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Interlinkages between Urbanization and Regional Sustainable Development

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ABSTRACT

The article examines the impact mechanisms of urbanization on the sustainable development of territories, as evidenced by 85 regions of the Russian Federation. An abstract logical approach was used to summarize the key provisions of the sustainable development concept and evaluate the relevance of specific indicators. Econometric and statistical methods were applied for statistical data collection and analysis to assess the considered factors. Hypotheses and assumptions were employed to assess the investigated factors and perform regression analysis through economic and mathematical modeling methods. The presence of a moderate positive relationship between the level of regional sustainable development and the share of urban population and the total population in the region was revealed. It has been assumed that the indices of regional sustainable development should encompass indicators characterizing rural areas to estimate urban-rural development proportions. Greater emphasis should be put on the effective coordination of urban and rural development and the assessment of economic, institutional, infrastructural, environmental, and other conditions at the level of rural local communities. The latter have scarce opportunities for sustainable socio-economic development due to remoteness from urban centers (depopulation, aging population, poverty, unemployment, low quality of life, digital divide, etc.). This is urgent for the Russian Federation's sustainable development, considering its spatial extent and territorial heterogeneity.

KEYWORDS: Urbanization, Sustainable Development, Economic Development, Regions, Spatial Differences, Spatial Polarization, Environmental Sustainability, Russia

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JEL Code O11, O31, O32, O33

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1. INTRODUCTION

The Russian Federation is characterized by the crucial divergence of its socio-economic space due to the internal territory heterogeneity, the peculiarities of population and resource distribution, and the sectoral specifics of the economy. Notably, the enhanced spatial polarization is evidenced in the dramatic growth of large cities (Sukhinin et al., 2022). Undoubtedly, being specific to modernity, urbanization processes are a powerful tool for sustainable development, provided these are appropriately planned and effectively managed. Today, more than 50% of the world's population lives in urban areas, expected to increase to nearly 70% by 2050. Projections indicate that urbanization combined with the overall growth of the world's population could add another 2.6 billion people to urban areas and reach 6.3 billion (67%) (United Nations, 1987).

Urban areas occupy almost all the population growth, captivating a significant part of rural residents located remotely from resource attraction venues, often deprived of favorable working conditions and lacking opportunities to choose suitable jobs. A similar case concerns the possibilities of using social infrastructure, the accessibility and quality of the transport network, the housing, etc. Eventually, rural areas will be heavily restricted in their ability to respond to current challenges and threats (depopulation, poverty, unemployment, aging population, digital divide, etc.), which is especially relevant for the Russian Federation, given its scale. As a result, population migration becomes a critical negative factor in shaping the development direction for rural settlements and small and medium-sized cities.

Because of a long-lasting demographic decline, the Russian Federation ranks ninth by population with 146.2 million inhabitants in 2024, causing compression of economic space and an increased polarization. This is how the central growth poles and peripheries are formed, and the differences reach enormous proportions (3.5 times difference by the average income of the population per capita between 10% top and lagging regions). Unfortunately, it does not appear easy to overcome such trends despite the government policy focusing on ensuring openness, safety, resilience, and sustainability of cities and human settlements (United Nations Sustainable Development Goal 11). These stem from the lack of a systematic approach in terms of sustainable development goals (SDGs).

The sustainable development agenda is one of the most important and addressed issues by government authorities and academicians. The increased anthropogenic effects on the environment inevitably lead to a decrease in the population's level and quality of life and a deterioration of business conditions for economic entities. In recent decades, in conditions of instability of the external environment and geo-political and geo-economic turbulence, the sustainable development of the Russian Federation and the constituent entities has gained increased attention from the state leadership. According to the Decree of the President of the Russian Federation dated February 04, 1994, No. 236 On the State Strategy of the Russian Federation for Environmental Protection and Sustainable Development, and the Decree of the President of the Russian Federation dated April 01, 1996, No. 440 On the Concept for the Transition of the Russian Federation to Sustainable Development, the transition to sustainable development should provide a balanced solution to socio-economic development and environmental preservation, meeting the needs of present and future generations.

Furthermore, some founding documents acting as a regulatory framework for sustainable development were approved (e.g., decrees, laws, and strategies regulating socio-economic development in the context of limiting greenhouse gas emissions, etc.). In 2017, several critical documents aimed at creating sustainable development were drafted: the Instructions of the President of the Russian Federation following a State Council meeting On the Environmental Development of the

Russian Federation for the Benefit of Future Generations (dated January 24, 2017); the Decree of the President of the Russian Federation dated April 19, 2017 No. 176 On Strategy for Environmental Safety of the Russian Federation until 2025; the Decree of the President of the Russian Federation dated May 13, 2017 No. 208 On Strategy for Economic Security of the Russian Federation until 2030; the Order of the Government of the Russian Federation dated October 29, 2021 No. 3052-r On Approval of the Strategy for the Socio-Economic Development of the Russian Federation with Low Greenhouse Gas Emissions until 2050 to launch a comprehensive framework in adapting the economy to the global energy transition.

The adopted Resolution of the Government of the Russian Federation dated September 21, 2021, No. 1587, On Approval of the Criteria for Sustainable (including green) Development Projects in the Russian Federation and the Verification System Requirements for Financing Instruments for Sustainable Development in the Russian Federation is considered to be a significant step forward (Shmeleva, 2023). In the context of increasing sanctions pressure and shifting the economic interests of the state and business entities toward the East, the relevance of the environmental, social, and corporate governance (ESG) agenda in the Russian Federation would be enhanced.

The balance of a territorial system's natural, social, and economic subsystems is vital for sustainable development, with structural proportions, interaction mechanisms, and the interests of territorial community subjects being the priorities. The trend of moving the population into cities and increasing the share of the urban population in the regions of the Russian Federation should be interpreted as contravening ESG principles and reducing the level of sustainable territorial development. This assumption requires analytical research.

