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TERRITORIAL FEATURES OF THE FORMATION AND DEVELOPMENT OF URBAN AGGLOMERATIONS IN UZBEKISTAN (THE CASE OF THE ANDIJAN AGGLOMERATION)

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Abstract. The article analyzes the territorial features of the formation of urban agglomerations in Uzbekistan using the Andijan agglomeration as a case study. The study covers the territorial distribution of urban settlements, the hierarchy of the urban system, the criteria for agglomeration formation, the recognition of agglomeration cores in state programmes, and a comparative analysis with the Urgench agglomeration. It is substantiated that the agglomerations of Uzbekistan belong to the urban–rural type, and proposals on the management of agglomerations have been developed.

Keywords: urban agglomeration, core, satellite city, territorial urban system, level of urbanization, urban–rural agglomeration, urban network, urban potential, agglomeration criterion.

INTRODUCTION. The deepening of urbanization processes has become one of the main determinants of territorial development. Since the structural composition of national and regional economies is closely linked to the urban network and urban system, the urban agglomeration—a form of clustered location of cities of various functional types and sizes in one place, resulting from the concentration of productive forces—is the most dynamic link of the territorial urban system. International experience confirms that the agglomeration effect is an objective economic phenomenon governed by a universal regularity. According to J. Henderson's study, in 2000 the 38 largest cities of the European Union, while occupying only 0.6 percent of the total area, concentrated 25 percent of the population and approximately 30 percent of gross domestic product (GDP). In Japan, the Central Region, comprising five prefectures, concentrated 33 percent of the population and 42 percent of GDP on 5.2 percent of the territory. In the USA, in 1997, 53 percent of the population lived in the 40 largest cities (Zokirov, 2021). In G. Beyks's study of Hungarian enterprises for 1992–2003, it was noted that a twofold increase in city scale raised the productivity of the factors of production by 16 percent; this figure is twice as high as the results of S. Rosenthal and W. Strange [3].

The theoretical foundations of the study of agglomerations go back to central place theory (Christaller, 1933) and to views on the hierarchy of urban systems. The concept of "territorial urban structure" was introduced by I.M. Maergoiz. In the views of E.B. Alaev and G.M. Lappo, the directions of agglomeration formation "from the city" and "from the rayon" were distinguished. In Uzbekistan, the problem of agglomerations began to be studied specifically with S.K. Toshtayeva's research on the Tashkent agglomeration [8]. S.S. Zokirov developed a definition of urbanization at the national scale, the application of Zipf's law, the satellite cities programme, and a methodology for assessing urban potential [3]. Z.Q. Babajanova and N.J. Karieva analyzed the problems of the Urgench

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agglomeration [2]. Qayumov and Nizamov (2015) elucidated the role of the cities of the Zarafshan region in structural changes. However, within the analyzed sources, the Andijan agglomeration has not been taken as an independent and comprehensive object of research: it is merely mentioned among other cities in nationwide statistics or within the satellite cities programme. This scientific gap determines the relevance of the study.

The aim of the study is to identify the territorial features of the formation and development of urban agglomerations in Uzbekistan and to substantiate their significance for the Andijan agglomeration. To achieve this aim, the following tasks were set:

- to quantitatively assess the unevenness in the territorial distribution of urban settlements;
- to determine Andijan's place in the hierarchy of cities;
- to compare Andijan's position against the criteria of agglomeration formation;
- to periodize the stages of recognition of agglomeration cores in state policy;
- to identify general regularities and develop proposals on the basis of a comparative analysis with the Urgench agglomeration.

LITERATURE REVIEW AND METHODS. The research methodology combines five directions. First, a systematic analysis of scientific literature and regulatory-legal documents (Decree No. PF-5623, the "Roadmap" appended to it, and the resolutions of 2005, 2009 and 2016) was carried out. Second, regions, provinces and cities were compared using the comparative-geographical method. Third, a criterion-based (typological) assessment was conducted according to the five criteria of agglomeration formation given in the literature. Fourth, administrative-territorial reforms were periodized chronologically. Fifth, simple statistical calculations (shares, growth multiples, absolute and relative differences) were performed, and the results were visualized by means of charts.

The data sources used were secondary data based on official statistics [3, 2], educational literature on urban geography concerning the agglomeration criteria, and the data of the author's earlier research on the territorial composition of the Andijan agglomeration. The indicators given in the sources are presented unchanged, as they are; the author's own calculations are specifically marked in the text.

