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URBANIZATION AND HOUSING INFRASTRUCTURE IN TASHKENT: AN ECONOMIC-GEOGRAPHIC ANALYSIS

ABSTRACT

This study examines the urbanization processes and the economic-geographic characteristics of housing infrastructure in Tashkent, Uzbekistan, from 2015 to 2024. As the capital of the Republic of Uzbekistan and one of Central Asia's largest cities, Tashkent has undergone significant demographic and economic transformations in recent years. Over the nine years, the city's population surged 28.2 % from 2 371 300 to 3 040 800. The population density is growing from 7 000 to 9 000 people per km². This growth is driven by internal and external migration flows, a high birth rate (20–25 per 1 000 people), and economic reforms. The research employs various methods, including statistical analysis, cartographic modeling, Geographic Information Systems (GIS), and case study analysis. The escalation of housing prices and deficiencies in water supply, public transportation, and social services (e. g., schools and kindergartens) have intensified social inequalities. GIS-based analyses indicate that central districts (Shaykhontohur, Yakkasaray, Yunusobod) benefit from well-developed infrastructure, while peripheral areas (Sergeli, Yangi-hayot, Bektemir) suffer from limited access to communal and transportation services. Construction of new residential complexes often fails to align with existing infrastructure capacities, resulting in water supply interruptions, traffic congestion, and environmental challenges. The study highlights the critical need for synchronized infrastructure development that accommodates demographic growth, environmentally sustainable construction practices, and regulated migration within urban planning frameworks. This research proposes evidence-based strategies to foster sustainable urbanization in Tashkent and aims to inform and enhance urban development policies. Looking ahead, comprehensive approaches addressing regional balance, infrastructure modernization, and the fulfillment of social needs will be paramount for the city's sustainable growth.

KEYWORDS: urbanization, housing infrastructure, demographic growth, GIS, urban planning, environmental sustainability

INTRODUCTION

The urbanization process is a critical driver of socio-economic development globally, particularly in developing countries, where rapid urban population growth increases demand for infrastructure such as housing, transportation, and social services. In Uzbekistan, urbanization processes have accelerated, and this trend is particularly pronounced in Tashkent. The capital's economic-geographic position, natural resources, and infrastructure define its leading role within the country.

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The Tashkent economic-geographic region, adjacent to the Fergana Valley and Mirzachul, serves as the country's primary gateway to international markets. Its geographic location and natural conditions create favorable opportunities for industrial and agricultural development. In recent years, urbanization in Tashkent has progressed rapidly, directly influencing the development of housing infrastructure.

The housing stock encompasses residential units suitable for habitation, including houses, apartments, service accommodations, and specialized housing such as dormitories, temporary housing units, care homes for people with disabilities, veterans, or elderly individuals living alone, as well as orphanages and other purpose-specific residential facilities¹.

However, forecasting urbanization processes presents several challenges. The lack of reliable data, the complexity of urbanization dynamics, and the uncertainty of future developments create difficulties in planning urban development policies. Additionally, the development of infrastructure in settlements transferred from Tashkent Province to Tashkent City remains a pressing issue.

This study aims to examine the formation of urbanization processes and the development trends of housing infrastructure in Tashkent from an economic-geographic perspective. The research analyzes the historical stages of urbanization, the impact of population density and migration flows on infrastructure, the mapping of spatial disparities using Geographic Information Systems (GIS) technologies, challenges in housing construction, and prospective directions for development. The findings of this study serve as a foundation for formulating practical recommendations to manage urbanization processes and enhance housing infrastructure development in Tashkent.

RESEARCH MATERIALS AND METHODS

The research was conducted in the territory of Tashkent, the capital and largest city of the Republic of Uzbekistan, located in the northeastern part of the country within the Chirchiq River Valley. "The height above sea level varies from 380 m in the southwestern part of Tashkent City to 530 m in the northeastern part. The climate of Tashkent is continental" [Sharipov, Khayitmurodov, 2024]. In addition to its ancient history, Tashkent remains a key economic, political, and cultural hub in Central Asia today. In recent years, demographic growth, increasing population density, and internal migration flows have accelerated urbanization processes in the city. These processes have significantly influenced housing construction and infrastructure development, not only in the city center but also in its peripheral zones.

Administratively, Tashkent is divided into 12 districts, each characterized by distinct demographic and economic features. The uneven distribution of the population, the expansion of new construction projects, and the disproportionate development of infrastructure have led to disparities among the city's districts.

The climate of Tashkent is continental. Winter is cold, the average temperature of the coldest month, January, is -0.6 °C. The average temperature of July, the hottest month, is 27 °C. Annual rainfall is unevenly distributed over the seasons. The summer season in Tashkent is very dry, with only 4 % of the precipitation falling in the summer months. Due to the lack of precipitation, the relative humidity in summer is quite low, 45 %. In the summer months, high temperatures and low relative humidity create an unpleasant situation for residents [Sharipov, Khayitmurodov, 2024].

Annual precipitation in Tashkent ranges between 350–500 mm, primarily occurring during the spring and autumn seasons. Spring experiences higher rainfall, which increases soil moisture and positively impacts agricultural planting processes. In autumn, precipitation is lower and coincides with cooler temperatures.

¹ Web resource: <https://gov.uz/oz/advice/NaN/document/1344> (accessed 07.07.2025)

The climatic conditions of Tashkent significantly influence various aspects of residents' lives. For instance, the hot and dry summer season affects people's activities, while the cold winter increases energy consumption and impacts the operation of heating systems. These climatic characteristics necessitate a thorough examination of urban development and urbanization processes, as they can contribute to socio-economic challenges.

