annex 2 for city population change data.) The capital, Belgrade, experienced 3 percent growth between 2011 and 2021, while the secondary city, Novi Sad, grew by 6 percent. The most significant growth took place in Novi Pazar, a medium sized city, which grew by 8 percent over the same time period.

11. Most cities in Serbia have been losing population, but the most pronounced demographic decline is prevalent across small cities. (See Annex 1 for city categorization.) Small cities (having a population of 10,000 to 50,000) have witnessed the fastest shrinkage, with their populations having declined 9 percent between 2011 and 2021. Medium sized cities (those between 50,000 to 100,000 of population), on average, with the exception of Novi Pazar, have also lost population but less dramatically, experiencing a 6 percent decline. For the four secondary cities (population greater than 100,000 but less than 1 million), the average population grew by a minimal one percent, but the change in population varied across the four cities. Novi Sad is the only secondary city that experienced population growth. Of the three other cities, Subotica experienced the most significant decline at 4 percent, while Niš and Kragujevac both declined by 2 percent. However, when considering a longer period, from 2002 to 2021, Niš and Kragujevac registered an increase in their populations, indicating that over time these two cities have had a more or less stable population, unlike small and most medium sized cities which have continued to face a downward trend in their city size.

12. Data suggests that there is a population shift from small cities and rural areas to larger urban agglomerations, contributing to their growing or stable population. Data on internal migration in 2020[25] indicates that large cities (Belgrade and secondary cities) or municipalities close to large cities were among the few that showed a positive net internal migration balance, although ultimately the net city population growth or decline is largely determined by net migration at the national level.

13. Given urban population trends, most small and medium cities are expected to continue losing population. Extrapolating from the demographic trends over the past two decades, it is unlikely that medium cities like Kraljevo, Zrenjanin, Pančevo and Čačak would reach secondary city status (experiencing population growth over 100,000). Assuming city growth rates retain their current trajectory, Novi Pazar is the only city that could potentially assume a secondary city status in the foreseeable future, replacing Subotica which may become a medium- sized city in coming decades. For small cities, the continued rapid population decline they have been experiencing makes it improbable for them to witness a reversal in their population growth trends. Moreover, internal migration data over the past years suggest that these cities will continue to lose their populations to either larger cities or to other countries outside of Serbia. As such, with continued population decline of small and medium cities expected in coming years the number of large cities is unlikely to change.

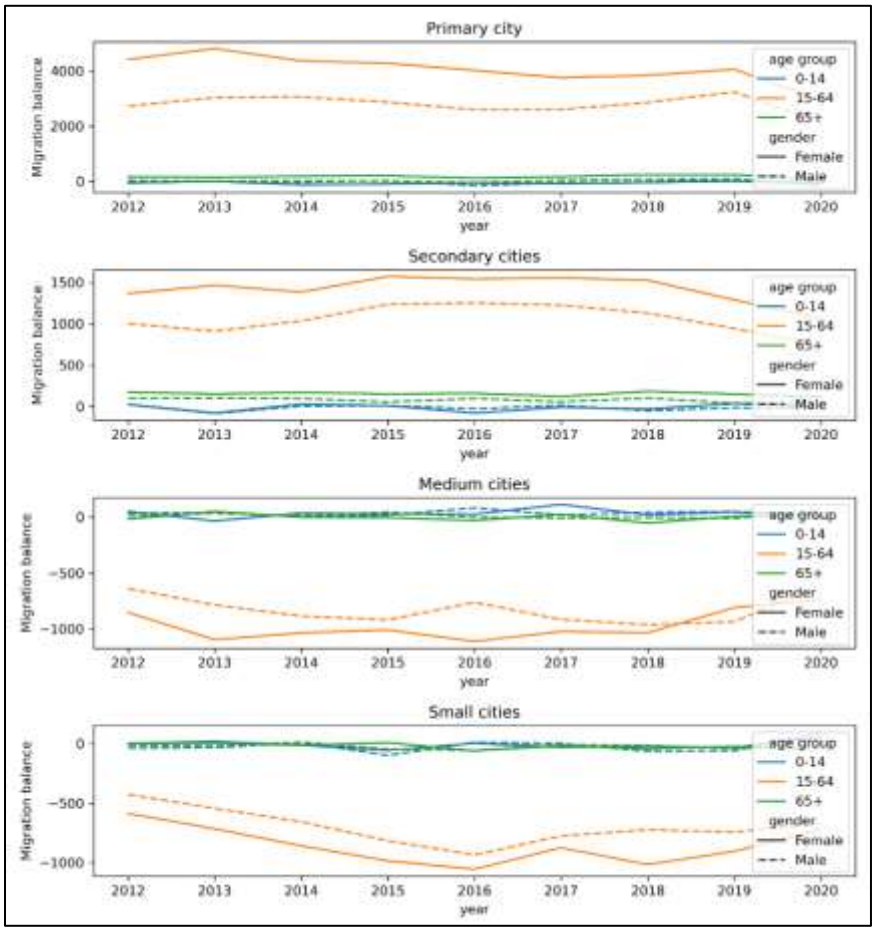
1.2.3 Serbia's population is aging but urban areas are on average relatively younger

14. Cities are relatively younger than rural areas but among cities, the populations of smaller cities are older and are ageing relatively faster. In 2021, the median age in urban and rural areas was 42.4 and 45.1 respectively (national average age was 43.4). There are observed differences amongst cities, with median ages in Belgrade and secondary cities at 42.5 and 42.7 respectively while the median age in medium and small cities was somewhat higher at 43 and 44 respectively. Data also indicates that over the

last decade, medium and small cities on average aged more rapidly than their larger counterparts. In 2020, the youngest population could be found in Novi Pazar, with a median age of 35.3 years, followed by Novi Sad with a median age of 41 years. Belgrade had the third youngest population, with the median age of 42.5. Twelve cities had a median age lower than the national average of 43.4 and the three cities with the oldest population - Sombor, Pirot and Zaječar - are all cities categorized as small.

15. Growing variance in age structure between larger and smaller cities can be explained by internal migration. Cities account for 66 percent of the total young population (below 15 years). While this segment of the population has been declining at the national level, across cities, the young population increased by four percent between 2011 and 2021. The variance in age structure across the different classes of cities can be explained to an extent by internal migration patterns. See Figure 4. The positive net internal migration to Belgrade and to secondary cities is solely accounted for by persons between 15 and 65, or the working age population, according to census data. The situation in medium and small cities is in stark contrast, as the emigration of the working age population results in the consistent increase in the median age of these cities.

Figure 4. Majority of those moving into large cities appear to be of working age whereas among those moving out of smaller cities, a significant share comprises the working age populous.



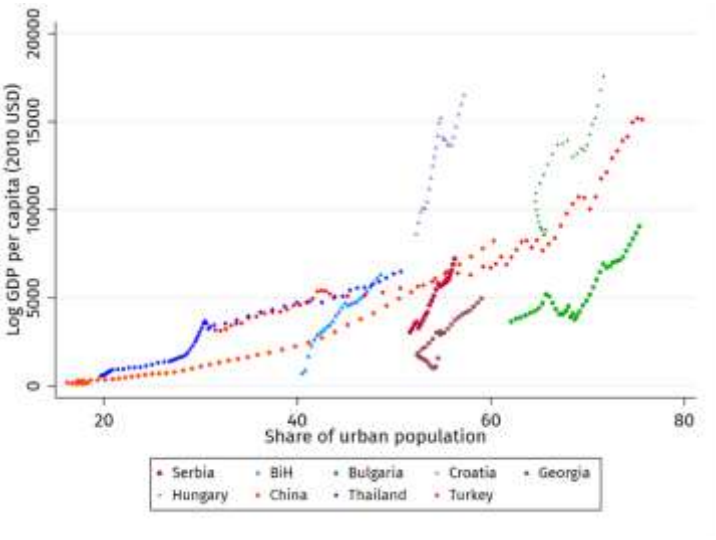
Source: Authors' elaboration based on Statistical office of the Republic of Serbia, 2022, https://data.stat.gov.rs

16. These demographic trends have implications - local governments will have to plan and prepare explicitly for an ageing population. This is especially relevant for medium and small cities. To support implementation of SUDS, cities will need to become "age ready" by including as part of their urban plans services and infrastructure improvements that provide for ageing in place.[26]

1.3 Economic trends: Cities are the engines of Serbia's economy but could be leveraged further

17. Serbian cities contribute an estimated 75 percent of the national Gross Value Added (GVA).[27] The disproportionally large role of cities in Serbia's economy can be explained by economic advantages or "agglomeration economies" fostered by the high density and spatial concentration of economic activity that manifests in urban areas. Thus far, it appears that the positive relation between urbanization and economic growth for Serbia has held true (Figure 5) indicating that Serbia has been able to leverage agglomeration effects and that urban areas are acting as growth engines. Home to 74 percent of all jobs,[28] indeed, urban areas are economic hubs in Serbia. Workers in cities earn on average 13 percent more than those in the rest of the country.[29] Figures 6 and 7 capture light intensity data which is used as a proxy for economic productivity and shows the pronounced role of cities as the country's economic engines, demonstrating that much of the economic activity growth witnessed in Serbia over the last decade has been spatially concentrated in and around urban areas.

Figure 5. Share of urban population to log GDP per capita in Serbia and global comparators



Source: WDI 2022

Figure 6. Night-time lights data in 2021.

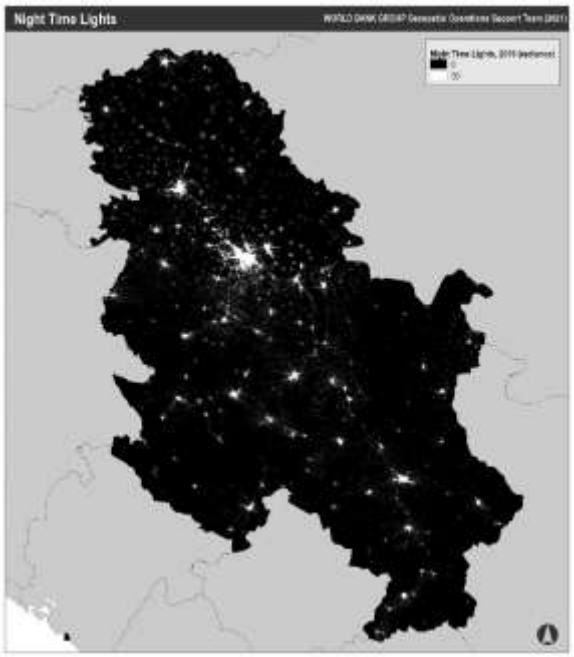
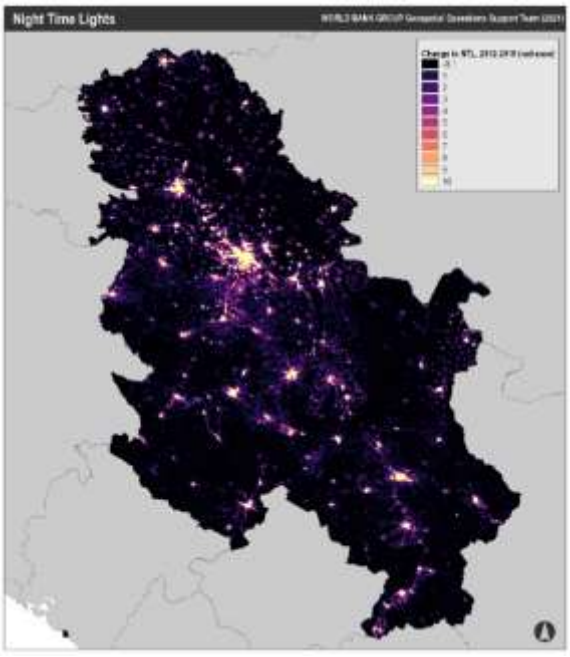


Figure 7. Changes in night-time lights 2012 and 2021.



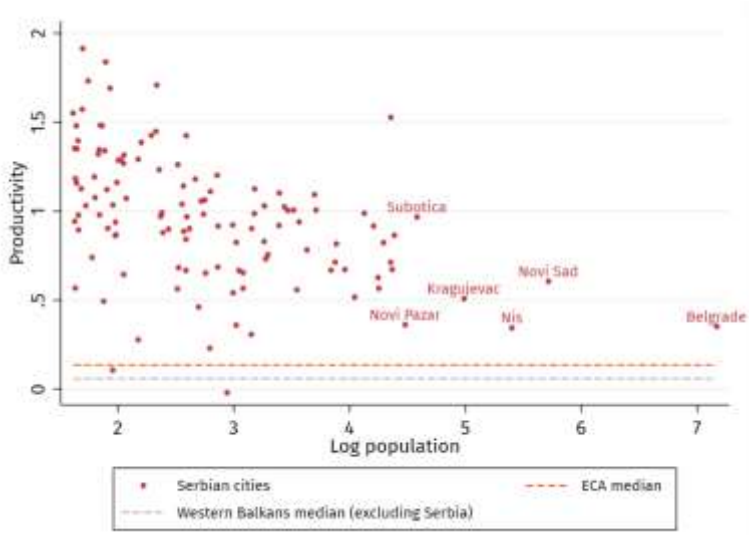
Source: Authors' elaboration using the Earth Observation Group (EOG) Visible and Infrared Imaging Suite (VIIRS) night-time light data from 2012 to 2019.

18. However, easy growth dividends from urbanization are likely over for Serbia. To defend their role as engines of economic growth, Serbian cities will need to double down on efforts to not only increase productivity levels but also to maintain and support concentration of people and economic activity. As seen typically in the East Asia, South Asia and African regions, in countries that are rapidly urbanizing, population growth in urban areas is yielding economic gains. However, given Serbia's plateauing urbanization rates and demographic transition, it is unlikely that Serbia can continue to rely on its urban population alone to sustain long term economic growth. The ability of Serbian cities to derive agglomeration benefits will be deterred by structural challenges of their ageing populations, migration outflows and low fertility rates. Given the declining populations in most cities, the ability to continue benefitting from agglomeration economies would entail attracting and retaining people and firms in cities and/or given rapid decline, enhancing density and concentration through appropriate policy, planning and development.

19. Belgrade and secondary cities are not performing to their potential. In 2015, cities in Serbia seemed to be performing better than the median comparators in the Western Balkans and ECA in terms of productivity. However, Belgrade and secondary cities with the largest population concentration were not among those driving productivity (see Figure 8).[30] Indeed, at the country level there is a clear negative relationship between productivity (proxied through nighttime lights data) and city size. The relative underperformance of the largest cities is confirmed by more recent productivity estimates based on the same methodology: between 2014 and 2020, productivity decreased in all larger cities while remaining stable in small and medium sized cities, with the exception of Novi Pazar, where productivity increased until 2018 and has been declining since (Figure 9). As a result, Belgrade and Novi Sad are now close to the average (unweighted) productivity of medium and small cities. The underwhelming performance of Serbian cities is also predicated by the tepid growth in real wages (measured using the country CPI with 2010 as the base year) especially in secondary cities where they largely stagnated from 2009 to 2018 after

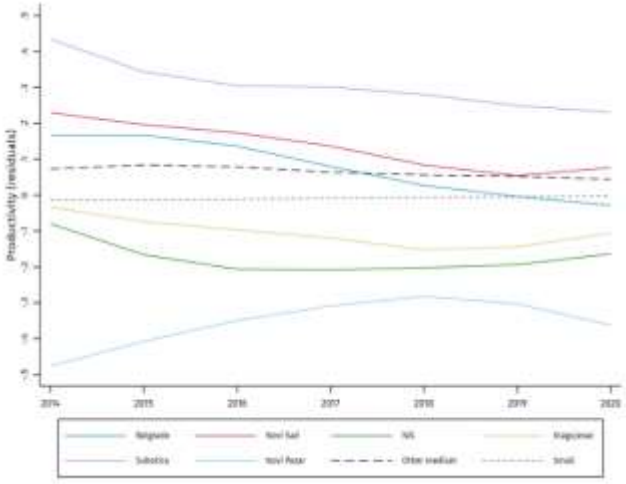
an initial rapid growth and steep decline in 2008 following the global financial crisis. Nonetheless, real wages have started growing fast after 2018, with Belgrade and Novi Sad displaying the highest growth rates (Figure 10).

Figure 8. While Serbia's cities performed better than ECA cities, among cities within Serbia, productivity growth was lower across Belgrade and secondary cities



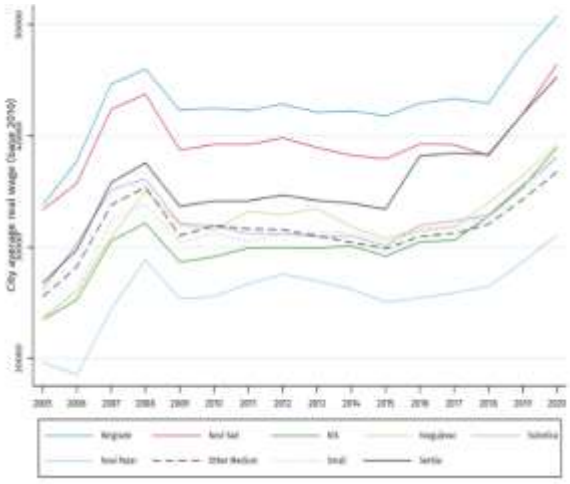
Source: Authors' elaboration based on the 2015 population grid from GHS-POP R2019A.

Figure 9. In Recent years productivity has declined across all cities, especially across Belgrade and secondary cities (2014-2020)



Source: Authors' elaboration using EOG and VIIRS night-time light data and population grid

Figure 10. Decline in real wages attests the fall in economic performance (2014-2020).

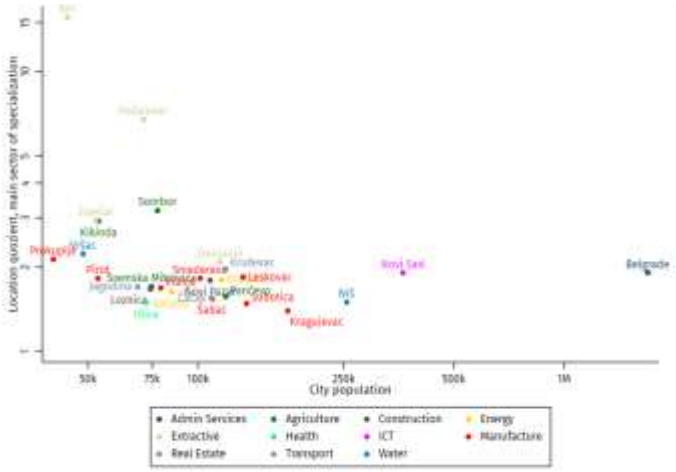


Source: NSO

20. Belgrade and most secondary cities have yet to fully leverage the process of structural transformation and become specialized in the more productive knowledge intensive service sectors. With exception of Novi Sad, cities in Serbia are not specialized in knowledge-intensive service sectors, which are more typically found in larger, more diversified cities. Due to their size, Belgrade and secondary cities have a comparative advantage in some high value-added service sectors, but in these cities, more

productive service sectors are either declining or growing very slowly, indicating lost opportunities and threatening future productivity gains (see Annex 3 for further information). Figure 11 shows that Belgrade has the highest concentration of workers in the administrative services sector while Niš, Kragujevac and Subotica are dominated by either manufacturing or non-tradeable utilities (water or energy). Novi Sad is the only city specializing in more advanced knowledge-intensive service sectors, specifically information and communications technology (ICT).

Figure 11. Main sector of specialization of cities (calculated by the location quotient)



Source: Authors' elaboration using employment and population data from NSO

21. Secondary and medium cities are yet to successfully play their parts as regional growth poles. Research across ECA and the Western Balkans region shows that secondary and medium cities can act as regional growth poles. (See Annex 4 for more information.) The spillovers of urban development to economic growth in rural areas is evident in Serbia, yet secondary and medium cities have yet to fully harness their regional growth potential.

22. Although small cities appear to be performing well, economies of these cities are less diversified, often reliant on a single sector and would need to be managed as Serbia transitions to a greener economy. In general, medium and small cities in Serbia have comparative advantage in more labor-intensive sectors rather than knowledge-intensive and service sectors found in larger cities (see Table 1). In Serbia, medium cities specialize in manufacturing while small cities specialize and depend on the mining and extractives sectors, as in the case of Bor, Požarevac and Zaječar. Typically, the extractives and manufacturing sectors are energy intensive. With a large proportion of the local economy reliant on these sectors, as cities go through the green transition, they would need to adopt strategies to reduce the carbon footprint while also ensuring the stability of the local economy and needs of the local population.

Table 1. Location quotient by city size typology, 2021

LQ	Manufacturing	Less knowledge-intensive services	Tradable knowledge-intensive services	Non-tradable knowledge-intensive services	Agriculture	Mining
Belgrade	0.43	1.21	1.59	1.09	0.34	1.10
Secondary	1.21	0.98	1.03	1.00	0.46	0.24
Medium	1.42	0.90	0.62	0.96	0.74	0.53
Small	1.28	0.83	0.60	1.09	1.34	1.98

Source: COWI, 2023.

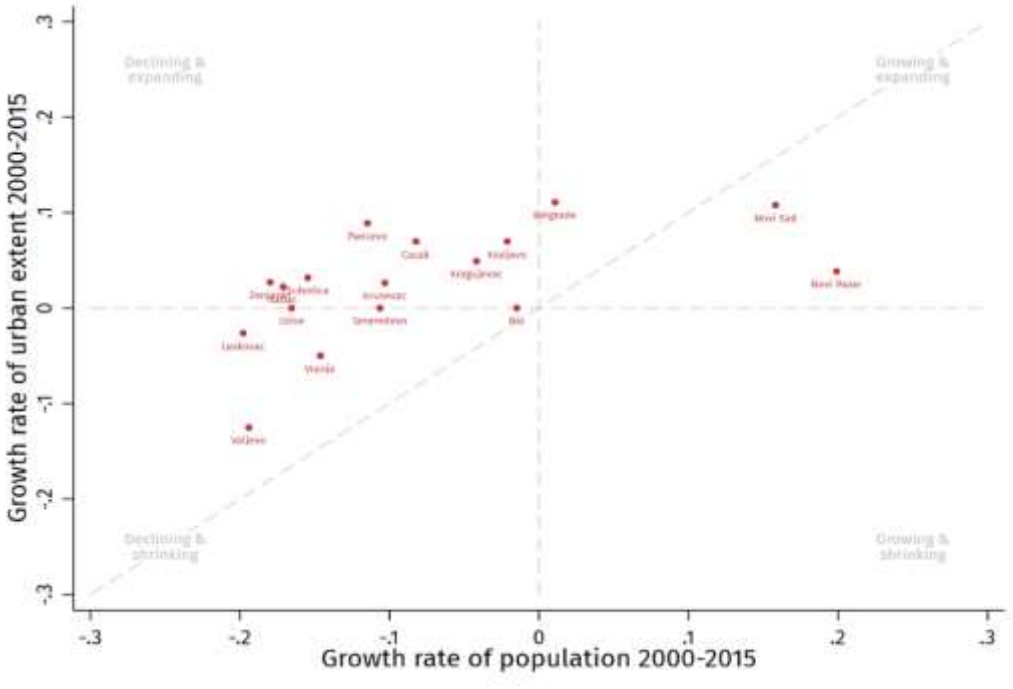
1.4 Spatial trends: cities are expanding despite declining populations

1.4.1 Most Serbian cities are expanding their urban footprint

23. Despite declining populations, the majority of Serbian cities witnessed an expansion of their urban territory between 2000 and 2015. Figure 12 shows the growth rate of the urban extents[ii] of Serbian cities *vis-a-vis* their population growth rate between 2000 and 2015. Most Serbian cities fall in the top left quadrant of Figure 11, i.e., they are declining in population but spatially expanding at the same time. Except for Belgrade, Novi Sad and Novi Pazar, all cities that experienced an increase in their urban extents also saw a decline in their population. This implies a fall in population density and the emergence of low-density sprawling urban forms, which according to global evidence are more likely to generate sustainability and service delivery challenges, leading to poor economic performance and lower quality of living. The few cities located in the bottom left quadrant represent cities whose urban extent is shrinking, i.e., due to population decline, areas that were once classified as "urban" no longer meet the threshold as "urban." However, the reduction is outpaced by the decline in population suggesting that cities in this group have been struggling to densify.