RESULTS. On the eve of independence, the republic had 123 cities and 104 urban-type settlements (227 urban settlements in total), and the level of urbanization was 40.8 percent. In 1992, 17 urban-type settlements emerged in various regions; in particular, in weakly urbanized Surkhandarya, the urban network expanded at once by five units (Angor, Dustlik, Sariq, Hurriyat and Elbayon). After the administrative-territorial reform of 2009, the number of urban settlements reached 1,199, of which 966 are newly established urban-type settlements (Figure 1). According to the author's calculation, this is 5.28 times the 1991 figure, and the new urban-type settlements account for 80.6 percent of all settlements. According to the forecast, over the next ten years the number of settlements is expected to increase from 1,187 to 1,428, i.e., by 241 (20.3 percent) [4].

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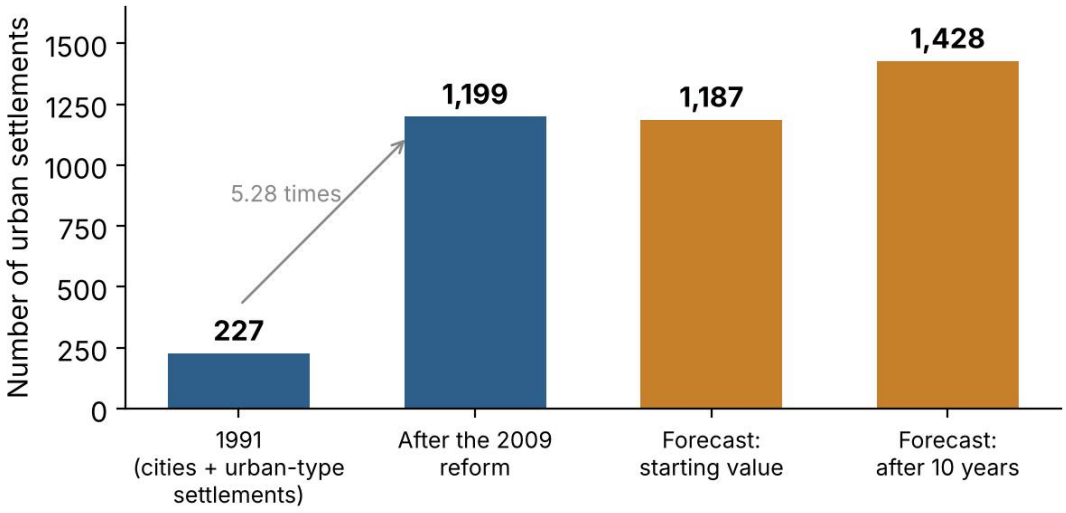


Figure 1. Dynamics and forecast of the number of urban settlements in Uzbekistan

Source: The diagram was compiled by the author based on the research results.

Urban settlements are unevenly distributed across regions. The largest number of settlements belongs to the Fergana region (423), which accounts for 35.1 percent of the republic's total. In the agro-industrial Lower Amudarya and Mirzachul regions, the urban network is weakly developed, and their shares are 8.2 and 6.8 percent, respectively (Figure 2a). According to the author's calculation, the share of the Fergana region is 4.3 times higher than that of Lower Amudarya and 5.2 times higher than that of Mirzachul. By level of urbanization, Namangan Province leads the republic; the share of urban population in Fergana (57.0 percent) and Andijan (52.4 percent) provinces is higher than the national average (50.6 percent in 2016), with differences of 6.4 and 1.8 percentage points, respectively (Figure 2b). In Khorezm, Surkhandarya, Samarkand and Bukhara provinces, this indicator is below the national average.