One of the primary challenges associated with urbanization in Tashkent is the inconsistent development of infrastructure. In some areas, social services, transportation systems, and communal infrastructure have not kept pace with population growth. Consequently, examining the urbanization processes and the economic-geographic characteristics of housing infrastructure in Tashkent remains a critical research priority [Abdurakhmanova et al., 2020]. In the years 1990–2000, there was a great influence of the market economy factor on the rural settlements of the regions of the republic and the rural population [Tojiyeva et al., 2024].

The population of Tashkent continues to grow annually, intensifying the city's urbanization processes. According to official statistical data, as of 2024, Tashkent is home to over 3 040 800 residents. This rapid population growth is driven by two primary factors: natural growth, resulting from changes in birth and mortality rates, and internal and external migration flows.

Tashkent, Uzbekistan's capital, exhibits significant natural population growth, driven by a young demographic and favorable demographic trends. In 2023, Uzbekistan recorded 873 428 births and 189 269 deaths, yielding a natural increase of 684 159, with Tashkent contributing substantially as the largest urban center. The national fertility rate remains high (approximately 2.8 children per woman), supported by a median age of 27.1 and low infant mortality (18.9 per 1 000 live births). These factors, alongside increasing life expectancy, ensure robust natural growth, though internal migration remains the primary driver of Tashkent's population increase¹.

External migration also exerts a considerable impact on Tashkent. Migrants from Central Asian countries, notably Tajikistan, Kyrgyzstan, and Turkmenistan, contribute significantly to the city's labor force. These migration flows are reshaping Tashkent's social and economic landscape while exerting substantial pressure on the housing market. The growing number of migrants exacerbates housing shortages, increasing demand for new construction and housing infrastructure [Lukyanets, Ryazantsev et al., 2020]. The master plan project for Tashkent City until 2045 envisages the construction of a new area in the capital called New Tashkent. The city will cover an area of 20 000 ha. The initial land plots covering 1 000 ha will be put up for sale this year².

“The vital importance of urban land availability is tremendous, and there will be a certain chance of deviation in the city plan (e. g. master plan, i. e., changes in the land use). As a result, there will be categorical damage of historical, biological, archeological, aesthetic, and visual impacts and pollution in land, water, air, and noise. There should therefore be a definite impact assessment for any such type of development to safeguard the city environment... Remote Sensing, Photogrammetry, and GIS are the latest technologies and tools, which will produce much more accurate results and perform various geographic analyses even in complex situations [Muthusamy, Ramalingam, 2003]”.

The growing population of Tashkent is exerting significant pressure on the city's infrastructure systems, particularly in the areas of transportation, healthcare, education, and communal services. This process demands proactive measures from city administration and local authorities to construct new infrastructure facilities, expand existing networks, and modernize them. However, in many districts, the pace of infrastructure development does not fully align with population growth, leading to a decline in service quality and challenges in adequately meeting the social needs of residents in certain areas.

¹ Web resource: <https://stat.uz/en/statistics/demography> (accessed 07.07.2025)

² Web resource: <https://www.gazeta.uz/oz/2024/07/18/new-tashkent/> (accessed 07.07.2025)

Since the 1960s, the population of some cities has grown at a very high rate: 24 times in Navoi, 11.5 times in Karshi, and 10 times in Jizzakh. The Tashkent, Angren, Margilan, Samarkand, and Chirchik cities almost doubled [Tashtaeva, Yakubov, 2020].

“Due to the growing population within the capital city, there was an increase in the demand for residential buildings, which caused the government to permit numerous construction projects around the capital. This increase within the construction industry provided more job opportunities for the country and further caused a large migration into the capital city... The average house price between 2016 and 2023 in Tashkent increased, which further strengthened the economy for the people already living there” [Shakhlo, 2022].

“The results suggest that locational characteristics are relatively more important than intrinsic characteristics. This study finds that proximity to the city center and access to subway stations significantly increase housing values. The results, therefore, call for an integrated approach to city planning” [Ozsoy, Ahunov, 2023].

“The Tashkent economic region accounts for one-fifth of Uzbekistan’s population and one-quarter of its gross domestic product. Key factors and conditions — such as the availability of raw materials, energy, and consumers — have positioned the Tashkent Region as a hub for industrial sectors, particularly energy and non-ferrous metallurgy. The Tashkent economic region is the most developed area in Uzbekistan, with its industrial sector holding a leading position. In 2019, a total of 126 355 enterprises and organizations operated in this economic region, of which 84 072 were located in Tashkent City. Industrial enterprises constitute 18.1 % of the total, with 64.7 % concentrated in Tashkent City. Within the sectoral composition of industrial production in Tashkent City, the food industry leads (16.3 %), followed by chemical, petrochemical, and gas-chemical industries (13.1 %). The share of other sectors is below 10 %” [Nazarov et al., 2021].

The development of transport infrastructure — particularly the improvement of components such as the metro, bus, and road networks — has a positive impact on Tashkent’s economic dynamics and will remain a critical factor in the sustainable growth of the city’s spatial framework in the future.

In 1930, the city of Tashkent became the capital city, making it an important transport hub in the region. Due to its convenient economic and geographical position, the city has grown rapidly functionally, territorially, and demographically, its area has increased by 4.4 times, and its population by 11.1 times in the last 100 years (Table 1). The borders of the city are expanded in the south, northeast, northwest, and east directions and are entering the rural districts of Qibray, Zangiota, Tashkent, and Ortachirchik. The area of the city has been expanding from year to year and is currently equal to 441 km² [Madrimov et al., 2024].

