



MOSCOW
2030
smart city

Moscow 'Smart City – 2030'

A brief version





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Moscow Mayor

We have attained a lot; however, life is changing, new requirements are set, and new technologies appear. Therefore we need to reach new heights and establish new standards of electronic and information city's services. We can now go beyond providing individual services and rather develop a comprehensive 'Smart City' program that will encompass all aspects of our life^[1].

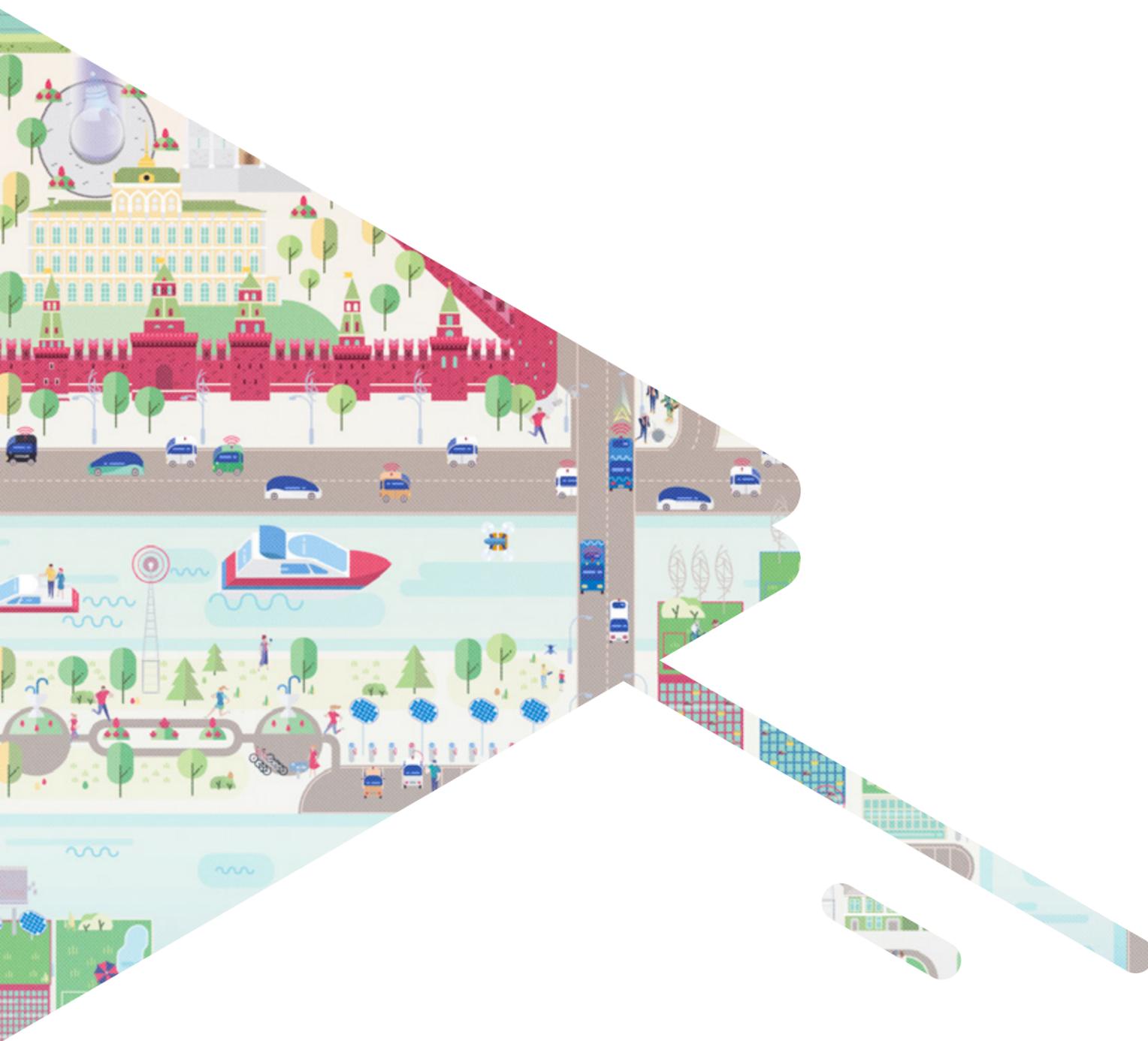


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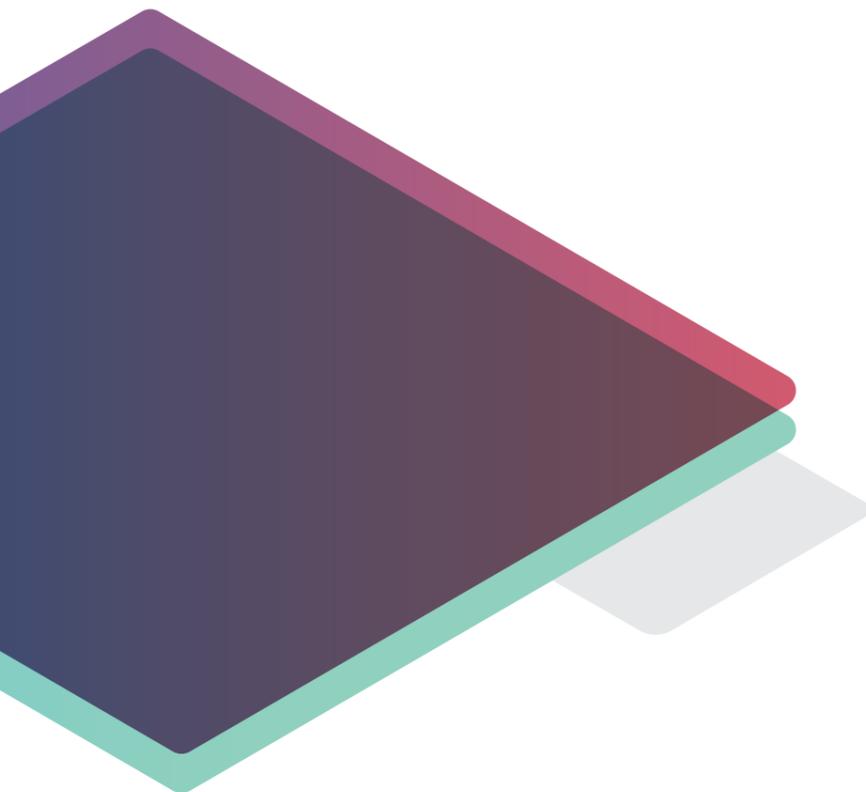
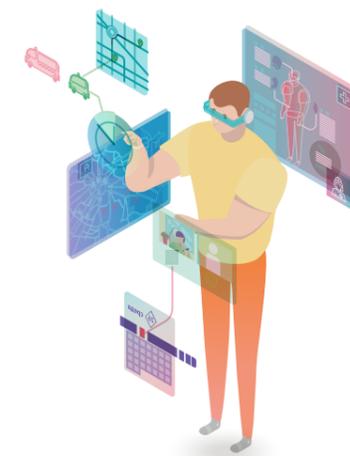
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All over the world smart cities are an integral component of the society's sustainable development. Russia is currently making great efforts in achieving the goals of sustainable development set by the UN General Assembly in 2015^[2]. In the nation, Moscow is the unquestionable leader in this area.

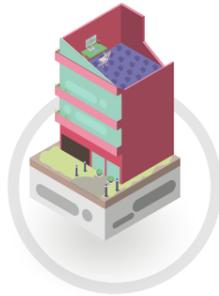
The 'Smart City – 2030' strategy sets priorities, goals, and objectives for the governance and development of digital economy in Moscow to 2030.

This document is based on an analysis of global megatrends in urban developments. Also, in shaping the strategy, opinions of Moscow residents and industry experts have been taken into account together with the forecasts of leading visionaries, consultants to the world's largest digital companies.

Global megatrends



Experts identify eight trends in world development ^{[3]-[5]}



Accelerated urbanization

Growing urban population and increasing role of cities and urban culture in the development of society