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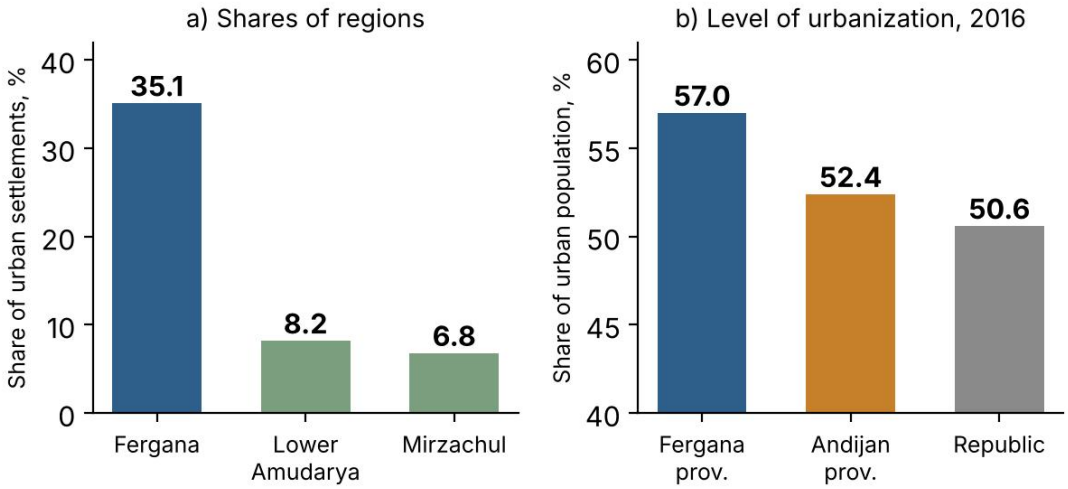


Figure 2. Regional distribution of urban settlements and the level of urbanization

Source: The diagram was compiled by the author based on the research results.

Small cities predominate in the chain of cities: in 2016, 1,091 small cities and urban-type settlements accounted for 90.1 percent of all urban settlements, and mid-tier cities for 1.6 percent; there were only 7 major cities (Samarkand, Namangan, Andijan, Karshi, Nukus, Bukhara, Fergana), and 11 large cities. In S.S. Zokirov's studies, the number of major cities with a population of 250,000 to 1 million has been raised to 8. It is precisely this group that accounts for a substantial share of the country's industrial output and consumer goods production. According to Zipf's law, in countries with a low level of development the share of the population of the largest city is relatively high, and this gap narrows with economic growth and the improvement of the system of urban location (Zipf, 1949). According to Zokirov's data, the difference in population among Tashkent (first), Namangan (second) and Samarkand (third) is narrowing, which indicates a hierarchical balancing of the republic's urban system, including the growing relative standing of regional centers such as Andijan.

The literature specifies five conditions for the formation of an agglomeration [9]. The results of comparing Andijan's situation against these criteria are presented in Table 1. Four of the five criteria are confirmed on the basis of the available sources, while the fifth (the share of satellite cities in the agglomeration population) requires a separate quantitative calculation.

Table 1

Criteria for agglomeration formation and the status of Andijan

Criterion	Status of Andijan	Assessment
1–2 major cities (core)	Among the 7 major cities; population exceeds 100,000	Met

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Criterion	Status of Andijan	Assessment
At least 2 cities and urban-type settlements in the vicinity	Asaka, Shahrikhan, Khojaobod	Met
Core–satellite distance of at most 2 hours	Andijan–Asaka road distance is 11 km	Met
Pendular (oscillatory) migration	35–40 thousand people per day	Met
Satellite cities account for at least 10 percent of the agglomeration population	A separate quantitative assessment is required	Verification required

Table: Compiled by the author based on the research results.

The comparative examples given in the source show the discriminating power of the criteria: although Jizzakh is a large city, there are few cities around it; Navoi is in almost the same situation; although there are cities such as Kitab and Yakkabag around Shahrisabz, Shahrisabz's capacity to form an agglomeration is low [9]. Thus, for an agglomeration, both the size of the central city and the density of the network of satellite settlements are decisive.

Within the framework of the programme for forming satellite cities, 12 satellite urban-type settlements adjacent to 7 major cities—Andijan, Bukhara, Samarkand, Karshi, Fergana, Namangan and Nukus—were selected [3]. In the "Programme for Developing Draft Master Plans of Prospective Settlements to Be Transformed into Satellite Cities in the Republic in 2020–2023," developed on the basis of the "Roadmap" appended to Decree No. PF-5623 (10 January 2019), Andijan is officially approved as a separate major center, and Shahrikhan (design scheduled for 2020) and Asaka (2021) as its satellite cities. The responsible executors are the Urbanization Agency, the Hokimiyat of Andijan Province, the Main Construction Department of Andijan Province, and the State Unitary Enterprises "UzShaharsozlikLITI" and "UzGASHKLITI." In addition, medium-term population growth forecasts have been prepared for the cities of Andijan, Bukhara, Navoi, Namangan, Nukus, Nurafshon and Samarkand on the basis of the methodological recommendations for developing the economic base of settlement master plans [5].