This article reviews the interrelation between urbanization and regional sustainable development, as evidenced by 85 constituent entities of the Russian Federation, varying in natural resource, financial, economic, geographical, institutional, and other development parameters. The study aims to provide a comprehensive analysis of the impact of urbanization on regional sustainable development, considering the diverse characteristics of the Russian regions and identifying key factors influencing this relationship. The findings will contribute to a better understanding of how urbanization processes can be managed to support sustainable development goals and address the challenges faced by different regions in the Russian Federation.

2. LITERATURE REVIEW

Since the urbanization rate has grown worldwide, including in the Russian Federation, it is urgent to consider these processes related to achieving global SDGs. Sustainable development is a complex and multidimensional challenge that requires a holistic and systemic approach to address human well-being's interrelated economic, social, and environmental aspects. The fundamental debate regarding sustainable development is whether we adopt a strong or a weak conception of sustainability.

Granberg et al. (2002) consider sustainable development as “stable, balanced socio-economic development that does not destroy the natural environment and ensures the continuous progress of society”. According to Tatarkin and others, “sustainable development of a region as a subject of specific socio-economic relations should mean balancing the four important factors: economic, socio-political, natural-ecological, and legal” (Tatarkin et al., 1999, p.7). Podprugin (2012) specifies regional sustainable development as a complex process that ensures balanced socio-economic and environmental development.

According to the author, it is necessary to consider the region's resource potential and its geographical, economic, industrial, infrastructural, and other features. Tsapieva believed sustainable development would be achieved through “balanced, safe, and effective

development to ensure the achievement of the intended goals and priorities of a social, environmental, and economic nature" (Tsapieva, 2010, p. 309).

Scientific research on the methodology for analyzing sustainable development of territories is characterized by a differentiated approach to studying specific aspects of this phenomenon in particular scientific disciplines. Such practice restricts identifying a generally accepted comprehensive methodology for assessing the level of sustainable development of a country, a region, and a city.

In turn, geographers, urbanists, economists, sociologists, architects, and representatives of other scientific disciplines carry out interdisciplinary research into urbanization processes. Numerous scholars explore the relationship between the urbanization factor and ESG development of territories. According to Feng and Li (2024), urbanization has proved to be a dominating factor in increasing ecological destruction. Loseva et al. (2019) attempted to investigate the impact of the urbanization process regarding megacities as regional centers on the sustainability of territorial development.

Sui et al. (2024) studied the relationship between urbanization and the ecological environment using the dynamic equilibrium model evidenced by Shandong Province in China. The long-term equilibrium analysis established that the long-term equilibrium relationship between the two can be achieved through short-term adjustment. Dong et al. (2024) found that the negative impact of spatial urbanization on ecological land use is not apparent in Liaoning Province in China, which indicates that the relationship between urbanization and environmental quality is not always a simple negative correlation.

A highly negative impact of urbanization on social development and the environment was revealed by Feng et al. (2019). It is shown that the urban-rural relationship is the most basic social and economic relationship, a topic that has become a hotspot for the sustainable development of territories. Based on panel data from 298 cities in China (2001 to 2013), the authors constructed the extended Cobb-Douglas model to measure the effect of land-centered urbanization on rural development and its spatial pattern characteristics. The results show that, from 2001 to 2013, China's urbanization level increased steadily, while the level of rural development showed a trend of declining first and then rising. Moreover, land-centered urbanization significantly promoted the development of rural areas nationwide, and urbanization's influence intensity displayed strong regional and particular characteristics.

Li and Liu (2021) explored the bidirectional relationship between urbanization and rural sustainable development in China based on panel data for 298 Chinese cities from 2000 to 2013. The empirical results suggest that most dimensions of urbanization and rural sustainable development in Chinese cities have had a positive bidirectional relationship

Pan et al. (2024) established the relationship between the level of urbanization and green development in the Yangtze River Economic Belt (YREB). However, cities have significant differences regarding their aggregate level and growth rate. The relationship between urbanization and urban green development in the YREB follows a "U" shaped curve, where urbanization initially hinders green development but later facilitates it.

Bai et al. (2019) concluded that a rising urban population share significantly influences residential CO2 emissions, as does population scale, GDP per capita, urban compactness, and the comprehensive level of urbanization. Moreover, urban population share positively affects residential CO2 emissions, surpassing the demarcation point (75%) in China's urban agglomerations.

Thus, the findings of the research above manifest ambiguous and contradictory results. Based on the conducted literature review, a research hypothesis was formulated: urbanization significantly impacts regional sustainable development in the Russian Federation, influencing various socio-economic and environmental dimensions in both positive and negative ways.

3. METHODOLOGY

To conduct the research, an abstract logical approach was used to summarize the key provisions of the sustainable development concept and evaluate the relevance of individual indicators. Econometric and statistical methods were applied for statistical data collection and analysis to assess the considered factors. Hypotheses and assumptions were employed to appraise the investigated factors and perform regression analysis. Economic and mathematical modeling methods were used to create regression models to validate the existence of a relationship between the reviewed factors. Graphic design and cartographic techniques were applied to translate research outcomes visually.

The data from the Federal Service for State Statistics of the Russian Federation (Rosstat), the Unified Interdepartmental Statistical Information System (UISIS), the National Rating Agency, the Statista Research Department, etc., were used as the critical research data sources evidenced from 85 constituent entities of the Russian Federation.

The sustainable development of the regional economy was evaluated using the integral ranking indicator for the sustainable development of the entity. In turn, the level of urbanization was assessed using the indicator for the share of the urban population of the total population in the region. This work aims to test the hypothesis regarding the importance of the urbanization factor for regional sustainable development rather than to create predictive models.

In the Russian Federation, a domestic system for assessing the sustainable development of economic entities has been elaborated recently. Various agencies and organizations are developing ESG ratings. About 15 large Russian companies were included in international ESG ratings from 2015 to 2016 (Babkin et al., 2023).