“The results of the study show that metropolitan transport is an important component of the effective development of urban infrastructure and modernization of the transport system in the context of urbanization. The Tashkent metro directly affects the city’s economy, increases the mobility of the workforce, ensures environmental sustainability, and serves to reduce congestion in the urban road transport system. The analysis shows that the demand for the city’s population and public transport is increasing. During 2016–2021, the permanent population of Tashkent increased from 2.4 million to 2.7 million, which requires further development of the passenger transport system. By creating an integrated public transport system in Tashkent and providing the metro with digital management tools, it is possible to increase the efficiency of passenger service. The main advantages of the metropolitan transport system are: reducing traffic congestion in the city center; transportation of passengers with high comfort and safety; reducing air pollution as an environmentally friendly means of transport; increasing the socio-economic activity of the population and creating new jobs” [Norkulov, 2025].

During the current period of fundamental reforms in the social and economic spheres, with the improvement of the city’s functional structure, its transformation into a business center, and

the attraction of foreign investments, great work is being done in the construction of large social facilities and housing in Tashkent. The change of the territory of the city of Tashkent is influenced by economic, social, and ecological factors, and as a result of the growth of the population, the organization of the industries that form the city, and the fulfillment of the function of the capital, the expansion of the center is taking place at the expense of the surrounding agricultural regions [Islomov, Abdalova, 2023].

Tashkent's significance as a political and scientific hub holds a distinctive place in Uzbekistan's development processes. The city serves not only as the nation's capital but also as the epicenter of political, economic, and social life, where all major state decisions are made. Government institutions located in Tashkent, including the Presidential Administration, the Oliy Majlis (Parliament), and other state agencies, oversee the country's political activities. Furthermore, the higher education institutions, research institutes, and centers based in Tashkent play a crucial role in enhancing the nation's scientific capacity. The city occupies a central position in the fields of science, technology, and innovation, contributing to the country's competitiveness through the development of these sectors.

People are moving to the city not only from the regions, but also from Kazakhstan, Tajikistan, and Russia. Relatively cheap housing in Bektemir, Sergeli, and Yangihayat, which are the suburbs of the city, as well as houses with private courtyards around the city, are increasingly attracting them, and suburbanization processes are accelerating. Luxury buildings are rising inside and outside the city, and new features such as the emergence of unique "elite" districts are taking place [Madrimov et al., 2024].

"Several strategic and economic reasons underline why Tashkent hopes to play an increasingly essential role as a transport hub in Central Asia. To begin with, Uzbekistan wants to use the existing opportunity to open new trade routes, create an alternative corridor to traditional Russian-Kazakhstan routes, and attract international companies from, among others, China and the European Union. Additionally, Mirziyoyev aims to securitize the country by way of becoming a regional transportation corridor for the great powers... All three of these routes bypass Kazakhstan, thus elevating Uzbekistan's role as a regional transit hub. In addition, the new routes reflect the growing interest of Chinese companies to use and invest in Uzbekistan for improved East-West rail trade" [Yunis, 2022].

Urbanization is a complex socio-economic process that encompasses multiple dimensions and manifests differently across countries. In Tashkent, urbanization processes are driven by structural changes, territorial expansion, and internal migration. The city's division into functional zones is influenced by factors such as population density, the location of industrial and commercial centers, and the balance between residential and employment areas. These processes play a significant role in Tashkent's economic and social development¹.

The development of Tashkent's urbanization processes contributes to strengthening regional integration. As one of the largest cities in the region, Tashkent has emerged as a key center for governance and planning in these processes. Projects implemented in the city and its surrounding areas, including the construction of new industrial and infrastructure facilities, position Tashkent to play a central role not only within Uzbekistan but also as a hub for economic and social connectivity across Central Asia.

This study analyzes the economic-geographic foundations of urbanization processes and housing infrastructure in Tashkent. The research methodology incorporates several scientific and applied approaches, primarily based on statistical analysis, cartographic modeling, Geographic Information Systems (GIS) technologies, and case study methods. "GIS has been used to analyze

¹ Web resource: <https://lex.uz/docs/-4154818> (accessed 07.07.2025)

the spatial distribution of population, land use, and transportation infrastructure to support urban planning and emergency management” [Abdurakhmonov et al., 2023].

Statistical analysis is a fundamental method for examining urbanization processes, population density, migration flows, and other socio-economic indicators. This approach involves the collection and analysis of data, including population size, housing shortages, industrial and construction sector metrics, and urban infrastructure characteristics. These datasets are used to identify interrelationships and assess the dynamics of urban development. The primary advantage of statistical analysis lies in its capacity to systematically process large volumes of data using advanced statistical techniques, enabling a structured evaluation of urban trends. Furthermore, statistical methods facilitate the identification and forecasting of the socio-economic impacts of urbanization, providing valuable insights for urban planning and policy-making [Batty, 2013].

Cartographic modeling, utilizing maps and diagrams, was employed to create a visual representation of urbanization processes. This method enabled a precise depiction of Tashkent’s urbanization levels, territorial distribution, locations of industrial and commercial centers, growth of housing infrastructure, and other critical factors. Additionally, cartographic modeling facilitates the representation of various social and economic processes within a territorial context. The application of this method effectively illustrates the spatial impacts of urbanization processes on Tashkent’s urban landscape [Kraak, Ormeling, 2021].

The case study analysis was utilized to thoroughly investigate the urbanization processes and housing infrastructure challenges in Tashkent. This method facilitated an in-depth examination of the unique characteristics of urbanization initiatives across various districts of the city. Case studies helped identify changes in specific urban areas or sectors and the factors influencing these transformations. This approach provided a comprehensive understanding of how urbanization and housing construction are implemented in real-world conditions, as well as their social and economic impacts.