The agglomerations of Uzbekistan (Central Asia) have formed mainly in piedmont areas, in irrigated-farming locales, under conditions of weakly developed electric transport and surrounded by agricultural crops; in essence, they are not purely urban but urban–rural agglomerations (Human Geography). In the irrigated oases of the Fergana Valley, agglomerations have often formed on the basis of a previously existing dense network of rural settlements, in the "from the rayon" direction: the settlement with the most favorable economic-geographical position gradually became dominant and turned into a core. According to the demographic wave theory, in 2020–2030, 48.2 percent of urban

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population growth is expected to occur through natural increase, 14.1 percent through rural-to-urban migration, and 37.8 percent through rural areas acquiring urban status (Figure 3a; the total equals 100.1 percent owing to summation and rounding). According to the author's calculation, the contribution of natural increase is 3.4 times that of migration, and the contribution of status change is 2.7 times that of migration.

The population of the city of Urgench in 2019 was 190 thousand people (400 people per km²). The population of Khorezm Province rose from 1,066 thousand in 1991 to 1,601 thousand by 2011 (Figure 3b), i.e., it increased by 535 thousand people, or 50.2 percent (the author's calculation). The population of Urgench has increased sixfold over the last 70 years, while the city's territory has expanded fourfold. This expansion occurred mostly extensively at the expense of agricultural land, and almost no vacant land remains in the city [2]. On the basis of the source data, it is concluded that density increased approximately 1.5 times (6:4) (the author's calculation). The factors are divided into two groups: natural population growth and administrative-commercial centrality, and the population's demand for housing. Agglomeration has formed around the main industrial centers; 74 percent of the country's industrial output is generated in such areas, while the Urgench agglomeration specializes mainly in light industry [2].

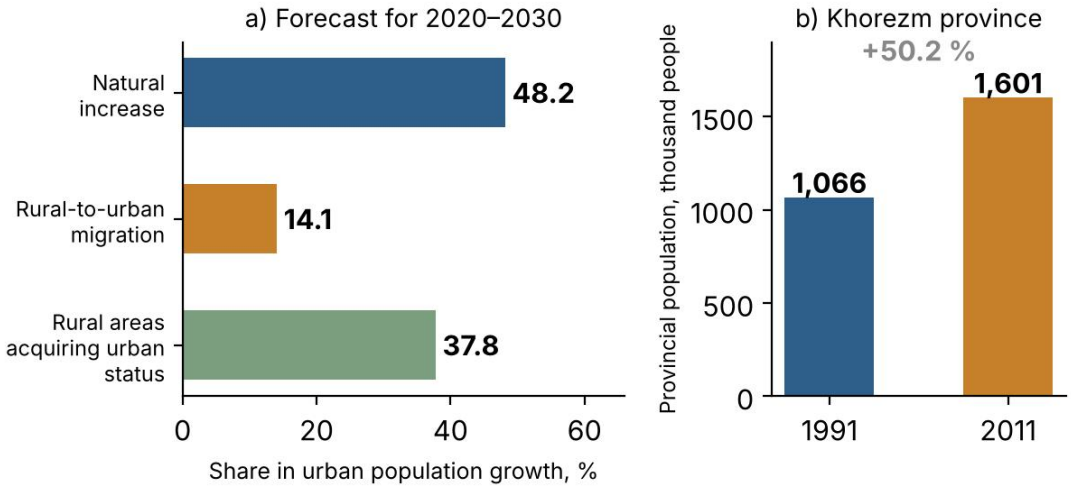


Figure 3. Sources of urban population growth (a) and population dynamics of Khorezm Province (b)

Source: Compiled by the author based on (Zokirov, 2021; Babajanova, Karieva, 2020).

