SUSTAINABLE DEVELOPMENT OF URBANIZATION AND SOCIAL INFRASTRUCTURE IN UZBEKISTAN

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Abstract. This research is aimed at spatial analysis of the impact of modern urbanization processes in Uzbekistan on the stability of social infrastructure. In the conditions of rapid population growth and territorial expansion of cities in the country, the need for schools, kindergartens and health institutions is analyzed. The results show that infrastructure development in newly built residential areas is lagging behind population growth. At the end of the article, scientific proposals are made to ensure social equality in urban planning and introduce the "compact city" model in accordance with the Sustainable Development Goals (SDG 11).

Keywords: *urbanization, social infrastructure, sustainable development, Uzbekistan, spatial analysis, urban sustainability, social services.*

Introduction. In the modern world, urbanization processes have become one of the most important drivers of sustainable development. In the Central Asian region, in particular, Uzbekistan, which is the country with the largest population of the region,[1] this process is gaining momentum. Today, the population of Uzbekistan exceeds 37 million people, and the annual growth rate remains high. Such demograffiku activism is increasing the pressure on urban systems, especially social infrastructure, to an unprecedented extent.

In order to systematically manage these processes, the Government of Uzbekistan has adopted a number of strategic documents. In particular, the Presidential Decree[2] No. PF-5623 of January 10, 2019, served as the legal basis for the radical improvement of urbanization processes.[14] According to this document, the strategic task is to increase the level of urbanization in the country to 60 percent by 2030[3]. In addition, the creation of a sustainable urban environment based on human capital and social well-being is identified as a priority area within the framework of the "Uzbekistan - 2030" strategy.[15]

However, the expansion of cities and the rapid increase in population are not always accompanied by the development of social infrastructure. There is a shortage of schools, preschool educational institutions, and medical facilities (hospitals) in newly built residential areas and "New Uzbekistan" complexes. This "spatial gap" between housing construction and infrastructure provision negatively affects the quality of life of the population and contradicts the principles of the UN's 11th Sustainable Development Goal (SDG 11)[4] - the creation of safe and sustainable cities.

Literature Review: The conceptual framework of urban resilience is based on the UN's 11th Sustainable Development Goal (SDG 11), which promotes making cities inclusive, safe, resilient and sustainable.[22] E.According to Glaeser (2020), the future of a city depends on its ability to manage population density and effectively provide essential social services. [8] Also,

[1] *Statistics Agency, 2025*
[2] *Presidential Decree No. PF-5623, 2019*
[3] *Presidential Decree No. PF-158, 2023*
[4] https://api.mf.uz/media/document_files/Ikkinchi_milliy.pdf

S.Bibri and J.Krogstie (2017) argues that "smart sustainable cities" require an integrated approach where digital infrastructure and social services converge to improve the quality of life of residents.[3] From a spatial perspective, Batty (2018) argues that urban resilience is not just about physical structures, but about the "connection" of infrastructure to the population. [2]

In Western countries, urban planning models focus on transport-oriented development (TOD) and the concept of "dense city". P.Newman and J.Kenworthy (2015) showed that reducing car dependence through sustainable transport links is important in creating equal access to social facilities. [13] However, H.Buhaug and H.Urdal (2013) warns that the lack of synchronization of infrastructure growth in rapidly urbanizing regions of Asia is creating “poverty traps” in urban peripheries,[4] undermining the inclusive nature of modern cities.

In the post-Soviet and Central Asian countries, urban transformation, the transition from socialist planning to urbanization based on a market economy, has created unique challenges in the post-Soviet space. M.Gentile (2015) and K.Stanilov (2007) have observed that the “microdistrict” system, which once provided standardized social services, is now in crisis under the pressure of neoliberal housing development.[6-16] In Central Asia, this transformation is characterized by significant territorial imbalances. A.Syzdykov et al. (2020) identified a "spatial mismatch" in the case of Almaty, where housing construction outstrips the provision of schools and clinics.[18] In addition, M.Ahunov (2021) and J.Tukhtabayev (2022) argue that while urbanization drives economic growth, it can also exacerbate environmental and social vulnerabilities if not managed through rigorous spatial planning. [1-20]