The emergence of national ratings in 2018-2022 influenced the behavior of Russian companies and regional authorities to develop sustainable development (seeTable 1).

TABLE 1. Comparative characteristics of Russian ESG ratings

Rating Provider	Rating Object	Methodology
Rating-Agentur Expert RA GmbH (RAEX-Europe)	Financial and non-financial enterprises, regions, financial and credit companies	The integral rating is calculated as a weighted average of the following areas: social, environmental, and governance.
Analytical Credit Rating Agency (ACRA)	Non-financial enterprises, regions, municipalities, mutual funds	The integral index is calculated as a weighted average of the following areas: ecology, social responsibility, and management.
Credit Rating Agency Expert RA	Enterprises, regions, urban districts	The integral index is calculated as a weighted average of the following areas: environment, society, quality of management, stress factors, and support factors.
National Rating Agency (NRA)	Financial and non-financial enterprises, regions, portfolios of management companies	The final rating calculation is based on qualitative and quantitative analysis using several fundamental and industry indicators grouped into three ESG components.
National Credit Ratings Limited (NCR)	Non-financial enterprises, regions, financial and credit companies	The basic ESG assessment is carried out for environmental, social, and governance factors; the resulting scores are summed up considering the factor weights; a comparative analysis is performed to differentiate ESG risks.

Note: compiled by author based on source Babkin et al. (2023)

The table overviews various ESG (Environmental, Social, and Governance) rating methodologies used by different Russian rating agencies. The comparison includes the types of entities being rated, the methods employed, and the specific factors considered in the ESG evaluation. This comparative overview highlights the diversity in ESG rating methodologies among Russian rating agencies, reflecting different emphases on various ESG factors and integration methods.

The conducted research was specified by the NRA Ranking of Sustainable Development and Integration of ESG Criteria into the Activities of Constituent Entities of the Russian Federation (National Rating Agency, 2022). This ranking was compiled for 85 regions of the Russian Federation using 45 indicators. Fourteen indicators were applied for the environmental (E) block, 17 indicators – for the social (S) block, and 14 indicators – for the governance (G) block (Konstantinidi et al., 2023). The higher the ESG score, the higher the region ranks (see Table 2).

The study employed descriptive statistics and Partial Least Squares Regression (PLSR). The dataset comprised indicators for different cities across multiple years, including variables such as population growth, average salary, and various economic metrics. The data was normalized using the Min-Max Scaler, facilitating a balanced comparison across various indicators. Next, cities were classified into three development categories - highly developed, moderately developed, and less developed - based on composite scores calculated from the normalized indicators. Scatter plots were generated, visually depicting the trends and development levels of different cities. For the final phase, PLSR analysis was conducted to test two hypotheses related to the impact of social and economic factors on the Gross Regional Product (GRP) of the cities.

The conducted literature review allows to identify key indicators for the study of urbanization process development. The indicators were then divided into two main groups economic and social (see Figure 2).

TABLE 2. Integrated groups of methodology indicators

Methodology Indicator	Data Source
Environmental (*E*) block of risk score indicators	
Environmental impact (air, water, and soil quality, waste management strategies)	Rosstat, Federal Service for Supervision of Natural Resources of the Russian Federation (Rosprirodnadzor)
Climate change (costs of air protection and climate change prevention)	Rosstat, the Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters of the Russian Federation (EMERCOM of Russia)
Resource utilization (scales of natural-resource consumption and the status of regional capital resources)	
Social (*S*) block of risk score indicators	
Population (demographic situation and migration flows)	Rosstat
Human capital (quality of life indicators and social development level)	Rosstat, the Federal Treasury of the Russian Federation, the Ministry of Internal Affairs of the Russian Federation
Sustainable development policy (a managerial component of ESG transformation in the region, including integration assessment of sustainable development agenda into strategic documents, specialized strategies and programs aimed at protecting the natural environment, increasing resource efficiency, etc.)	Regional Executive Authorities (ROIV), Regional Divisions of the Ministry of Natural Resources and Environment of the Russian Federation

Sustainable development management (managerial and economic indicators, including public-private partnership (PPP), capital accumulation rate, budget security, etc.)	Rosstat, the Ministry of Economic Development of the Russian Federation, Federal Treasury, Carbon Supersites of the Russian Federation

Note: compiled by author based on National Rating Agency, 2022

Standard correlation and regression analysis were used to establish the relationship between the urbanization factor of a region and sustainable development. By employing these methods, the study aimed to rigorously investigate the interplay between urbanization and sustainable development, providing a comprehensive understanding of how different levels of urbanization impact ESG factors across regions.

4. FINDINGS AND DISCUSSIONS

In the Russian Federation, as in many other countries, urbanization significantly impacts various aspects of public life, including economic development, infrastructure, standard of living, and social processes. Over the past decades, the proportion of the urban population in Russia has undergone significant changes, reflecting the country's general trends and challenges. Studying these changes makes it possible to understand better the processes taking place in Russian society and can serve as a basis for developing effective management and planning strategies.

Figure 1 presents the dynamics of the share of the urban population of the total population in the Russian Federation from 1990 to 2023.