[ii] The *urban extent* of a city is calculated using the European Commission's Degree of Urbanization methodology. The *urban extent* of a city can be measured by the area of all the grid-cells classified as part of the urban cluster by applying the degree of urbanization methodology as described in Annex 2. As such, the Urban extent reflects population spread in a city rather than the boundaries of the built-up area.

Figure 12. Serbian cities according to population and urban extent changes between 2000 and 2015.



Source: Authors' elaboration using the 2010 and 2015 population grids from GHS-POP R2015A.
Note: Only cities included in the dataset are portrayed in the figure.

24. Among cities with a growing or stable population, Novi Sad and Novi Pazar are the only ones that show densification over time. Between 2000 and 2015, Novi Pazar and Novi Sad were the only cities to have witnessed a higher population growth rate than that of their urban extent (shown in Figure 12), implying that they have densified as a result. In the case of Belgrade, the roughly one percent expansion of its urban extent was matched by a smaller increase in population indicating that the capital accommodated its slowly growing population via urban expansion rather than through densification. Amongst the other larger cities, Niš showed a slight overall decline in population and no change in urban extent, while Kragujevac and Subotica both expanded while experiencing a decline in their populations.

25. Expansion of urban built-up areas, similarly, does not align with city population growth trends. Urban built-up areas in Serbia occupied just over 3 percent of the total territory of the country in 2015[31] - similar to that in comparator countries - and the cumulative built-up areas of cities in Serbia has been increasing, although to a modest degree. While this trend is not alarming, an analysis of the built-up area growth across 27 of the 28 cities in Serbia[32] showed that every city, including those whose population is rapidly declining, displayed an increase in their built-up area between 2002 and 2018. On average, cities in Serbia increased in built-up area by 1.4 percent during this period with significant differences across city types. While urban built-up area increased across secondary and medium sized cities on average by 1.4 percent and 1.2 percent respectively, the expansion of built-up area in small cities on average was notably higher at 1.8 percent. The highest increase in built-up area was in the city of Loznica (almost five percent) followed by Sremska Mitrovica (4.4 percent) and Leskovac (1.8 percent). Loznica and Sremska Mitrovica are both small cities that experienced an 8 percent decline in population between 2011 and 2021 (see Annex 2). Leskovac, a medium sized city that witnessed a higher rate of population decline at

nine percent (see Annex 2), demonstrated a declining urban extent (see Figure 12) yet had an above average increase in built-up area (see Annex 2). Spatial expansion of larger cities is attributed to rampant illegal construction of housing in urban peripheral areas and illegal construction becoming a common housing development practice due to insufficient housing in city centers (see Box 11 for more information). Increase in built-up area in smaller and declining cities likely reflects an inefficient use of land and sub-optimal city planning and reinforces the notion that cities in Serbia – especially medium and small cities—are struggling with managing their urban densities smartly and may not be actively planning for decline.

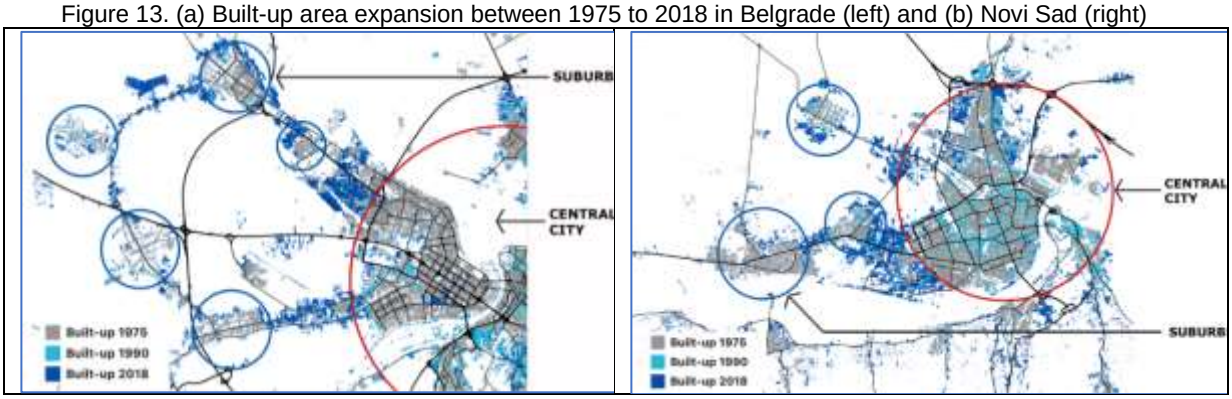
1.4.2 Sprawling spatial patterns impact livability, productivity and the environment

26. Urban expansion is occurring at the city edges and along transport axes. A landcover analysis for the period of 2000 to 2015 of ten cities in Serbia[33] shows that much of the increase in built-up area in the cities is through expansion occurring at city edges.[34] For the ten cities analyzed, on average only 10 percent of built-up area increase was through infill development and contained within existing urban areas, while 84 percent was through expansion, thereby increasing the cities' built-up area (see Table 2). Expansion tends to take place along transport networks leading to central city areas to an extent due to a legacy of the spatial planning approach in Serbia until the 1990s, which envisioned the growth of cities through medium- or low-density residential suburbs outside of the city center. The examples of Belgrade and Novi Sad in Figure 13 highlight this expansion trend. Increase in built-up area also took place through leapfrog development, referring to urbanization taking place in outlying areas physically detached from the core city, but less so than through expansion and infill development. On average, 6 percent of built-up area increase occurred through leapfrog development. However, the leapfrog share in Novi Pazar and Zrenjanin is much higher, at 15 and 12 percent respectively. Landscape expansion of four cities is visualized in Figure 14. Leskovac (Figure 14a) and Kraljevo (Figure 14b) illustrate built-up area expansion occurring mostly along the previous city boundaries, while Novi Sad (Figure 14c) and Novi Pazar (Figure 14d) demonstrate leapfrog development encroaching into green spaces and water bodies.

Table 2. Percent share of increase in built-up area in 10 Serbian cities according to urbanization mode

	Expansion (percent)	**Infill (percent)**	**Leapfrog (percent)**
Belgrade	84.55	11.39	4.07
Novi Sad	84.05	13.79	2.16
Niš	85.39	10.52	4.09
Kragujevac	88.98	6.32	4.70
Novi Pazar	77.40	7.84	14.76
Subotica	82.97	13.54	3.49
Kraljevo	94.03	3.53	2.44
Zrenjanin	69.76	18.56	11.68
Šabac	90.75	6.22	3.03
Leskovac	85.85	9.38	4.77
AVERAGE	84.37	10.11	5.52

Figure 13. (a) Built-up area expansion between 1975 to 2018 in Belgrade (left) and (b) Novi Sad (right)

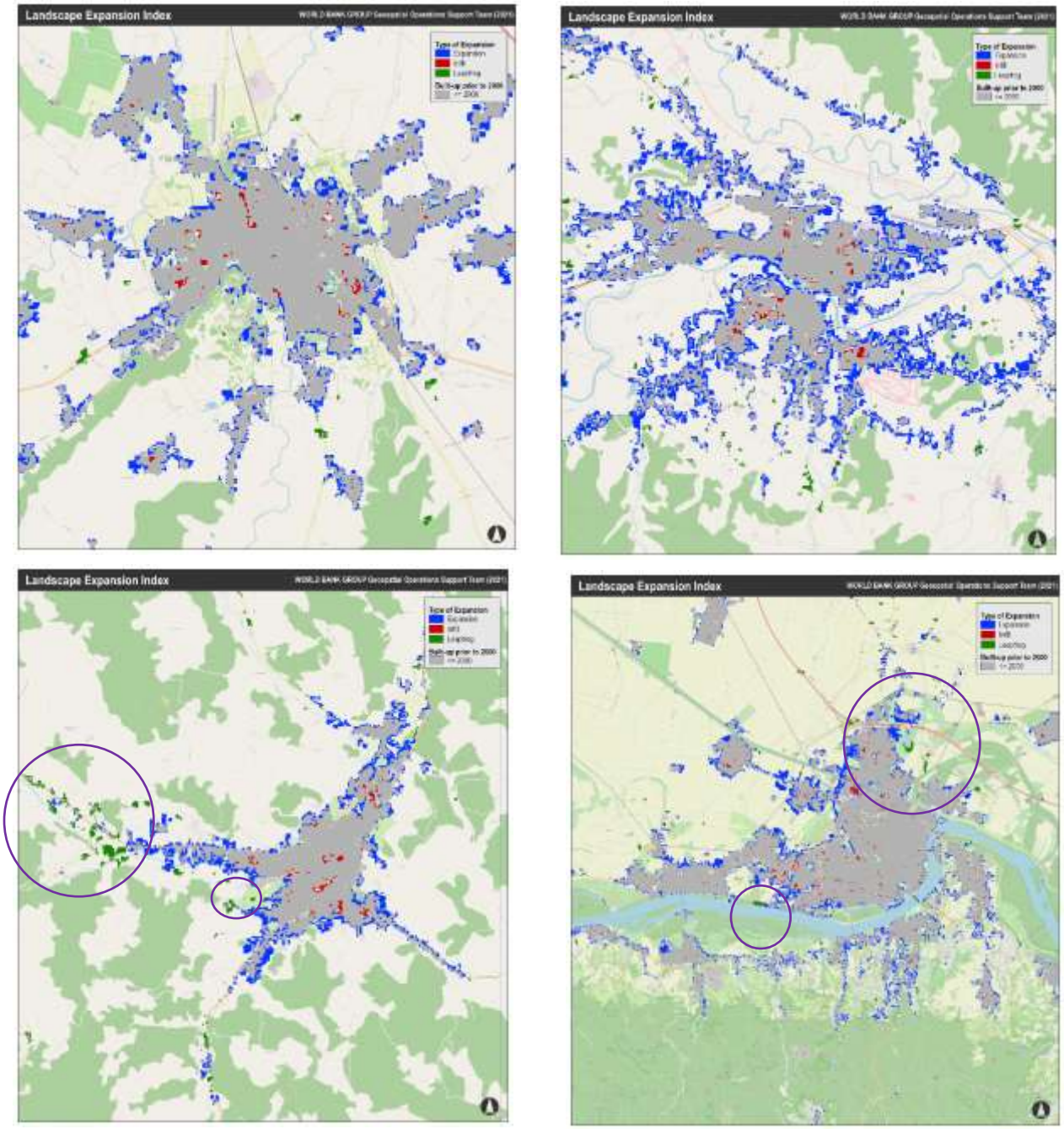


Source: COWI, 2023.

Note: (A)Built-up area changes in the north-west parts of Belgrade show expansion occurred between the central city area and former (satellite) suburbs, along the main roads and (B) In Novi Sad, the largest expansion happened in the western parts of the city, via the development of land between the central city and former satellite suburbs nearby villages, also along the main transport roads

27. The expansion of built-up areas is happening mainly at the cost of agricultural land followed by green cover. A land composition analysis of Serbia for the period 2000 to 2015 estimated that almost 97 percent of increase in urban land was through a transition from agricultural land. The remaining increase in built-up area can be explained by transformation of natural vegetation, green cover and water bodies to urban use. Although three percent does not appear to be a large share, land transformation is irreversible and the encroachment of urban land into green areas and water bodies could potentially have significant negative impacts on the environment and propagate climate mitigation and adaptation challenges. A spatial analysis of Serbian cities shows instances of urban land expansion eroding or likely to feed into green areas both within the city as well as on the periphery. For example, in the case of Novi Sad, urban expansion in the north has largely been situated within the green cover. Similarly, in the west and the south of Novi Pazar, a notable portion of urban expansion has been in and around green areas, and around river streams, putting these areas at greater flood risk.

Figure 14. Landscape expansion between 2000 and 2021 in four cities: (a) Leskovac (top left), (b) Kraljevo (top right), (c) Novi Pazar (bottom left) and (d) Novi Sad (bottom right).



Source: World Bank

28. The expanding urban footprint of cities is putting pressure on local governments with limited capacities to extend urban services, while sprawling growth increases the carbon footprint of cities. This has negative impacts on livability and business attraction, hampering Serbian cities from living up to their role as drivers of national economic growth. To implement Serbia's SUDS, spatial growth patterns will need to shift towards more compact and well managed cities, to reduce carbon emissions and improve the performance of cities in terms of economic productivity and livability. The Intergovernmental Panel

on Climate Change (IPCC, a UN body) estimates that integrating spatial planning to achieve compact and resource efficient urban function through co-location of higher residential and job densities, mixed land use, and transit-oriented development can lower GHG emissions between 23 and 26 percent by 2050.[35]

1.5 Conclusion

29. Analysis of the three dimensions of urbanization – demography, economy and space – suggests that while cities are the driving force of Serbia's economy, they are not performing to their development potential. To steer cities towards fully realizing their potential and supporting the green transition, decision makers will need to tackle three broad policy challenges simultaneously. First, cities will need to implement strategies and investments to help retain population and attract businesses to support economic development through increased productivity and to transition to less carbon-intensive industries. Second, cities will need to better manage urban development by right-sizing investments through improved spatial planning to better align with their population needs and climate goals, to minimize sprawl, improve livability and reduce their carbon footprint. And third, cities will need to plan for and address the needs of their declining and aging population.

30. At the national level, urban development strategies and plans would necessitate the adoption of an explicit and differentiated policy approach – at the very least across Serbia's two broadly distinct types of cities. Growing or stable cities and declining cities have vastly differing needs and capacities with respect to economic, spatial, social and climate smart development:

- *Growing or stable cities*: These are typically the larger cities, with a relatively younger population and a more diversified economy. These cities have greater potential to foster highly productive and tradeable knowledge-intensive service sectors but in recent years have not been performing to their economic potential. In addition, most large cities have not been able to densify to better leverage agglomeration.
- *Declining cities*: These are typically the medium and small cities with a rapidly aging population and with economies more reliant on the manufacturing, extractive and mining industries which hold back Serbia from meeting its green targets. Despite rapidly declining populations, in recent years, these cities have been expanding their urban footprint. This is problematic as it puts pressure on local governments with limited capacities to extend urban services, can lead to irreversible environment losses, and lowers the standard of living and economic potential.

Understanding the challenges specific to each city should help to inform targeted investment decisions to implement Serbia's SUDS. Different drivers and different potential entry points for management or adaptation in each of the city typologies point to the need for a diversified approach to city planning, investment and management.

31. Serbia's economic growth relies on cities being able to foster agglomeration economies and at the same time enhancing livability. Agglomeration economies can be fostered by ensuring spatial concentration of people and businesses in cities and further facilitating productivity growth by employing policies that leverage comparative advantages of each city (See annex 3). This requires adequate investments in public infrastructure, improving connectivity and access to domestic and international markets and containing sprawl. While on the one hand cities benefit from agglomeration economies, on the other hand spatial concentration, if not appropriately planned for, can have negative impacts on productivity and welfare. Traffic, air pollution, poorly managed public spaces, deteriorating infrastructure, increasing disaster risks, lack of access to housing, and land and services can all increase with spatial

concentration and directly affect per capita productivity, climate risks as well as resident welfare. To maximize the economic potential of cities, Serbia would therefore need to ensure that its cities are not only enabling agglomeration benefits, such as through harnessing their potential as regional growth poles, but also addressing livability challenges through effective city management and spatial planning, targeted investments and urban policy.

32. Some of the challenges associated with urban agglomeration in Serbia are discussed in Chapter 2; the next chapter details how Serbian cities can enhance livability and resilience – necessary for improving their economic outlook - through improved environmental performance and efficient service delivery. What cities need to do to support the green transition also makes them more livable and economically efficient, attractive (to firms and industry) and equitable. However, a high carbon footprint, combined with poor environmental management and services and vulnerability to extreme weather events, can negatively impact economic growth and human welfare in Serbian cities and have far reaching consequences on Serbia's development trajectory considering the crucial role of cities. These topics are discussed in Chapter 2.

2. Climate Action, Disaster Resilience, and Urban Services

2.1 Introduction

33. Managing both the urban footprint and economic growth of cities are key to place Serbia on the path of sustainable and climate smart development. Serbia's ambitious yet necessary climate goals cannot be realized without concerted efforts to channel urbanization – demographic, economic and spatial growth patterns of cities - in a less carbon intensive and climate resilient manner. Urbanization is further closely linked to environmental and climate policy as urban development affects air and water quality, generation of waste and wastewater, use of energy, and importantly, GHG emissions. These topics, along with disaster risks facing cities, are the focus of this chapter.

34. A high carbon footprint combined with poor environmental management and services, and vulnerability to extreme weather events, negatively impact economic growth and human welfare. Air quality in Serbia's cities ranks among the worst in Europe, and GHG emissions are considerably higher than the average for EU member states.[36] Floods, droughts and heat waves have caused significant damage to infrastructure and human livelihoods, especially among vulnerable groups. A recent World Bank public opinion survey[37] shows that more than 75 percent of respondents perceive that air pollution is worsening[38] and almost 85 percent feel that climate change affects their immediate environment. Serbia's citizens consider a clean and livable environment as an essential factor in decisions related to where they want to live and bring up their children. A significant proportion of the age group between 18 and 29 years old considers emigrating as a result of these inadequate conditions. This would exacerbate Serbia's negative demographic trends.

35. At the policy level, Serbia has taken a proactive approach to building resilience to climate and disaster risks, but implementation at the urban level lags behind. The political awareness of climate change issues seems to be growing as 18 cities have joined the Global Covenant of Mayors.[39] The Law on Climate Change (2021) introduced climate change adaptation programs at a national level. Efforts to improve multisectoral coordination include the establishment of the National Climate Change Council, which includes local governments as members and has an important role to play in communication around climate change related matters, as well as the National Disaster Risk Management Program. Digital Terrain Models using advanced LiDAR surveying technology are being prepared to better predict flood risks.[40] Although Užice, Niš, Smederevo and Belgrade have partly developed mitigation and adaptation plans, climate action mainstreaming lags behind, and climate related hazards require further consideration from the perspective of city sustainability. Actions are considered through sectoral perspectives rather than through an integrated cross-sectoral approach and significant coordination improvements remain to be achieved.

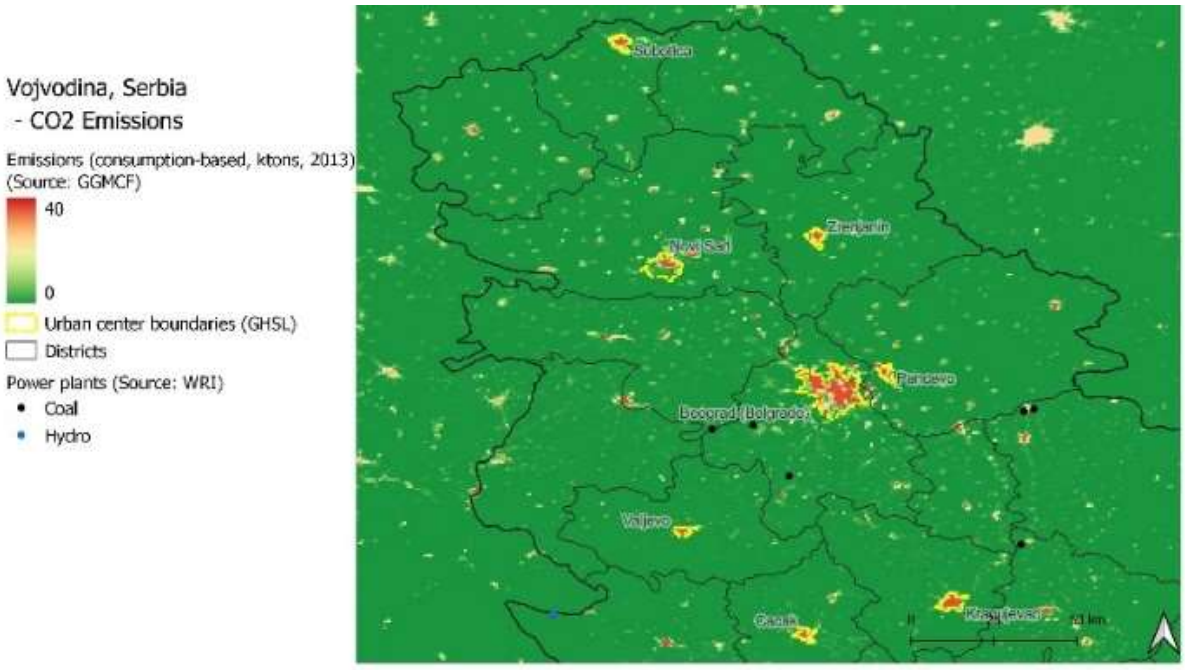
2.2 Cities are key to delivering on Serbia's green agenda

36. Serbia has committed to reduce 33.3 percent of GHG emissions by 2030. [41] This is a significant increase from the initial Nationally Determined Contribution (NDC) commitment of a 9.8 percent reduction, but still well below the EU climate targets of a 55 percent reduction by 2030 and carbon neutrality by 2050. [42] The national Sustainable Urban Development Strategy (SUDS) prioritizes, among other policies, adaptation to climate change, energy transition and air quality improvement actions. [43] Serbia has been able to reduce emissions from the power industry (with growing renewables

contributions while still dominated by coal generation) and transport sectors have been increasing significantly. [44]

37. Urban areas contribute to more than two-thirds of national carbon emissions. Serbia has the highest GHG emissions across all Western Balkan countries.[45] In 2019, its per capita CO_2 emissions was higher than all comparator countries[46] at 6.6 metric tons, up from 5.8 metric tons per capita in 2000. The European Commission's Emissions Database for Global Atmospheric Research (EDGAR) database indicated that in 2015, Serbia's urban areas accounted for an estimated 68 percent of the country's total CO_2 emissions.[47,48] When considering consumption-based emissions, the average per capita CO_2 emissions for Serbia's 12 urban centers (as defined by GHSL, see Annex 2) is 5.41 tons, higher than the global average of urban centers, which is 4.64 tons.[49] Figure 15 shows where consumption-based carbon emissions are generated in Serbia and that highest emissions are found in urban areas.