The urban landscape of Uzbekistan has changed dramatically since 2017. O.Gritsai and A.Treivish (2020) document the rapid "metropolization" of Tashkent, noting that urban growth is engulfing its suburbs.[9] Sh.Recent research by Qodirova (2023) shows that the availability of social infrastructure is unevenly distributed, with a clear "spatial gap" between historical centers and new neighborhoods.[12] A.Yusupov (2022) argues that while housing reform is a priority, a more robust legal base of urban planning is needed to coordinate them with SDG 11.[24] The numerical measure of this process is N.Ibragimov and S.Haidarovs (2024) have studied and propose that digitization of urban management eliminates the lack of data in monitoring infrastructure needs.[10] However, X. As Umarov (2019) notes, addressing regional disparities in social infrastructure remains the biggest obstacle to Uzbekistan's long-term urban sustainability.[21]

Despite the extensive literature on global urban trends and post-socialist transitions, there is a lack of empirical studies that have quantitatively assessed the social infrastructure of Uzbekistan's new massifs for 2017–2025. This study aims to fill this gap by statistically assessing the shortage of social services in Tashkent and major regional centers, and to provide a data-driven strategic framework for sustainable urban growth.

Methodology: This study uses a systematic approach based on the comprehensive study of territorial and socio-economic systems. Urbanization processes and social infrastructure are analyzed in an interrelated way. The population size, urbanization rate, and the state of social infrastructure (education, healthcare) are determined through statistical analysis. The data is based on official sources from the State Statistics Committee. The comparison method compares regions of Uzbekistan, identifies differences between cities, and compares them with international experience. The forecast is made for the years 2030–2040 using extrapolation analysis.

The scientific novelty of the methodology consists in the joint assessment of urbanization and social infrastructure and the construction of a territorial rating through an Integral Index, as well as analysis based on the criteria of sustainable development. The research stages include the following. 1. Data collection. 2.Selection of indicators. 3.Index calculation. 4.Regional analysis. 5.Identifying problems. 6.Development of proposals and recommendations.

Results: The process of urbanization in Uzbekistan is considered one of the strategic directions for modernizing the country's economy and improving the well-being of the population. As of January 1, 2026, the country's urbanization rate is around 52%, with more than 19.3 million people living in cities.[5] Since 2017, the urbanization policy in Uzbekistan has undergone a radical change. Previously, this process was more focused on restrictions (the propiska system) and the preservation of agriculture, but after 2017, cities began to be seen as economic drivers. During this period, in accordance with new approaches, the Urbanization Agency (later transferred to the Ministry) was established under the Ministry of Economy and Finance in 2019.[6] This was the first case when a separate state body was created to manage urbanization. In 2021, the Resbuplika Center for the development of urbanization and urban planning documents was established under the Ministry of destruction. And in November 2025,[7] the National Committee for urbanization and sustainable development of the housing market was established[8]. Main goal is to increase the level of urbanization to 60% by 2030, from the current level of about 50.6%. [17]

Due to ongoing urban development, the population of cities is growing. This situation is particularly noticeable in Tashkent. In 2017, the population of the city was over 2.4 million, and by the beginning of 2026 it had reached 3.2 million. The population of large and major cities in the republic has changed over the past 10 years as follows. Table 1.

Table 1

Information about the population of large and major cities in the republic

№	Towns	2015	2025	Growth %
1	Andijan	410,4	492,4	120,0
2	Bukhara	273,5	300,2	109,8
3	Jizzakh	165	199,9	121,2
4	Karshi	257,8	300,8	116,7
5	Navoi	133,5	166,5	124,7
6	Namangan	484,9	713,4	147,1
7	Samarkand	513,6	595,8	116,0
8	Termez	137,9	207,3	150,3
9	Gulistan	85,4	102,1	119,6
10	Fergana	268,1	328,4	122,5
11	Kokan	236,8	313,6	132,4
12	Urganch	138	155,7	112,8
13	Nukus	300,7	344,7	114,6
14	Chirchik	150.4	175,3	117.5
15	Tashkent	2371,3	3112,8	131,3

The table was compiled by the author based on statistical data.