Globalized business

Increasing size of global trade and mass distribution of value adding in production

Innovations and technological breakthroughs

Enhanced implementation of robotic technologies in all areas, occurrence on marketplace of new technological solutions and innovative developments that boost quality standards and performance



Limited natural resources

Reduced amount of natural resources due to growing consumption and non-uniform distribution and, as a consequence, stronger competition between manufacturers



Changing consumer preferences

Changing preferences of customers and end consumers of products and services as a result of transformation of all life areas



Population growth in developing countries

Rapid growth of population and population density in developing countries

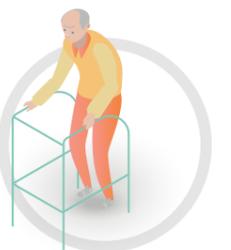
Increasing environment-friendliness of production

Enhanced requirements for manufacturing processes that aim at preventing negative impact on climate and maintaining biosphere sustainability and environment protection



Ageing population in developed countries

Increasing average age and growing longevity of population due to development and occurrence of new health care technologies





What the futurologists say



How will the city of the future look like?
This issue has been discussed
in the works and reports of [6]–[13].



Ray Kurzweil,
Google



Nicola Millard,
British Telecom



Dave Evans,
CISCO



Ian Pearson,
British Telecom



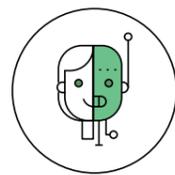
Brian David
Johnson, Intel



Dave Coplin,
Microsoft

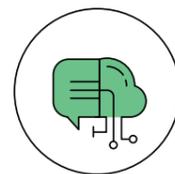
In the Strategy below, the forecasts are adapted to the specific features of a megalopolis, Moscow.