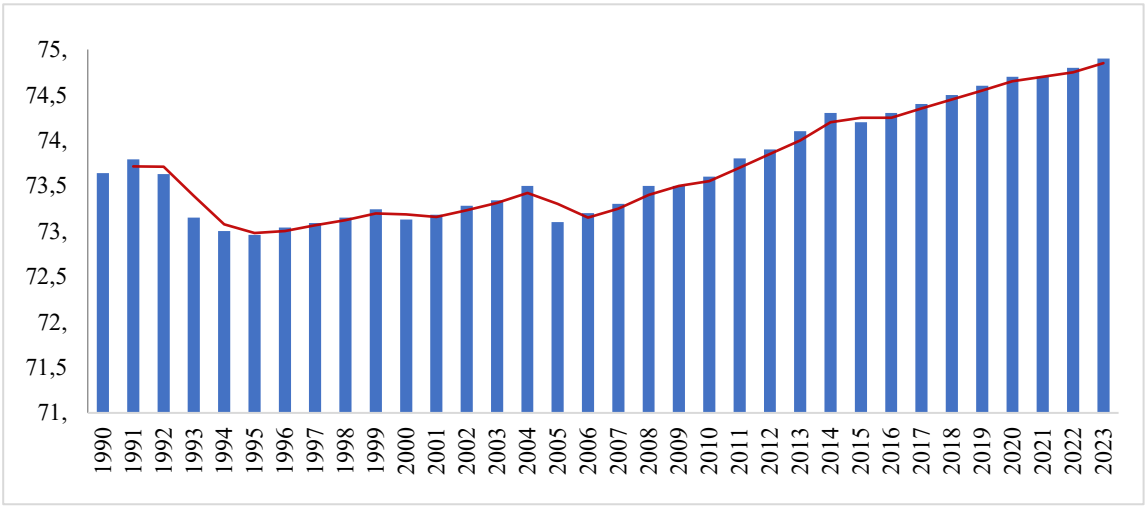

FIGURE 1. Dynamics of the share of the urban population of the total population in the Russian Federation for 1990-2023

Source: compiled by author based on source the UISIS (2023)

At the beginning of the period under review, from 1990 to 1993, there was a noticeable decrease in the proportion of the urban population. This phenomenon may be related to several factors, including the economic and social transformations in the country during that period. The early 1990s in Russia were characterized by a transition from a planned to a market economy, accompanied by significant economic difficulties, including rising unemployment and inflation. From 1994 to 2005, the urban population share shows minor fluctuations, remaining relatively stable. This period is characterized by the population's adaptation to new economic conditions and the gradual stabilization of the socio-economic

situation in the country. Starting from 2006, there is a consistent increase in the share of the urban population, which continues until 2023. Government policies aimed at modernizing urban areas and improving living conditions have contributed to an increase in the urban population.

Furthermore, the map presented in Figure 2 shows the share of the urban population as a percentage of the total population across different regions of the Russian Federation in 2022.

FIGURE 2. Map of the share of urban population in the Russian Federation in 2022, %

Source: compiled by author based on Degree of urbanization in Russia by federal district (2022)

The map uses a color gradient to represent varying levels of urbanization, with lighter shades indicating lower percentages of urban population and darker shades indicating higher percentages. There is significant regional variation in the share of the urban population. High urbanization levels are observed in the western part of the country and some eastern regions, as indicated by the darker shades on the map. The part of the west of Russia, including the Central Federal District, the Northwestern Federal District, and the Volga-Vyatka region, has historically been the center of economic and industrial activity. This area hosts the largest cities in the country, such as Moscow and Saint Petersburg, which are significant economic and cultural hubs. The high urbanization level in these regions can be attributed to the well-developed infrastructure, ample employment opportunities, and high standard of living, attracting people from less developed regions.

The lighter shades on the map indicate regions with low urbanization levels, primarily in the southern and far eastern parts of Russia. Southern regions, such as the North Caucasus Federal District, are characterized by a significant share of rural population and a historically agrarian lifestyle. These regions exhibit lower urbanization levels due to economic and social factors, including a need for more investment in urban development and

infrastructure, as well as traditional ways of life.

The highest degree of urbanization was recorded in the Northwestern Federal District of Russia, where 85% of the inhabitants lived in urban areas. This is followed by the Central Federal District, with an urbanization rate of 82.4%. The lowest share of the urban population, at 50.4%, was registered in the North Caucasian Federal District. There are differences in regional urbanization regarding various federal districts (see Figure 3).

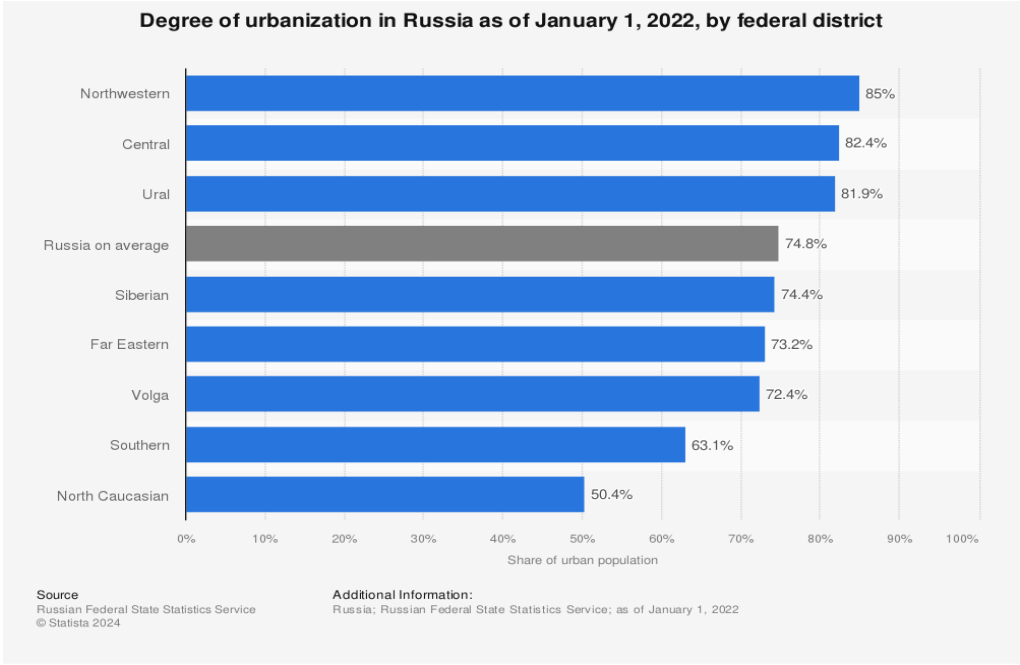

FIGURE 3. Degree of urbanization in Russian federal districts

Source: compiled by author Statista Research Department (2023)

The data is presented as the percentage share of the urban population within each district, providing a clear comparison of urbanization levels across the country. These variations in urbanization levels across federal districts reflect differing economic, historical, and geographic factors influencing population distribution in Russia. Regions with higher urbanization rates typically have more developed infrastructure, more excellent economic activity, and larger urban centers. Conversely, regions with lower urbanization rates may face challenges related to rural development and require targeted policy interventions to improve living conditions and infrastructure.