As can be seen from the table above, during this period, the population of Tashkent and Kokand increased by more than 30 percent, while in Namangan and Termez, this figure increased by up to 50 percent. While the population of Tashkent has increased mainly due to internal migration, the population of Namangan and Termez has increased mainly due to administrative

[5] https://stat.uz/en/press-center/news-of-committee
[6] https://lex.uz/uz/docs/6968349?ONDATE=11.01.2019
[7] https://lex.uz/uz/docs/-6600549?ONDATE=22.11.2025%2000
[8] https://lex.uz/uz/docs/7865814

reforms and the construction of new housing in these cities, which has resulted in a shift in internal migration. In the cities of Andijan, Jizzakh, Gulistan, Navoi and Fergana, it is more than 20 percent. The Uzbekistan-2030 strategy also aims to transform Samarkand, with a population of over 600,000, and Namangan, with a population of over 700,000, into million-plus cities with a population of 1 million. With this, it is necessary to maintain the capacity of social infrastructure facilities in these cities at the same growth rate.

The demand for social infrastructure systems is increasing dramatically as a result of urban population growth and increasing urban economic capacity. This process is especially evident in large cities, including Tashkent, Samarkand and the regions of the Fergana Valley. At the same time, the rapid pace of urbanization processes is placing additional pressure on social infrastructure, education, health, transport, and housing systems.[25] Managing these processes in accordance with the principles of sustainable development is one of the important areas of regional policy. In comparison with 2017, in 2025, social urbanistic pressure should be borne on the basis of the population of cities and the capacity of social facilities (in the case of the most necessary secondary school student seats, the capacity of preschool educational institutions and coyotes in shifoxanas).

The World Health Organization (WHO) traditionally recommends 30 to 50 hospital beds per 10,000 people.[23] However, in developed countries (such as Japan or Germany), this figure is much higher (up to 120-130), while in developing countries it may be lower. In Uzbekistan, this recommendation is also established in the healthcare system. Currently, the average number of people per 1,000 residents in the Republic is around 70. However, this requirement may not be met in urban areas. Based on the above, it is necessary to determine the social pressure on the medical sector in cities. Based on this, the current situation can be assessed and the medical social urbanist pressure can be determined based on the following index.

$$IUB_{tibbiyot} = \frac{P}{K} * 100$$

In this:

IUBtibbiyot – Social urbanist pressure on medicine

P: — Population size.

K: — Number of beds.

This table allows you to assess the dynamics of population and hospital beds (places) in the period 2015–2025 in the largest cities of Uzbekistan. The analysis shows that over the past 10 years, the population in all cities has grown steadily, but the pace of development of the medical infrastructure has varied across regions.

The development of healthcare infrastructure in Uzbekistan from 2015 to 2025 has been uneven across regions, as exemplified by cities. In some cities (Namangan, Termez, Kokand), the rate of demographic growth exceeded the development of the healthcare system, which increased the pressure on medical services. At the same time, there has been an improvement in the level of medical care in Samarkand, Bukhara, and Gulistan. In general, it is necessary to develop infrastructure in the future based on a territorial balance.

Table 2

Information on the number of hospital beds in cities.