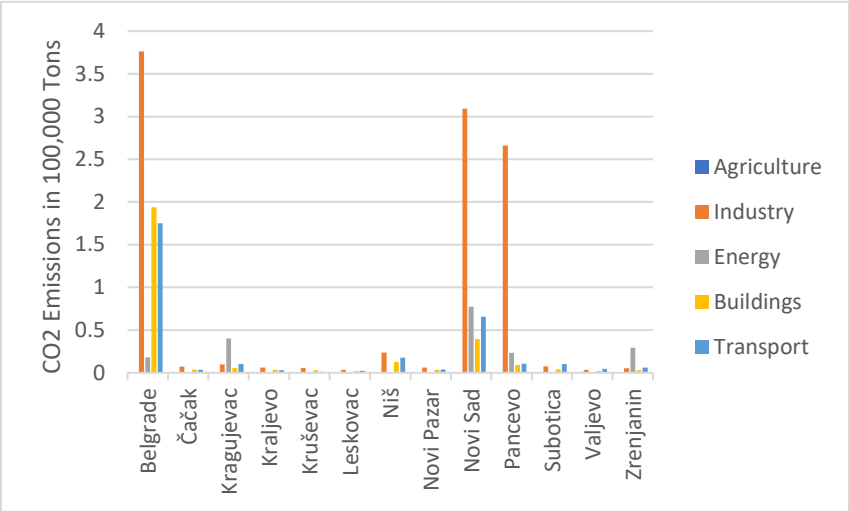
Figure 15. Areas with the highest consumption-based emissions are predominantly in and around cities



Source: Authors' elaboration based on GGMCF data

38. In Serbian urban areas, 57 percent of emissions came from the energy sector, 18 percent from transport, and 17 percent from residential building emissions.[50] Belgrade, Novi Sad and Pančevo emit the largest amount of CO_2, especially in the industry sector (see Figure 16). Pančevo, which is home to a diverse array of manufacturing as well as thermal power stations, produces energy and industry related carbon emissions as well. Other cities of note include Niš, Kragujevac and Zrenjanin, which also produce high concentrations of CO_2 emissions. Niš is a significant contributor to transport-related emissions, as it serves as a transport hub connecting Europe with Central Asia. Kragujevac, an industrial center producing cars and firearms, and Zrenjanin, which has developed a diverse processing industry and thermal power plants, have high carbon emission levels related to energy.

Figure 16. Belgrade, Novi Sad, and Pančevo have the highest concentrations of emissions from the energy and industry sectors.



Source. EDGAR data, 2018

39. There is a key role for cities in reducing the reliance on fossil fuels through improving building energy efficiency and developing low carbon mobility.[51] Residential buildings are the largest consumers of energy in Serbia (31 percent of final energy consumption), largely due to the poor energy efficiency of the country's building stock[52] which is concentrated in urban areas. Serbia has achieved significant progress towards the EU's Energy Efficiency Directive by promulgating the new Law on Energy Efficiency and Rational Use of Energy in 2021. However, progress in energy efficient district heating has been slow (see Section 2.4.4 for more information). Urban transport is the fastest growing GHG emission source in Serbia[53] and is a significant contributor to air pollution in Serbian cities.[54] This confirms the importance of developing low carbon mobility.

40. While sectoral initiatives are crucial for emissions reduction, Serbian cities need a significant shift in their approach to urban form and expansion. Built area expansion cannot be reversed and infrastructure has a lifespan of decades, creating a lock-in effect with long term implications for climate mitigation and adaptation**.** As presented in the preceding chapter, almost all Serbian cities are increasing in built-up area and expanding their urban footprint which is in stark contradiction to their shrinking populations. Urban planning actions to limit sprawl and to favor compact, transit-oriented urban development, together with a push towards land-use planning centered around the greening of the built environment, are vital to reduce emissions.

2.3 Cities are increasingly vulnerable to extreme weather events and climate change impacts

41. Extreme weather events are fast becoming routine in Serbia and the surrounding countries in the face of climate change. According to the Government of Serbia, in recent years, extreme weather events have cost Serbia more than EUR 5 billion in economic losses.[55] There is a correlation in Serbia between the volatility of economic growth rates and external shocks, with the GVA growth curve showing significant dips in the years with climate-related disasters, such as the severe droughts of 2003 and 2012, the floods of 2014 and the landslides of 2017.[56] In addition, floods and droughts have caused significant

damage to infrastructure and human livelihoods in the past, especially among vulnerable groups. In the face of increasing climate and disaster risks, drops in GDP are expected to bring declines in employment and thus an increase in poverty unless timely and appropriate mitigation measures are put into effect.[57] Donor partners for the implementation of SUDS have identified key climate change-related challenges that need to be addressed (see Box 2). [58]

Box 2. A review of SUDS climate change adaptation issues by donor partners: key findings

As part of the review process of SUDS, several donor partners contributed studies focused on climate change adaptation, including but not limited to dedicated technical assistance provided by the French Development Agency (AFD) in order to (i) prepare a vulnerability and risk assessment of the urban sector and (ii) identify and prioritize relevant adaptation measures which will support the revision of the strategy and its action plan, and the preparation of climate adaptation urban projects. Key findings from the studies are summarized below:

- Damages to ecological infrastructure and to the built environment are expected to increase. Green and blue infrastructure are key assets to mitigate the effects of climate change, yet they are highly vulnerable. Urban sprawl, soil sealing, and substandard settlements heavily increase risk.
- Rising frequency and intensity of heatwaves combined with the urban heat island effect, represent a major threat to human health. Inadequate urban design, lack of green spaces, and a lack of thermal insulation of buildings reinforce the effect of heat.
- An increased disruption of basic infrastructure and a decrease in durability over the long term are expected. Planning and financing operations and maintenance costs under extreme weather events will be required to avoid prolonged service disruptions.
- Water stress and a decrease of water quality will have negative implications on public health. Reducing water losses and water contamination require upgrading water networks.
- Urban areas are heavily exposed to climate change impacts the economy and livelihoods. The increase of extreme weather events (especially floods) will disrupt value chains and microbusinesses, especially the informal economy.

Source: Authors

2.3.1 Floods pose a significant risk to Serbian cities

42. Serbia is a flood-prone country and ranks fourth among ECA countries in output affected by a 100-year flood.[59] On average, every year, about 200,000 people are affected by flooding, at an estimated cost of USD 1 billion in GDP.[60] The 2014 flood was the worst in over a century, causing nearly USD 1.5 billion in damages and forcing more than 125,000 people into poverty.[61] The number of days with heavy precipitation has increased by one to two times on average which is likely to increase higher pluvial flood risk.[62] In line with the EU Floods Directive (2007), a preliminary flood risk assessment was prepared for Serbia in 2019 which identified 101 areas of potentially significant flood risk.[63]

43. Since 1990, flood prone areas in cities have increased, indicating the inability of urban planning to address the issue.[64] Nine cities have more than 20 percent of their built-up area under potential flood risk, with Belgrade and Smederevo having more than a third of their built-up area under real flood risk.[65] A deep dive analysis of flood risk was conducted for Niš (see Box 3). Recent urban expansion has occurred in both flood-risk and non-flood risk areas, indicating several potential issues including a failure to actively integrate flood risk into urban planning and a lack of control in the building approval and regulation processes.

Box 3. Flood risk in Niš

COWI performed an analysis of the flood risk in Niš and found that 42.6 percent of built-up area is exposed to fluvial (river) flooding, with annual growth of flood exposed areas at 1.87 percent since 1985, while 11.9 percent of built-up area is exposed to rainwater (pluvial) flooding, growing by 2.13 percent annually. In total, 45.3 percent of Niš' built up area is exposed to combined river and rainwater flooding, with average annual growth of 1.88 percent since 1985.

Intense rainfall in urban areas can generate both fluvial and pluvial flooding due to the limited capacity of drainage systems. The concurrence of fluvial and pluvial flooding often aggravates the damage potential they individually produce. Regarding population exposed to flood hazard, 49.2 percent of the densest settlement areas (between 20 and 31 persons per $100m^2$) is exposed to combined river and rainwater flooding. Furthermore, 52 percent of schools, 82 percent of hospitals, 80 percent of police stations, 100 percent of fire stations, and 24 percent of major roads are located in a river and rainwater flood risk zone with a minimum depth of 15 centimeters.

Source: COWI. 2023. Serbia Green, Livable and Resilient Cities.

2.3.2 Heatwaves and urban heat island effect are additional prevailing hazards

44. Increased frequency of heat waves poses a risk to human health, especially in cities.[66] By the end of the century, prolonged periods of heat waves are estimated to reach about four weeks, and the average temperature across the country is expected to be above 35°C. Currently, summer temperatures in the city center of Belgrade are about 2°C higher than temperatures in suburban areas. Droughts and rising temperatures account for the largest percentage of cost from extreme weather events estimated by the Government of Serbia.[67] Given the increasingly larger proportion of the elderly, it should be noted that advanced age represents one of the most significant risk factors for heat-related deaths. Within this context, key adaptation measures will need to be taken to make Serbian cities cooler and to better monitor the effects of heat on health.

45. Green space is key to combating urban heat effects and further helps to improve air quality,[68] **but few cities in Serbia have an adequate share of green space**. A deep dive analysis was conducted for Novi Sad (see Box 4). A correlation between higher density and less green space can be observed in most cities, with Niš, Subotica, Novi Pazar and Leskovac recording a low share of green areas.[69] Although urban plans consider a system of open public spaces and the preservation and expansion of green areas, there are no data sources to confirm that these plans are ultimately implemented. In the last two decades, urban green spaces have been reduced due to real estate speculation and uncontrolled urban expansion.[70] The fragmented management of urban green areas between municipal administrations and public utility companies, lack of capacity to articulate urban regulations with green infrastructure, and the limited opportunity and long process to update spatial plans, constitute barriers to preserve and prevent the elimination of green spaces.[71]

Box 4. Urban Heat Impacts in Novi Sad

Urban heat islands in Novi Sad are exacerbated by high levels of air pollution, among factors of urban form such as impervious land cover and a lack of green spaces (see Figure a). A network of green spaces in Novi Sad can be found along the Danube River but green spaces are deficient in the urban core and more prominent in the periphery. Figure b shows estimated surface temperature in summer months (from June through September) between 2015 and 2019, in degrees Celsius. It contextualizes how variation in urban land cover entails variation in urban surface temperature with higher temperatures primarily in the central built-up areas, and in the city's industrial zones in the north.

Figure a: Impervious surfaces

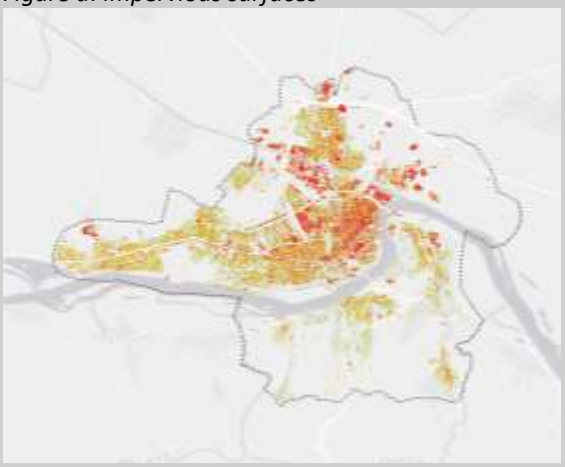
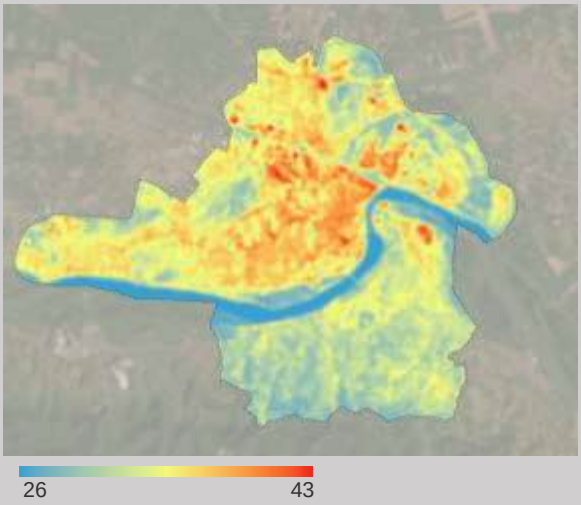


Figure b: Land Surface Temperatures (in degrees Celsius)



As urban land areas are expected to continue to expand, one expected result will be an average summer daytime and nighttime warming in air temperature of 0.5 °C–0.7 °C, up to ~3°C in some locations, particularly in Novi Sad's northwest zones. This extra urban expansion-induced warming, presented in Figures c and d, will increase extreme heat risks for about half of the future urban population, primarily where existing forecasts already indicate stronger GHG emissions-warming and lack of adaptive capacity at local level.

Figure c: SSP 2 Daytime, Summer

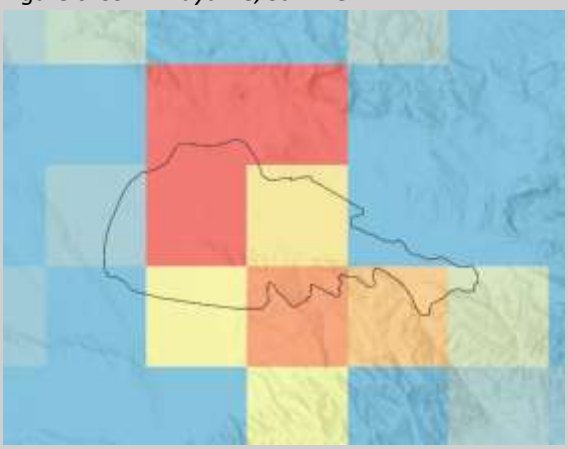
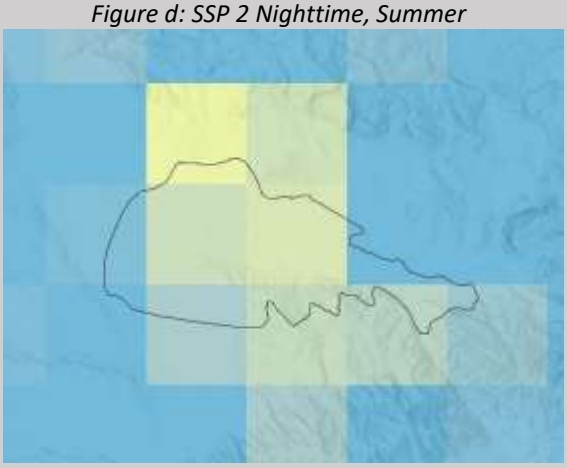


Figure d: SSP 2 Nighttime, Summer



0 0.5 Changes in air temperature (Celsius) due to land change

Sources: Analysis conducted by City Resilience Program (CRP)
All figures: Greenspace, Sentinel 2 data, provided through European Space Agency (ESA), 2022, 30m resolution
Additional for Figure c & d: Settlement Area, World Settlement Footprint, through the German Aerospace Center (DLR), 2019, 10m resolution

2.3.3 Seismic risk also serves as a threat especially for older and illegally/informally built homes

46. Serbia lies in a seismically active zone, with an overall medium level of seismic hazard risk.[72] Earthquakes are a regular occurrence and typically result in limited damage.[73] The annual average population affected by earthquakes in Serbia is about 60,000 and the annual average affected GDP is about USD 300 million. The annual average number of fatalities is about 10 while annual average capital losses caused by earthquakes is about USD 40 million. The fatalities and capital losses caused by more intense, less frequent events can be substantially larger than the annual averages.[74]

47. Large numbers of informally constructed buildings, as well as buildings built before the 1960s that are not properly maintained, significantly increase the risk for city dwellers and assets. It is well documented that improved building regulations and construction laws result in reduced losses from earthquakes.[75] A 5.4-magnitude earthquake that hit Kraljevo in 2010 exposed the seismic hazard-related vulnerability of informal and older buildings compared to newer buildings built in accordance with seismic-proofing regulations. City records show that almost 16,000 individual residential buildings and 8,262 collective housing facilities were damaged. The earthquake also damaged 30 school buildings, one health care facility and 219 businesses.[76] A damage assessment showed that the buildings designed in accordance with seismic-proofing regulations performed well, while multi-family residential buildings built before seismic building codes were introduced in Serbia and illegally built single-family homes sustained a much higher level of damage on average. In Kraljevo, it is estimated that nearly a third of developable land in the city is occupied by illegal/informal construction with poorly maintained and ageing housing stock. In addition to Kraljevo, Kragujevac and Čačak have the largest share of informally constructed buildings amongst Serbian cities considered in this review.[77] High levels of illegal/informal housing are attributed to inadequate urban planning and building controls, insufficient supply of affordable housing, and weak land management and infrastructure policies.

2.4 Poor quality of urban services contribute to risk vulnerability and poor livability

48. Polluted air, a high carbon footprint, and inefficient solid waste and wastewater systems make Serbia's environmental performance worse than the EU average.[78] A city level environmental performance assessment confirmed that Serbian cities perform poorly in several environmental categories and very poorly against comparators in terms of air quality.[79] Out of 14 cities assessed,[80] several cities are particularly exposed to environmental issues, namely Pančevo, Valjevo and Leskovac. These cities have low sewerage network coverage (around 60 percent), a high share of the built-up area under flood risk (20 to 40 percent) and poor or unavailable air quality data. Results of the performance assessment are presented by city in Annex 5. Some thematic areas are discussed in more detail in this section.

2.4.1 Poor air quality in cities is largely attributed to the energy and urban transport sectors

49. **The concentration of air pollutants, and especially particulate matter (PM), in urban areas regularly exceed the levels recommended by the World Health Organization, which results in thousands of premature deaths and enormous costs to the economy**.[81] More than one third of Serbia's population lives in regions where the air contains at least one pollutant at levels deemed hazardous for human health.[82] The latest government report places air quality in the category of excessively polluted against different threshold levels in 18 cities.[83] Local air quality monitoring actions are insufficient[84] and data for medium and smaller cities are significantly lacking. However, when considering air quality data for Serbian

and comparator cities from the Europe Environment Agency,[85] medium sized cities are found to be performing particularly poorly in terms of daily PM levels (see Table 3). Under current regulations these cities would be obliged to adopt an Air Quality Plan.

Table 3. Share of air quality measurements above EU standards across stations from 2015 to 2022 by city category.

Serbia	PM2.5	PM10 daily	PM10 yearl	SO2 hourly	SO2 daily	NO2 hourly	NO2 yearly	Ozone
Primary	0%	16%	39%	6%	35%	20%	38%	30%
Secondary	17%	4%	35%	0%	3%	5%	6%	23%
Medium	100%	83%	100%	11%	4%	0%	0%	
Comparators								
Primary	16%	11%	23%	1%	3%	6%	21%	40%
Secondary	21%	10%	24%	3%	6%	4%	6%	19%
Medium	14%	2%	20%	0%	0%	7%	0%	9%

Source: Air quality database of the Europe Environment Agency

50. Air quality is a multi-sectoral challenge, but urban transport is a key contributor. While the energy sector is the main contributor (see Section 2.4.4), urban transport is both a large consumer of energy and among the main producers of GHG emissions and air pollution. In Serbia, private vehicles are generally powered by poorly maintained diesel engines, and it is projected that vehicle ownership could increase by 30 percent by 2033. Transport related issues can be addressed by urban policies and there are several initiatives ongoing[86] around the adoption and implementation of Sustainable Urban Mobility Plans (SUMPs) at the LSG level. Following EU guidelines,[87] SUMPs aim to transform urban transportation systems from being primarily auto oriented to becoming multimodal, to promote low and zero carbon emitting mobility, including walking, cycling, public transport and other eco-friendly forms of transport, which could have positive impacts on the urban living environment. The City of Kragujevac adopted an Air Quality Plan (November 2021)[88] that links air quality and urban transport, which could be a model for other Serbian cities. Kragujevac's plan emphasizes already implemented measures to improve public transport fleet management and the importance of urban transport reform for air quality and climate change mitigation. Future measures are focused on traffic management, parking management, non-motorized modes of transport and further public transport improvements.

2.4.2 Poor water supply and sanitation services impact the environment and public health

51. Water supply is largely constrained by poor management and governance challenges. Challenges include an overlap and division of competencies between several ministries and a high fragmentation of water supply companies (especially in smaller cities). In urban areas, water supply and sanitation services in Serbia are provided by around 150 municipal-owned utility companies,[89] while in rural areas inhabitants also rely on self-provision. Nationally, the percentage of the population connected to water supply has increased to 91.1 in 2021 from 86.9 percent in 2017.[90] Belgrade and secondary cities have a higher connectivity rate to the water supply network, but coverage in medium sized cities tends to be poor. The sector is dominated by a few large utility companies covering major cities, with the four largest utilities covering approximately 40 percent of consumers, while 71 utilities are servicing less than 25,000 customers.[91] Municipal water companies are burdened with technical and administrative losses, excessive staff numbers, low tariffs, mounting arrears and insufficient investments.

52. Water supply losses are at 41 percent, significantly higher than the average in the EU.[92] Non-revenue water is especially high (above 50 percent) in Novi Pazar, Valjevo and Čačak.[93] This could be attributed to a lack of maintenance and investment in aging water infrastructure systems. Tariffs barely cover operational and maintenance costs, and average residential tariffs are lower than the regional average. The price of water supply and sanitation services is low at 0.61 EUR/m^3, or 1.2 percent of the

average household budget. As a result, water utility companies rely heavily on subsidies from national and local budgets to cover operational costs and on external sources to finance capital expenditures.

53. Untreated wastewater remains a pressing environmental challenge. Although access to the wastewater collecting network has improved nationally (from 66.2 percent coverage in 2017 to 67.2 in 2021),[94] connections to sewer systems remain inadequate and the lack of wastewater treatment facilities has resulted in a low rate of safely managed sanitation services and significant environmental and public health hazards, including pollution of surface water bodies. Nationally, only 18 percent of wastewater undergoes treatment (1.3 percent is purified through primary treatment, 11.8 percent goes through secondary treatment and 4.9 percent goes through tertiary treatment).[95] Septic tanks are widely used in rural areas and in informal settlements in cities. The faster growth of wastewater discharged in septic tanks can indicate that the development of sanitation networks in cities is not keeping pace with the development of settlements.[96]

2.4.3 Inadequate solid waste management also contributes to environmental challenges

54. The lack of solid waste treatment and disposal infrastructure results in pollution of air, soil and rivers. The vast majority of municipal waste (81 percent in 2020)[97] is dumped in unsanitary landfills, posing a serious threat to the health of the population, environmental safety and biodiversity conservation. The government estimates that there were 2,305 illegal landfills in 2019.[98] Cities lack systemically organized separate collection, sorting and recycling of municipal waste. The actual level of recycling in Serbia is unclear - with estimates by the European Commission suggesting a recycling rate of only three percent (2018)[99] while the government reports a significantly higher rate of 15.8 percent in 2019. Lack of reliable data hampers effective planning and the use of evidence to guide investment decisions.