Notably, this trend is concurrently observed with the growth rate decline of both urban and rural populations in the Russian Federation (see Figure 4).

The graph illustrates the growth rate of the population in Russia from 1990 to 2022, segmented by type of area. The urban population growth rate exhibits considerable fluctuations throughout this period. A sharp peak is observed in the early 1990s, reaching about 1.5% in 1992, followed by a significant decline to negative growth in the mid-1990s. Another notable spike occurs in 2004, after which there is modest growth until around 2009. From 2010 to 2018, there was a slight positive trend, with growth rates peaking at around 1% before declining again towards 2022. The rural population growth rate generally remains negative throughout the entire period.

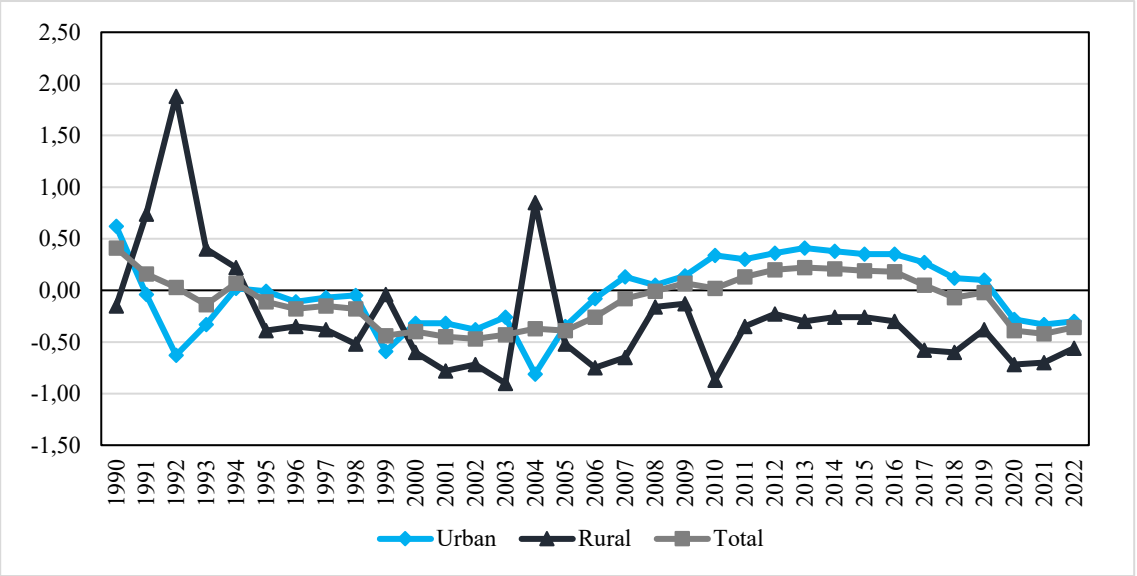

FIGURE 4. Growth rate of urban and rural population in the Russian Federation

Source: Statista Research Department (2023)

The overall trend indicates ongoing urbanization, with urban areas experiencing periods of positive growth, particularly during economic upswings. The consistently negative growth rates in rural areas suggest ongoing rural depopulation, driven by migration to urban centers, economic factors, and possibly declining birth rates in rural regions. However, the declining trend towards 2022 indicates potential demographic challenges ahead.

The average level of ESG assessment calculated for 85 regions of the Russian Federation is 0.528. It can be regarded as achieving ESG regional development in the Russian Federation by an average of 52.8% (see Table 3).

TABLE 3. ESG regional ranking

Leading Regions	Indicator Value	Lagging Regions	Indicator value
Moscow	0.781	Ivanovo Region	0.413
Republic of Tatarstan	0.769	Republic of Crimea	0.411
Tyumen Region	0.723	Republic of Tyva	0.41
Belgorod Region	0.702	Republic of North Ossetia-Alania	0.409
Saint Petersburg	0.683	Republic of Kalmykia	0.403
Yamalo-Nenets Autonomous Okrug	0.674	Republic of Dagestan	0.393
Krasnodar Territory	0.662	Republic of Ingushetia	0.393
Sakhalin Region	0.649	Republic of Karelia	0.392
Moscow Region	0.648	Pskov Region	0.382
Magadan Region	0.647	Republic of Khakassia	0.38

Note: compiled by author based on source National Rating Agency (2022)

The highest positions in terms of sustainable development are occupied by the federal city of Moscow (0.781), the Republic of Tatarstan (0.769), the Tyumen region (0.723), the Belgorod region (0.702), and the federal city of Saint Petersburg. These regions benefit from economic stability, substantial investments in sustainable initiatives, and effective management practices. Conversely, regions like the Ivanovo Region, the Republic of Crimea, and the Republic of Tyva occupy the lower end of the ranking.

These areas need improvements in terms of economic development, governance, and social infrastructure. Political instability, economic underdevelopment, and environmental issues contribute to their lower ESG performance.

The ESG ranking for E block is presented in Figure 5.