Qualitative methods, including interviews, surveys, and the collection of expert opinions, were employed to explore the attitudes of Tashkent’s residents toward urbanization processes and their demands for changes in housing infrastructure. Through interviews and surveys conducted with urban residents and specialists, detailed insights were gathered regarding the state of Tashkent’s housing market and the impacts of urbanization on urban infrastructure. The primary strength of qualitative methods lies in their ability to provide a comprehensive understanding of social, economic, and cultural processes, enabling a deeper exploration of complex urban issues [Creswell, Poth, 2018].

The source supports the paragraph’s emphasis on using interviews, surveys, and expert opinions to understand residents’ attitudes and infrastructure demands in Tashkent. It highlights the value of qualitative methods in capturing the social, economic, and cultural dimensions of urbanization.

RESEARCH RESULTS AND DISCUSSION

As the economic, political, and cultural hub of Uzbekistan, Tashkent holds a significant position in Central Asia, exemplifying the acceleration of urbanization processes. This analysis examines the demographic dynamics of the city from 2010 to 2024, focusing on key indicators such as population size, birth rates, mortality rates, migration, and the overall population growth coefficient¹.

¹ Stat. Committee of Uzbekistan, 2025

Table 1. Demographic indicators of the city of Tashkent from 2015 to 2024

Year	Population of the city of Tashkent	Birth rate	Mortality Rate	Immigrants	Emigrants	Urban population growth	Population growth rate (%)
2015	2 371 300	42 802	16 346	12 561	17 110	2 393 207	0.9
2016	2 393 200	43 879	16 517	17 983	14 375	2 424 170	1.3
2017	2 424 100	43 152	16 361	24 562	10 564	2 464 889	1.7
2018	2 464 900	45 548	15 745	25 473	10 240	2 509 936	1.8
2019	2 509 900	50 258	15 482	34 682	7 786	2 571 572	2.5
2020	2 571 700	54 401	21 199	77 971	6 330	2 676 543	4.1
2021	2 694 400	63 034	18 892	111 919	73 660	2 776 801	3.1
2022	2 860 600	74 036	16 471	99 064	62 665	2 954 564	3.3
2023	2 956 400	75 017	15 616	94 542	69 541	3 040 802	2.9
2024	3 040 800	68 153	16 720	92 145	71 616	3 112 762	2.4

Source: Compiled by the researcher based on data from the State Statistics Committee of the Republic of Uzbekistan¹

According to the table data, the population of Tashkent city increased from 2 371 300 in 2015 to 3 040 800 in 2024, recording an approximate growth of 28.2 % over nine years. The annual average growth rate between 2015 and 2024 varied from 0.9 % to 4.1 %, with an average of 2.3 %. “Tashkent’s population grew at an average annual rate of 2.3 % from 2015 to 2024, outpacing other Central Asian capitals. Almaty recorded an average growth rate of approximately 1.5 %, while Astana’s growth averaged around 2 %, driven by migration and urbanization. Tashkent’s higher rate reflects robust natural increase (75 017 births in 2023) and net migration (25 001 in 2023). Central Asia’s youthful demographic and increasing urban concentration amplify these trends, with Tashkent leading in absolute population growth” [Turemuratov et al., 2024].

The highest growth rate was observed in 2020 (4.1 %), driven significantly by a sharp increase in migration flows (77 971 individuals relocated) and a rise in births (54 401). This trend is associated with economic reforms and the acceleration of urbanization processes in Uzbekistan [Abdurakhmonova et al., 2020].

Natural growth (the difference between births and deaths) has significantly contributed to the overall population increase. Between 2015 and 2024, the number of births rose from 42 802 to 75 017 (peaking in 2023), followed by a slight decline in 2024 (68 153). The number of deaths remained relatively stable at approximately 16 000–18 000 annually, with a notable increase in 2020 (21 199) due to the impact of the pandemic. The average annual contribution of natural growth is estimated at 30 000–50 000 individuals, accounting for 40–50 % of the total population growth.

This indicator is explained by Uzbekistan’s high birth rate (20–25 births per 1 000 people) and the predominance of a young population. Tashkent’s natural growth rates are comparable to those of cities in other developing countries, such as Dushanbe or Bishkek [Howell, Tikunov, 2022].

According to the table, migration has significantly influenced population growth. Between 2015 and 2024, the number of in-migrants increased from 12 561 to 111 919 (peaking in 2021), while the number of out-migrants fluctuated between approximately 10 000 and 70 000. Net migration (in-migrants minus out-migrants) was highest between 2020 and 2022, averaging

¹ Web resource: <https://www.stat.uz/uz/rasmiy-statistika/demography-2> (accessed 07.07.2025)

30 000–50 000 individuals. This underscores Tashkent, Uzbekistan’s economic and cultural capital, is a major hub for internal migration, driven by its abundant economic opportunities, prestigious educational institutions, and advanced healthcare facilities. In 2021, the city attracted 111 919 internal migrants, reflecting its appeal as a center for employment, higher education, and medical services. Kakhkharov and others highlight Uzbekistan’s urban migration trends, noting Tashkent’s role as a focal point for socioeconomic opportunities. These factors underscore Tashkent’s dominance in attracting rural-to-urban migrants, supported by its robust infrastructure and services [Kakhkharov et al., 2021].

