The modern urban environment: development trends and prospects

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Abstract. The government has been paying attention to the issues of creation and implementation of comfortable physical, psychological and social conditions in the urban environment. In this regard, in order to increase competitive advantages and improve the sustainable development of urban areas, it is necessary to revise principles of city management, implement new approaches to the urban environment design, build new facilities, and develop programs for implementing advanced technologies. These goals can be achieved by moving into the existing spaces of "smart" cities. Innovative proposals and modern technologies are an integral part of any territorial development project. Smart cities operate at the intersection of digital technologies, breakthrough innovations and an urban environment, which should be a comfortable zone for work and life and a favorable place for implementing modern ideas. At the same time, innovative technologies implemented into the urban environment should not be a sign of scientific and technological progress. Their main purpose is to create territories with the sustainable use of existing opportunities and to focus on high quality public spaces interacting with citizens.

1. Introduction
Currently, the issue of a modern and comfortable urban environment is crucial. The importance is due to the fact that the growth of urban population is inevitable. According to the UN and the World Health Organization, by 2050 the share of urban residents will be 70%. [6]

It should be noted that the urban population growth is observed around the world. In 2018, the average share of urban population was 59.78%. Currently, in Europe, the urban population accounts for 74%. In other countries, this indicator is higher. For example, in France it is 80.44%, in Spain - 80.32%, in Belgium - 97 %, in the Netherlands and Great Britain - 90%. In Canada, the urban population accounts for 81.41%, in the USA - 82.26%, and in China - 59.15% of the total population. [1]

In the Russian Federation, over the past ten years, the share of urban population was 74%. According to the statistics for 2020, it is 74.7%. [11, 12, 13, 14] Moreover, Russia is characterized by the uneven concentration of the urban population. According to the statistics for January 1, 2019, there are 16 cities with a population of one million. Almost a quarter of the Russian population live in these cities.

A consequence of the high rates of urbanization is the overpopulation of cities, which negatively affects the living standards and decreases the level of comfort of each individual. Figure 1 presents generalized problems caused by the high level of urbanization.
Figure 1. Problems arising in cities due to the increasing number of urban population. [1]

At the same time, it should be noted that demographic changes are one of the factors affecting the world economy. The urbanization and economic growth depend on each other since no country has ever reached the level of average income per capita without a significant outflow of people to cities. [2]

The urbanization process maintains and stimulates the growth of the national economies and contributes to the development of living spaces. In addition, there is a sufficient number of problem areas in the economy in general and in the land relations and the urban planning and construction sectors in particular, especially under the coronavirus pandemic and Western sanctions. Moreover, the current standards for the maintenance of adjoining territories and urban public spaces are regularly violated despite the fact that the population's requirements for the urban environment are increasing. In order for cities to remain attractive, it is necessary to create and develop powerful and high-quality infrastructures, which will ensure the stable and long-term urban development. [3]

2. Materials and methods
As the number of urban population increases, the load on life-supporting systems (infrastructure, transport, ecology, social security) increases as well. In this regard, the prospects for cities should be fundamentally transformed. Quantitative indicators need to be restructured. The qualitative criteria are coming to the fore, allowing the creation of new cities, organically integrated into the existing ones.

A large number of foreign and Russian scientists are engaged in the problems of the urban environment and living standards in cities. At the same time, most studies on the urban living standards are based on the analysis of urban environment quality parameters. [7]

For example, the McKinsey Global Institute developed the Urban Prosperity Index to assess the urban environment quality. Comprehensive indicators were the criteria for the urban planning environment and the City Development Index (CDI) [4].

The "urban planning environment" criterion was assessed using the following indicators: population density, public transport intensity, public space greening and social infrastructures. The "social infrastructure" indicator was assessed on the basis of budget expenditures per capita.

The urban development index was assessed using the following indicators: gross urban product, health care and education quality, infrastructures and solid waste generation, etc. [5]

The European standards for assessing the degree of development of infrastructures and territories have been applied for a long time:
- ISO / TS 37151: 2015, "Smart community infrastructures - Principles and requirements for performance metrics";
- ISO 37120: 2018 Sustainable cities and communities - Indicators for city services and quality of life. This standard contains a system of indicators that are used to assess various areas of the urban
environment: economy, education, energy, ecology and climate, finance, management, healthcare, housing conditions (shelter), population and social conditions, recreation, safety, solid waste, sports and culture, telecommunications, transport, urban / local agriculture and food security, urban planning, waste water, water supply.

Figure 2 presents the main ISO indicators.

![Figure 2. The main ISO indicators.](image)

Like the European counties, the Russian Federation has adopted the National Standard GOST R ISO 37120-2015 “Sustainable Development of the Community. Indicators of urban services and quality of life”, which establishes a system of indicators that should allow cities to improve the quality of urban services. [6]

In general, the quality of the urban environment assessment contributes to the development of urban areas, since it is aimed at finding opportunities for developing long-term strategies and transforming the urban area by maximizing the involvement of available resources into the transformation process.

In modern Russia, there are no new cities. The existing ones have been developing due to the agglomerations and large cities that are former industrial centers. Therefore, it is important to develop the urban space in order to increase its competitiveness and the success of the city as a whole.

The Government has been paying attention to the problems of innovative urban and spatial development. On March 1, 2018, the President of the Russian Federation emphasized the need to rethink the process of urban development management. On February 20, 2019, the President emphasized the need for the innovative urban development and the role of complexity and environmental friendliness in the development of urban areas. Since 2019, the departmental urban space digitalization project "Smart City" has been implemented. It is aimed at boosting mobility, personification, visualization, socialization and modernization of urban infrastructures. [8, 9, 10]

3. Results
The "smart city" concept is aimed at streamlining the process of management of city flows and reducing the time to resolve arising problems and complex tasks.