55. Despite a rich and expanding body of primary legislation, major implementation weaknesses remain. The Law on Waste Management (2009, as amended most recently in 2018) requires LSGs to prepare Local Waste Management Plans and makes it mandatory for two or more LSGs with at least 250,000 residents to associate in Waste Management Regions and prepare a Regional Waste Management Plan (RWMP). The implementation of the RWMP is the responsibility of the LSGs and regionally established bodies. Twenty-six (26) waste management regions cover the entire territory of Serbia and 13 waste management regional companies have been established. In addition, 12 regions have signed inter-municipal agreements, but have not yet established regional companies.[100] Even though all LSGs have adopted local waste management plans, their implementation is largely voluntary and there are no consequences for LSGs that do not fulfill the requirements established in their plans. Institutional challenges, such as the lack of capacities for planning, tendering and implementation of complex investment projects, pose a significant obstacle for much needed investments in the waste sector. An additional weakness is the low level of economic incentives for needed investments and inadequate penalties for illegal practices.[101]

56. The informal sector plays a major role in both waste production and collection. As much as 87 percent of packaging waste collected for recycling originates from the informal sector. In Belgrade alone, some 2,350 families, or more than 12,000 persons, are engaged in collection of secondary raw materials as the only source of income. Some sources estimated that up to 50,000 individuals nationally are working as full-time collectors, with a further 100,000 persons participating in waste picking on a part-time basis, in some cases alternating waste picking with other economic activities.[102] In larger cities in Serbia, informal waste collection is largely conducted by Roma men along set routes with makeshift vehicles.[103]

57. To reduce the solid waste management sector's harmful effects on the environment and human health, Serbian cities will need to move towards a more circular economy. This includes the development of integrated waste management systems that include waste minimization, collection, separation, and increased and improved treatment measures, including recycling. Serbia has taken a first step towards development of a circular economy through the recent adoption of a short-term Circular Economy Development Program (see Box 5 for details), but program implementation results are yet to be seen.

Box 5. Circular Economy

Almost 99 percent of all materials consumed each year in Serbia is not recycled for use as secondary raw materials. This means that Serbia's economy is currently only 1.4 percent circular. Various development partners including UNDP and GIZ have contributed to the process to better understand and draft a roadmap towards circularity for the country. Serbia adopted the 2022–2024 Circular Economy Development Program, which defines priorities for the three-year period and lays the groundwork for the further development of a circular economy. One of the program's specific goals is to support businesses in removing waste from the supply chain, recycling materials and components, switching to renewable energy, and extending the lifespan of their products.

A 2019 study by GIZ reviewed the capacity of LSGs in Serbia as a prerequisite to facilitating a transition to a circular economy. Some of the key findings include:

- The percentage of respondents who stated that they are more or less familiar with the circular economy concept is 71.1 percent, which is a good starting point for implementation of activities at the local level. This percentage is even higher in the group of cities with more than 100,000 inhabitants and amounts to 81.8 percent.
- The low level of awareness and lack or absence of financial instruments for circular economy activities are the most significant barriers at the local level.
- When it comes to a strategic circular economy framework at the local level, only one third of LSGs have circular economy principles incorporated in their strategic documents.

Source: GIZ. 2019. Analysis of local self-government capacities for creation of preconditions for transition towards circular economy, with recommendations for practical policies at local level.) Citing Statistical Office of the Republic of Serbia, Eco-Bulletin 2020

2.4.4 Heat and electricity sources threaten the sustainability of Serbian cities

58. The residential sector is the largest consumer of energy in Serbia, largely due to poor energy efficiency of the country's building stock, which is concentrated in cities. The residential buildings sector accounted for 31 percent of Serbia's final energy consumption in 2019, followed by transport (25 percent), industry (24 percent), commercial and public services (9.5 percent), and agriculture and forestry (2 percent).[104] The average specific heat consumption (per square meters) of residential buildings is 37 percent higher in Serbia than the average level for EU member countries. More than 10 percent of overall household expenditure goes to covering energy costs, while assessments show that electricity consumption per household is almost 50 percent higher than the EU average.[105] The policy environment in terms of energy efficiency continues to evolve (as example the Law on Energy Efficiency and Rational Use of Energy adopted in April 2021). While enforcement of new regulations would be key to the efficiency of the future building stock, the historically poor thermal quality, especially of residential buildings will require significant attention. Investments required to improve building energy efficiency in Serbia are significant but are estimated to result in sizeable benefits, especially for those living in single-family houses.[106]

59. Only around one-third of households in urban areas are connected to district heating, and 28.5 percent of urban households still use firewood as a main source of energy.[107] Heating plants use 80 percent natural gas, 7.8 percent coal, 11.7 percent petroleum products and 1 percent biomass for the production of thermal energy. About 75 percent of the final energy consumed by Serbian households is used for space and water heating, largely using firewood and coal (36 percent and 12 percent respectively, in 2018),[108] with these sources of energy used almost exclusively in rural areas. Firewood and coal are often burnt in old, inefficient boilers, leading to negative environmental and health impacts as a result of air pollution. The use of firewood as a fuel source raises concerns related to the sustainability of wood harvesting through deforestation.[109] While the government recently adopted the Law on Energy Efficiency and Rational Use of Energy (2021), the country has yet to tap the potential of retrofitting buildings to be energy efficient, through the use of cogeneration technologies and centralized heat generation systems, which would reduce carbon emissions.

2.5 Conclusion

60. Cities play a key role in meeting Serbia's emissions reduction targets in support of the green transition, but this requires a shift from their current carbon pathways. Weaknesses in the management of the built environment, including extensive and often uncontrolled urban land expansion (including into flood prone areas), poor quality of the building stock (characterized by energy inefficient and often illegal construction), and insufficient investments in urban services and green infrastructure, are locking Serbian cities into carbon pathways that are not in line with climate action. While progress has been made in terms of national level policies, implementation is constrained by a strong sectoral focus and a lack of a clear understanding of the role of cities. National government investment programs consider investments in water and sanitation, solid waste management and district heating in a siloed manner. While the focus on improving access to services is positive, cross-sectoral coordination and development of integrated systems that would better support resilience seem to be lacking. Climate change and disaster risk reduction continue to be treated as separate issues, and a lack of structured information sharing and exchange across responsible entities as well as capacity weaknesses particularly at the local level are prevailing barriers. National targets (such as those for emissions reduction or recycling) are not cascaded down to the local level, resulting in an inability to allocate resources where they are most needed to meet such targets.

61. In order for cities to improve their performance, improved services, climate action and disaster resilience are key. In the short term, a critical first step would be to explicitly link the national level green growth and climate policy objectives to city specific action at the local level. Urban level actions in the short term should prioritize decarbonization. Such actions would be designed to reduce emissions by tackling weaknesses in the management of the built environment, but also would aim to make cities more livable, equitable, and attractive to firms and industry, thereby fostering economic development. Some of these actions may include developing an integrated database on green spaces and implementing urban greening programs that are part of a systemic approach to green space in cities; delivering pilot urban regeneration projects for compact urban development that increase efficiency and delivery of municipal services while promoting the positive health impacts of non-motorized modes of transport, such as walking and bicycling; and accelerating and complementing programs for energy efficiency upgrades in residential buildings, supported by the development of a green buildings certification program.

62. Process-related actions in the short term could enable reliable and regular data collection, vertical and horizontal cooperation, and cross-sectoral coordination. These actions are necessary to

support the translation and achievement of national targets at the local level. Strengthening data collection, monitoring, and reporting at the local level to enhance identification of key urban challenges, inform targeted policy planning, and encourage greater accountability and transparency regarding the implementation of proposed policies and investments are recommended actions to take. Beyond the focus on data, vertical and horizontal cooperation across different tiers and jurisdictions of governments and cross-sectoral coordination should be enhanced to improve sustainability results.

63. In the medium term, investments would focus on upgrading infrastructure systems and buildings and designing cities to be climate smart. This includes developing integrated water and solid waste management systems to improve quality of services and mitigate environmental and public health impacts. Nature-based solutions (NbS) are increasingly recognized in national policies for their potential to mitigate climate and disaster impacts and should be reflected in infrastructure design options at the city level. Designing cities to be climate-smart would also entail using compact urban development approaches to prevent further sprawl and reduce the carbon footprint. This would be supported by coordinated land use and urban transport through the development of urban mobility plans that promote the development of an integrated, multi-modal system, which would serve to alleviate traffic, reduce travel costs, promote physical activity, improve air quality and reduce carbon emissions. Switching to clean energy in the public and private transport fleet will reduce emissions and air pollution, while incentives and a green building certification program will support a transition of the existing building stock to become energy efficient. The development of seismic-proofing programs for older and informal housing will also support disaster resiliency. All these measures would support the implementation of SUDS.

64. The next chapter focuses on the urban governance systems that have led to the risks and challenges presented in this chapter and Chapter 1. While this chapter identified the need for risk-informed planning and climate-smart services and infrastructure systems in order to support Serbia's green transition at the city level, Chapter 3 presents an analysis of Serbia's local governance systems, specifically urban planning and capital investment financing, which are key tools to identify, prioritize, coordinate and finance activities to foster economic, environmental and social sustainability of Serbian cities.

3. Urban Governance, Planning and Investment for Sustainable Urban Development

3.1 Introduction

62. Serbia has, in theory, some urban governance advantages to tackle its green transition challenges at the local level as it is less subdivided than countries of similar size in the region. There are much fewer LGSs in Serbia[iii] than in comparator countries, with Austria, Hungary, and Czech Republic, having 2,100, 3,201 and 6,258 respectively, compared to Serbia's number in the one-two hundred range.[110] Being less subdivided, Serbian LSGs typically cover an area much larger than the actual built-up urban area. The areas of LSGs include an urbanized core settlement (city or municipality which serves as the administrative center), the surrounding rural hinterland, and a network of towns and villages. Cities and municipalities are therefore just a small part of the administrative area under the jurisdiction of LSGs. In most European countries, the lowest-level administrative subdivision is of a much smaller scale, usually consisting of a city itself, without its hinterland, which is oftentimes limiting effective policy making across metropolitan regions. In theory, therefore, Serbia's LSG administrative framework should be well placed to provide services across broader geographic areas in line with a *functional urban area*[iv] approach and therefore also conducive to managing the green transition at the local level. However, in practice such an approach is rarely taken.

63. There are numerous reasons why LSGs are hampered in effectively delivering services and supporting the green transition at the local level. Chapter 2 discussed the poor quality of urban services, and the mounting climate change mitigation and adaptation challenges cities are facing which can be attributed in part to urban governance practices. While national policies and regulations on planning, finance, service delivery, and infrastructure network management are generally in place and are being upgraded, LSGs lack the human, technical and financial capacity to effectively implement them locally. In addition, Serbia's planning system exhibits an unusual level of complexity which inhibits effective implementation of the required policy and investment measures. A particular challenge relates to the interlinkages between spatial, urban, and sectoral planning, as well as limitations in the local government finance system. Serbia's planning is all too often uncoordinated across different instruments, based on unrealistic assumptions about growth prospects of cities, and has enabled sprawling land use which is undermining the country's efforts to develop a more sustainable trajectory. These issues are discussed in the next sections.

3.2 Serbia's planning system is unusually complex

64. Spatial, urban and sectoral planning in Serbia is unusually complex and insufficiently coordinated. The Law on the Planning System (2018) specifies different types of planning documents in general, while the Law on Planning and Construction (2009)[111] focuses specifically on urban and spatial planning. The hierarchy of planning documents begins with the Spatial Plan of the Republic of Serbia (SPRS),[112] which is currently under preparation (see Box 6). The SPRS provides the long-term strategic

[iii] Serbia is organized as a unitary country with a dominant central government level and local self-government units (LSGs). The Law on Territorial Organization (2007) defines the administrative division of the country with local self-government units (LSGs) as the lowest-level administrative subdivision.

[iv] The term, functional urban area, identified by the World Bank using the CE-OECD's methodology, encompasses an urbanized core settlement (city or municipality in the case of Serbia) and the surrounding localities from where at least 15% of employed residents travel to work in the core city or municipality.

framework for spatial development of the national territory. All other planning documents must be in accordance with the SPRS, including local spatial plans, and in theory, sectoral plans. However, in practice, sectoral plans of LSGs are often insufficiently linked to spatial plans at the national and local levels and are instead guided by national sectoral plans, which leads to an uncoordinated approach between spatial and sectoral planning. The lack of coordination between different plans can result in inefficient land use allocations, land use conflicts and suboptimal capital investments in infrastructure. The new SPRS is expected to overcome this sectoral fragmentation but based on the implementation track record of the two previous national spatial plans, coordination is likely to remain a significant challenge.[113] Furthermore, complying with the SPRS' implementation calendar at the local level will place significant strains on LSGs given that, once the new SPRS is adopted, local spatial and urban plans need to be adjusted for coherence with the national plan. This means that the spatial and urban plans of all LSGs would need to be updated by 2025.

Box 6. Draft Spatial Plan for the Republic of Serbia (SPRS)

The SPRS 2021-2035, currently under development, is expected to be approved during 2023. The SPRS intends to guide Serbia to "achieve competitive, integrated, and coherent spatial development, provide a basis for supporting multifunctional development of urban and rural areas, strengthen the functions and economic development of urban systems, and reduce interterritorial inequality." However, in practice, and based on the experience of the two previous plans for the periods of 1996-2000 and 2000-2020, it is likely to be difficult to achieve these goals. The legacy of adopting sectoral approaches, action plans, programs/ projects, and funding sources is compounded with a lack of instruments for identifying the potential for integration and for resolving conflicting interests across different sectors. Horizontal and vertical cooperation would need to be addressed by the new SPRS and then followed through during implementation.

Source: Authors. 2023

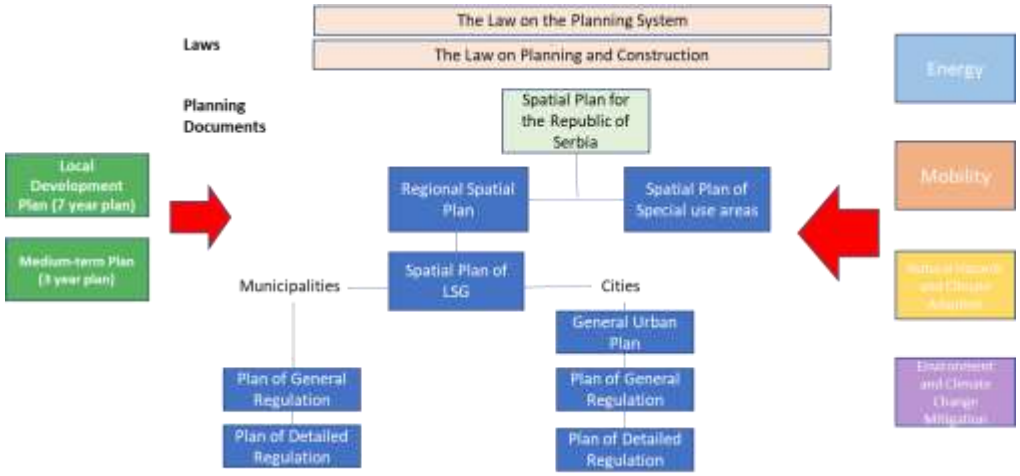
3.2.1 Multiple plans determine land use in Serbian cities

65. Local spatial plans and corresponding urban and regulatory plans determine land that can be developed in cities. The Law on Planning and Construction specifies a family of urban level instruments which comprise the General Urban Plan (GUP), equivalent to a "master plan" in planning systems of other countries, which is mandatory for the 28 cities; a Plan of General Regulation (PGR) developed for zoning and issuance of building permits purposes for cities and municipalities and mandatory for the administrative center (city or municipality) of an LSG; and a Plan of Detailed Regulation (PDR) which is developed for specific urban development areas and zones. The areas for which urban development is authorized within an LSG are primarily defined by a LSG's spatial plan and fine-tuned by the GUP, PGR and PDR, with the GUP being the most influential in terms of the actual impact on spatial and land development patterns. However, many GUPs are hampered by a lack of underlying basic technical studies (e.g., accurate demographic projections) to guide informed decision making. Inaccurate technical information is carried over to lower-level urban planning documents which reproduce imprecise estimations and lead to a lower than required quality of planning documents. These problems are in addition to the fact that parts of continuous urban areas are often left out of the GUP because of administrative divisions, which results in unequal treatment and regulation of parts of the same, continuous built-up area and leading to land use inefficiencies (see also Section 3.2.4).

3.2.2 Local development and sector-specific planning adds a layer of complexity

66. Local development and sectoral plans add to the plethora of planning documents. Mandatory for all LSGs since 2018, the Local Development Plan (LDP) is a planning document for a seven-year investment horizon that determines three-year mid-term plans and annual budgets. LDPs stipulate all priority development goals which should be achieved in the LSG as well as provide a description of the actions to be implemented and how they will be financed. LDPs are supposed to consider the LSG's spatial plan, GUP, PGR, and PDR (and vice versa). However, in practice, this is only achieved to a limited extent and sectoral planning adds a further layer of complexity. There is a myriad of mandatory and optional sectoral planning documents for energy, mobility, climate and the environment, and disaster risk management, which should be coordinated with development, spatial, and urban planning documents. However, formulating documents to the specified quality and ensuring that there is coherence between them requires capacity, sound methodological approaches and supporting technical and analytical work which often are not available at the local level.

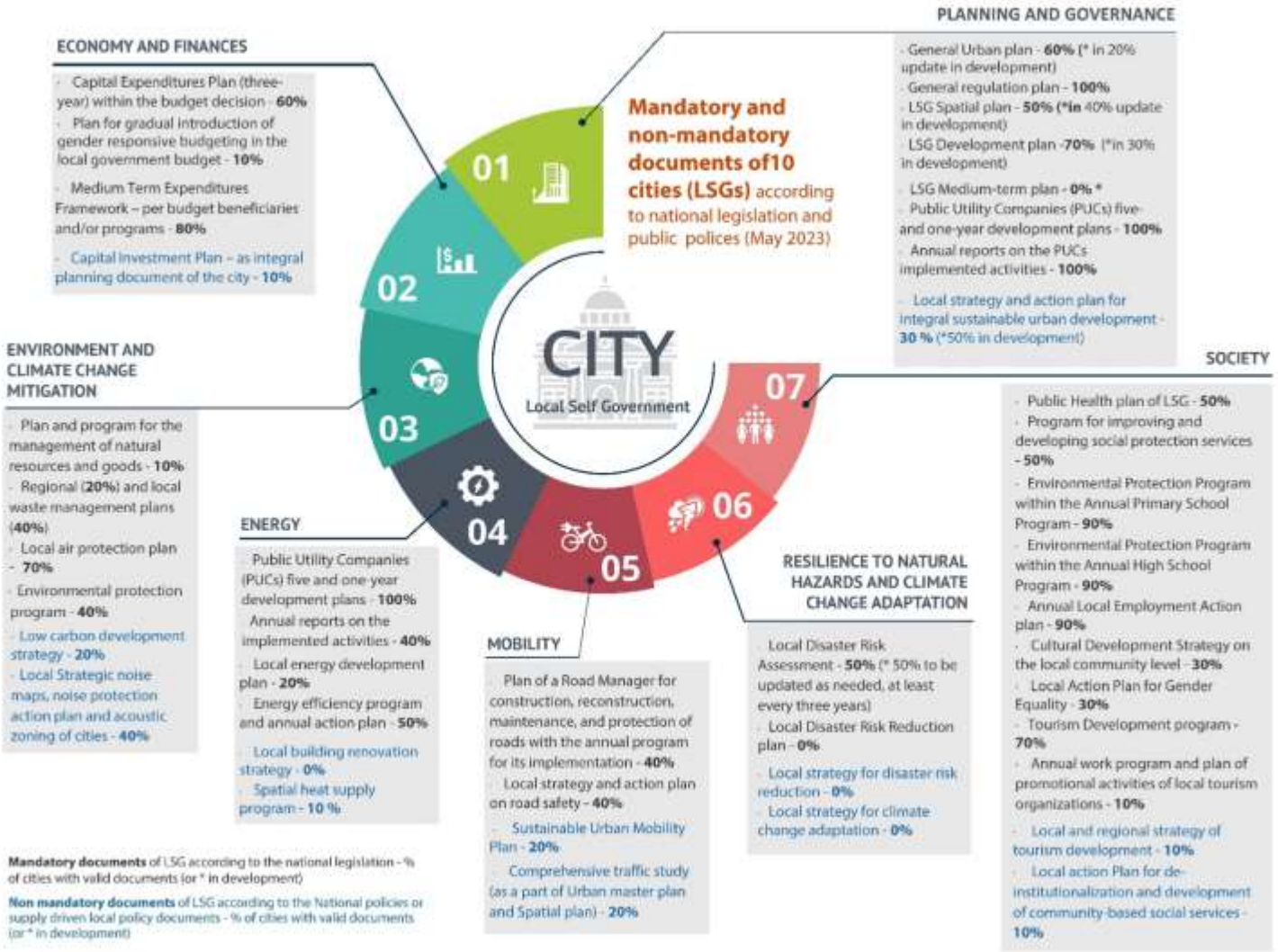
Figure 17. Overall Spatial, Urban, Regulatory, Development and Sectoral Planning



Source: Authors, 2023.

67. The multitude of planning documents required clearly overwhelms the capacity of most LSGs. The vast amount of required and optional planning documents hinders effective planning of Serbian cities and suggests the need to streamline the planning system to make it "fit for purpose." Figure 17 provides an overview of the main planning laws and documents, illustrating the complexity of the coordination and implementation challenge for LSGs,[114] while Figure 18 provides an overview of the status of mandatory and non-mandatory documents in ten selected small and medium sized cities in Serbia.[115] Most of the cities in the sample are not in full compliance with producing the required documents or their spatial and urban plans are beyond their intended period of use. This reflects the underlying challenge of producing the documents in the first place, independent of the need to assure the required quality standards, based on supporting underlying analysis and accurate data and projections.

Figure 18. Compliance with Mandatory and Option Planning Documents – Overview Results of 10 Select Cities



Source: GFA. 2023. Framework Analysis Report

3.2.3 Integration of climate and disaster resilience is a significant challenge

68. Given the complexity of the planning system, integrating sustainability, climate and disaster-risk considerations remains a tall order. City sustainability and disaster and climate resilience are cross-cutting topics that require coordinated actions and investments across sectors. However, with limited coordination taking place, the systematic integration of sustainability, climate and disaster risk resilience considerations into local plans has been challenging and often ineffective. Recent adoption of climate- and disaster risk-related laws and requirements are promising, but LSGs face significant implementation challenges. For example, the Law on Climate Change, adopted in 2021, mainly considers nationwide measures to be achieved through a sectoral rather than a spatial approach, thus failing to recognize that cities play an active, interconnected role in climate action. Furthermore, the Law on Disaster Risk Reduction and Emergency Management (2018) requires LSGs to prepare Disaster Risk Assessments and Disaster Risk Reduction Plans, but these tools are not necessarily developed based on the latest up to date information and they do not consistently inform and influence other planning documents – spatial and urban planning and construction processes are not risk informed as Disaster Risk Assessments and Disaster Risk Reduction Plans are often treated as separate sectoral planning documents.

3.3.4 Poor planning practices lead to unsustainable spatial growth and ill-informed investments

69. The prevalence of a sprawling spatial pattern in a context of population decline signals the limitations of the spatial and urban planning system. The spatial approach applied by GUPs – in the context of the broader planning system challenges outlines in the previous sections - has not led to climate-friendly compact development. As highlighted in Chapter 1, despite most cities experiencing population decline, the urban built-up area is expanding. City centers are losing population to suburban zones which extend along main transport axes, to a large extent spontaneously, characterized by informal construction, transforming agricultural land and green cover, and without sufficient consideration of climate and disaster risks.[116] Urban land use planning approaches, a long history of complex requirements for obtaining a building permit, and multiple unsuccessful attempts to formalize illegally constructed buildings have inadvertently facilitated this. Supporting compact urban form and the reuse of urban land would align with a transition to a sustainable spatial pattern, but the observed correlation between urban extension, less public space and more air pollution in Serbian cities evidences the inability of current planning approaches and regulations to manage the spatial growth of cities in a sustainable manner.