RESIDENTS



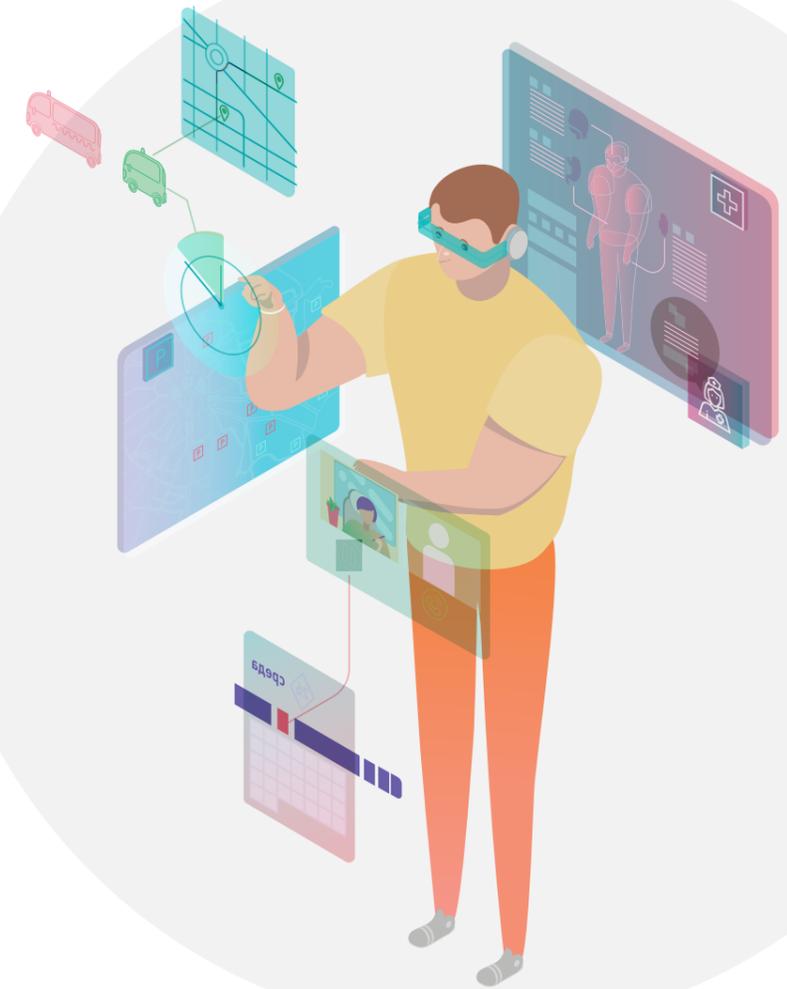
Combining human capacities and technologies

- Qualitative changes in day-to-day life owing to usage of neurointerfaces and digital assistants – ranging from using smart meters to smart device control
- Changes in the quality and content of education: a ‘digital teacher’ on the basis of artificial intellect (AI) and educational VR/AR/MR-technology-based online platforms



Dialog on par between humans and artificial intelligence

- Personal digital AI-based assistant in each smart device
- Language barrier removed owing to advanced real-time translation technologies



VR (Virtual reality) – is an environment generated using technical means that is transmitted to the human via his/her senses (vision, hearing, smelling, touching, etc.)

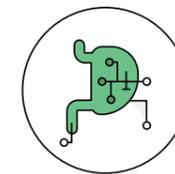
AR (Augmented reality) – is an extension the perception field with any sensory data to enhance perception of the environment and information received from it

MR (Mixed reality) – is a combination of the real and virtual worlds that create new environments and visualizations wherein physical and digital objects coexist and interact in real time



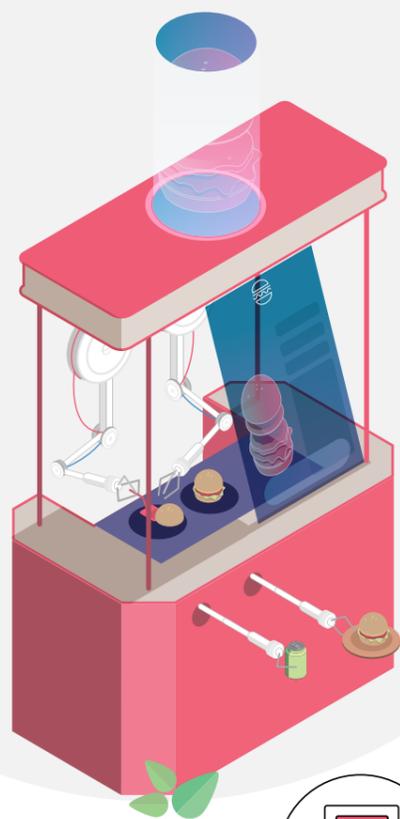
Unlimited motion capacity

- Equivalence of virtual and physical presence
- Individual cars are no longer used and substituted with self-driving taxis and car sharing services
- Logistics services used instead of a physical travel



Technologies incorporated into human body

- Early AI-based diagnostics of diseases and administration of medical treatment, monitoring of the patient’s condition
- Transplantation of artificial organs
- Implantation of medical devices into the human body
- Implementation of transhumanism concepts: application of research and technology for enhancing human intellectual and physical capacities and eliminating undesirable features of human life such as suffering, illnesses, and ageing