DISCUSSION. The results obtained indicate the existence of the objective conditions necessary for the formation of the Andijan agglomeration: high urban potential, a major core, and a dense network of satellite settlements. At the same time, a unique form of population distribution has emerged in the Fergana Valley: in one source it is called the "FAN" (Fergana–Andijan–Namangan) megalopolis, named after the initial letters of the major cities, while in another it is described as the "FANOKh" (Fergana–Andijan–Namangan–Osh–Khujand) megapolis, that is, one that also

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encompasses the neighboring cities of Kyrgyzstan and Tajikistan [6]. The concept of the megalopolis was introduced into scientific circulation by J. Gottmann (Gottmann, 1957). The terminological diversity indicates that the phenomenon is still insufficiently studied and that there is no single criterion for delineating its boundaries. Since Andijan is noted as one of the main cores in both interpretations, it is simultaneously an independent monocentric agglomeration (local tier) and a "node" of the broader megapolis system (regional tier) (Figure 4).

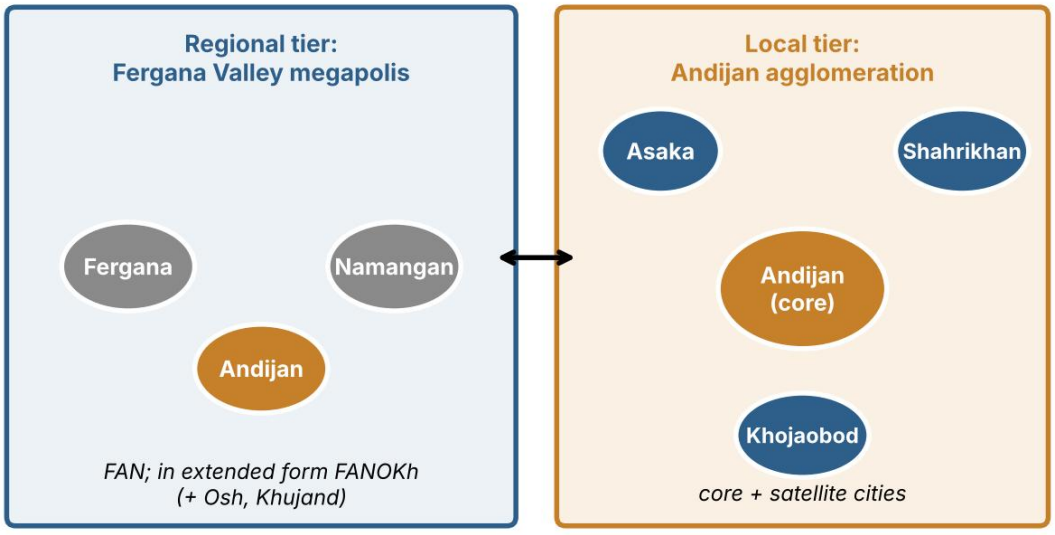


Figure 4. Position of the Andijan agglomeration in the two-tier system

Source: Compiled by the author based on the textbook Geography of Cities.

A comparison of the approaches of the existing works (Table 2) shows that they complement one another: the combination of the general theoretical approach tested on Tashkent, the republic-scale inventory-survey methodology, the problem-oriented analysis at the level of a provincial center, and the methodology for assessing regional potential creates a complete methodological basis for studying the Andijan agglomeration. Zokirov's methodology covers 43 indicators (11 general data, 6 employment and migration, 7 production infrastructure, 19 social infrastructure) and can therefore serve as a suitable model for the quantitative assessment of the potential of satellite settlements.

Table 2

Comparative analysis of research on the agglomerations of Uzbekistan

Author	Research object	Main contribution	Significance for Andijan

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Author	Research object	Main contribution	Significance for Andijan
Toshtayeva (2011)	Tashkent agglomeration	One of the first in-depth works devoted to the problem of agglomerations; theoretical-methodological approach	The general theoretical approach is adapted
Zokirov (2021)	National scale	Definition of urbanization; Zipf's law; the programme of 7 major cities and 12 satellite urban-type settlements; 43-indicator inventory survey	Model for assessing the potential of satellite settlements
Babajanova, Karieva (2020)	City of Urgench	Extensive expansion, limited land resources, infrastructure problems	Basis for comparative analysis
Qayumov, Nizamov (2015)	Zarafshan region	Large and major cities as centers of structural change	Methodology for assessing regional potential

Source: Compiled by the author based on the research results.

The chronology of administrative-territorial reforms defines the institutional basis for the official recognition and management of agglomeration processes. The periodization given in Table 3 makes it possible to distinguish between the objective economic-demographic foundation of the Andijan agglomeration, formed in the former Soviet Union era, and its official institutional recognition in the period of independence: although the agglomeration has already formed demographically and economically, its recognition at the management level and its purposeful development is a relatively new process of the last five to six years.