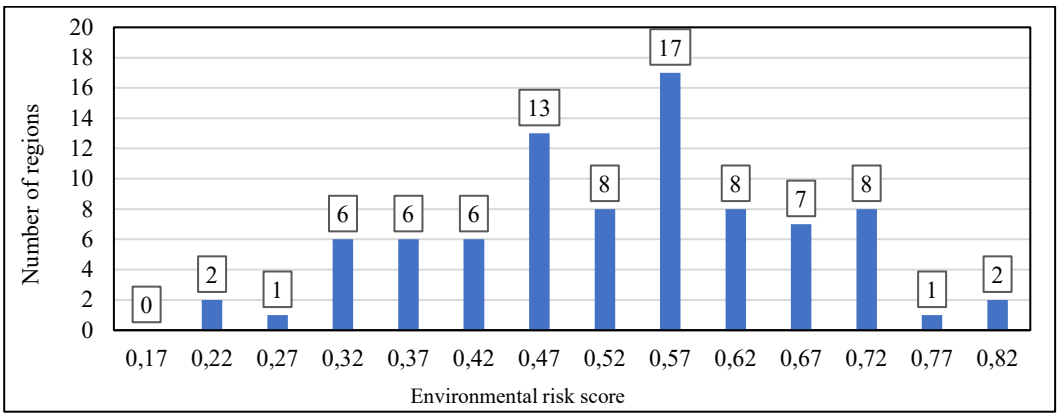

FIGURE 5. ESG ranking of Russian regions for *E* block

Note: compiled by author based on source National Rating Agency (2022)

Moscow and Saint Petersburg, are the leaders in environmental rating. The Republic of Tatarstan ranks second and then comes the Tyumen Oblast. The leading positions are ensured by large amounts of shipped goods manufactured and performed works and services that yield a minimum specific volume of air pollution per unit production. In turn, fixed asset depreciation endemic to the status of regional capital resources is relatively low in regions with advanced ESG rating levels.

The ESG ranking for S block is given in Figure 6.

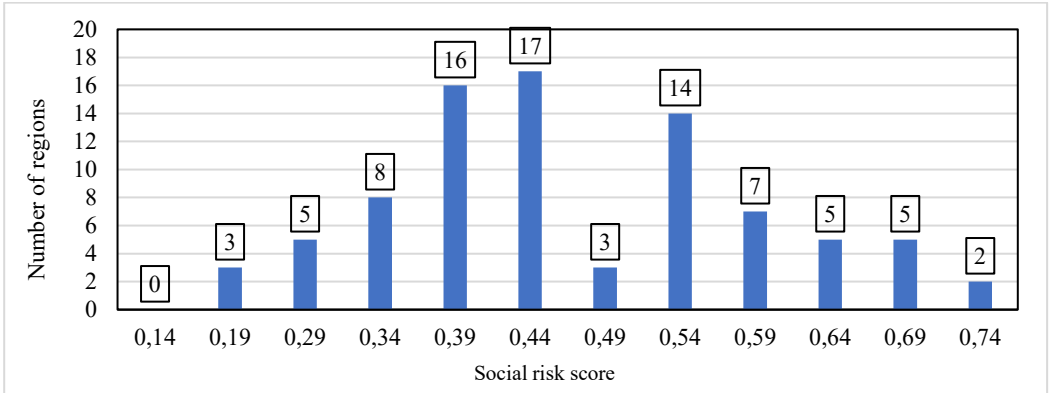

FIGURE 6. ESG ranking of Russian regions for *S* block

Source: compiled by the author based on National Rating Agency, 2022

Moscow and Saint Petersburg are absolute leaders in social rating, particularly in terms of income level for the population, housing affordability, and infrastructure. Moscow is among the highest life expectancy regions following the Republic of Dagestan and the Republic of Ingushetia.

The ESG ranking for G block is provided in Figure 7.

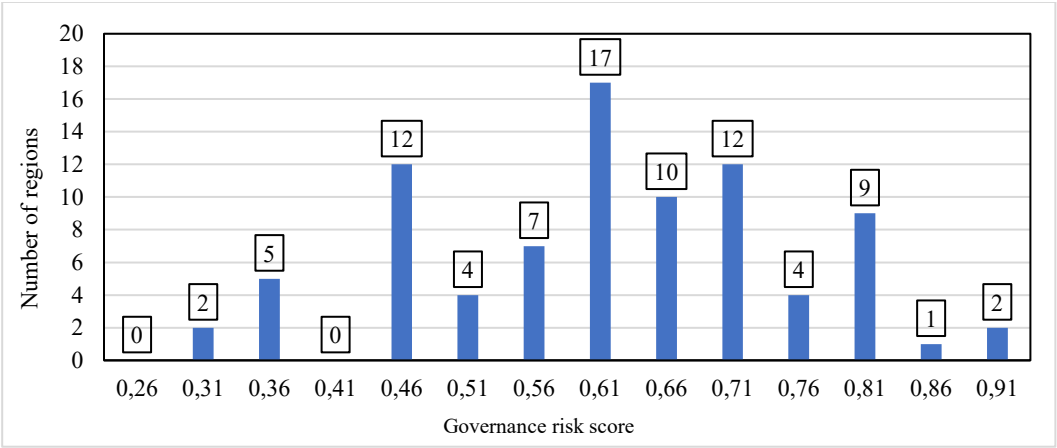

FIGURE 7. ESG ranking of Russian regions for *G* block

Source: compiled by the author based on National Rating Agency, 2022

It is noteworthy that the regions are poorly differentiated in G block (16 regions received maximum scores). Most regions (80 constituent entities of the Russian Federation) have integrated the principles and postulates of sustainable development into the context of regional socio-economic development strategies; 84 regions have their own strategies for environmental protection. Moreover, the regions have launched the process of developing specialized strategies for sustainable socio-economic development since 2022, and the Lipetsk Region will be the leader in advancing this strategy until 2030.