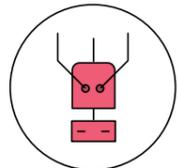


BUSINESS

Reducing production costs

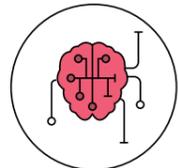


- Time, resources, and space saved owing to application of 3D technology in manufacturing
- Personalized products and services
- Reduction in production costs owing to application of nanotechnologies



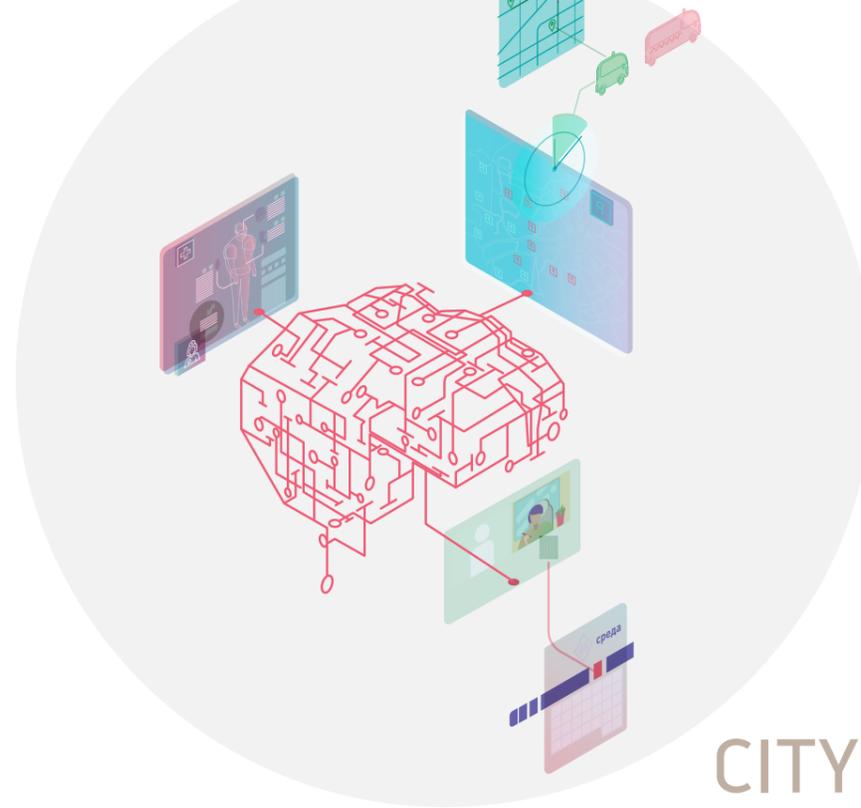
Complete automation of production; human's mission is to create and control

- Universal application of robots and drones
- Buildings designed and constructed using VR/AR/MR technologies



Some business tasks solved by AI

- Services priced and targeted without involving humans
- Business process optimized owing to accurate forecasting and planning on the Big-data basis and universal usage of the Internet of Things



CITY GOVERNANCE

City residents + AI = city governance

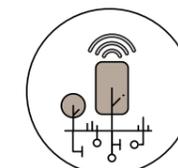


- Unified city platform of data about city residents, city infrastructure, governance systems, and business environment
- Unlimited usage of city Big data
- Security systems controlled using AI-processed data in real time
- City residents' participation in decision-making via electronic polling systems based on blockchain technology
- Electronic voting in city elections



Autonomous self-driving transport

- Intelligent control of the transport system: control of traffic-light operations and optimization of routes
- Self-driving transport: the driver controls but does not drive the vehicle
- Traffic situation improved owing to reduced number of individual cars and development of car sharing services



High quality of urban environment

- Carbon-dioxide level in atmosphere reduced owing to development of electric vehicles
- Separate waste collection and recycling
- Noise and air pollution sensors universally used to reduce negative environmental effects
- Smart sensors employed in utility infrastructure to save resources and control quality of services and operability of devices



