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Opportunities and prospects for digitalization of the urban environment under the Smart City 2030 program in Moscow

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Abstract. The study focuses on the Smart City 2030 program in Moscow, which aims to digitalize the urban environment on a large scale and improve the living conditions for its residents. The goal of the program is to create a smart and convenient metropolis by integrating modern information and communication technologies into key areas of the city's life. The authors emphasize the comprehensive approach to solving urban problems, including transportation infrastructure, healthcare, education, housing and utilities, and security. The key areas of focus include automation of management processes, the use of big data, artificial intelligence, and the Internet of Things. In conclusion, the authors emphasize the importance of a long-term city development strategy, highlighting the need for continuous monitoring of the achieved results and adapting the program's goals to changes in the external environment and the needs of residents.

Keywords: artificial intelligence, urbanism, information and communication technologies

Contribution. All the authors participated in the development of the concept of this review, data collection, processing and analysis, drafted the manuscript, and formulated the conclusions.

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Возможности и перспективы цифровизации городской среды по программе «Умный город — 2030» в Москве

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Аннотация. Исследование посвящена рассмотрению московской программы «Умный город — 2030», направленной на широкомасштабную цифровизацию городской среды и улучшение условий проживания жителей столицы. Цель программы заключается в создании умного и удобного мегаполиса посредством интеграции современных информационно-коммуникационных технологий в ключевые сферы жизнедеятельности города. Авторы отметили комплексный подход к решению городских проблем, включая транспортную инфраструктуру, здравоохранение, образование, жилищно-коммунальное хозяйство и безопасность. Важнейшими векторами программы являются автоматизация процессов управления, использование больших цифровых данных, искусственный интеллект и Интернет вещей. В заключении подчеркнута важность долгосрочной стратегии развития города, выделена необходимость постоянного мониторинга достигнутых результатов и адаптации целей программы к изменениям внешней среды и потребностям жителей Москвы.

Ключевые слова: искусственный интеллект, урбанизм, информационно-коммуникационные технологии

Вклад авторов. Все авторы участвовали в разработке концепции исследования, сборе, обработке и анализе данных, написании текста рукописи, формулировке выводов.

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Introduction

Effective management of a multimillion-person metropolis is a complex task on the agenda in many countries worldwide. The number of cities with a population exceeding 1 million continues to grow. In Russia, according to the 2010 and 2020 population censuses, the number of such megacities has increased to sixteen. The number of cities with populations up to one million is also rising due to the scale of global urbanization, as people increasingly prefer city life. Global statistics confirm these trends: experts predict that by 2030, 60% of the planet's population will live in cities, and this figure will grow to 70% by 2050[1].

[1] Entertaining urbanization. *Kommersant.* 02.11.2024. URL: https://www.kommersant.ru/doc/7266452 (accessed: 20.08.2025). (In Russ.).

Many factors contribute to comfortable city living: competent governance, modern infrastructure, and comprehensive development. According to global rankings, Moscow holds leading positions [1]. For example, based on the Urban & Innovation Environment Index, which draws on sources such as Statista, Numbeo, OpenStreetMap (OSM), the UN E-Government Development Index (2022), the Integrated Index for Postal Development (UPU, 2022), and the Global Innovation Index from the World Intellectual Property Organization (WIPO, 2022), Moscow ranks 4th in the world for 2024 out of 50 cities[2].

The aim of research is to examine the specifics of integrating modern information and communication technologies into key spheres of life in a contemporary metropolis, using Moscow as a case study.

These high achievements were made possible by the city's comprehensive development, within the framework of which a number of strategic documents have been adopted, including, in particular, the "Smart City — 2030" Program (2018). In this program, Moscow is viewed as an "innovative city of the future"[3]. The strategy was developed by the Moscow Department of Information Technology with the involvement of citizens, experts, and the business community. The main goal of the program is to improve citizens' quality of life, enhance management and service delivery processes, and meet people's needs in economic, social, cultural, and environmental aspects. The program focuses on improving residents' quality of life and creating an innovative urban environment for future generations through advanced technologies, including the development of artificial intelligence (AI) [2]. To popularize the ideas to be implemented within the program, for the second consecutive year starting in 2024, the colorful forum "Territory of the Future. Moscow 2030" has been held in the summer months at various venues, including Moscow's main parks. According to statistics, in 2025 the forum was attended by over 14 million Muscovites and capital guests[4].