№	Towns	2015			2025			Growth from 2015 to 2025
		Population	Number of beds	Each Bed	Population	Number of beds	Each Bed	
1	Andijan	410400	5918	69	492400	6706	73	105,9
2	Bukhara	273500	2480	110	300200	3325	90	81,9
3	Jizzakh	165000	1957	84	199900	2717	74	87,3
4	Karshi	257800	3800	68	300800	4400	68	100,8
5	Navoi	133500	1700	79	166500	2100	79	101,0
6	Namangan	484900	4026	120	713400	4928	145	120,2
7	Samarkand	513600	13201	39	595800	16332	36	93,8
8	Termez	137900	2453	56	207300	2905	71	126,9
9	Gulistan	85400	1400	61	102100	2300	44	72,8
10	Fergana	268100	3434	78	328400	4587	72	91,7
11	Kokan	236800	1671	142	313600	1795	175	123,3
12	Urganch	138000	2800	49	155700	3600	43	87,8
13	Nukus	300700	2676	112	344700	3520	98	87,1
14	Chirchik	150400	961	157	175300	1091	161	102,7
15	Tashkent	2371300	18644	127	3112800	26888	116	91,0

The table was compiled by the author based on statistical data.

Many methods have been proposed to identify social urbanistic pressures in social areas, particularly in the field of education. The field of education is a necessary area for the population. The education sector is divided into types based on the age of its population, namely pre-school education, general secondary education, professional education, higher education, and post-higher education. General secondary schools are considered the longest and most important link in the education system, which is the most important of the social infrastructure. This pressure is mandatory for children aged 7-18 in general secondary education. It is important to determine the social urbanist pressure index in the regions by school, which is done by determining the number of students in urban areas and the capacity of schools.

Table 3

Information about the number of students and student places in cities

№	Towns	Enrollment			Number of places in the school		
		2015	2025	Growth (%)	2015	2025	Growth (%)
1	Andijan	86 000	108 000	125,6	70 000	85 000	135,7
2	Bukhara	57 000	66 000	115,8	46000	58 000	126,1
3	Jizzakh	34 000	44 000	129,4	28 000	41 000	153,6
4	Karshi	54 000	66 000	122,2	45 000	60 000	144,4
5	Navoi	28 000	36 000	128,6	22 000	28 000	113,6
6	Namangan	102 000	147 000	144,1	80 000	105 000	131,3
7	Samarkand	108 000	151 000	121,3	100 000	105 000	120,0
8	Termez	28 000	36 000	128,6	24 000	28 000	108,3
9	Gulistan	17 000	22 000	129,4	13 000	19 000	115,4
10	Fergana	56 000	72 000	128,6	45 000	62 000	115,6
11	Kokan	49 000	59 000	120,4	39 000	45 000	115,4
12	Urganch	29 000	34 000	117,2	25 000	28 000	112,0
13	Nukus	63 000	76 000	120,6	58 000	65 000	112,1
14	Chirchik	32 000	39 000	121,9	25 000	29 000	116,0
15	Tashkent	420 000	615 000	137,5	321000	379000	118,1

The table was compiled by the author based on statistical data.

The table data shows that urbanization and demographic growth in major cities of Uzbekistan are putting varying degrees of pressure on educational infrastructure. A general case study shows that the growth rate of the number of school places in the cities of Andijan, Bukhara,

Jizzakh and Qarshi (e.g. 153.6% in Jizzakh and 144.4% in opposition) is significantly higher than the growth in the number of students, which has been effective in reducing the school deficit. However, in most other regions, including Navoi, Termez, Gulistan, and Fergana, the growth in student numbers has outpaced the creation of school places, leading to increased infrastructure strain. Especially in Tashkent and Namangan, the situation is more remarkable: at a time when the number of students in Namangan increased by 144.1%, school places increased by 131.3%, and in the capital Tashkent, students increased by 137.5% (up to 715 thousand people), while school capacity increased by only 118.1%. This confirms that the problem of shortage of school places is most acute in Tashkent, meaning that urbanization and population growth in the capital have outpaced school construction. Also, the increase in the number of seats (112% -120%) in cities like Samarkand, Kokand, Nukus and Chirchiq, slightly behind the flow of students (120% -121%), will require further expansion of the network of schools to maintain the quality of education in the future.

The analysis shows that the urbanization process is putting a lot of pressure on the education system across the country. While the pace of school construction is good in most regional centers, urgent measures are needed to develop school infrastructure in Tashkent.