As for building relationships with indigenous peoples inhabiting 34 regions, this aspect has been integrated into the legal framework of 32 regions. The indicators

regarding the economic aspects of this rating block generally typify regional financial capabilities for pursuing a long-term sustainable development policy, assessing the development of public-private partnerships of economic entities, investment activity, and the rate of capital accumulation as the basis for ESG transformation, as well as GRP per capita and budgetary capabilities of the entity. Accordingly, four regions are assigned zero scores, while eight regions have maximum scores. Overall, regional differentiation apropos this economic component of G block is high enough.

Thus, the Student's t-test indicates a significant relationship between the investigated indicators stated in the following econometric model:

$$Y_i = 0.292712^{***} + 0.00333^{***} X_i, \quad (1)$$

where X_i is the level of urbanization assessed using the indicator for the share of urban population of total population in the region as of January 1, 2022;

Y_i - is the level of sustainable development of the region calculated using the integrated 2022 ESG index;

i - is the index number of regions (1…85) in the Russian Federation.

Regression modeling strategies were applied to establish the relationship between the degree of urbanization and regional sustainable development rating (Tables 4-5).

TABLE 4. Regression statistics

Indicators	Values
Multiple regression coefficient *R*	0.467234619
Determination coefficient *R*-squared	0.218308189
Normalized coefficient of *R*-squared determination	0.208890215
Standard error	0.082263139
Observations	85

Note: compiled by author

TABLE 5. Regression analysis results

Indicators	Coefficients	Standard Error	t-statistic	p-value
Y-intercept	0.292712	0.049899	5.866103	8.81E-08
Urbanization variable	0.00333	0.000692	**4.814556**	6.54E-06

Note: compiled by author

The coefficient of determination was 0.218 (Table 4). Since this model can only clarify 21.8% variation for regional sustainable development indicators, it is unsuitable for forecasting purposes. A moderate positive relationship (r = 0.47) indicates that the higher the urbanization of the territory, the higher the level of sustainable development of the region.

Though the analysis results have revealed a rather high sustainability level of urbanization processes in Russian regions, sustainable development ratings must consider enhanced center-periphery spatial polarization. Currently, the cities attract the most available resources to the area, including production factors and human capital. The present economic policy is focused on urban agglomerations, which should become promising centers for federal and regional socio-economic growth and development (Spatial Development Strategy of the Russian Federation, 2019). Thus, cities are the sources of economic growth and development, while the population outflow from rural areas is swiftly increasing. In turn, the spatial development of the rural regions and small towns needs to be paid more attention to. Such “desertification” of rural areas is neither taken into account nor included in the assessment methodology when calculating ratings of regional sustainable development.

The indices of regional sustainable development should likely include extra indicators characterizing the local level of the economic system, the status of rural areas, and urban-rural development proportions. Rural areas are national strategic resources, the importance of which is rapidly growing in the context of increasing emphasis on natural and territorial resources in the country's development. In our opinion, greater emphasis should be placed on assessing economic, institutional, infrastructural, environmental, and other conditions at the level of local communities. The latter have scarce opportunities for sustainable socio-economic development, providing remoteness from urban centers (depopulation, aging population, poverty, unemployment, low quality of life, digital divide, etc.). This is urgent for the sustainable development of the Russian Federation, given its spatial extent and territorial heterogeneity.

The current state of affairs stems from the imperfection of statistical accounting at the level of local rural communities, shifting the focus of academic research towards regions or the country as a whole. According to Zamyatina and Pilyasov (2013), using both federal and regional statistics, macro data, and micro data on economic entities and households to research small territories is vital.

5. CONCLUSIONS

The study provides a comprehensive analysis of the impact of urbanization on regional sustainable development within the Russian Federation. By examining the data from 85 regions, this research identified a moderate positive relationship between urbanization levels and regional sustainable development indicators. Specifically, the regression analysis revealed that an increase in the share of the urban population is associated with higher sustainable development ratings of the regions. However, the model accounts for only 21.8% of the variance in sustainable development indicators.

The data showed significant regional differences in urbanization levels. The highest levels of urbanization are observed in the Central and Northwestern Federal Districts, where the largest cities of the country, such as Moscow and St. Petersburg, are located. On the contrary, low levels of urbanization are typical for southern and Far Eastern regions, such as the North Caucasus Federal District. Key findings indicate that regions with higher urbanization tend to have better sustainable development outcomes, primarily due to enhanced economic activities, better infrastructure, and more robust social services available in urban areas. However, this urban-centric development approach also exacerbates the challenges faced by rural areas, including depopulation, aging populations, poverty, and limited access to essential services and infrastructure.

The analysis underscores the importance of integrating rural development indicators into sustainable development assessments to achieve a balanced and holistic view. It is crucial to address the spatial disparities between urban and rural areas by promoting policies that foster inclusive growth and ensure that rural regions are not left behind in the development process. This includes improving statistical accounting at local levels, enhancing infrastructure, and creating economic opportunities in rural areas to mitigate the negative impacts of urbanization.

Future research should focus on developing more refined models that incorporate a broader range of factors influencing sustainable development. Additionally, there is a need for policies that enhance the coordination between urban and rural development, ensuring that both areas can contribute to and benefit from the nation's overall sustainable development strategy. Emphasis should be placed on creating resilient, inclusive, and sustainable communities that align with the broader goals of the Environmental, Social, and Governance (ESG) agenda.

The findings of this study contribute to the ongoing discourse on sustainable development and urbanization, providing valuable insights for policymakers, researchers, and stakeholders involved in regional planning and development. By adopting a more inclusive and integrated approach to sustainable development, the Russian Federation can better address the diverse needs of its regions and promote a more equitable and sustainable future for all its inhabitants.

AUTHOR CONTRIBUTION

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REFERENCES

Babkin, A. V., Salimova, T. A., & Soldatova, E. V. (2023). ESG-ratings: Development trends, international and national practices. *π-Economy, 16*(6), 77-92. https://doi.org/10.18721/JE.16606 (In Russ.)