Table 3

Periods of administrative-territorial reforms and their impact on agglomeration processes

Stage	Period	Features and documents	Impact on agglomeration processes
I	1991–2000	The structure inherited from the former Soviet Union era remained almost unchanged; new urban-type settlements appeared in some regions (17 in 1992)	Agglomerations remained without official recognition

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Stage	Period	Features and documents	Impact on agglomeration processes
II	2000s	Market relations deepened; Resolution of 14 July 2005; Resolution of the Cabinet of Ministers of 13 March 2009 (1,199 settlements)	Informal, spontaneous processes around provincial centers; regulatory framework insufficient
III	2016 to the present	Resolution of 5 January 2016; PF-5623 of 2019, the "Roadmap," the satellite cities programme	Urbanization is managed on a scientific basis; Andijan is an officially recognized core

Source: Compiled by the author based on the research results.

That the current administrative boundaries may lag behind real processes is confirmed by the near-merger of the cities of Fergana and Margilan and the urban-type settlement of Toshloq: uniting this conurbation, whose total population has reached 526 thousand, under a single administrative management would allow rational use of communication systems and budget funds and would improve management efficiency [3]. A similar situation also applies to the Yangier–Khovos and Shahrisabz–Kitab agglomerations. According to the proposal on improving the criteria for granting status to cities and urban-type settlements, cities of republican subordination must have a population of more than one million, cities of provincial subordination at least seventy thousand, and urban-type settlements of district subordination at least twenty thousand [7]. These criteria are important in determining the future status of satellite settlements such as Asaka, Khojaobod and Shahrikhan.

The Urgench experience reveals the recurrent problems characteristic of the agglomerations of provincial centers: extensive expansion of the central city, mainly through individual housing construction; reduction of irrigated land; limited water resources; land salinization; transport and industrial waste; and insufficient establishment of sanitary protection zones between the center and the satellite cities [2]. These problems are also relevant for Andijan, since Andijan Province is characterized by high population density, limited land and water resources, and intensive irrigated agriculture. Moreover, the expectation that in 2020–2030 more than one-third (37.8 percent) of urban population growth will occur through rural areas acquiring urban status further strengthens the need to clearly distinguish administrative and functional criteria in determining the boundaries of an agglomeration. These results are limited by the analysis period and by the fact that the sources relate to different years; in subsequent stages, agglomerativeness indicators for the Andijan agglomeration should be calculated on the basis of data for a single time cross-section.

CONCLUSIONS AND PROPOSALS. The following conclusions were reached as a result of the study:

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First, the Fergana region leads the republic in the number of urban settlements (423, or 35.1 percent), and the level of urbanization in Andijan Province (52.4 percent) is above the national average (50.6 percent); this has ensured that agglomeration processes are more advanced in this region.

Second, Andijan is among the 7 major cities and meets four of the five criteria of agglomeration formation.

Third, it is officially recognized as the core in the programme based on Decree No. PF-5623, and Shahrikhan and Asaka as satellite cities.

Fourth, the agglomerations of Uzbekistan are of the urban–rural type and have formed mainly in the "from the rayon" direction. Fifth, Andijan is a structural component of a two-tier system—local (agglomeration) and regional (megapolis).

Proposals and recommendations:

- to consolidate the two-tier (local and regional) approach to the analysis of agglomerations in regulatory and methodological documents, and to clarify the concepts of "FAN/FANOKh" on the basis of unified criteria;
- to formalize the agglomeration criteria (core size, number of satellite settlements, distance, pendular migration, and the share of the population of satellite cities) with quantitative threshold values, and to carry out regular statistical monitoring of pendular migration;
- to assess the correspondence of administrative-territorial boundaries to real processes along the Andijan–Asaka–Khojaobod and Andijan–Shahrikhan directions on the basis of the Fergana–Margilan–Toshloq experience;
- to encourage the compact development of the core city through multi-storey construction rather than extensive expansion, and to form green-sanitary zones between the core and the satellite settlements;
- to develop the master plans of Asaka and Shahrikhan not separately but in a mutually coordinated manner at the scale of the agglomeration;
- to apply the 43-indicator inventory-survey methodology to all satellite settlements of the agglomeration;
- to develop a scenario forecasting model that takes into account the components of the demographic wave theory (natural increase, migration, status change).

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