What citizens wish

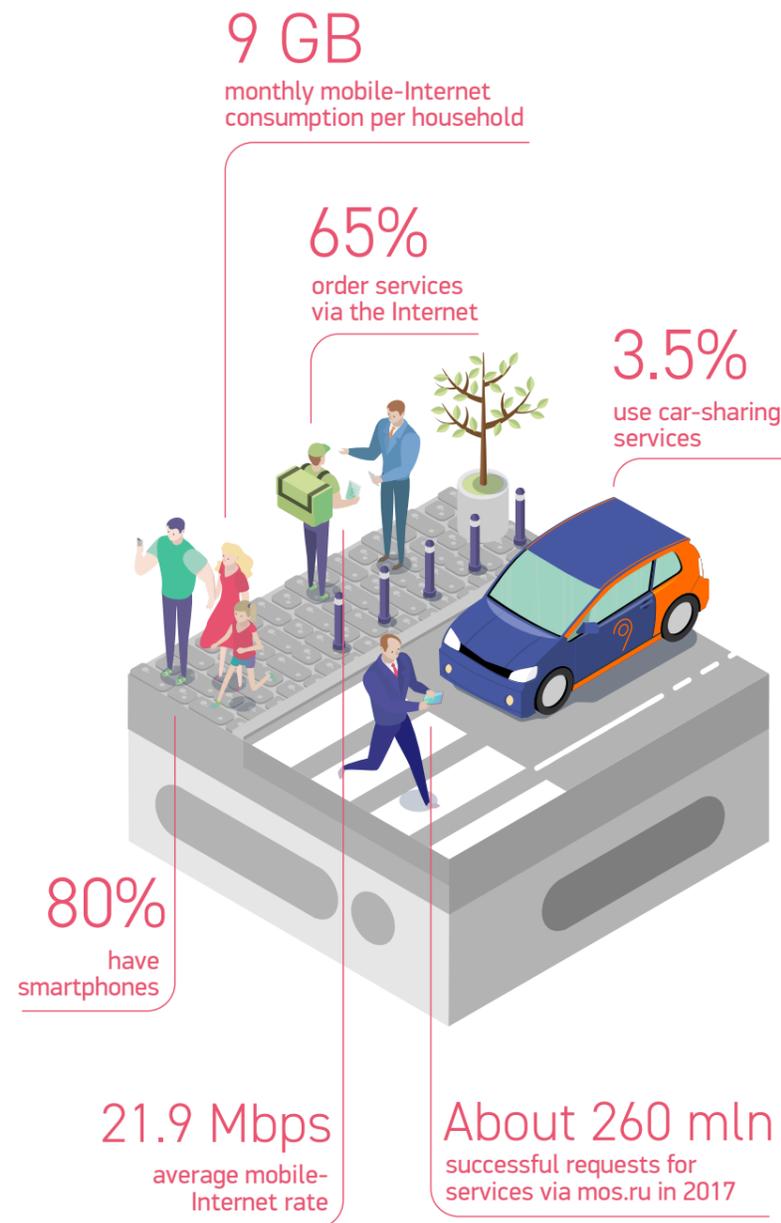


The 'Smart City – 2030' strategy aims at creating a comfortable urban environment for everyone

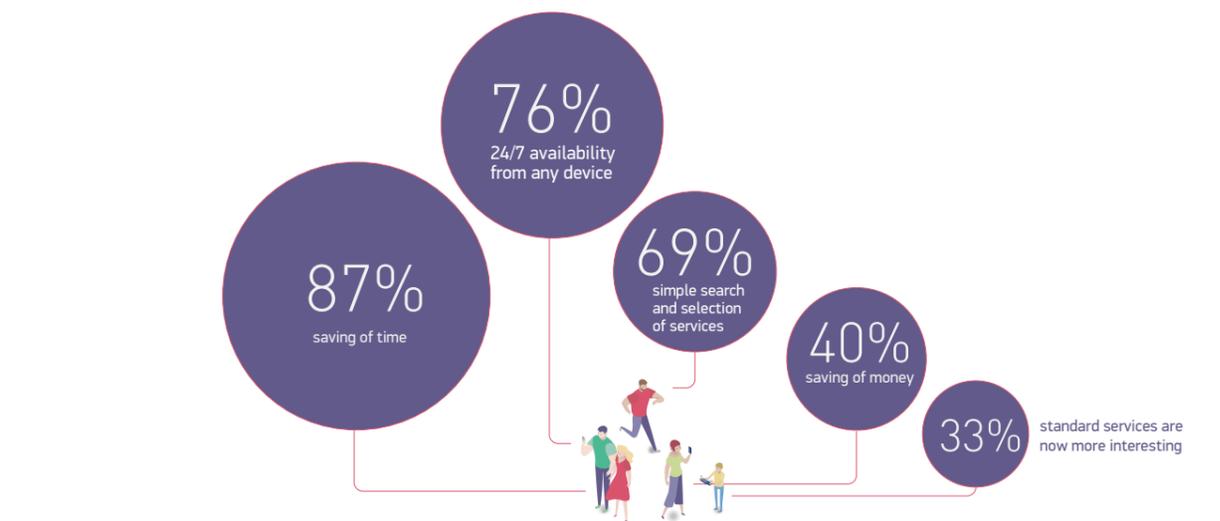
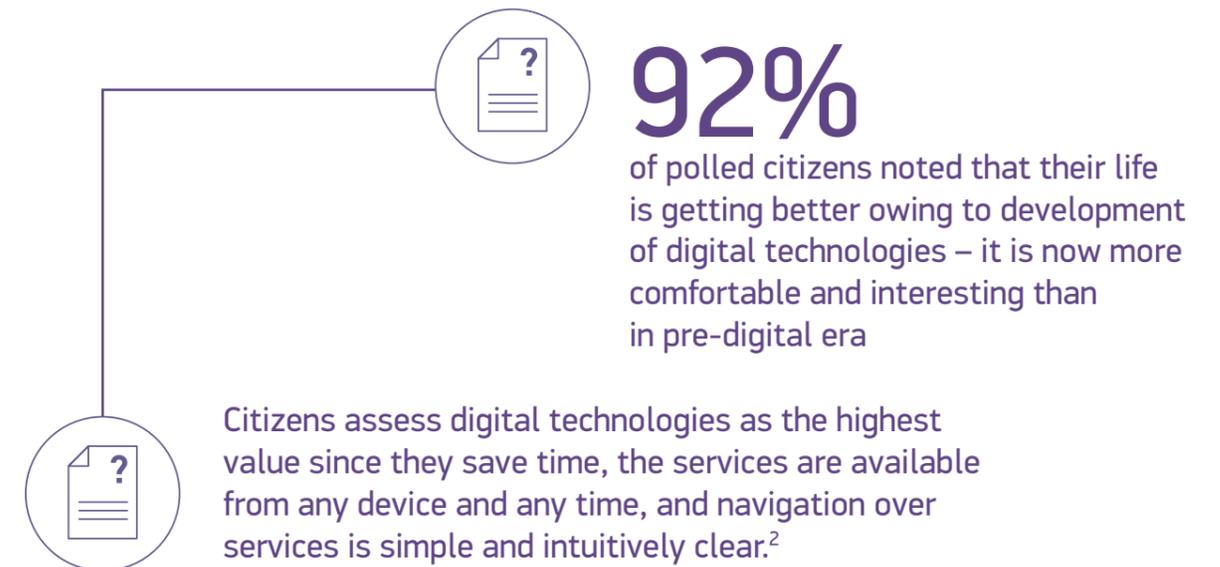
Moscow is already a world leader in development and application of digital technologies in everyday life of city residents