70. The effectiveness of Serbia's planning system is also mired by the lack of meaningful public participation in planning processes. Although the regulatory environment for a participatory approach to local development planning exists (as specified in the Law on State Administration, Law on Local Self-Government, and Law on the Planning System), in practice, public engagement is predominantly used to provide legitimacy for planning decisions *after* they have been made. Citizens have limited opportunities to provide input to the investment planning and selection process. The lack of familiarity of the public with consultative processes and sparse active citizen participation demonstrates that public awareness is limited. While most LSGs hold public hearings, less than half have developed public awareness campaigns to inform citizens of how to actively participate, and public knowledge of participatory events is limited as events are only advertised at the municipal building or official website. The potential of the e-Government portal[117] is still not fully utilized. The ''participation index'' that is part of the SUDS monitoring system is intended to support governments in developing participatory planning processes beyond making it a ''formal'' bureaucratic step but corresponding implementation of meaningful participation is yet to take place in many LSGs.

3.3.5 Spatial and urban plans do not appropriately guide development

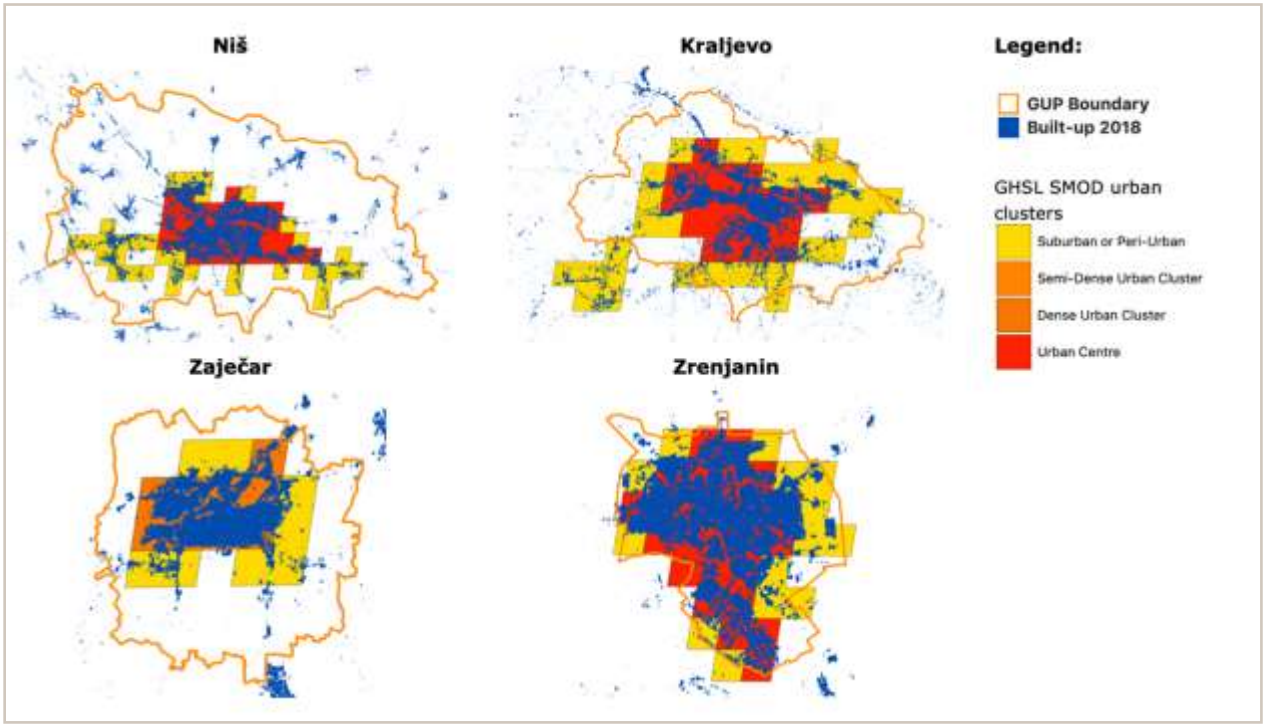
71. A deficiency of GUPs is that in many cases, vast areas are zoned for development, which does not promote compact and sustainable development. GUPs define the extent of "urban land" and the boundaries of areas zoned for development and restricted from development, such as parks, natural protected areas, corridors around infrastructure and agriculture land. Changes in GUP boundaries can extend or shrink the land classified for urban functions. However, GUPs in most cases do not match actual built-up areas of cities and GUPs continue to zone large areas of natural and agricultural land for urban development. Although the actual built-up areas of Serbian cities do not consume more construction land per capita than cities from comparator countries, the per capita area of construction land as zoned by GUPs is among the highest in Europe. An analysis of the 12 largest cities in Serbia indicate that, on average, 670 m^2 of construction land per inhabitant is zoned which is more than in any European city (see Table 4). On average, cities in Serbia zone close to 3.2 times more land for construction than their built-up areas really occupy - Belgrade zoned 2.7 times more land for construction than its built-up area occupies, Novi Sad 1.5 times, Niš 9.2 times, Kragujevac 2.7, and Novi Pazar 3.3 times, to name examples. This is in sharp contrast with the proclaimed principle of creating a compact city which is an objective stated in the GUPs of most cities. Figure 19 presents examples of cities in which GUPs zone larger areas than the actual built-up area.

Table 4. Construction land consumption and population densities in actual built-up areas and in General Urban Plans

CITY	Population in a continuously built-up area (2021)	Built-up area 2018 (km^2)	Urban construction land in current GUP (km^2)	Pop. density built-up area (2018)	Pop. density in current GUP coverage	Urban construction land consumption - built-up (m^2 per capita)	Urban construction land consumption – current GUP (m^2 per capita)
Belgrade	1,399,752	187	520	7,484	2,693	133.62	371.28
Novi Sad	356,825	69	109	5,138	3,274	194.63	305.47
Niš	219,855	29	267	7,553	824	132.41	1213.39
Kragujevac	147,222	26	70	5,654	2,103	176.88	475.47
Subotica	100,645	30	80	3,389	1,258	295.10	794.87
Novi Pazar	90,507	10	33	9,264	2,743	107.95	364.61
Pančevo	80,203	19	63	4,143	1,273	241.39	785.51
Čačak	74,952	17	40	4,358	1,874	229.48	533.67
Kruševac	73,766	14	75	5,295	984	188.84	1016.73
Kraljevo	72,037	13	74	5,713	973	175.05	1027.25
Zrenjanin	70,400	21	39.6	3,356	1,778	298.01	562.50
Leskovac	69,309	13	41.1	5,161	1,686	193.77	593.00
AVERAGE	**229,623**	**37**	**118**	**5,542**	**1,789**	**197**	**670**
TOTAL	**2,755,473**	**449**	**1,411**	**66,506**	**21,463**	**2,367**	**8,044**

Source: COWI, 2023.

Figure 19. Cities in which GUPs zone larger areas than the actual built-up area. Comparisons of continuous urban built-up areas of cities as seen by the GHSL SMOD and boundaries of GUPs.



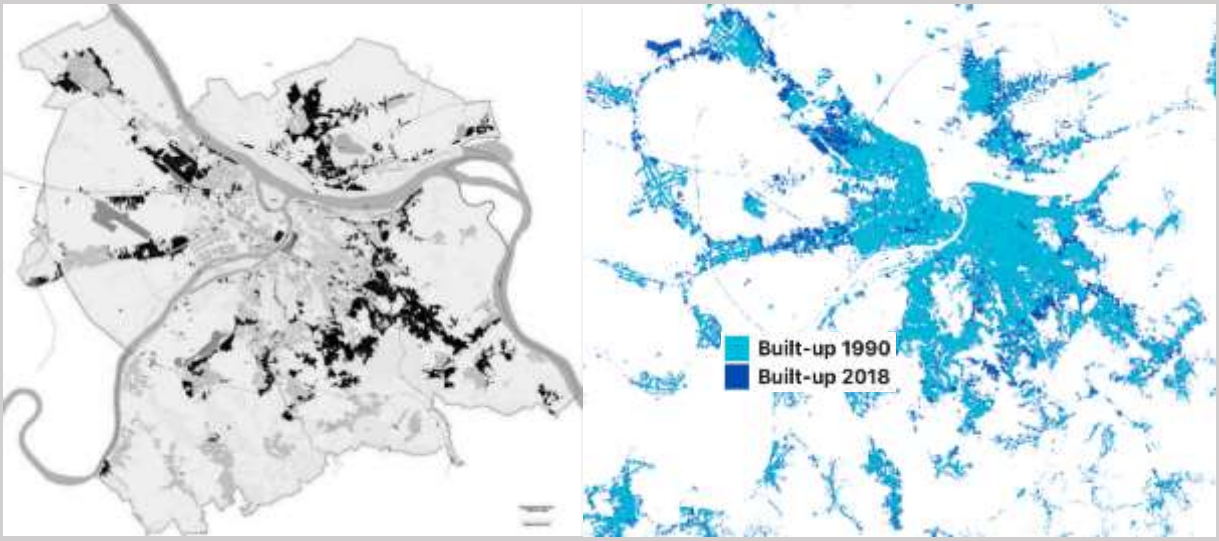
Source: COWI, 2023.

72. The reasons for zoning large areas for urban development are numerous, but amongst the most important is the attempt to formalize informal construction. (See Box 11.) The *Law on Legalization* requires local governments to "integrate" informal settlements into their urban plans.[118] Since reliable information on the exact locations of informally constructed buildings is missing, local governments tend to produce urban plans that cover a large territory, to be able to "capture" all informally constructed buildings. There are also examples of local governments that zone large areas of land for future residential and commercial construction, industrial development, and other purposes in attempts to attract investors.[119] Also, due to unresolved ownership issues related to brownfields, LSGs and developers tend to favor greenfield construction over infill development. Finally, GUPs are still developed under the influence of a growth paradigm, which results in a lack of adaptation to and preparation for the context of shrinking populations. In the process of development of GUPs, many cities in Serbia keep relying on increasing populations and on extending city built-up areas, although statistical evidence shows that their populations are declining. In general, adaptation to demographic dynamics – here shrinking populations – is rarely included in the strategic planning objectives of GUPs.

Box 11. The challenges of illegal construction

The existing land management system lacks adequate statistical data, and weaknesses in the land management process at the local and national levels have resulted in 4.8 million structures that have either not been registered in the cadaster or are registered but the actual building characteristics do not match the cadaster records. Illegal construction has been a massive urban development phenomenon since the 1960s, especially in the post-socialist period. In the period from 1960 to 1970, accelerated urbanization increased housing demand in cities while the government was unable to provide sufficient housing and overcome bottlenecks in the delivery of prepared land. These factors, along with the absence of policies to guide and regulate urban land development, contributed to

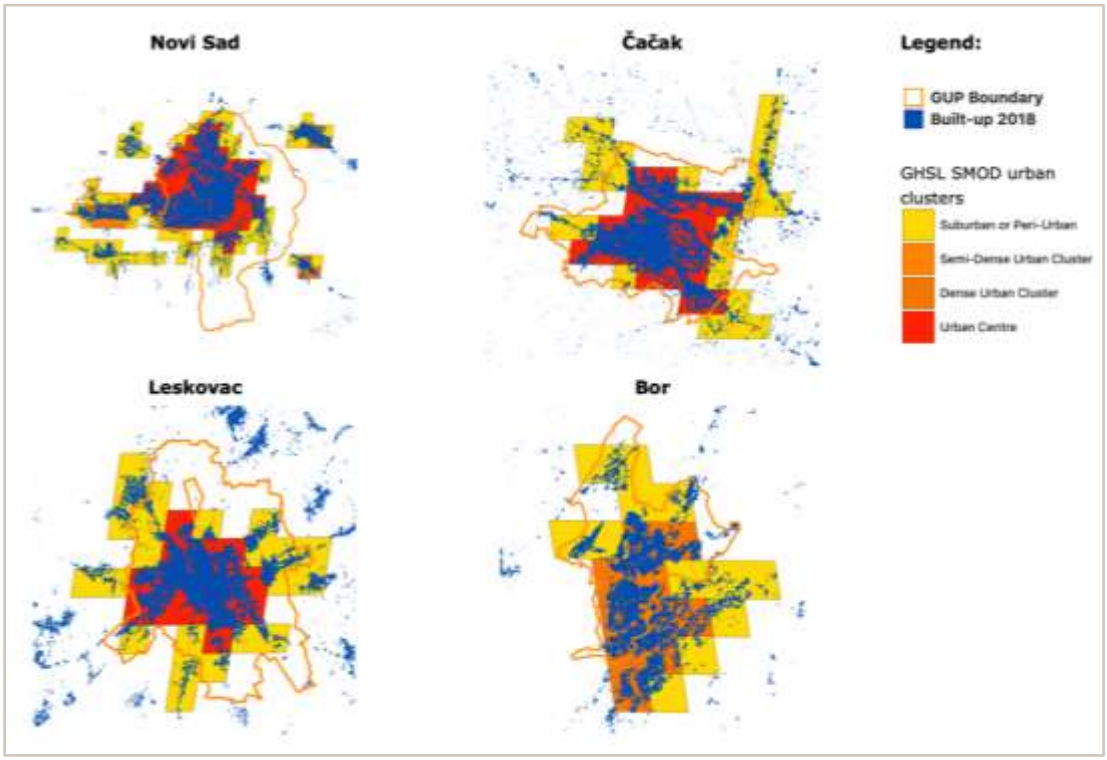
rampant illegal construction of individual homes in urban peripheral areas and illegal construction becoming a common housing development practice for decades. Precarious settlements without infrastructure and services have proliferated. After 1990, the process of mass illegal construction intensified. The Ministry of Construction, Transport and Infrastructure's first database of illegally constructed buildings revealed that by 2017, 2.05 million housing units or 49.5% percent of the total number of units in the country were illegally built. To address this, LSGs are responding by integrating informal settlement areas into urban planning and zoning. Belgrade serves as a case in point. The first detailed mapping of informal settlements was done for Belgrade's GUP n 2003. The 2003 GUP designated zoning of informal settlement areas for housing development, to enable regularization and legalization of existing illegally built homes. It was calculated that 43.3 percent of all urban land zoned for housing in Belgrade in 2003 was occupied by informal construction, and that 74 percent of informal homes were built on land that was, at the time of construction, zoned for agricultural use. The analysis of changes in built-up areas of cities shows that the largest expansion since 1990 occurred in these areas, and that a significant part of expansion corresponds with zones of informal settlements, as seen in the map illustrations below.



Left: zones of informal settlements in Belgrade (black colour) (Source: Draft GUP Belgrade 2021). Right: Changes in built-up area in Belgrade from 1990 to 2018 (Source: GHS built-up 2018)

73. In addition, GUPs in some cases do not cover the entire actual built-up urban areas of cities, although they zone much more land than the city's built-up area occupies. This is due to built-up areas transgressing administrative and settlement boundaries, which place parts of continuous built-up areas in different administrative and cadastral units and often under the jurisdictions of different LSGs. This tendency can be observed, for example, in Novi Sad, which has a GUP for the urban settlement as administratively defined which does not cover a large built-up area on the west side (see Figure 20). In addition, some parts of the built-up area south of the city, across the Danube River, fall under the jurisdiction of different local governments, so are not treated in either the GUP or Spatial Plan of Novi Sad, although spatial analysis shows that they are part of the same continuous built-up urban area. Figure 19 shows a comparison of continuous urban built-up areas and the boundaries of the GUPs of Novi Sad, Čačak, Leskovac and Bor, which all exemplify this planning practice.

Figure 20. Cities in which GUPs do not cover the whole built-up area. Comparisons of continuous urban built-up areas of cities as seen by the GHSL SMOD and boundaries of GUPs.



Source: COWI, 2023.

3.3 Urban sprawl escalates investment costs and inhibits climate resilient development

74. Considering the cross-cutting nature of climate action and city sustainability, investment costs are high. In the water and sanitation sector alone, it is estimated that EUR 5 billion in investments would be required to achieve full compliance with EU standards: 40 percent for drinking water supply and 60 percent for sanitation.[120] In the solid waste management sector, investments of nearly EUR 1 billion would be required to comply with existing waste framework and landfill directives.[121] The costs associated with upgrading and expanding the district heating system and renewing and expanding the system of public transport would add to these figures. However, with cities not actively planning for the demographic transition or for sprawling development attributed to the zoning large areas for construction, infrastructure investments may not be right-sized, leading to unnecessarily higher investment costs as well as higher operations and maintenance costs. Furthermore, and as mentioned in Chapter 1, the IPCC estimates that integrating spatial planning to achieve compact and resource efficient urban function through co-location of higher residential and job densities, mixed land use, and transit-oriented development can lower GHG emissions between 23 and 26 percent by 2050.[122]

75. At current levels of capital spending, it will take decades for Serbian cities to become more livable and resilient to disasters and climate change. Increased resources are required to finance the capital investments needed to foster the sustainability and resilience of Serbian cities. Achieving water and sanitation and solid waste management targets per EU directives alone would take LSGs ten years. This assumes that entire capital budgets are devoted to these two sectors. But municipalities have other capital spending obligations and fostering city sustainability involves more than just investments in water and solid waste management. However, at present, LSG capital spending is generally devoted to the

construction and rehabilitation of roads, while upgrading of district heating and public transit systems are priorities in the larger cities. At the same time, municipal revenues are limited for a variety of reasons and tariffs for municipal utility services are not market based and are insufficient for covering capital and operational expenditures. With significant investment needs and limited revenues, capital budgets are clearly insufficient for cities to achieve sustainability within a reasonable length of time. LSGs could draw on a vast array of external sources that support sustainability and resilience-focused investments, but poor capacity to prepare bankable projects hampers accessing funds.

3.4 Conclusion

76. Improved planning, land management and investments in cities are critical to enable Serbia's green transition. Initial steps have been taken to improve urban planning and land management practices, but a comprehensive reform is needed. The national SUDS provides an overarching framework to advance the green, livable, and resilient cities agenda in Serbia. However, while SUDS is included as a statutory planning document in the Law of Planning and Construction, the high-level SUDS objectives are not yet mainstreamed in urban planning instruments and thus have not yet been carried out at an operational level. Making impact depends on LSGs preparing and implementing cascading urban planning instruments such as GUPs and regulations that enforce plan implementation.[123] In addition to the need to mainstream SUDS objectives, LSGs require support to overcome constraints posed by the complex planning system. Constraints include institutional shortcomings that result in a general lack of coordination, weak alignment of spatial and sectoral plans and resource allocation mechanisms, a lack of integration of climate and resilience considerations into the planning process, and ineffective participatory processes.

77. Streamlining the current urban planning system is a critical and necessary action to take in the short to medium term. In the short term, this means simplifying administrative requirements for mandatory and optional planning documents, adjusting to realities on the ground (at the LSG level). Substantive and technical guidance to support LSGs in the development of planning instruments should be reinforced with the introduction of incentives for LSGs to embed participatory methods and to implement disaster- and climate-risk informed plans, and through coordination of land use, service sector and strategic economic development plans. A pilot application of the streamlined urban planning system in priority LSGs will help fine tune reforming the system and could introduce the functional urban area approach. In the medium term, the streamlined planning system should be rolled out to all Serbian cities. This requires the adoption of the streamlined urban planning regulatory framework and planning approaches aimed at city sustainability, resilience and inclusion, in alignment with national policy objectives. LSGs would develop and apply regulations that encourage compact and sustainable urban development and prevent sprawl. These regulations would be supported by improved urban planning practices related to zoning for built-up areas, unregulated spatial extension, and informal housing, and improved capacity of LSGs to implement and enforce building controls and to monitor and self-assess plan implementation performance.

78. To finance investments needed to support city sustainability and resilience, thereby supporting the country's green transition, LSGs can explore multiple strategies. In the short term, the focus could be on building capacities of LSGs to prepare bankable projects. This would better position LSGs to access external sources of funding available specifically for sustainability and resilience-focused investments. In the medium to long term, the focus could be on strategies to increase revenues to finance needed capital investments. One potential strategy could be to increase tariffs on water supply and sanitation services and for solid waste management, as current tariffs are extremely low. Another strategy could be

improving property tax administration to increase the tax base. As presented in Box 11, 4.8 million structures have either not been registered in the cadaster, which means they are not on the tax rolls, or the property information is not up to date. Furthermore, the application of standard real estate valuation processes in cities is underutilized, which also limits property taxation potential.

Chapter 4: Recommendations for More Sustainable Cities in Serbia

79. The diagnostic analysis of urbanization in Serbia, as presented in the previous chapters, identifies key trends and challenges facing Serbia's cities and the constraints that are holding cities back from reaching their potential to foster the country's green growth transition. The analysis points to four key findings:

1. Cities are the driving force of Serbia's economy, but they face mounting challenges with respect to economic performance, population dynamics, spatial growth, the environment and livability;
2. Improved services, climate action and disaster resilience are key to better urban performance;
3. Improved planning, land management and investments are critical to enable the country's green transition; and
4. To deliver on the green agenda, Serbia will need to recast the focus to cities.

80. The analysis finds that cities in Serbia are the key agents to fulfilling the country's sustainability and climate goals – the time is now to unlock their potential. To support Serbia's green growth trajectory, the Government of Serbia must address the compounding challenges its cities face in a more targeted manner. While progress has been made in terms of national level policies to support the green agenda, including Serbia's Sustainable Urban Development Strategy, critical action needed at the local level is lagging. Serbia's accession to the European Union, the EU's Green Deal, and policy commitments by the central government in the areas of environmental management and climate change have created a favorable policy context; however, policy makers now must explicitly focus on translating higher level national objectives to actions at the local level.

81. The World Bank's recent Western Balkans and Croatia Urbanization and Territorial Review [124] (WBCUTR) can provide a useful framework on how to approach the development of policies and investments for Serbian cities to become more sustainable and climate resilient. The WBCUTUR advocates for *concentrating* resources on leading city-regions to drive national growth and support secondary cities to become growth centers; *connecting* people and places to opportunities by linking high-level policy aims with actions that make an impact on the ground; and *capacitating* local governments by strengthening financial and technical expertise and improving local planning, coordination, and governance. In short, the WBCUTR applies a "Concentrate-Connect-Capacitate" (3Cs) framework. (See Box 12 for more information.)

Box 12 - The Concentrate, Connect and Capacitate Framework

The World Bank's Western Balkans and Croatia Urbanization Review advocates for spatially differentiated policies to be applied across the portfolio of places: the leading areas that include capital city regions and some secondary cites; and lagging areas that including small declining cities, low-income mostly sparse and peripheral regions, and low-growth regions with agglomeration potential. These policies can simultaneously position cities to act as drivers of economic growth, increase productivity, and create jobs, while also ensuring that lagging regions are not left behind as trends in demographics, technology, and integration with EU further push to concentrate population and economic activity in fewer places. To this end, the report encourages policymakers to focus on 3Cs:

- ***Concentrate*** resources on leading city-regions to drive national growth and support secondary cities to become growth centers that expand opportunities to their hinterland.
- ***Connect*** people and places to opportunities, by developing competitive tradable sectors to leverage the comparative advantages of cities and regions, integrating enterprises into local, regional, and global markets, and delivering high-quality public services to citizens regardless of where they live.