The Social Urban Pressure Index by city can be calculated by the following formula for schools:

$$IUB_m = \frac{U}{Q} * 100$$

In this,

IUBm – Index of Social Urbanism Pressure by Schools

U – Number of Students in General Secondary Education

Q – Number of Students in General Secondary Schools

This formula is used to estimate the demand for school places in a population. If the number of students exceeds the available school places, then the urban pressure is high. For example, if a city has 45,000 students but only 30,000 school seats, the pressure index would be 1.5. This number means that the available spaces are not enough to accommodate the number of students and there is a 50% overload. As a result, classrooms are overcrowded, students are crammed together, and the quality of education suffers.

For example,

According to the city of Tashkent,

$$IUB_m = \frac{615000}{379000} * 100 = 162$$

By city of Samarkand,

$$IUB_m = \frac{131000}{105000} * 100 = 140$$

The social urbanist pressure of secondary schools was determined using the formula above, using the example of cities in the Republic.

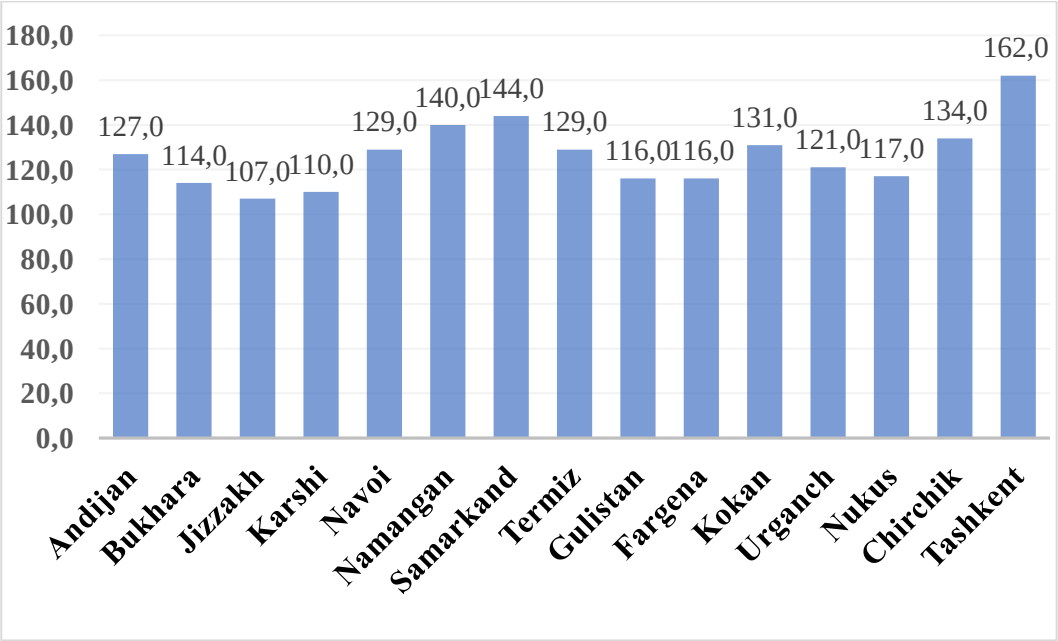


Figure 1. Social urbanist pressure index for cities by education.

It is clear that the social urbanistic pressure in cities is different. Based on this index, cities should be divided into the following groups.

Very high pressure.Higher than 150, in Tashkent

High pressure. From 125 to 150, in Andijan, Navoi, Namangan, Samarkand, Termez, Kokand and cities

Stable pressure. From 100-125, it is observed in Bukhara, Jizzakh, Karshi, Gulistan, Fergana, Urgench and Nukus.