The quality of delivered services is enhancing from year to year and their functionality is extending. However, citizens' requirements for digital services are also growing

In March and April 2018 Moscow residents were polled about the impact of digital technologies on their everyday life and expectations for the year 2030¹



¹About 5,000 citizens, ages from 18 to 65, were polled. The poll was conducted on city and open public sites: mos.ru, ICT Telegram channel, Yandex, Mail.ru, Odnoklassniki, and VKontakte.



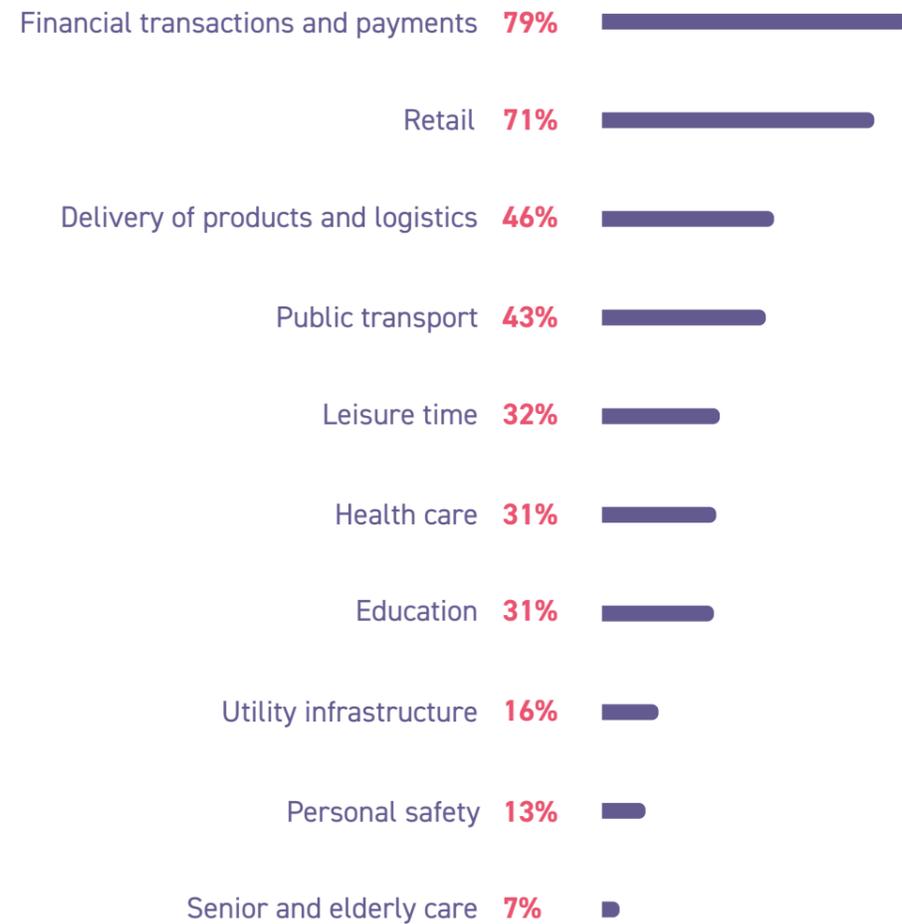
Only 4% of those polled were concerned with the impact of digital technologies on their lives. They primarily complained on failures and errors in digital service operations. Respondents were also concerned with safety of payments and potential spying after them. However, should safety and anonymity of data be guaranteed, the, owing to easy usage of services or increased awareness of how digital technologies work, they could change their negative attitude.