- ***Capacitate*** local governments by strengthening financial and technical expertise and improving local planning, coordination, and governance, while investing to raise human capital to ensure that citizens can take full advantage of their potential regardless of where they are born.

Across cities, the priority is to concentrate resources on capitals-to unlock the benefits of agglomeration. Governments can give impetus to population and economic concentrations by reducing domestic barriers, such as gaps in human capital and connectivity, easing restrictions in labor and housing markets, and reforming policies that prevent people and businesses from moving to areas of greater opportunity. Higher concentrations of urban populations and economic activities, if well managed, can support the emergence of agglomeration economies in larger cities. As populations concentrates, however, some smaller cities will likely experience an abrupt decline, and that will also need to be managed.

82. Building on the 3Cs framework, this report offers a series of high-level recommendations for Serbian cities to drive the country's transition to more productive, greener and resilient growth. Based on the findings of the diagnostic analysis of Serbian cities, the World Bank advocates for a stronger focus on cities as the key agents for the country's green transition overall and urges policymakers to deploy spatially targeted policies at the local level. Drawing on the demographic and economic trends observed in Serbian cities, measures would need to support managing agglomeration to increase productivity, improve livability and perform well environmentally, and to right-size investments, based on each city's specific needs and characteristics. Capacities at the local level should be developed to support achieving the multi-pronged goals of increased productivity, improved livability and climate resiliency. To this end, policymakers can deploy the 3Cs Framework towards Serbian cities:

- **Concentrate** – by deploying a spatially differentiated approach to cities based on the demographic and economic trends and needs of each city to enable right-sizing policies and investments in urban infrastructure and services. For the few cities that are increasing in population and have the potential to develop as regional growth poles, interventions would address productivity constraints at an agglomeration level while support decarbonization and compact spatial development. For the majority of cities that are declining in population, targeted measures would improve livability and inclusivity to accommodate ageing in place, improving accessibility of buildings, public spaces, and public transport services, and providing social services. At a system of cities level, measures would target the potential growth pole areas, including along key transport corridors.

- **Connect -** by enabling the linkage between high-level policy aims with actions that translate to results at the local level. Improving the planning system to support improved city sustainability and resilience requires making connections at various levels, for example, between national and local administrations, across adjacent jurisdictions to synchronize land use decisions, and across the system of spatial, urban and sectoral planning instruments, regulations, incentives and permits so that they coherently and unequivocally promote compact urban development and discourage expansion in fringe areas. Climate and disaster resilience aspects would be connected to all elements of the planning system. Measures that connect sectors would contribute to improving productivity and to implementing integrated solutions for improved sustainability and resilience. Proposed recommendations also include leveraging connectivity along transport corridors and through digital infrastructure for territorial development.

- **Capacitate** – by providing LSGs with the required competencies to deliver on their role as key agents in the green transition. This includes strengthening technical capacity to implement sustainable land use, infrastructure planning, and strategic economic development planning, and the ability to apply an agglomeration-level approach with functional urban areas as the unit of analysis and decision

making. Capacity strengthening is also needed for developing and implementing disaster and climate risk-informed plans and for implementing improved participatory planning processes. These measures would be integrated with enhancing the financial capacities of LSGs to increase resources for needed capital investments. This would entail building the capacity of LSGs to identify and prepare bankable projects, and developing financial aptitudes to increase local revenues, including property tax reform and tariff adjustments.

83. Table 5 lays out high-level recommendations to support more sustainable Serbian cities using the 3Cs framework. Each recommendation will require both short and medium- to long-term actions. It is important to note that change will not happen overnight. It is critical to lay out a vision to sequence policy reforms and to prioritize investments in order to achieve improved city sustainability and climate resilience in support of Serbia's green transition.

Table 5. Recommendations for more sustainable Serbian cities using the 3Cs framework

	Recommendations
Concentrate	- Adopt a spatially differentiated approach for developing targeted policies and identifying investment needs based on the demographic and economic trends and needs of each city - Strengthen the cities with potential to develop as regional growth centers or poles, which can also become decarbonization champions - Explicitly account for demographic decline and plan for shrinking and aging cities, through right-sizing infrastructure systems and supporting investments to age-in-place - Improve planning practices to foster compact urban development and control sprawl across all cities, especially in medium and small cities - Develop a cross-sectoral portfolio prioritizing infrastructure investments that contribute to increased productivity, improved livability and climate resilience
Connect	- Explicitly link the national level green growth and climate policy objectives to city specific action at the local level - Streamline the planning system to make it "fit for purpose" to address the overwhelming complexity in the current planning approach - Support horizontal and vertical coordination across different tiers of government and sectors to synchronize land use decisions, improve planning effectiveness and improve sustainability results - Update approaches to connect and improve urban planning practices related to zoning for built-up areas, unregulated spatial extension, and informal housing - Leverage connectivity along transport corridors and through digital infrastructure for territorial development
Capacitate	- Strengthen technical capacities of LSGs in reliable and regular data collection, in the coordination of land use, infrastructure programming, and strategic economic development planning, and the ability to utilize the functional urban area approach for planning and investment decisions. - Strengthen institutional capacities for developing and implementing disaster and climate risk-informed plans, for engaging public participation in the plan development and implementation processes, and for improving the quality and delivery of infrastructure and services to improve livability and resilience. - Strengthen financial capacities of LSGS to prepare bankable increase resources for needed capital investments.

Endnotes

[1] Novi Pazar, a medium-sized city, is the only city where productivity increased between 2014 and 2020.
[2] World Bank, 2022b.
[3] ibid
[4] Health Effects Institute, 2020.
[5] Serbian Environmental Protection Agency (SEPA), 2022.
[6] The government reports the country's recycling rate at 15.8% (2019), but European Commission data indicates 3%.
[7] The European Commission's EDGAR database combines emissions data for Serbia and Montenegro. Estimates for Serbia are thus assumed based on this data.
[8] Crippa et al., 2021. Country-level data accessed through EC's EDGAR database (https://edgar.jrc.ec.europa.eu/).
[9] Compared to 1990 levels. Source: Jovovic, A., 2020.
[10] Refers to the 13 urban centers as defined by GHSL.
[11] According to data from the Global Gridded Model of Carbon Footprints (GGMCF), which considers consumption-based emissions.
[12] UNDP, 2020.
[13] Ministry for Construction, Transport, and Infrastructure. 2019.
[14] Waste Management Program of the Republic of Serbia for the period 2022-2031 Based on the Article 38 Paragraph 1 of the Law on the Planning System of the Republic of Serbia ("Official Gazette of the RS", number 30/18).
[15] World Bank. 2019. West Balkan and Croatia Urbanization Review. Washington, DC. Available at: http://hdl.handle.net/10986/32308.
[16] World Bank, 2019.
[17] National population figures do not include Kosovo and Metohija unless otherwise stated.
[18] Statistical Office of the Republic of Serbia.
[19] Eurostat, 2022. The birth rate in 2021 was 8.9 per 1000 people, well below the mortality rate of 16.0 per 1000, while the fertility rate in the country has been below replacement level for years, as in many other countries in ECA.
[20] Statistical Office of the Republic of Serbia, 2022. In 2021, 135,194 people changed residence within Serbia. Of those, around 72 percent have moved to a city. The number of individuals migrating to cities has been increasing in recent years from 88,769 in 2017 to 97,806 in 2021.
[21] World Development Indicators, 2021.
[22] According to GHSL estimates, the total urban population (including urban centers and urban clusters) in Serbia declined from 71 percent in 1990, to 69 percent in 2000 to 64 percent in 2015 – thereby confirming that the urban population has indeed as estimated by the WDI data and the NSO data, been declining over time.
[23] The population data for cities is based on the Annual Survey carried out by the National Statistical Office in 2021 and indicates the population of the urban settlements within each of the cities. As such, the administrative estimation of the urban population, based on the boundary demarcation of LSGs and settlements within, may not be an accurate representation of the urban population. See Annex 2 for further explanation.
[24] The Western Balkan and Croatia Urbanization Review (2019) too found that the urban primacy of Belgrade was lower than that in not only ECA comparators but also global comparators. These results however may not be conveyed when considering the administrative data (see Annex 1).
[25] National Statistical Office, 2021.
[26] Das et al., 2022.
[27] COWI, 2023.

[28] ibid
[29] ibid
[30] Productivity is measured using night-time lights to allow international comparisons. Namely, productivity is measured as the residual from regression the natural logarithm of the sum of night-time lights emission within the urban cluster on the natural logarithm of its population.
[31] GHSL, 2015.
[32] The analysis did not include Ucize due to the absence of data.
[33] Using the GHS-MOD dataset.
[34] Built-up area expansion can occur in three forms: (1) expansion where the city's previously built-up area is extended, (2) infill development where new built-up areas in vacant spaces between existing urban structures, and (3) leapfrog development, which refers to detached patches of development in outlying areas beyond the built-up area.
[35] Lwasa et al., 2022.
[36] World Bank, 2022b.
[37] Public opinion surveys were completed in November 2021 and March 2022.
[38] Public opinion follows World Bank analyses which found that PM2.5 caused an estimated 12,578 premature deaths in Serbia in 2019 or some 144 deaths per 100,000 population. The annual costs of health damages from PM2.5 amounted to the equivalent of 18.9 percent of Serbia's GDP, the highest share worldwide.
[39] European Commission, n.d.
[40] World Bank, 2022b.
[41] Jovovic, A. 2020.
[42] European Commission, 2020.
[43] UNEP-LEAP, 2019.
[44] European Commission, Joint Research Centre, Olivier, J., Guizzardi, D., Schaaf, E., 2021.
[45] Knez et al, 2022.
[46] Selected comparator countries include Hungary, Croatia, Bulgaria, Slovak Republic, Albania, Georgia, and Azerbaijan.
[47] The EDGAR database combines emissions data for Serbia and Montenegro. Estimates for Serbia are thus assumed based on this data.
[48] Crippa et al., 2021.
[49] Based on Global Gridded Model of Carbon Footprints (GGMCF) which uses income and expenditure data to estimate a city's consumption-based carbon footprint.
[50] European Commission. EDGAR data, 2018. Available at: https://edgar.jrc.ec.europa.eu.
[51] Agence Française de Développement (AFD), 2022.
[52] International Energy Agency, n.d.
[53] European Commission, Joint Research Centre, 2021.
[54] Stojić et al, 2022.
[55] World Bank, 2020.
[56] World Bank, 2022b.
[57] ibid
[58] Donor partner support includes but is not limited to dedicated technical assistance provided by the French Development Agency (AFD) to (i) prepare a vulnerability and risk assessment of the urban sector, and (ii) identify and prioritize relevant adaptation measures which will support the revision of the strategy and its action plan and the preparation of climate adaptation urban projects.
[59] World Bank, 2020.
[60] ibid

[61] World Bank, 2014.
[62] Republic of Serbia, 2021.
[63] A list of the 101 areas is available here: https://www.rdvode.gov.rs/doc/ZPP_2019_tabela.pdf.
[64] COWI, 2023, citing data from https://climateknowledgeportal.worldbank.org/.
[65] The share of built-up area under flood risk by city is calculated as the area that is built-up and under flood risk (all categories) within city boundaries divided by total built-up area within city boundaries. This analysis only considers fluvial floods and not pluvial floods.
[66] World Bank. 2020.
[67] ibid
[68] European Commission, Joint Research Center, Günther, S., Maes, J., Thijssen, M. 2019.
[69] The data on green spaces within Urban Centers has been produced by analysing Landsat annual Top-of-Atmosphere (TOA) reflecting the period 1990-2015. These composites are created by considering the highest value of the Normalized Difference Vegetation Index (NDVI) as the composite value (i.e., greenest pixel).
[70] Lukić, 2013.
[71] AFD, 2022.
[72] World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR), 2023. Classification of Medium defined as the maximum earthquake hazard level, describing expected frequency of damaging ground shaking. The classification uses simulated Peak Ground Acceleration and expert guidance.
[73] Quantectum, n.d.
[74] World Bank, 2017.
[75] Planić & Cvetković, 2021.
[76] Maksimović, 2021.
[77] COWI, 2023.
[78] World Bank, 2022b.
[79] COWI, 2023.
[80] 14 of the 28 cities in Serbia lacked available data and thus were not included in the assessment.
[81] World Bank, 2022b.
[82] McDuffie et al, 2021.
[83] Serbian Environmental Protection Agency (SEPA), 2022. These cities include Belgrade, Niš, Bor, Kraljevo, Kragujevac, Pančevo, Smederevo, Sremska Mitrovica, Subotica, Sombor, Kosjerić, Loznica, Užice, Valjevo, Novi Sad, Novi Pazar, Zajecar and Zrenjanin.
[84] Popovic, 2020.
[85] Europe Environment Agency, n.d.
[86] As examples, the Standing Conference of Towns and Municipalities implemented a capacity building project in 2019 funded by GIZ ORF EE and EIB is providing grant funding to the city of Niš to prepare its SUMP (January 2022).
[87] Rupprecht Consult, 2019.
[88] City of Kragujevac, n.d.
[89] Multiple sources report conflicting numbers of utility companies, including UTVSI (Association of Waterworks and sewage PUCs) and the Institute for Public Health. This estimate is consistent with the Water Management Plan (until 2027).
[90] Statistical Office of the Republic of Serbia, 2021.
[91] ibid
[92] World Bank, 2015.
[93] The Water Management Strategy in the Republic of Serbia until 2034 considers 25% to be an acceptable level – as cited in World Bank, State of the Sector Report – 2018 Update (2015).
[94] Statistical Office of the Republic of Serbia, 2021.

[95] World Bank, 2022b.
[96] COWI, 2023.
[97] Republic of Serbia, 2022b.
[98] Republic of Serbia, 2022a.
[99] European Commission, 2021.
[100] According to the Waste Management Program in the Republic of Serbia for the period 2022-2031 (Official Gazette No 30/18) from 28th January 2022.
[101] World Bank, 2022b.
[102] Data from the Eco Service Cooperative.
[103] GIZ, 2019.
[104] International Energy Agency, n.d.
[105] Energy Community, 2021.
[106] World Bank, 2022b.
[107] Statistical Office of the Republic of Serbia, 2020.
[108] Eurostat, 2018.
[109] World Bank, 2022b.
[110] CCRE-CEMR, 2016.
[111] The current Law on Planning and Construction undergone numerous and frequent changes since it was adopted in 2009. In total, 13 changes took place since 2009 and with an additional change expected for 2023.
[112] Ministry for Construction, Transport, and Infrastructure, 2021.
[113] Ministry of Construction, Transport and Infrastructure, 2020.
[114] World Bank, 2022a.
[115] Cities analyzed: Sombor, Novi Sad, Sabac, Zrenjanin, Kragujevac, Užice, Novi Pazar, Leskovac, Niš and Kraljevo.
[116] Ministry for Construction, Transport, and Infrastructure, 2019.
[117] E-Government portal is the government portal's for services for citizens, businesses, and public entities: www.Euprava.gov.rs. MCTI is also working on establishing the e-Space platform where all planning documents will be accessible and published, to provide better visibility and information sharing.
[118] Republic of Serbia, 2015.
[119] Zeković S. et al., 2015.
[120] World Bank, 2015. An updated version of the report, published in 2019, does not provide revised figures for investment needs. A more detailed breakdown of needed investment costs is provided in the Ministry of Agriculture's water strategy, available only in Serbian. An English summary is available at: https://www.rdvode.gov.rs/doc/dokumenta/javne-rasprave/strategija/Strategijapercent20SUMMARY.pdf
[121] Waste Management Program of the Republic of Serbia for the period 2022-2031 Based on the Article 38 Paragraph 1 of the Law on the Planning System of the Republic of Serbia ("Official Gazette of the RS", number 30/18).
[122] Lwasa et al., 2022.
[123] World Bank, 2021.
[124] World Bank. 2019. West Balkan and Croatia Urbanization Review. Washington, DC. Available at: http://hdl.handle.net/10986/32308.

References

Agence Française de Développement (AFD). 2022. Urban Sector Vulnerability Impact Assessment.

CCRE-CEMR. 2016. Local and Regional Governments in Europe: Structures and Competences. Available at: https://www.ccre.org/img/uploads/piecesjointe/filename/CEMR_structures_and_competences_2016_EN.pdf.

City of Kragujevac. Air quality plan in the agglomeration of Kragujevac, year 2021 (in Serbian). Available at: https://www.kragujevac.rs/lokalna-samouprava/strateski-dokumenti/.

COWI. 2023. Serbia Green, Livable and Resilient Cities.

Crippa et al. 2021. "Global Anthropogenic Emissions in Urban Areas: Patterns, Trends, and Challenges." Environmental Research Letters 16 (7): 074033. https://doi.org/10.1088/1748-9326/ac00e2.

Das, Maitreyi Bordia; Yuko, Arai; Chapman, Terri B.; Jain, Vibhu. World Bank. 2022. Silver Hues: Building Age-Ready Cities.

Energy Community. 2021. Study on Addressing Energy Poverty in the Energy Community Contracting Parties. Available at: https://www.energy-community.org/documents/studies.html.

Europe Environment Agency. Annual AQ statistics (AirBase & e-Reporting merged). Available at: https://discomap.eea.europa.eu/App/AirQualityStatistics/index.html.

European Commission. Covenant of Mayors – Europe, Local Action Plans. Available at: https://eu-mayors.ec.europa.eu/en/action_plan_list.

European Commission. EDGAR data, 2018. Available at: https://edgar.jrc.ec.europa.eu.

European Commission. 2020. 2030 Climate Target Plan. Accessed on July 21, 2022. Available at: https://ec.europa.eu/clima/eu-action/european-green-deal/2030-climate-target-plan_en.

European Commission. 2021. Serbia Report. Accessed on 7 January 2022. Available at: https://ec.europa.eu/neighbourhood-enlargement/serbia-report-2021_en.

European Commission, Joint Research Center, Günther, S., Maes, J., Thijssen, M. 2019. Enhancing Resilience of Urban Ecosystems through Green Infrastructure. (EnRoute): final report, Publications Office. Available at: https://data.europa.eu/doi/10.2760/689989.

European Commission, Joint Research Centre, Olivier, J., Guizzardi, D., Schaaf, E. 2021. GHG Emissions of All World: 2021 Report, Publications Office of the European Union. Available at: https://data.europa.eu/doi/10.2760/173513.

Eurostat. 2018. Final energy consumption in Serbian households by energy product and purpose.

Eurostat. 2022. Enlargement countries – population statistics. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Enlargement_countries_-_population_statistics&oldid=560967#Fertility_rates.

GIZ. 2019. Inclusion of Informal Collectors into the evolving waste management system in Serbia – A roadmap for Integration.

Health Effects Institute. 2020. State of Global Air 2020. Special Report. Boston, MA. Available at: https://www.stateofglobalair.org/.

International Energy Agency. Serbia, Key Energy Statistics. Accessed on 15 January 2022. Available at: https://www.iea.org/countries/serbia.

Jovovic, A. 2020. Update of Serbia's Nationally Determined Contribution in CCM Part, n.d., 16.

Knez, S., Štrbac, S. & Podbregar, I. 2022. Climate change in the Western Balkans and EU Green Deal: status, mitigation and challenges. Energ Sustain Soc 12, 1. Available at: https://doi.org/10.1186/s13705-021-00328-y.

Lukić, N. 2013. Urban Forests and Greening in the Republic of Serbia–Legal and Institutional

Aspects. South-east European forestry: SEEFOR, 4(1), pp.51-55.
Lwasa, S., K.C. Seto, X. Bai, H. Blanco, K.R. Gurney, Ş. Kılkış, O. Lucon, J. Murakami, J. Pan, A. Sharifi, Y. Yamagata, 2022: Urban systems and other settlements. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter08.pdf.
Maksimović, Z. 2021. Observe to predict, predict to prevent: Kraljevo's approach to DRR. 6 July 2021. Available at: https://www.preventionweb.net/blog/observe-predict-predict-prevent-kraljevos-approach-drr.
McDuffie, E.E., Martin, R.V., Spadaro, J.V. et al. 2021. Source sector and fuel contributions to ambient PM2.5 and attributable mortality across multiple spatial scales. Nat Comm 12, 3594. Available at: https://doi.org/10.1038/s41467-021-23853-y.
Ministry for Construction, Transport and Infrastructure. 2019. Sustainable Urban Development Strategy of the Republic of Serbia Until 2030.
Ministry of Construction, Transport and Infrastructure. 2020. Report on implementation of Spatial plan of the Republic of Serbia in 2010-2020 period and spatial development in year 2018 (in Serbian). Available at: https://www.mgsi.gov.rs/sites/default/files/Izvestaj%20o%20ostvarivanju%20PPRS%20i%20stanju%20prostornog%20razvoja_2018.pdf.
Ministry for Construction, Transport, and Infrastructure. 2021. Draft Spatial Plan of the Republic of Serbia from 2021 to 2035.
Planić, J., & Cvetković, V. 2021. Earthquake risk perception in Belgrade: implications for disaster risk management.
Popovic, T. 2020. Report on Air Quality protection at the local self-government level in the Republic of Serbia. UNDP & Standing Conference of Towns and Municipalities.
Republic of Serbia. 2015. Law on Legalization of Buildings (Official Gazette of the Republic of Serbia, No. 96/2015, 83/2018 and 81/2020).
Republic of Serbia. 2021. Spatial Plan of the Republic of Serbia 2021-2035. Draft for public consultation (May 2021).
Republic of Serbia. 2022a. Circular Economy Development Program in the Republic of Serbia for the Period 2022-2024.
Republic of Serbia. 2022b. Serbia Waste Management Program 2022-2031. Official Gazette number 30/18.
Rupprecht Consult (editor). 2019. Guidelines for Developing and Implementing a Sustainable Urban Mobility Plan, Second Edition. European Commission, Brussels. Available at Eltis Urban Mobility Observatory: https://www.eltis.org/mobility-plans/sump-guidelines.
Quantectum. Seismic Activity in the Balkans. Accessed on 15 January 2023. Available at: https://quantectum.com/blog/seismic-activity-in-the-balkan/.
Serbian Environmental Protection Agency (SEPA). 2022. The Annual Report on Air Quality in the Republic of Serbia for 2021. Available at: http://www.sepa.gov.rs/download/Vazduh_2021.pdf.
Statistical Office of the Republic of Serbia. 2020. Energy Consumption in Households in Serbia.
Statistical Office of the Republic of Serbia. 2021. Eco-Bulletin 2021.
Statistical Office of the Republic of Serbia. 2022. Statistical Release. Number 187, 11/07/2022.
Stojić, D., Fazekaš, T., Horvat, A.M., Radovanov, B., Stojanović, S. and Sedlak, O. 2022. Public transport management in smart environmental protection–case study of Subotica, Serbia.
UNDP. 2020. Study on Nature-based Solutions in Serbia. Belgrade, Serbia: United Nations Development Programme.
UNEP-LEAP. 2019. Sustainable Urban Development Strategy of the Republic of Serbia until 2030.

Accessed July 21, 2022. Available at: https://leap.unep.org/countries/rs/national-legislation/sustainable-urban-development-strategy-republic-serbia-until-2030.