Main Directions of the Program

The "Smart City — 2030" Program encompasses several key areas covering various aspects of urban life:

1. **Digitalization of Urban Infrastructure.** Introducing digital technologies into the management of city resources, including transport, healthcare, education, and utilities. Since its launch in 2012, the "Moscow Public Services" portal, providing access to over 500 online services, has registered more than 18 million users. Moreover, "Moscow Public Services"

[2] *Urban & Innovation Environment Index 2024*. URL: https://en.ac-mos.ru/rankings/urban-innovation-environment-index/ (accessed: 20.08.2025).

[3] Moscow is getting smarter. *Mos.ru*. 27.06.2018. URL: https://www.mos.ru/dit/documents/view/217258220/ (accessed: 20.08.2025). (In Russ.).

[4] How it was-2025. *Moscow 2030*. URL: https://moscow2030.mos.ru/how-it-was/2025/ (accessed: 20.08.2025). (In Russ.).

is in demand among citizens of various ages: 60% are capital residents aged 35 to 65, and 10% are Muscovites over 65. "This indicates that the application's interface and capabilities are convenient and understandable for everyone"[5], said Dmitry Ivanov, Deputy Head of the Moscow Department of Information Technology.

2. **Development of Human and Social Capital.** Creating conditions for retraining and upskilling citizens, especially those in need of support [3], such as pensioners and young mothers. A career guidance program for schoolchildren is also being developed. The program aims to assist in selecting an educational profile and choosing a profession that will be in demand in the near future.

3. **Safe Urban Environment and Mobile Logistics.** Implementing digital technologies for managing traffic flows and enhancing citizen mobility. According to the Moscow Department of Information Technology, the city has installed over 200,000 intelligent devices and sensors to monitor traffic, air quality, and other environmental factors: the Intelligent Transport System (ITS) includes about 2,400 smart traffic lights, more than 6,500 sensors, and over 2,500 cameras connected to the Traffic Management Center[6]. In the Moscow Metro, which transports over 7 million passengers daily, a smart ticket system has been implemented, allowing fare payment via smartphone or using a smart camera, "with a smile". Face Pay enables passengers to pay for travel simply by looking at a camera, eliminating the need for tickets, cards, or mobile phones. This makes the process faster and more convenient, especially during peak hours when queues can be significant[7].

4. **Improvement of the Ecological Situation.** Developing systems for monitoring the city's environmental situation and fire safety. Moscow authorities have set a goal to reduce the city's carbon dioxide emissions by 30 % by 2030 through a series of initiatives, including promoting electric vehicles and implementing energy-efficient buildings and infrastructure [4].

5. **Artificial Intelligence and Big Data.** Developing and implementing solutions based on AI and big data analysis to improve the management of urban processes and the provision of public services [5]. Moscow has launched several smart city pilot projects, including a program using blockchain technology to store and exchange real estate transaction data, as well as a project to introduce autonomous vehicles in certain city districts.

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[5] Citizens have downloaded the Gosuslugi Moskvy mobile application almost 10 million times. *Mos.ru*. 15.02.2024. URL: https://www.mos.ru/news/item/135329073/ (accessed: 20.08.2025). (In Russ.).

[6] Smart City: how digital technologies are changing the urban environment and everyday life. *CIS Internet Portal*. 10.05.2025. URL: https://e-cis.info/news/569/127262 / (accessed: 20.08.2025). (In Russ.).

[7] How did Moscow METRO TICKETS change throughout the years? *Gateway Russia*. 10.09.2022. URL: https://www.gw2ru.com/history/3710-how-did-moscow-metro-tickets-change (accessed: 20.08.2025).

Development Prospects

The successes in implementing the program are impressive; within a year of its launch, remarkable results have been achieved in urban development, transport, economy, and the social sphere. These achievements were presented at the "Territory of the Future. Moscow 2030" forum, which served as a report by city authorities on the strategy's implementation. Continuing along the chosen trajectory, the Moscow government has announced new vectors for the program's development:

• **Promoting Sustainable Development and Energy Efficiency** with renewable energy sources and "green" construction methods, which primarily mean energy efficiency of future residential buildings, the use of materials and equipment with minimal greenhouse gas emissions, and "the use of construction machinery and mechanisms with an environmental class no lower than Euro-4"[8].