²Responses to the question 'What is the positive impact of digital technologies on your everyday life?' (more than one response might be selected)



Areas where, in citizens' opinion, digital technologies are already in active use³



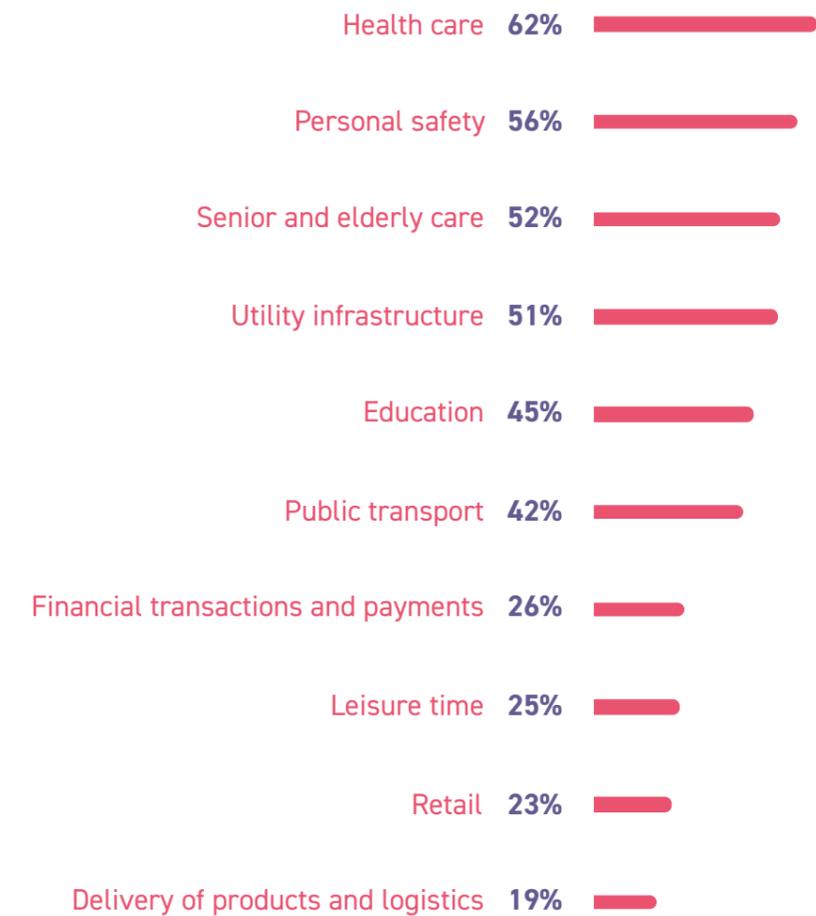
Citizens familiar with electronic products and services note that, from the digitalization perspective, finances and retail are the most advanced areas.

³ Responses to the question 'In your opinion, in what areas in Moscow are digital technologies applied in the most active way?' (more than one response might be selected)

In the opinion of many citizens, digital technologies are to be further developed in such areas as health care, personal safety, senior and disabled care, and in utility infrastructure