World Bank. 2014. After the Rain – Helping Serbia rebound from Disaster. Available at: https://www.worldbank.org/en/news/feature/2014/10/06/after-the-rain-helping-serbia-rebound-from-disaster

World Bank. 2015. Water and Wastewater Services in the Danube Region: Serbia Country Note. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/22136/Water0and0wast00state0of0the0sector.pdf?sequence=1&isAllowed=y.

World Bank. 2017. Europe and Central Asia - Country risk profiles for floods and earthquakes. Available at: http://documents.worldbank.org/curated/en/958801481798204368/Europe-and-Central-Asia-Country-risk-profiles-for-floods-and-earthquakes.

World Bank. 2019. Western Balkans and Croatia Urbanization Review.

World Bank. 2020. Serbia Systematic Country Diagnostic Update.

World Bank. 2021. Background note, Financing Urban Development in Serbia's Secondary Cities.

World Bank. 2022a. Local Infrastructure and Institutional Development Project Appraisal Document.

World Bank. 2022b. Supporting Serbia's Transition to Greener and More Resilient Growth. Policy and Institutional Reforms.

World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR). 2023. ThinkHazard! tool. Classification of Medium defined as the maximum earthquake hazard level, describing expected Frequency of damaging ground shaking. The classification uses simulated Peak Ground Acceleration and expert guidance.

World Development Indicators. 2021.

Zeković S. et al., 2015. Planning and land policy tools for limiting urban sprawl: the example of Belgrade. Spatium No. 33, June 2015.

Annex 1: Definitions relating to the urban network and spatial units of analysis

In Serbia, the classification of cities and urban areas is based on administrative divisions as defined by law. Serbia's Local Self-Government units (LSGs) that are categorized as a *'city'* or a *'municipality,'* based on the *Law on Territorial Organization*[v] which stipulates that LSGs with a population of 100,000 or more derive a "city" status. However special economic, geographical, or historical reasons can assign an LSG with less than 100,000 inhabitants a "city" status. This is the case for most of the 28 "city" LSGs in Serbia. The remaining LSGs are designated as municipalities.

LSGs are further sub-divided into either urban or rural settlements. Typically, each LSG has a central urban settlement and a network of rural settlements surrounding it.[vi] Therefore, the territory and population of a "city" or "municipality" combines both urban and rural areas. Official population data for cities in the census and other statistics are presented in two ways: (i) the total population covering the entire LSG, and (ii) the population of only the urban settlements within an LSG.

This report focuses on Serbia's 28 cities and unless otherwise stated, the term "city" refers to the Serbian administrative definition of a city, i.e., at the LSG level and the urban settlements within it. For analyses that involve cross-country comparisons or for which administrative data is not available, the alternative definition of "city," as defined by the Degree of urbanization methodology, is used.

The report categorizes the 28 Serbian cities based on population size and population growth, derived from population data at the settlement level, provided by the National Statistics Organization, as described below. This categorization reflects the administrative classifications within Serbia and the urban context across ECA and is informed by classifications across literature accepted globally. [vii]

- **Capital city/Primate city:**[viii] This refers to Belgrade, which is the largest city and the only city with over 1 million inhabitants, thus making it Serbia's primary city.
- **Secondary cities** are cities where the urban settlement population is over 100,000 up to 1 million inhabitants. Serbia has four secondary cities. Together, secondary cities and Belgrade are also referred to as "large cities."
- **Medium cities** are cities where the urban settlement population is over 50,000 up to 100,000 inhabitants.
- **Small cities** are cities with over 10,000 up to 50,000 inhabitants. Serbia has 12 small cities.
- **Growing cities** are cities which have experienced a growth in their urban settlement populations between 2011-2021.
- **Declining cities** are cities which have experienced a decline in their urban settlement populations between 2011-2021.
- **Stable cities** are those which have experienced a decline in their urban settlement populations between 2011-2021 but experienced a growth in their urban settlement populations between 2001-2021.

[v] Law on Territorial Organization (Official Gazette of the RS, No 129/2007, 18/2016, 47/2018 i 9/2020 - dr. zakon)
[vi] However, there are cases where there are two or more urban settlements within the territory of an LSG.
[vii] The city classifications used attempt reflect the Serbian and ECA context while also aligning with global literature. The classification of cities as secondary is based on UN-HABITAT's definition of cities falling between 100,000 and 500,000 (UN-Habitat 1996, *The Management of Secondary Cities in Southeast Asia*) which is also in line with the threshold of 100,000 people used by Serbian legislation. The medium sized city classification is based on the GHSL definition of urban center that requires a minimum population of 50,000. The classification of small cities in the report considers the urban cluster population threshold as defined by GHSL (minimum total population of 5000), but bearing in mind the number of legally defined "cities" in Serbia, raises the minimum "urban cluster "population threshold to 10,000.

Annex 2: Estimating the urban population in Serbia

Annex 2.1 Population estimates of Serbian cities by city size

	City as defined by Official Statistics	Degree of Urbanization Classification (GHSL)	Population 2011 (Official Census; At the LSG level)	Population 2011 (Official Census; At the Urban settlement level)	Population 2011 (Census based on continuous built-up settlement)	Population 2021 (Official Census; At the LSG level)	Population 2021 (Official Census; At the Urban settlement level)	Population 2021 (Census based on continuous built-up settlement)	Population change based on continuous built-up settlement (2011-2021)	Population change based on Administrative data (2011-2021); Settlement level	Built-up change 2002-2018 (Percent)
Capital	Belgrade	Urban Centre	1,659,440	1,344,844	1,359,621	1,681,405	1,383,875	1,399,752	3%	3%	1.26
	Novi Sad	Urban Centre	341,625	277,522	336,760	368,967	306,702	356,825	6%	11%	1.41
	Niš	Urban Centre	260,237	187,544	225,252	249,501	182,797	219,855	-2%	-3%	1.50
	Kragujevac	Urban Centre	179,417	150,835	150,835	171,186	146,315	147,222	-2%	-3%	1.18
	Subotica	Urban Centre	141,554	105,681	105,681	123,952	94,228	100,645	-5%	-11%	1.57
Average of secondary cities			**230,708**	**180,396**	**204,632**	**228,402**	**182,511**	**206,137**	**1%**	**-1.46%**	**1.42**
	Pančevo	Urban Centre	123,414	90,776	83,676	115,454	86,408	80,203	-4%	-5%	1.11
	Novi Pazar	Urban Centre	100,410	66,527	83,450	106,720	71,462	90,507	8%	7%	1.5
	Kraljevo	Urban Centre	125,488	68,749	82,338	110,196	61,490	75,470	-8%	-11%	1.44
	Čačak	Urban Centre	115,337	73,331	81,996	105,612	69,598	76,673	-6%	-5%	1.01
	Krusevac	Urban Centre	128,752	58,745	80,593	113,582	53,746	73,766	-8%	-9%	0.89
	Zrenjanin	Urban Centre	123,362	76,511	76,511	105,772	67,129	70,400	-8%	-12%	0.64
	Leskovac	Urban Centre	144,206	65,289	76,234	123,950	58,338	69,309	-9%	-11%	1.77
	Šabac	Dense urban cluster	115,884	53,919	73,023	105,432	51,163	68,350	-6%	-5%	1.41
	Smederevo	Dense urban cluster	108,209	64,175	69,603	97,930	59,261	64,677	-7%	-8%	1.37
	Valjevo	Dense urban cluster	90,312	59,073	58,932	82,169	56,145	54,653	-7%	-5%	0.64

	Vranje	Dense urban cluster	83,524	60,485	55,783	74,381	55,214	52,810	-5%	-9%	0.98
Average of medium cities			**114,445**	**67,053**	**74,740**	**103,745**	**72,723**	**70,620**	**-6%**	**-6.45%**	**1.16**
	Sremska Mitrovica	Dense urban cluster	79,940	37,751	54,013	72,580	40,144	49,930	-8%	6%	4.44
	Jagodina	Dense urban cluster	71,852	37,282	50,121	64,644	34,892	47,520	-5%	-6%	1.22
	Sombor	Dense urban cluster	85,903	47,623	47,623	70,818	41,814	42,288	-11%	-12%	1.37
	Požarevac	Dense urban cluster	75,334	53,752	44,183	68,648	51,271	41,238	-7%	-5%	0.81
	Pirot	Dense urban cluster	57,928	57,807	43,143	49,601	34,942	39,200	-9%	-40%	0.95
	Zaječar	Dense urban cluster	59,461	38,165	38,165	47,991	32,448	33,169	-13%	-15%	0.75
	Kikinda	Dense urban cluster	59,453	38,065	38,065	49,326	32,084	33,702	-11%	-16%	1.18
	Vrsac	Dense urban cluster	52,026	36,040	36,040	45,462	31,946	33,251	-8%	-11%	0.92
	Bor	Dense urban cluster	48,615	34,160	34,160	40,845	28,822	30,484	-11%	-16%	1.25
	Loznica	Dense urban cluster	79,327	24,363	33,880	72,062	23,988	31,189	-8%	-2%	4.97
	Prokuplje	Dense urban cluster	44,419	27,333	27,333	38,054	24,627	24,390	-11%	-10%	1.39
	Užice	Dense urban cluster	78,040	59,794	no data	69,997	54,965	no data	no data	-8%	no data
Average of small cities			**66,025**	**41,011**	**40,611**	**57,502**	**35,995**	**36,942**	**-9%**	**-11.14%**	**1.75**
Small towns			**n/a**	**1,038,831**	**994,818**	**n/a**	**925,379**	**919,997**			
TOTAL urban population			**n/a**	4,334,972	4,441,832	n/a	4,120,782	4,327,475			

Annex 2.2 The Degree of Urbanization approach

The Degree of Urbanization approach shows that administrative data may not be reflecting a precise picture of Serbia's urban system

Demographic data defined by administrative boundaries do not accurately capture the extent of urbanization in many countries across the world. In addition, each country relies on its own approaches while accounting for its cities and urban areas, limiting meaningful cross-country comparisons. While the World Development Indicators dataset attempts to allows for cross country and regional comparisons over time by making in adjustments in country administrative data, the comparability is still limited due to differences in legal definitions of what constitutes "urban" across each country.

The Degree of Urbanization methodology standardizes the definition of "urban areas" To overcome the shortfalls of administrative data, the European Commission's Degree of Urbanization methodology defines what constitutes an urban area and the classification of cities.[ix] The methodology relies on (a) population source data from the national statistical offices, and (b) Built-up area data using the GHSL method on satellite imagery from Landsat. A population grid is then created by extracting the level of development of each grid cell and combining the processed satellite imagery with administrative census data. The Degree of Urbanization classifies the entire territory of a country is classified along the urban-rural continuum. Based on population size and density thresholds, the full settlement hierarchy is established, and two types of urban definitions are proposed.

- **Urban center (city):** The urban center consists of contiguous grid cells with a density of at least 1,500 inhabitants per km² and a population of at least 50,000.
- **Urban cluster (towns and suburbs):** The urban cluster consists of contiguous grid cells with a density of at least 300 inhabitants per km2 and has a population of at least 5,000 in the cluster. An urban cluster can be a town or a suburban area.
- **Rural grid cell**: Rural clusters are villages that do not belong to an urban center or urban cluster, most these will have a density below 300 inhabitants per km2.

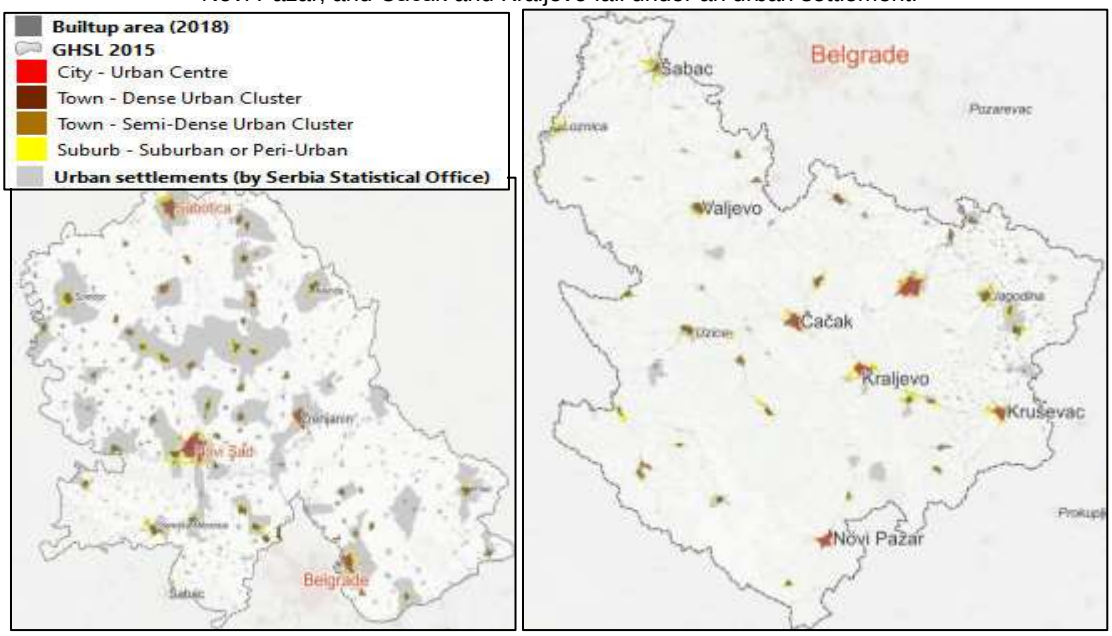
To paint a more complete picture of urbanization patterns in the country, this report uses the "urban cluster" definition to characterize urban areas. The choice of focusing on the lower-density definition is influenced by the consideration that most cities in ECA are small and have low density.

For Serbia, discrepancies between the administrative characterization of cities and urban areas and the Degree of urbanization classifications based on the GHSL data, are evident. Based on the degree of urbanization methodology that classifies urban areas as cities using a density and population threshold, Serbia has a total 12 cities (urban centers)[x] — Belgrade, Novi Sad, Niš, Kragujevac, Subotica, Pančevo, Novi Pazar, Kraljevo, Čačak, Krusevac, Leskovac and Zrenjanin— in contrast to the 28 LSGs designated as cities by the Serbian administration. The remaining 16 cities fall under the category of dense urban clusters, per the degree of urbanization methodology. Similarly, the classification of urban settlements too does not necessarily coincide with that of the GHSL data and degree of urbanization methodology. As seen in figure 2A.1, part A, many settlements assigned an "urban" status do not meet the criteria for being assigned as such by the degree of urbanization methodology, and vice versa, ie, in many cases, dense urban clusters and part or whole of urban centers seem to not fall within an urban settlement, as defined by the Serbian administration.

[ix] The method was proposed and endorsed by a consortium of international organizations (EU, OECD, World Bank, FAO, UN-Habitat, ILO) led by the EU.
[x] Detailed list of Serbia settlements according to the Degree of Urbanization available at: https://ghsl.jrc.ec.europa.eu/cl.php?wcw=208.

The administrative classification of urban areas, maybe resulting in a mischaracterization of cities and inaccurate estimation of urban data. As is the case in most comparator countries in Serbia, it appears, overall, the urban population share is underestimated by the administrative data. Based on figure 2A.1 above, it is apparent, that while in some cases, urban population numbers may be overstated, in cities, such as Novi Pazar, Čačak, Kraljevo there may be an underestimation of the urban population. Both these scenarios deter effective urban policymaking and optimal delivery of services and infrastructure to cities.

Figure 2A.1: (A) In the Vojvodina region, large areas have been designated as urban settlements despite not coinciding with the urban grid cell classifications (GHSL) (B) In the Western Serbia region, only part of cities like Novi Pazar, and Čačak and Kraljevo fall under an urban settlement.



Given the limitations in administrative data and the absence of GHSL data post 2015, this report leverages both sources depending on the type of analysis. For Serbia, to determine a more complete picture of urbanization patterns in the country, and benchmark against its regional neighbors and relevant comparator countries, the report uses the Degree of Urbanization estimations wherever possible and in most cases combines both "urban centers" and "urban cluster" to portray urban agglomerations (i.e., areas that are defined using the "urban cluster" technical definition above). The inclusion of the lower-density definition was influenced by the consideration that most cities in ECA are small and have low densities (indeed, the median ECA city in the GHSL dataset compiled has a population of 11,508). For national level analysis and comparisons of urban trends within country, in most cases, relatively recent NSO data has been leveraged to ensure consistency with national policies and definitions. This NSO data may refer to the urban settlement data or to the LSG city-level data depending on the variable considered and data availability.

To enable a better and more up-to-date characterization of the urban system in Serbia, for the 28 LSGs designated as "Cities" in Serbia, an attempt was made to estimate their 2021 urban populations by combining the degree of urbanization methodology and administrative data and definitions. Available GHSL data only provides population estimates for the 12 urban centers identified in Serbia. Moreover, for these same urban centers, the city populations estimated do not account for surrounding urban clusters. Finally, the most recent data is from 2015 and more recent data is required to understand the trends over time. On the other hand, administrative data, although updated each year through annual surveys, is collected based on administrative boundaries and does not strictly align with urban areas as defined by the GHSL grid cells as seen

above. The methodology combines GHS-POP data from 2015, WorldPop 2020[xi] data as well as built-up area data from the 2018 GHS Built-S2 dataset with the administrative data on urban settlements determined by the 2021 annual survey. Based on this methodology (referred to as continuous-built-up settlement) updated urban population figures of the 28 Serbian cities have been estimated and can be found in the table above.

Examples of city population estimation

Figure 1: The urban settlement Novi Pazar is depicted by the red line in the figure below, surrounded by rural settlements (in green). The actual built-up area is shown in grey, which is clearly not limited to the defined urban settlement and extends into rural settlements (to the north, west and south of the urban settlement). Based on Census 2011, the population of the urban settlement of Novi Pazar was 66,527.

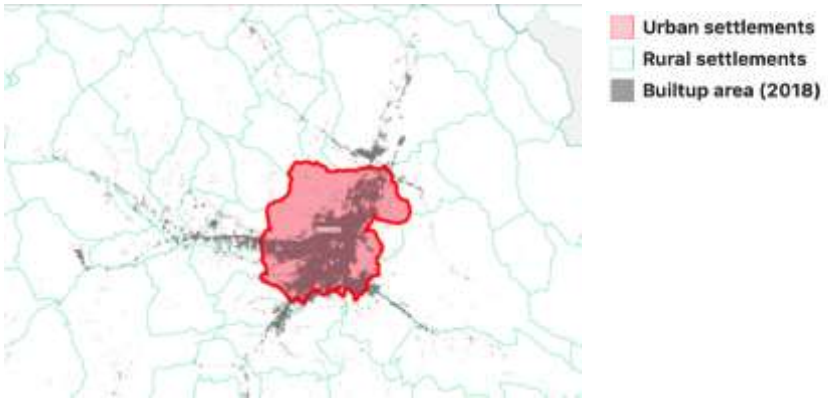
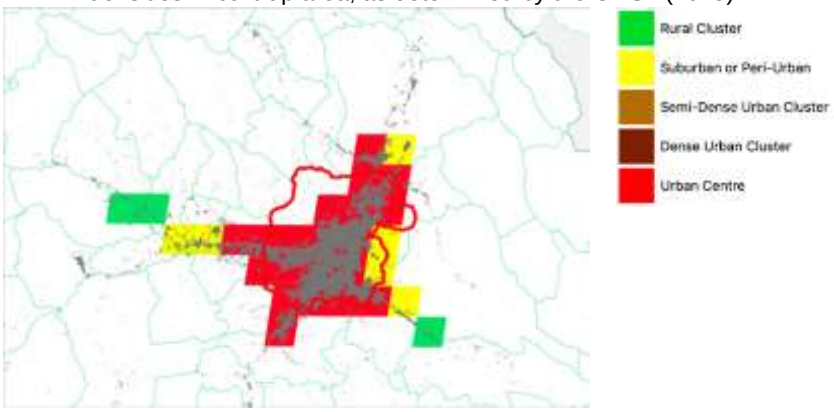
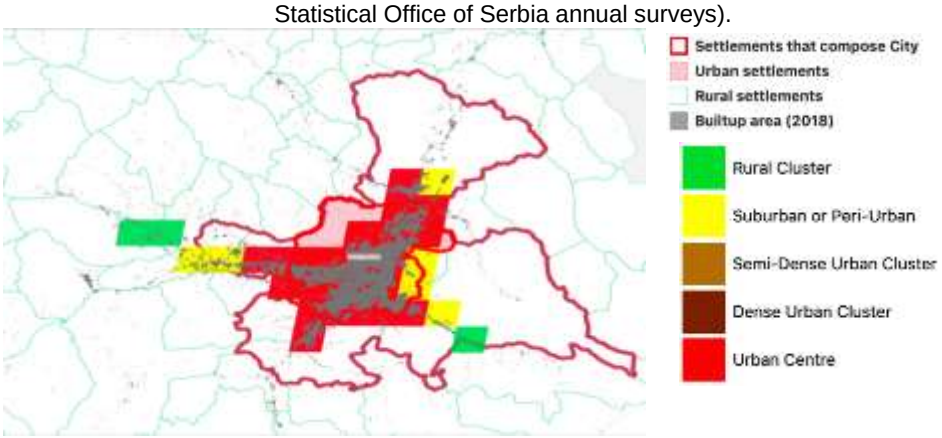


Figure 2: First, GHS SMOD is used to identify all urban clusters, and factor in entire continuous urban area. The urban center of Novi Pazar, as defined by GHSL, has a population of 82,728 (GHSL Degree of Urbanization 2015: https://ghsl.jrc.ec.europa.eu/CFS.php). Second, WorldPop (2021) is used to cross-check and compare the population densities in built-up area, as determined by the GHSL (2015).



[xi] https://hub.worldpop.org/geodata/summary?id=28745 The spatial distribution of population in 2020, allocated to 100x100 meter cells, with Serbia's total adjusted to match the corresponding UNCPD estimate.

Figure 3: The built-up areas confirmed by WorldPop and GHS SMOD information lead to a selection of settlements (regardless of their class in Serbian statistics as “urban” or “rural”) that cover the continuous built-up area of a city. Based on the census data aggregated at settlement level, the population is estimated. The city of Novi Pazar had 83,450 people in 2011 (based on the Census data for the settlements) and 90,507 people in 2021 (based on the Statistical Office of Serbia annual surveys).



Annex 3: Large Serbian cities are not specializing in high productive sectors

The contribution of cities to the national economy is reflected in the evolution of their economic structure. The correlation between growth in urban economies and the share of tradable sectors, which largely include services and manufacturing, in overall economic activity has been well-documented. In general, tradable sectors are those in which both demand for and consumption of the good or service produced extend beyond the local market. The productivity differentials between tradable and non-tradable sectors found in numerous empirical studies[xii] which can be linked to tougher competition in larger markets for tradable goods—provide a logical basis for these conclusions. In addition, tradable and non-tradable sectors are inextricably linked, and burgeoning economic activity in tradable sectors has positive spillover effects that can uplift the entire local economy. The growth of jobs in traded sectors sparks generation of employment in non-tradable sectors. This spillover results from a multiplier effect—higher earnings in the more productive tradable sectors push up demand for local services. This process is the driver of labor productivity growth as it puts the talents and energy of the people to more productive uses and inevitably leads to greater economic complexity, rising productivity, and increasing incomes. This process is clearly closely associated with urbanization (Satterthwaite 2007, 28–31; Michaels, Rauch, and Redding 2012, 535–86), and for it to succeed, cities need to create conditions for the development of nonagricultural industries that will attract investors and workers alike.