Discussion: Between 2015 and 2025, major cities in Uzbekistan have developed differently in terms of health infrastructure and population dynamics. The table shows that the population of all cities has grown steadily, but the pace of development of the medical infrastructure has varied significantly across regions.First of all, as a general trend, it can be said that although the number of beds has increased in most cities, this increase has not always been proportional to the increase in population. As a result, in some areas, the "number of people per bed" has increased, putting pressure on medical services. The most acute situation is observed in the city of Termez. In 2015, there were 56 residents per bed, but by 2025 this figure will increase to 71 (126.9%). This means that the city's medical infrastructure has not expanded sufficiently against the background of rapid population growth. A similar pattern is observed in Kokand (142 to 175 residents) and Namangan (120 to 145 residents). Demographic pressure is high in these areas, putting a strain on the healthcare system. On the contrary, a positive trend is noted in some cities. In Gulistan, for example, the number of inhabitants per koyka decreased from 61 to 44. The rate of decline was also observed in Bukhara and Samarkand, indicating that the medical infrastructure developed faster than the population growth. In some cities, a relatively stable situation is observed. In particular, the population per bed in Karshi and Navoi cities has remained almost unchanged. This indicates that infrastructure development has been carried out in line with population growth. Among the major cities, Tashkent deserves special attention. Despite the significant increase in population, the number of beds has also increased rapidly, and as a result, the load per bed has decreased from 127 to 116. This indicates that the healthcare system in the capital is relatively well developed.

Analyzing the relationship between student enrollment and school infrastructure in major cities in Uzbekistan between 2015 and 2025 clearly demonstrates the impact of urbanization processes on the education system. Data on the example of the cities of Namangan, Samarkand, Tashkent, Andijan and Kokand show that the country has a diverse demographic growth and infrastructure race: while the number of students in Namangan and Kokand has increased at the highest rate (154% and 141%, respectively), the number of school places in these regions has also increased almost in parallel (150% and 136%), managed to expand the network in accordance with the population, there was a strong ground for future urbanization and a reduction in load on schools as school seat growth (140% and 136%) advanced significantly from the flow of students (121% and 125%), but at a time when the situation in the capital Tashkent was sharply different from other areas of the Republic and the number of students increased by 137% by only 118% , as a result, according to future forecasts, if the pace of school construction in Tashkent is not sharply increased, then by 2030 the shortage of student seats will reach a crisis point, and in Valley cities, vertical reconstruction of existing schools will remain the main solution due to a shortage of land resources.

Conclusion: Analyzing the relationship between student enrollment and school infrastructure in major cities in Uzbekistan between 2015 and 2025 shows how urbanization processes are affecting the social urbanist pressure on the education system. The results of the above table and indices show that in some cities (for example, Tashkent, Namangan, Samarkand) the school network has not developed sufficiently due to the rapid growth of the population, which has led to a shortage of student places and overcrowding in classrooms. In Tashkent, the IUBm index reached 162, indicating the highest social urbanist pressure, which means that urgent measures are needed to expand the educational infrastructure in the capital.

In other regions, such as Andijan, Bukhara, and Jizzakh, the growth rate of school places has exceeded the increase in the number of students, indicating that the infrastructure of the education system is well developed in some regions. At the same time, in the cities of Namangan and Termez, the high IUBm index (in the range of 125–150) indicates that the educational infrastructure is lagging behind the population's demand, which poses a risk of a low-quality learning process in the future.

In some cities (Namangan, Termez, Kokand), the medical infrastructure has not expanded sufficiently due to rapid population growth, leading to an increase in the number of people per bed and increased pressure on medical services. In Tashkent, the medical infrastructure has expanded significantly, and the workload has decreased relatively.

The gaps between social infrastructure development and population growth vary across cities, making it important to implement balanced regional policies for sustainable urban development.

To align cities with the SDG 11 goals, provide adequate social services, and reduce urban pressure, the following are necessary:

-Expand school and hospital capacity or build new facilities based on population projections;

-Regular monitoring of social urbanist pressure indices;

-Optimal allocation of resources through the introduction of digital management systems;

-Territorial planning aimed at sustainable and inclusive development of urbanization processes.

While urbanization in Uzbekistan supports the country's economic modernization, it will negatively impact the sustainability of cities and the well-being of their residents if it is not coordinated with the development of education and health infrastructure. Therefore, developing social infrastructure based on territorial balance, supporting urbanization policies with scientifically based data, and strategic planning are key factors in urban sustainability.

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