Bai, Y., Deng, X., Gibson, J., Zhao, Z., & Xu, H. (2019). How does urbanization affect residential CO2 emissions? An analysis of urban agglomerations of China. *Journal of Cleaner Production, 209*, 876-885. https://doi.org/10.1016/j.jclepro.2018.10.248

Degree of urbanization in Russia by federal district (2022). Available online: https://xn--80apggvco.xn--p1ai/%D0%BA%D0%B0%D1%80%D1%82%D1%8B?id=208 (accessed on 29 April 2024)

Dong, S., Wang, X.-C., Dong, X., & Kong, F. (2024). Unsustainable imbalances in urbanization and ecological quality in the old industrial base province of China. *Ecological Indicators, 158,* 111441. https://doi.org/10.1016/j.ecolind.2023.111441

Feng, H., & Li, Y. (2024). The role of fintech, natural resources, environmental taxes and urbanization on environmental sustainability: Evidence from the novel panel data approaches. *Resources Policy, 92*, 104970. https://doi.org/10.1016/j.resourpol.2024.104970

Feng, W., Liu, Y., & Qu, L. (2019). Effect of land-centered urbanization on rural development: A regional analysis in China. *Land Use Policy, 87,* 104072. https://doi.org/10.1016/j.landusepol.2019.104072

Granberg, A. G., Danilov-Danilyan, V. I., Tsikanov, M. M., & Shopkhoev, E. S. (2002). Strategy and Problems of Sustainable Development of Russia in the XXI Century. Moscow, Economy. (In Russ.)

Konstantinidi, H. A., Yakovleva, E. Yu, Bobylev, S. N., & Solov'eva, S. V. (2023). Assessment of development sustainability and prospects for ESG-transformation of the subjects of the Russian Federation. Economics of Sustainable Development, 1(53), 176-180. Available online: http://www.economdevelopment.ru/wp-content/uploads/2023-1-53.pdf (accessed on 29 April 2024) (In Russ.)

Li, L., & Liu, D. (2021). Exploring the bidirectional relationship between urbanization and rural sustainable development in China since 2000: Panel data analysis of Chinese cities. *Journal of Urban Planning and Development, 147*(3), 05021024. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000721

Loseva, A. V., Pudova, M. V., & Samus, D. A. (2019). The role of megacities in achieving sustainable development goals. *Vestnik NSUEM, 4*, 233-243. https://doi.org/10.34020/2073-6495-2019-4-233-243 (In Russ.)

National Rating Agency (2022). Ranking of Sustainable Development and Integration of ESG Criteria into the Activities of Constituent Entities of the Russian Federation. Available online: https://www.ra-national.ru/wp-content/uploads/2022/12/ranking_esg_regions.pdf (accessed on 29 April 2024)

Pan, Y., Teng, T., Wang, S., & Wang, T. (2024). Impact and mechanism of urbanization on urban green development in the Yangtze River Economic Belt. *Ecological Indicators, 158*, 111612. https://doi.org/10.1016/j.ecolind.2024.111612

Podprugin, M. O. (2012). Sustainable development of the region: The concept, the basic approaches and the factors. *Russian Journal of Entrepreneurship, 13*(24), 214-221. (In Russ.)

Shmeleva, N. V. (2023). Formation of a system of integral indicators showing the windows of opportunities for sustainable development of industrial regions of the Russian Federation. *Russian Journal of Industrial Economics, 16*(1), 86-94. https://doi.org/10.17073/2072-1633-2023-1-86-94 (In Russ.)

Statista Research Department (2023). Available online: https://www.statista.com/statistics/1089745/urbanization-in-russia-by-federal-district/#statisticContainer (accessed on 29 April 2024)

Spatial Development Strategy of the Russian Federation until 2025 (2019). Decree of the Government of the Russian Federation dated February 13, 2019 No. 207-r. Available online: http://static.government.ru/media/files/UVAlqUtT08o60RktoOXl22JjAe7irNxc.pdf (accessed on 29 April 2024)

Sui, Y., Hu, J., Zhang, N., & Ma, F. (2024). Exploring the dynamic equilibrium relationship between urbanization and ecological environment -- A case study of Shandong Province, China. *Ecological Indicators, 158,* 111456. https://doi.org/10.1016/j.ecolind.2023.111456

Sukhinin, S. A., Nikulina, O. V., & Shut, M. A. (2022). Study of the socio-economic sustainability of the development of small towns. In the 12th All-Russian Scientific and Practical Conference on Current

Issues in the Development of Modern Society (pp. 323-326). Kursk, Southwest State University. (In Russ.)
Tatarkin, A. I., Lvov, D. S., Kuklin, A. A., Myzin, A. L., Bogatyrev, L. L., Korobitsyn, B. A., & Yakovlev, V. I. (1999). Modeling Sustainable Development as a Factor for Increasing the Economic Security of Territories. Yekaterinburg, Ural University. (In Russ.)
Tsapieva, O. K. (2010). Sustainable development of a region: Theoretical foundations and the model. *Problems of Modern Economics, 2*(34), 307-311. (In Russ.)
United Nations Department of Economic and Social Affairs. (2018). The 2018 Revision of World Urbanization Prospects. Available online: https://population.un.org/wup/ (accessed on 29 April 2024)
United Nations General Assembly (1987). Development and International Economic Co-operation: Environment. Report of the World Commission on Environment and Development dated August 04, 1987, A/42/427. Available online: https://www.un.org/ru/ga/pdf/brundtland.pdf (accessed on 09 April 2024)
UISIS (2023). The Unified Statistical Information System. Available online: https://digital.gov.ru (accessed on 09 April 2024)
Zamyatina, N. Yu., & Pilyasov, A. N. (2013). The Russia We Have Found: Exploring Space at the Micro Level. Moscow, New Chronograph. (In Russ.)

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