• **Promoting Innovation and Entrepreneurship** through the development of a robust ecosystem of startups, research institutes, and venture companies.

• **Applying Artificial Intelligence in Transport and Infrastructure.** The Moscow government is testing mobile complexes that help city services identify shortcomings in road infrastructure maintenance using AI technologies. "The neural network can already detect holes, faded road markings, damaged curbs, dirty bus stops and road signs, and other violations. Applying AI will help city services learn about shortcomings faster to address them more promptly"[9].

• **The Moscow government plans to more actively engage citizens in city life.** The "City of Ideas" crowdsourcing platform by the Moscow Government allows citizens to propose ideas and participate in discussing initiatives. During the platform's operation, about 80,000 ideas have been proposed, of which 9,204 have been adopted[10]. Thus, Muscovites can directly interact with the Moscow government and influence city life. "Our City" is a feedback channel where residents can comment on the work of officials and utility services. Muscovites can report a missing trash bin in a park, a broken staircase or sidewalk tile, as well as litter on the street, poor maintenance of green spaces, or potholes on roads. The site has over a million registered users. Since its launch in 2011, more than 11 million issues have been resolved, and the portal is actively used by over 2.4 million citizens[11].

• **The "Active Citizen" online voting system** allows residents to express their opinions on various issues, from additional bus routes and lawn mowing to the

[8] "Green" construction and adaptation to climate change discussed in Moscow. *Mos.ru.* 29.02.2024. URL: https://stroi.mos.ru/press_releases/v-moskvie-obsudili-zielienoie-stroitiel-stvo-i-adaptatsiiu-k-klimatichieskim-izmienieniiam (accessed: 20.08.2025). (In Russ.).

[9] Neural networks will help the capital's utilities to monitor the condition of roads. *Tadviser.* URL: https://www.tadviser.ru/index.php/Проект:Installation in Moscow of mobile complexes and for the purpose of providing services for the maintenance of road facilities (accessed: 20.08.2025). (In Russ.).

[10] *The Moscow Government's "City of Ideas" platform.* URL: https://crowd.mos.ru/?utm_source=articleny&utm_medium=mos&utm_campaign=ny (accessed: 20.08.2025). (In Russ.).

[11] The portal "Our city" helps to monitor the condition of container sites. *Mos.ru.* 28.06.2025. URL: https://www.mos.ru/news/item/155884073 / (accessed: 20.08.2025). (In Russ.).

name of a new metro ring line. "Active Citizens" accumulate bonus points to receive branded souvenirs or tickets to theaters and museums. Today, over 1.9 million participants are registered in the system, 2,600 votes have been conducted, and more than 81 million opinions have been considered[12].

• **The Moscow Electronic School (MES) resource deserves special mention.** Its key elements are digital school documentation, an electronic library with textbooks and lesson scripts, and additional interactive assignments. This system allows teachers to exchange opinions and creates healthy competition among educators, as scripts can be rated and the number of downloads is recorded. To date, teachers have created nearly 50,000 electronic lesson scripts. MES is being developed and modernized every academic year, expanding the number of services and updating its functionality. Currently, the resource allows not only tracking a child's academic performance, attendance, and meals but also participating in Olympiads, visiting museums and parks, and staying informed about the capital's cultural and educational trends.

Conclusion

In conclusion, it should be noted that the "Smart City — 2030" project implies a significant increase in the efficiency of the functioning and management of government bodies in the Russian capital, optimization of budget expenditures, and increased resident satisfaction with the quality of services provided. Among the program's expected outcomes are reduced strain on the road network, decreased energy and resource losses, improved environmental conditions, and enhanced overall city competitiveness. The program also focuses on actively involving Muscovites in decision-making, forming a comfortable social environment, and supporting initiatives of small and medium-sized businesses in the high-tech sector. As the capital, Moscow is a leader in developing digital infrastructure to improve residents' quality of life, and the successful implementation of its initiatives serves as an example not only for other Russian cities but for the entire world.

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[12] Merging the real and virtual: how a smart city works. *Mos.ru.* URL: https://www.mos.ru/news/item/29296073 / (accessed: 20.08.2025). (In Russ.).

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