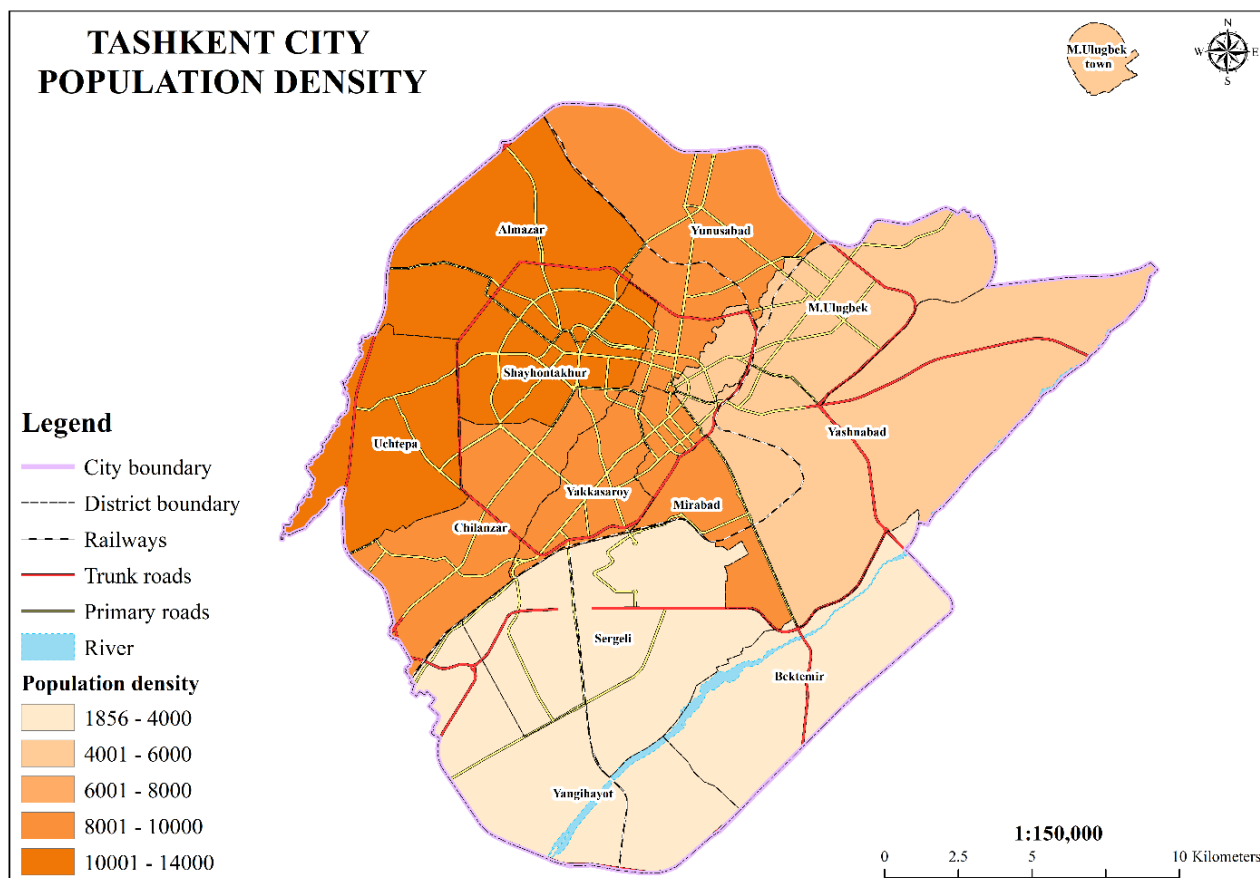


Fig. 1. Population density of Tashkent City

The sharp increase in migration flows in 2021 (111 919 individuals) may be attributed to the expansion of city boundaries (incorporating Zangiota and Yuqorichirchiq districts) and the establishment of new economic zones. However, migration data does not clearly distinguish the impact of these administrative changes.

The construction of new residential complexes in districts like Yashnabad, Yangihayot, and Sergeli (Table 2) has partially addressed housing needs. However, as shown in Table 2, these peripheral districts exhibit lower housing renewal rates (30–45 %) and weaker infrastructure (e. g., “Developing” in Yangihayot, “Weak” in Sergeli) compared to central districts like Shaykhontohur and Yakkasaroy, underscoring the need for synchronized infrastructure development.

Table 2 illustrates the disparities in population density and infrastructure status across Tashkent’s districts, with central areas like Shaykhantakhur (13 524.72 people/km², Excellent infrastructure) and Yakkasaroy (9 382.85 people/km², Excellent infrastructure) facing overload, as

evidenced by a 15 % increase in water and electricity disruptions in 2023¹. Conversely, peripheral districts such as Yangihayot (3 949.29 people/km², developing infrastructure), Sergeli (3 230.07 people/km², Weak infrastructure), and Bektemir (1 855.59 people/km², Outdated infrastructure) highlight underdevelopment, necessitating targeted urban planning interventions.

Table 2. Urbanization and infrastructure development levels by districts in Tashkent City, 2023

No.	District Name	Population density (people/km ²)	Living space (m ² /person)	Housing renewal (%)	Infrastructure status
1	Shaykhantakhur	13 524.72	20	65	Excellent
2	Olmazor	11 960.59	17	50	Average
3	Uchtepa	10 662.59	16	45	Average/Outdated
4	Yakkasaroy	9 382.848	19	70	Excellent
5	Mirabod	9 206.705	18	58	Average/Well
6	Yunusobod	9 158.941	18	60	Well
7	Chilonzor	9 004.618	17	55	Average
8	Mirzo Ulugbek	5 576.071	18	60	Well
9	Yashnabod	5 097.515	15	45	Average
10	Yangihayot	3 949.292	14	30	Developing
11	Sergei	3 230.072	15	40	Weak
12	Bektemir	1 855.585	14	35	Outdated/Partially available

Source: Compiled by the researcher based on data from the State Statistics Committee of the Republic of Uzbekistan²

Rapid population growth and insufficient infrastructure development are causing several negative consequences:

1. Housing Shortage. Despite the construction of new residential complexes, housing prices increased by an average of 40 % between 2018 and 2023, limiting housing opportunities for lower-income populations.
2. Quality of Communal Services. The obsolescence of water supply and sewage systems reduces service quality in new districts.
3. Transportation Problems. Overcrowding in public transportation and traffic congestion in road networks negatively affect the quality of life for city residents.
4. Social Services. The number of schools, hospitals, and kindergartens has not increased in proportion to population growth, making access to education and healthcare services more difficult.