Typically, cities, especially large cities tend to be specialized in knowledge intensive tradeable sectors. The process of structural transformation entails the dominance of agriculture shifting to manufacturing and trade and in the case of dense urban environments to high skilled knowledge intensive industry. This structural transformation is catalyzed by agglomeration effects over time and are more pertinently seen in the evolution of cities —growth in services and manufacturing thus starts pulling more workers away from agricultural employment and into urban areas. When firms choose cities, they face a tradeoff between marginal gains from agglomeration externalities and the cost of labor. In strategizing based on this tradeoff, confirmed in a rich body of literature, more labor-intensive firms would choose smaller cities with lower costs, while more efficient firms that are more concerned with innovation and knowledge exchange would choose larger, more diversified cities.[xiii] Indeed, Combes et al. (2012) found empirical evidence suggesting that firms in sectors that exhibit higher labor productivity are disproportionately more efficient in larger cities.

Serbian cities are yet to become specialized in the more productive knowledge intensive service sectors. With the exceptions of Novi Sad cities in Serbia do not have a knowledge-intensive service sector as the leading one in terms of specialization. As Figure A3.1 shows, the capital, Belgrade, has its highest concentration of workers relative to the country in the administrative services sector, possibly due to the concentration of major corporations' headquarters in the country. Amongst the most specialized cities, we find Kikinda and Sombor focusing on Agriculture, forestry and fishing; and the Extractive hubs of Bor, Požarevac and Zaječar.

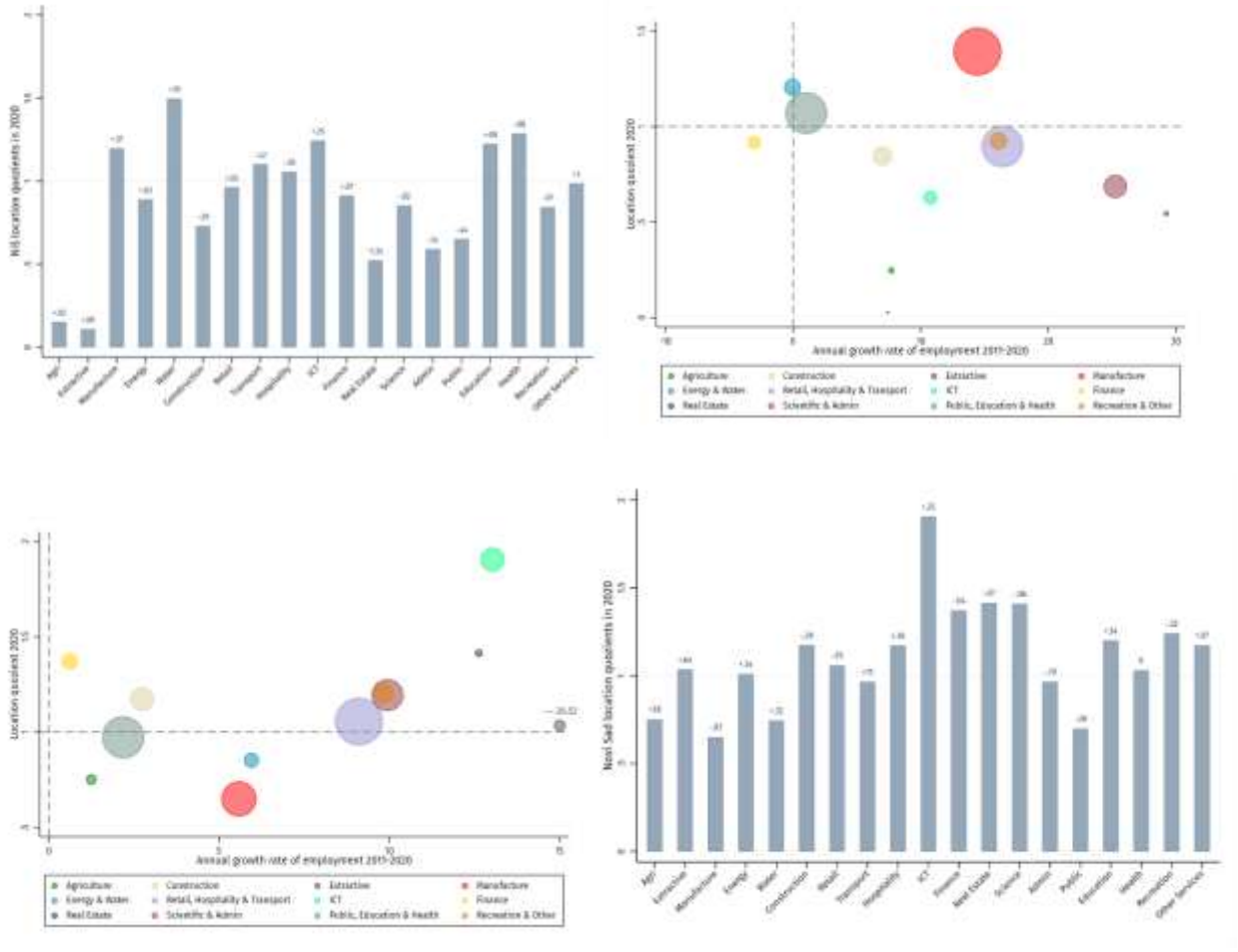
Larger cities – Belgrade and most secondary cities – are yet to fully leverage the process of structural transformation. Due to their size**,** Belgrade and secondary cities have a comparative advantage in the high-value-added services that benefit disproportionately from density. Novi Sad is the only city whose economic structure demonstrates efficient growth pattern. Economic growth is apparently driven by the tradable sectors (Figure A3.1) and more specifically by the high productivity sectors of ICT. Unlike in Niš which although growing

[xii] Mano, R., and M. Castillo. 2015. "The Level of Productivity in Traded and Nontraded Sectors for a Large Panel of Countries." Working Paper 15-48, International Monetary Fund, Washington, DC. And Frocrain, P., and P. N. Giraud. 2019. "The Evolution of Tradable and Nontradable Employment: Evidence from France." *Economie et Statistique* (503d): 87–107.

[xiii] Audretsch, D. B., and M. P. Feldman. 1996. "R&D Spillovers and the Geography of Innovation and Production." *The American Economic Review* 86 (3): 630–640. And Nocke, V. 2006. "A Gap for Me: Entrepreneurs and Entry." *Journal of the European Economic Association* 4 (5): 929–956.

shows low specializations across high value sectors, Novi Sad is highly specialized in the services sector. The economy of Kragujevac on the other hand is dominated by manufacturing, centered around typically non-tradeable energy and utilities industries while high productivity service sectors appear to have a low and declining role in the economy.

Figure A3.1: (panel A) The economic structure of Niš does not resemble that of a typical large city; (panel B) Kragujevac is not specializing in tradeable service sectors like finance and ICT and the finance sector seems to be declining; (Panel C and D) Novi Sad closely reflects an efficient pattern of economic structure growth with high specialization in finance and ICT and ICT sector driving the economy.



Annex 4: Role of cities as regional growth poles

Cities can better harness their roles as regional growth poles

Research across ECA and the Western Balkans region shows that secondary and medium cities can act as regional growth poles. An assessment of secondary city performance in Romania shows that they are the main growth poles outside of the capital,[i] with productivity about double the regional average, functioning as "magnet cities,"[i] and attracting migrants from the regional hinterlands. Previous research in the Western Balkan region has pointed to the importance of secondary and medium cities for promoting the development potential of lagging regions.

The spillovers of urban development to economic growth in rural areas is evident for Serbia. Cities in Serbia, demonstrate disproportionately high contribution to their regional economies in relation to their populations. Figure A4.1 below shows that almost all urban areas in Serbia have a larger contribution to the district level GVA than their share of population.[xiv] This is a confirmation of the role of urban areas as economic engines even more so as the city-level measures of GVA are likely to be underestimated.[xv] In Figure A4.1 urban areas that are in the same districts are bundled together. Among the best performing cities that produce a far larger share of district GVA than their population level are Novi Sad and Niš with their largely service-based economies as well as Požarevac and Bor, possibly due to their specialization in the high value-added extractive industries. Additionally, Figure A4.1 shows a statistically positive correlation between the urban wage index in 2015[xvi]and the growth rate of the average rural wage index for the same district between 2015 to 2020. This suggests that on average in districts where urban wages are relatively higher, rural wages tend to grow faster relative to other rural areas in the country. The relationship obviously cannot be interpreted as causal since it neglects the existence of local labor markets. A similar pattern is displayed for unemployment where when the urban municipality has a lower unemployment rate index, the unemployment rate in rural municipalities has increased relatively less to the average for the country's rural areas.

However, some cities are yet to successfully play their parts are regional growth poles through improved urban and regional policy and planning. While on average it is evident that economic growth across cities in Serbia has positive growth effects on rural areas in the same region, on a closer look this association depends on various factors and does not necessarily play out across all cities. For example, in the Figure A4.1, it is clear that for both Novi Sad and Bor, which demonstrate above average wages, nearby rural areas are not similarly displaying high growth in wages. In many cases the spillover effects depend to a large extent on the performance of the urban center, labor markets, market access based on quality of urban-rural connectivity etc. The Western Balkans and Croatia Urbanization and Territorial Review showed that in the Western Balkan region, for secondary cities with the potential to be regional growth poles, a short-term priority is to ensure the infrastructure is of adequate quality to support private investment. Combined with land rights issues, which are a particular problem in Serbia, infrastructure is a major impediment to private investment. It is equally important to strengthen the dynamism of cities so that they can retain skilled youth. Evidence from other EU regions, such as Abruzzo in Italy and Dolnoslaskie in Poland, shows that establishing an urban environment that

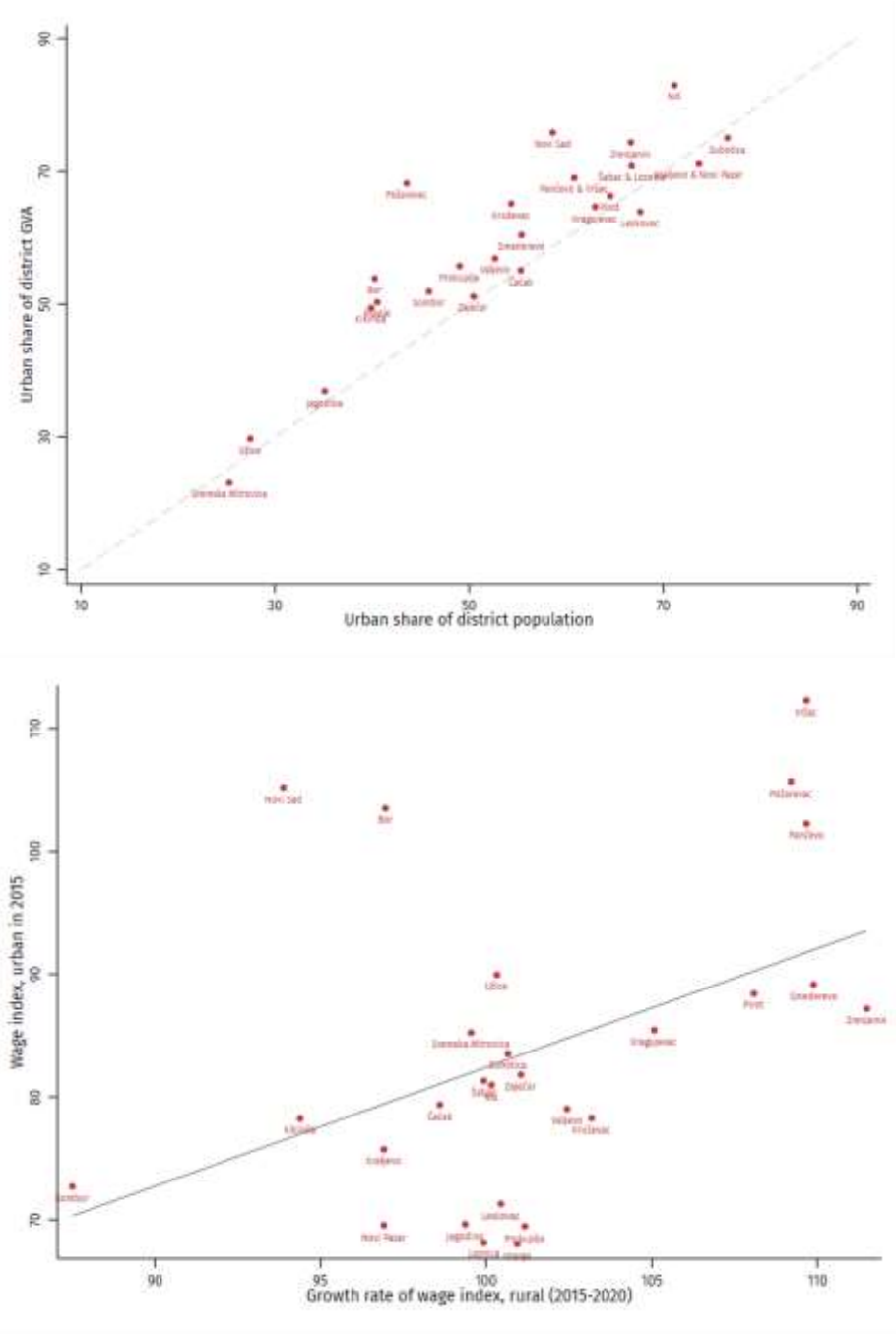
[xiv] This estimation does not consider the fact that spillovers are agnostic of administrative boundaries. The figure merely shows the share of urban GVA in the respective NUTS3 region

[xv] City level gross value added is estimated by decomposing district level sectoral GVA into municipal level values using the municipal fraction of total workers in the province employed by each sector. The implicit assumption is that GVA per worker is constant within the province. Nonetheless, we can expect urban workers (above all if engaged in knowledge-based activities) to be more productive than their rural counterparts due to different positive agglomeration externalities. Therefore, the municipal GVA estimates are likely to underestimate the actual contribution of urban areas.

[xvi] That is the ratio between the average wage in the city and the average wage in all urban areas in the country.

is attractive to younger skilled workers also requires making available good quality, affordable housing and services and investing in cultural infrastructure.

Figure A4.1: Serbian cities play the role of regional growth poles (a) The GVA contribution of cities to regional economy is higher than their population share (b) where urban wages are relatively higher, rural wages tend to grow faster relative to other rural areas in the country



Annex 5: Data source and indicators for environmental performance of cities

Different frameworks related to the evaluation of environmental performance were analyzed for this report: EBRD Green City Action Plan, EU Urban Agenda, IHS Green City Conceptual Framework, Global Platform for Sustainable Cities' Urban Sustainability Framework, as well as the World Development Indicators as data source. These frameworks, together with environmental indicators from the Sustainable Urban Development Strategy of Serbia (SUDS), were used to establish a list of indicators that will be explored in this part of the assignment. The following considerations were made in selecting the indicators:

- Indicators should cover the main environmental issues in Serbia;
- Indicators are selected in such a way that it is possible to find the data on either the urban sector level or the city/urban center level;
- And that the same data is available for other countries, to enable international comparisons.

At the level of individual urban centers, which comprises the bulk of analysis, most of the indicators are evaluated for the thirteen urban centers in Serbia that are identified by the GHSL Urban Center Database[xvii]. This data covers cities of different sizes, and includes the metropolitan complex of Belgrade, secondary cities like Novi Sad or Niš, and small cities such as Leskovac. Full list in the table (right):

Country	City	Category
SERBIA	Belgrade	Primary
	Novi Sad	Secondary
	Niš	Secondary
	Kragujevac	Secondary
	Novi Pazar	Medium
	Subotica	Medium
	Čačak	Medium
	Krusevac	Medium
	Kraljevo	Medium
	Zrenjanin	Medium
	Pančevo	Medium
	Valjevo	Medium
	Leskovac	Medium

To calculate the defined indicators the following main datasets are used:

- The GHSL database which provides information on urban centers globally, allowing international comparisons. It provides information on the following thematic areas: GHG emissions and air quality, energy, water and sanitation, solid waste, green space and land use, and disaster risk.
- Flood Hazard and Risk Mapping in Serbia[xviii] database, developed by the World Bank, GFDRR and COWI. This database provides a detailed mapping of areas exposed to flood risk and can be combined with the work related to spatial expansion of cities done in the previous stage of this project, to map parts of built-up areas of cities with high flood risk and assess the consequences for urban performance.
- Air quality database of the Europe Environment Agency,[xix] providing air quality parameters at the air quality station level for the European union and nearby countries (including the western Balkans).
- IB-net water utility database[xx], providing water services indicators at the water utility level worldwide.

Indicators are grouped in the following thematic areas:

[xvii] European Commission, GHSL Degree of Urbanization, Urban Center Database: https://ghsl.jrc.ec.europa.eu/CFS.php
[xviii] World Bank 2021. Flood Hazard and Risk Mapping: Component 2 of Serbia National Disaster Risk Management Plan.
[xix] https://discomap.eea.europa.eu/App/AirQualityStatistics/index.html
[xx] https://database.ib-net.org/

Indicator name	Indicator description	Source	Level of data availability
GHG Emissions and air quality			
CO2 Emissions	Total annual CO2 emissions in T/capita.	GHSL Urban Center Database WB data	City (14) National
PM2.5 Concentration	PM2.5 air pollution, mean annual levels (micrograms per cubic meter)	GHSL Urban Center Database WB data	City (14) National
Energy			
Energy intensity level	Energy consumption per unit of GDP - the ratio between energy supply and gross domestic product, an indication of how much energy is used to produce one unit of economic output.	GHSL Urban Center Database WB data	City (14) – GDP only National
Access to electricity	Percentage of population with access to electricity.	WB data Census and Statistics	National City (14) urban/rural
Access to clean fuels and technologies for cooking	Percentage of the total population primarily using clean cooking fuels and technologies for cooking	WB data Census and Statistics	National Urban/rural
Water and sanitation			
Access to water	The percentage of people using at least basic water services.	Comp. 1, P2- q. 4.4 WB data	City (10) National, Urban
Water consumption	Annual freshwater withdrawals, total (percent of internal resources).	Census and Statistics WB data	Urban
Water losses	Water system leakages - share of water lost in transmission between supplier and end-user	Census and Statistics	National
Access to improved sanitation	The percentage of people using improved sanitation facilities	Census and Statistics WB data	City (Census) National
Wastewater treatment	Share of wastewater produced by the city that is collected and treated to at least a basic/primary level.	Census and Statistics	National
Wastewater generated	Total wastewater generated	Census and Statistics	Urban
Solid Waste			
Waste collection	Waste adequately disposed of in sanitary landfills, incinerated or in regulated recycling facilities. Expressed as a percent of the total volume of waste generated by the city.	Comp. 1 – P2, q. 3.1 and 3.3 GIS portal – Waste management	City (10)

Indicator name	Indicator description	Source	Level of data availability
Waste generated	Total annual volume of waste generated, including waste not officially collected and disposed, in kg/capita.	Census and Statistics	National/urban /city
Green areas and land use			
Vegetated surfaces in cities	Amount of healthy vegetation in the city center as estimated by the Normalized Difference Vegetation Index (NDVI). Unitless value in the range from 0 to 1	GHSL Urban Center Database	City (14)
Share of green areas in cities	Share of the surface by class of Normalized Difference Vegetation Index (NDVI)	GHSL Urban Center Database	City (14)
Access to green areas	Percentage of population living in dense green areas	GHSL Urban Center Database	City (14)
Land use efficiency	The ratio of land consumption growth rate to the population growth rate (SDG11.3.1)	GHSL Urban Center Database Analytics from Task 2	City (14) City (27)
Disaster risk			
Population exposed to floods	Population potentially exposed to floods considering a 100-year return period	GHSL Urban Center Database WB Flood Hazard and Risk Mapping	City (14)
Built-up area exposed to floods	Built-up area potentially exposed to floods considering a 100-year return period (km2)	GHSL Urban Center Database WB Flood Hazard and Risk Mapping	City (14)
Heat waves	Maximum of the heatwave magnitude index (HWMId)	GHSL Urban Center Database (1980 – 2010)	City (14)

Results Visualized

To visualize the performance across the defined of indicators, a color-coded system depicts the distribution of indicator results. To allow international comparisons, the indicators are also evaluated for urban centers in Hungary, Bulgaria, Albania, Croatia, Georgia, Slovakia, and Azerbaijan. Sewerage coverage as only indicator in water and wastewater does not represent the full extent of the poor performance, explored further in the relevant thematic section. Comparison of flood risk was not possible due to the unavailability of directly comparable datasets.

			Land use and green areas		**Air quality**	**Water services**	**Flooding**	**Heat wave**
Country	City	Category	Density change 2000 - 2015 (%)	Population living in high green areas (%)	PM10 measurements above EU guidelines (%)	Sewerage Coverage (%)	Built-up area at risk of flooding	Heat wave index
Serbia	Belgrade	Primary	-11%	34%	39%	80%	64%	8
Serbia	Novi Sad	Secondary	0%	37%	27%	89%		11
Serbia	Nis	Secondary	-6%	16%	27%	84%	23%	6
Serbia	Kragujevac	Secondary	-13%	38%	75%	94%	1%	8
Serbia	Novi Pazar	Medium	14%	21%	100%	76%	0%	9
Serbia	Subotica	Medium	-24%	24%		59%	0%	12
Serbia	Cacak	Medium	-15%	40%		70%	2%	10
Serbia	Krusevac	Medium	-13%	28%		60%	0%	7
Serbia	Kraljevo	Medium	-12%	50%		81%	0%	8
Serbia	Zrenjanin	Medium	-22%	42%		80%	42%	9
Serbia	Pancevo	Medium	-21%	29%		59%	41%	8
Serbia	Valjevo	Medium	-20%	49%	100%	64%	18%	10
Serbia	Leskovac	Medium	-23%	18%		55%	43%	7
Comparators								
Albania	Tirana	Primary	52%	18%	50%	70%		7
Albania	Shkoder	Medium	-9%	25%	0%	51%		9
Azerbaijan	Baku	Primary	22%	0%				18
Azerbaijan	Lankaran	Secondary	3%					11
Bulgaria	Sofia	Primary	5%	20%	52%	50%		7
Bulgaria	Plovdiv	Secondary	-12%	12%	72%	60%		11
Bulgaria	Burgas	Secondary	-8%	14%	13%	50%		6
Bulgaria	Stara Zagora	Medium	-22%	24%	35%	50%		9
Croatia	Zagreb	Primary	-2%	46%	8%			10
Croatia	Split	Secondary	-1%	15%	0%			23
Croatia	Osijek	Medium	-15%	21%	6%			11
Georgia	Tbilisi	Primary	1%	9%				12
Georgia	Batumi	Secondary	13%	18%				5
Georgia	Kutaisi	Secondary	-27%	20%				9
Hungary	Budapest	Primary	10%	27%	9%			18
Hungary	Debrecen	Secondary	27%	20%	0%			18
Hungary	Szeged	Secondary	-14%	40%	42%			14
Slovakia	Bratislava	Primary	-11%	45%	3%	37%		11
Slovakia	Kosice	Secondary	-1%	43%	2%	30%		15