Due to the technical interaction of smart city elements, the "smart home" technology will allow us to create a unified system aimed at increasing the level of comfort and safety in the urban environment.

According to experts, the most problematic urban areas are:
- housing and communal services;
- transport and road infrastructure;
- ecology;
- urban planning, etc.
To streamline the problem areas, it is necessary to develop and implement digital technologies. For example, promising systems are being implemented in the housing and communal system (energy efficiency, solid waste management, “smart home”, etc.), the traffic management system (“smart” cameras, unmanned vehicles), the eco-monitoring system, and the energy system (renewable energy sources, electric transport, etc.).

Figure 3 shows the blocks of urban elements, in relation to which it is necessary to implement the "smart city" system.

Figure 3. The Smart city development areas.

The implementation of the “Smart City” concept into the urban space is one of the elements of the system of sustainable development of the territory with the maximum involvement of all interested groups: citizens, government, business structures (Figure 4).

The competitiveness and success of a modern Russian city are determined by its ability to implement digital technologies to improve the living standards and develop the urban environment.

For example, smart city projects are developing in Russia:
- 40% are building automation projects;
- 33% are energy and heat supply digitalization projects;
- 32% are public safety monitoring projects;
- 27% are waste management projects. [15]
Figure 4. Results of "smart city" concept implementation into the urban environment.

Digital technologies can help to find scalable solutions to the local problems and provide synergies for the urban development. The digitalization will affect most areas and industries that are concentrated in urban and rural areas: housing and communal services, industries, transport, energy, communications, trade, healthcare, education, municipal management systems, etc.

4. Discussion
Today, city dwellers want to live in a comfortable environment. The paramount aspects are comfort and safety of life, time-saving and easy use of social and commercial services, healthy ecology and proximity to the working place.

The primary task of the government is to implement new concepts in the development of free and built-up urban areas. [16]

One should remember that for most urban areas, the densely built-up urban landscape creates difficulties. To understand how to make a territory more comfortable, it is necessary to pay more attention to innovative technologies, business models, architectural designs and new ways of thinking.

Undeveloped areas are attractive for large investors. It is easy to implement a strategy of a comfortable life trajectory in the form of high-quality and rational transport infrastructure, efficient public transport, "green zones", increased traffic interchanges, etc.

But the difficulties are due to the fact that the "smart city" system needs to be implemented into already existing construction facilities, given the large share of such facilities in the total volume of the construction fund. It is much easier and cheaper to integrate smart systems during the construction of buildings than to remodel the existing buildings using smart technologies.

5. Conclusion
The new urban development strategy should contribute to the creation and development of environmentally sustainable, socially inclusive, safe, economically productive, and comfortable urban areas.

In Russia, the demand for a comfortable urban environment is slowly increasing, which makes it possible to develop projects that contain modern urban planning concepts, car-free courtyards, a new type of landscaping and interesting planning solutions. They should link urban infrastructures and unified smart grids.

Thus, cities have become key elements in the space of human, transport, information, and legal flows. The main goal of cities is to increase the level of comfort of dwellers. To achieve this goal, it is necessary to create smart cities based on networked devices that generate and transmit data from a large number of devices in real time.

Growing demands of the population for comfort as a key qualitative factor are drivers of the process of implementation of information and communication, innovative, technological, architectural and urban planning technologies.

References
[1] Moreno E, Arimah B, Otieno Otieno R, Mbeche-Smith U, Klen-Amin A and Kamiya M 2016 Urbanization and development: Emerging Futures. World cities report (Kenya: United
[2] Annez P and Buckley R 2009 *Urbanization and Growth* (Washington: The International Bank for Reconstruction and Development) p 258

[3] Ilyina I 2015 *Property relations in the Russian Federation* 5 (164) pp 69-82

[4] Woetzel J, Remes J, Boland B and Lv K 2018 *Smart Cities: Digital Solutions for a More Livable Future* (McKinsey Center for Government) p 152

[5] Pélissié du Rausas M, Manyika J, Hazan E and Bughin J *Internet matters: The Net’s sweeping impact on growth, jobs, and prosperity* (McKinsey Global Institute) p 70

[6] Airaksinen M and Kokkala M 2015 *Smart City - Research Highlights* (Kuopio: Printed in Grano) p 140

[7] Yaskova N Yu 2018 Construction in the context of new views on the goals of economic development. *Proceedings of Universities. Investment. Construction. Real estate* 8 pp 133-142 DOI: 10.21285/2227-2917-2018-1-133-142

[8] Castells M 2000 *Information Age: Economy, Society and Culture* (Moscow: SU HSE) p 608

[9] Zaborova E 2014 *City Administration* (Yekaterinburg: Ural University) p 296

[10] Raskhodchikov A 2020 *Smart cities for sustainable development* 1(14) pp 5-18

[11] Chursina Yu 2014 "Leave from" vs "Leave for". The quality of the urban environment as a factor in the population's migration attitudes 2 pp 142-164

[12] Adcock J Smart City 2017 (Vancouver) p 42

[13] Dubbeldeman R and Ward S 2015 *Smart Cities* (Netherlands: Deloitte The Netherlands) p 86

[14] Pupyrev E 2016 Economics and Management 1 pp 32-38

[15] Giffinger R, Fertner C and Kramar Hans 2007 *Smart Cities Ranking of European Medium-sized Cities* (Vienn: Centre of Regional Science) p 28

[16] Bezrukich O A *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* 880 012089

[17] Golubova O 2019 Proceedings of BSTU 1(5) pp 6-72

[18] Aptekman A 2017 *Digital Russia: a new reality* (Moscow: report of McKinsey) p 133