Tashkent's demographic growth (28.2 % from 2015 to 2024) is exerting considerable pressure on the housing sector and urban infrastructure. Although the construction of new residential complexes and the expansion of communal systems have partially met demand, issues in water supply, electricity, public transportation, and social services pose a threat to the sustainability of urban development. Addressing these problems requires modern urban planning approaches, infrastructure modernization, and sustainable development strategies.

¹ Web resource: <https://www.newtashkent.uz/en/news/authority-elon/yangi-toshkent-shahrining-infratuzilmasini-rivojlantirish-va-zamonaviy-qurilish-texnologiyalarini-qollash> (accessed 07.07.2025)

² Web resource: <https://www.stat.uz/uz/rasmiy-statistika/demography-2> (accessed 07.07.2025)

Future research is recommended to focus on the following directions:

1. In-depth study of the impact of housing shortages on social groups (e. g., low-income populations).
2. Evaluation of the effectiveness of infrastructure modernization projects.
3. Analysis of the impact of migration flows on housing and communal services using precise quantitative data.

The 2018 city-wide housing provision rate of 19 m²/person (Table 2) masks significant district-level disparities, with central districts like Shaykhantakhur (20 m²/person) and Yakkasaroy (19 m²/person) exceeding the average, while peripheral districts like Yangihayot (14 m²/person) and Bektemir (14 m²/person) lag. The projected increase to 21.7 m²/person by 2041 underscores the urgency of accelerating housing construction and infrastructure development to address these gaps¹.

Rising prices have exacerbated social inequality, making it increasingly difficult for lower-income populations to purchase or rent housing. This situation has led to an increase in the number of residents living in rented accommodations and a growing segment of the population without adequate housing. In particular, it has caused excessive strain on transportation, water supply, electricity, and social services (schools, kindergartens). For example, “the Tashkent Metro’s passenger transport volume increased by 16.1 % in 2023 compared to 2022” [State Statistics Committee of Uzbekistan, 2024], resulting in greater congestion and delays during morning and evening hours.

Challenges are also evident in social infrastructure. In 2023, shortages of school and kindergarten places in Tashkent increased by 10–15 %, driven by migration flows and rapid population growth. This situation negatively impacts residents’ quality of life and may intensify social discontent.

“As a result of migration flows, newly arrived populations are primarily settling in peripheral districts (e. g., Sergeli, Yangihayot), which exacerbates economic and social disparities between central and peripheral areas. Infrastructure in peripheral districts (water supply, road networks, social services) is developing more slowly compared to central areas, contributing to uneven urban spatial development” [Murodov, 2022].

This trend exacerbates imbalances in urban planning, leading to service shortages in peripheral areas. As a result, residents’ quality of life varies across districts, further intensifying social inequality.

GIS plays a crucial role in assessing and mitigating natural hazard risks by enabling accurate mapping, analysis, and planning. City planners can leverage GIS to identify vulnerable areas, develop evacuation plans, and improve disaster preparedness, ultimately fostering greater resilience in the face of natural disasters [Phyllis et al., 2024].

Geographic Information System (GIS) analyses indicate that construction activities frequently deviate from urban plans, occurring in ecologically vulnerable areas, such as lowlands, flood-prone zones, or areas with unstable soil conditions. These practices pose risks not only to infrastructure but also to the environment and residents’ health. Additionally, the inadequate development of transportation infrastructure, including difficulties in accessing the city center from new residential complexes, traffic congestion, and insufficient bus routes, adversely affects residents’ daily lives.

These challenges highlight that urbanization processes require not only housing construction but also comprehensive infrastructure planning. GIS-based monitoring serves as a critical tool in identifying practical measures, supporting planning, and facilitating urban management.

¹ Web resource: <https://mc.uz/oz> (accessed 07.07.2025)

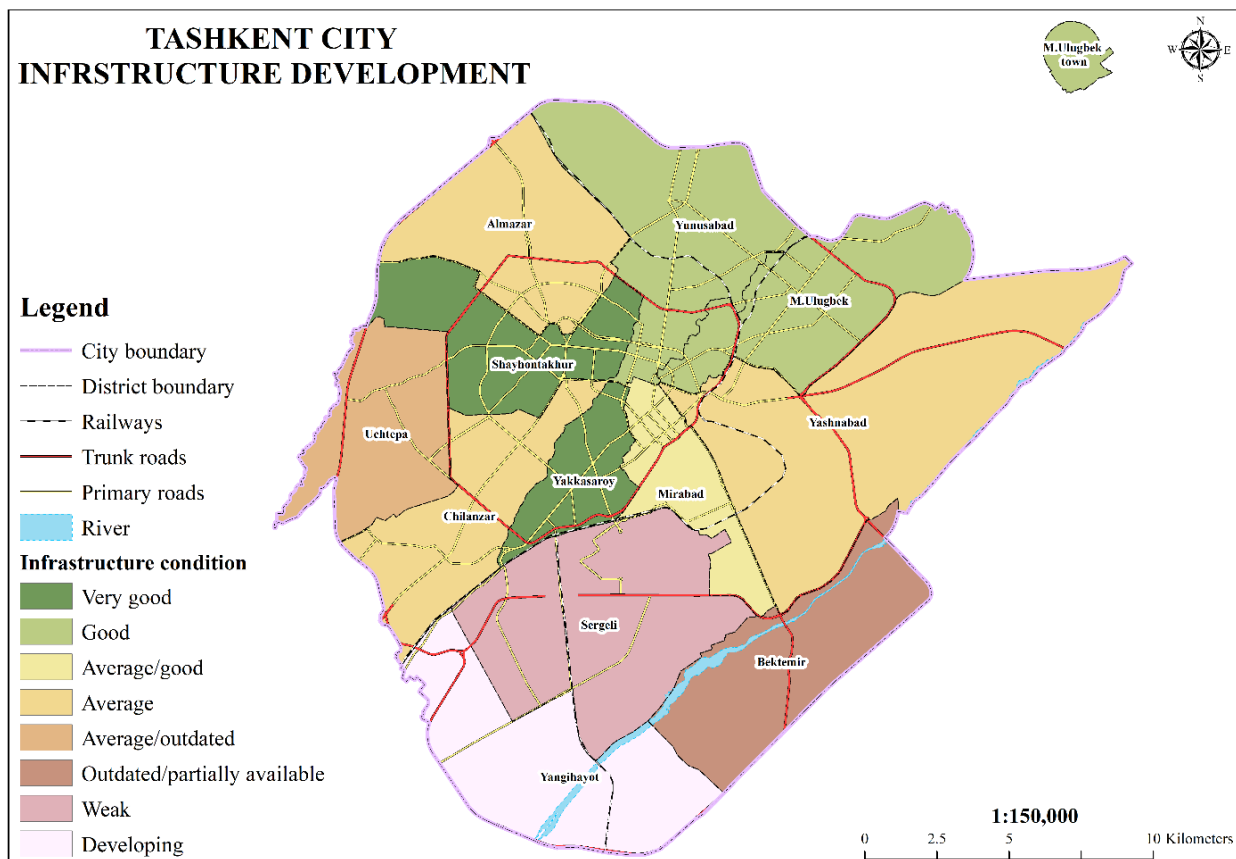


Fig. 2. Distribution of Tashkent City infrastructure facilities by districts

In particular, the districts of Shayxontohur, Yakkasaroy, and Yunusobod stand out due to their proximity to the city center, historically high development rates, and significant investment inflows, which have fostered advanced infrastructure and the implementation of extensive urban projects. These districts exhibit high rates of housing stock renewal, a substantial proportion of residents in multi-story buildings, and robust provision of transportation and social services (education, healthcare, retail, and recreation). The level of infrastructure provision for residents is elevated, contributing to a relatively stable quality of life.

In contrast, the districts of Sergeli, Bektemir, and Yangiayot serve as emerging growth centers on the periphery of Tashkent’s urbanization processes. Although construction has been rapidly advancing in these districts in recent years, the existing social infrastructure — schools, kindergartens, polyclinics, and public transportation systems — remains insufficient to fully meet the growing needs of the population. GIS maps designate these areas as “zones of infrastructure scarcity”. For example:

1. Yangiayot, a relatively newly established district, is still in the early stages of urban planning. In new residential complexes, electricity, water, and sewage networks lack fully integrated systems.
2. In Sergeli, population density has increased rapidly, but public transportation and road infrastructure have not expanded at a commensurate pace.
3. Bektemir is often adjacent to industrial zones, resulting in lower living comfort and relatively high environmental pressure.

Statistical indicators corroborate these observations: while per capita living space in Shayxontohur and Yunusobod ranges from 18–21 m², in Yangiayot and Sergeli, it is between 14–

16 m². Additionally, the number and capacity of social facilities in these peripheral districts are significantly lower compared to central districts.

These regional disparities highlight the urgent need to establish a unified, comprehensive, and strategic urban planning system in Tashkent. Revising urban development policies, strengthening infrastructure in peripheral districts, and ensuring sustainable, balanced urbanization are among the most pressing priorities. Cartographic modeling, particularly through GIS technologies, currently serves as one of the most effective tools, enabling more precise identification of development challenges and visual representation of regional differences.

Comparative analysis and challenges. The results of the conducted research elucidate the complex interplay between urbanization and housing infrastructure, while also being compared with existing scientific literature. The urbanization process in Tashkent is characterized by a population density increase that outpaces the development of infrastructure (water, electricity, transport). This situation is associated with “infrastructure scarcity”, whereby resource shortages intensify as population density grows.

This study analyzes the consequences of urbanization processes in demographic and social domains. In Tashkent, the rapid population growth resulting from urbanization highlights a lack of coordination with housing infrastructure. This imbalance manifests in the following areas:

1. The construction of new residential complexes does not align with the capacity of existing infrastructure (water, sewage, and electricity networks).
2. The settlement of populations in the city’s peripheral areas has accelerated, but the provision of social services lags.
3. The sharp rise in real estate market prices fails to fully meet the population’s housing needs.

Thus, complementing the issue of ecological pressure highlighted in this study, the disruption of the balance between the housing sector and demographic growth emerges as a new challenge. This necessitates an approach in urban planning and strategic management processes grounded in the principles of sustainable development.

Specifically, the following should be considered key priorities in urban development policy:

- aligning infrastructure development with the pace of demographic growth;
- incorporating ecological and social sustainability criteria into construction projects;
- maintaining a balance between central and peripheral areas by regulating migration flows;
- utilizing “smart planning” technologies in housing construction.

In this manner, the study builds on existing scientific literature while offering a novel perspective, emphasizing the need for systemic coordination between demographic pressure and infrastructure, thereby contributing to the development of practical solutions for urban planning.

Recommendations and future directions. Effective management of urbanization processes in Tashkent should not solely focus on increasing construction volumes but requires a comprehensive approach that considers territorial balance, population density, and infrastructure capacity. Currently, some districts experience high population density and excessive strain on infrastructure systems, while others have underutilized spaces and insufficiently developed infrastructure. To address this imbalance, the following strategic approaches are recommended:

1. **District-specific territorial development strategies**.** Tailored territorial development strategies for each district are essential, and grounded in the needs of the population, demographic forecasts, and infrastructure capacities.

Practical Measures

- Use of GIS technologies. Geographic Information Systems (GIS) should be employed to map population density, transport flows, and infrastructure needs accurately.
 - Demographic forecasts. Long-term planning documents based on population growth rates and migration flows should be developed.
 - Alignment with social provision. Planning processes must account for the adequacy of social facilities such as schools, kindergartens, and healthcare institutions.
2. **Ecologically and socially sustainable construction projects**.** New residential complexes must be environmentally sustainable, minimizing harm to the environment, while also enhancing the quality of life for residents from a social perspective.
Ecological technologies. Energy-efficient materials and low-carbon technologies should be utilized in construction.
Practical Measures
- **Green spaces and social facilities.** New complexes should include nearby green zones, playgrounds, schools, kindergartens, and clinics.
 - **Social responsibility.** Construction companies must adhere to principles of social responsibility, considering the interests of local communities.
3. **Synchronized infrastructure development.** The growth in population density and the construction of new residential complexes increase the load on infrastructure systems such as water supply, electricity, sewage, internet, and waste management. Currently, new districts like Yangihayot lack adequately developed services.
Synchronized planning of infrastructure systems with new construction projects is critical for ensuring residents' quality of life.
Practical Measures:
- **Preemptive planning.** Water, electricity, and sewage systems should be designed and constructed in new areas before building begins.
 - **Transport infrastructure.** Bus routes, roads, and metro station access must be expanded concurrently with new developments.
 - **Public-Private Partnerships (PPP).** The public-private partnership model is an effective approach for financing infrastructure projects.
4. **Regulation of internal migration.** The high volume of internal migration to Tashkent reflects insufficient socio-economic opportunities in other regions. This migration exerts excessive pressure on the city's infrastructure.
Practical Measures:
- **Establishment of economic centers in regions.** Large industrial zones, service sectors, and educational centers should be developed in regional areas.
 - **Job creation and housing loans.** Creating jobs, offering affordable housing loans, and supporting startup projects can enable residents to remain in their regions sustainably.
 - **Urban development in regional centers.** Expanding urban development projects in regional centers like Andijan, Namangan, and Samarkand can reduce pressure on Tashkent.

These recommendations aim to sustainably manage urbanization processes in Tashkent and address infrastructure challenges. Strategies focused on spatial planning, ecological sustainability, synchronized infrastructure development, and migration regulation will enhance the quality of life for the city's residents. Grounded in official statistics, scientific research, and international best practices, these approaches provide a robust foundation for Tashkent's long-term development.

CONCLUSIONS

This study revealed that urbanization processes in Tashkent have significantly intensified in recent years, leading to substantial changes in the urban landscape while exerting considerable pressure on infrastructure systems. Demographic growth (28.2 % from 2015 to 2024, increasing from 2 371 300 to 3 040 800 residents) and the acceleration of internal migration flows were identified as primary drivers of these changes. Utilizing statistical analysis, Geographic Information Systems (GIS) technologies, and cartographic modeling, the study uncovered systemic challenges in urban spatial development and emphasized the need for strategic approaches to address them.

The analyses demonstrate that urbanization and demographic growth act as mutually reinforcing factors, placing excessive strain on urban infrastructure, particularly housing, water supply, transportation, and social services systems. The development of housing infrastructure has not kept pace with demographic growth rates, with new construction often neglecting existing communal capacities. Consequently, issues such as low water pressure, outdated sewage networks, and insufficient public transportation are prevalent, especially in peripheral districts like Yangihayot and Bektemir. Rising real estate prices have further exacerbated social inequalities.

Inter-district disparities in development represent a key finding of the study. Central districts (Shaykhontohur, Yakkasaray, Yunusobod) are significantly more advanced in terms of infrastructure and social services, whereas districts like Sergeli, Yashnabod, and Yangihayot lag. GIS-based mapping vividly illustrated this imbalance, highlighting disparities in urban planning. Compared to existing scientific literature, the study identifies the imbalance between housing infrastructure and demographic growth as a novel challenge, complementing the previously emphasized issue of ecological pressure as a significant barrier.

The necessity of a comprehensive approach to managing urbanization was established. Urban development policies should not focus solely on construction volumes but must be grounded in infrastructure capacity, ecological sustainability, social equity, and inter-district balance. The following key points are highlighted as conclusions:

1. While urbanization offers significant opportunities, mismanagement can lead to infrastructure crises, ecological imbalances, and social conflicts.
2. Sustainable development in Tashkent requires GIS-based monitoring, territorial planning documents, and infrastructure networks informed by demographic forecasts.
3. Balancing internal migration through the establishment of economic centers in other regions can alleviate pressure on Tashkent's infrastructure.
4. Long-term sustainability necessitates the development of an urban model that is environmentally safe, socially inclusive, and economically competitive.

In conclusion, this study provides a scientifically grounded analysis of Tashkent's urbanization processes, identifying key challenges in urban development and proposing strategic directions for their resolution. The findings hold significant theoretical and practical implications for urban planning and regional policy, with potential applicability to other cities in Central Asia and Uzbekistan.

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