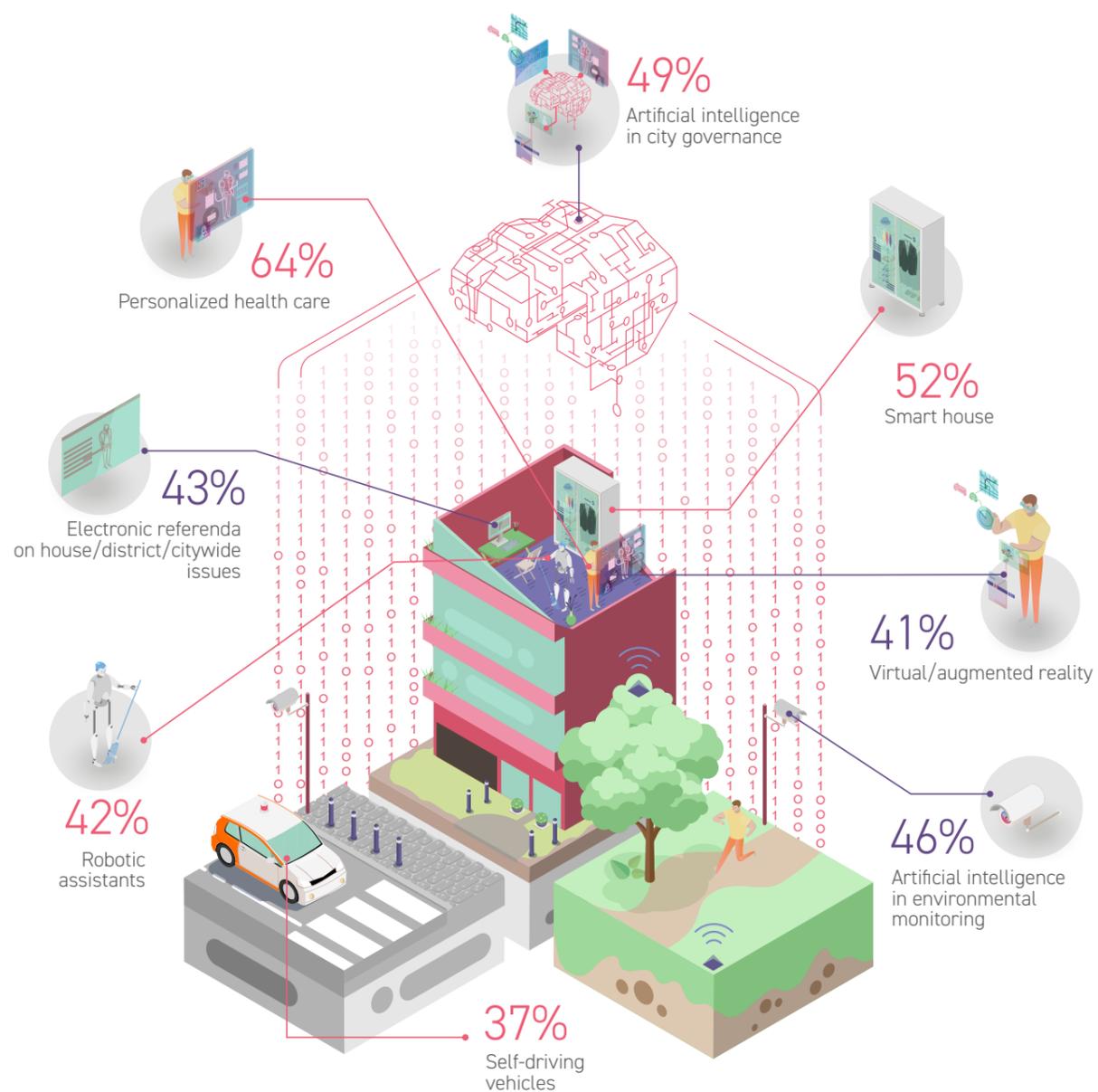
City life areas where digital technologies are to be developed more actively⁴



⁴ Responses to the question 'In what areas should digital technologies be implemented in a more active way?' (more than one response might be selected)



Citizens also specified the technologies that they would like to have implemented by 2030. The major part of city residents prefer personalized health care and smart home. Many of those polled also support using AI for city governance and environmental monitoring. ⁵



Polling confirmed that citizens feature high competence in digital-technology issues and set stringent requirements for future city solutions. Aggregated statistics was used for setting major areas in the 'Smart City – 2030' strategy



⁵ Responses to the question 'Imagine a digital city, the year 2030. Which of the items listed below would you like to see in that city?' (more than one response might be selected)

What the experts say



As part of public discussions on the 'Smart City – 2030' strategy, which involved experts and industry representatives, over 2500 productive ideas and over 6000 comments were put forward. Over 23,500 of representatives of business community and citizens participated in project activities. The draft strategy was discussed at the industry portal ICT.Moscow^[14], 'round tables', industry conferences, Moscow Urbanistic Forum 'Megalopolis of the Future. New Space for Life', and city portal Crowd.mos.ru.

Also, the draft strategy was presented to and approved by the leading experts attending 'Connected Cities 2020', an international forum of city IT heads.

Companies that took part in the discussion

Azbuka Vkusa	Saving bank
Aquarius	'Moskva' Technopolis
M.Video	TMT Consulting
MegaFon	'Skolkovo' Foundation
Association of the participants of the Internet of Things market	ER-Telecom
AFK 'Sistema'	Yandex
VEB	Avito
Komkor (Acado Telecom)	Biocad
Lanit	CISCO
MaximaTelecom	DOC+
MGTS	Foodtech Ventures
Medsi	Group-IB
Mikron	Huawei
'Higher School of Economics' Research University	IBM
RAEK	Luden.io
Rostelkecom	Mail.ru
Rostekh	Nokia
	Samsung
	Tele2



Mission and goals





Moscow that we'd like to see in 2030

We intend to create a Smart city

– an innovative city where digital technologies boost living standards, performance, and provision of services in the city, enhance competitiveness, and fulfill needs of current and future generations in economy, social services, culture, and environmental protection^[15]

Mission

is to use digital technologies to...

- ...make citizens happier, healthier, and more educated and to boost their well-being
 - ...make the city safer, greener, more environment-friendly, comfortable for life, sustainable, and joyful
 - ...create favorable environment for business, entrepreneurship, and scientific community that would facilitate well-being, innovations, and transformation of the city into a live laboratory for growth and development
 - ...unite people to enhance living standards and city governance efficiency
 - ...facilitate consolidation of the society
 - ...ensure active life for elderly residents^{[17]-[29]}
-

Goals



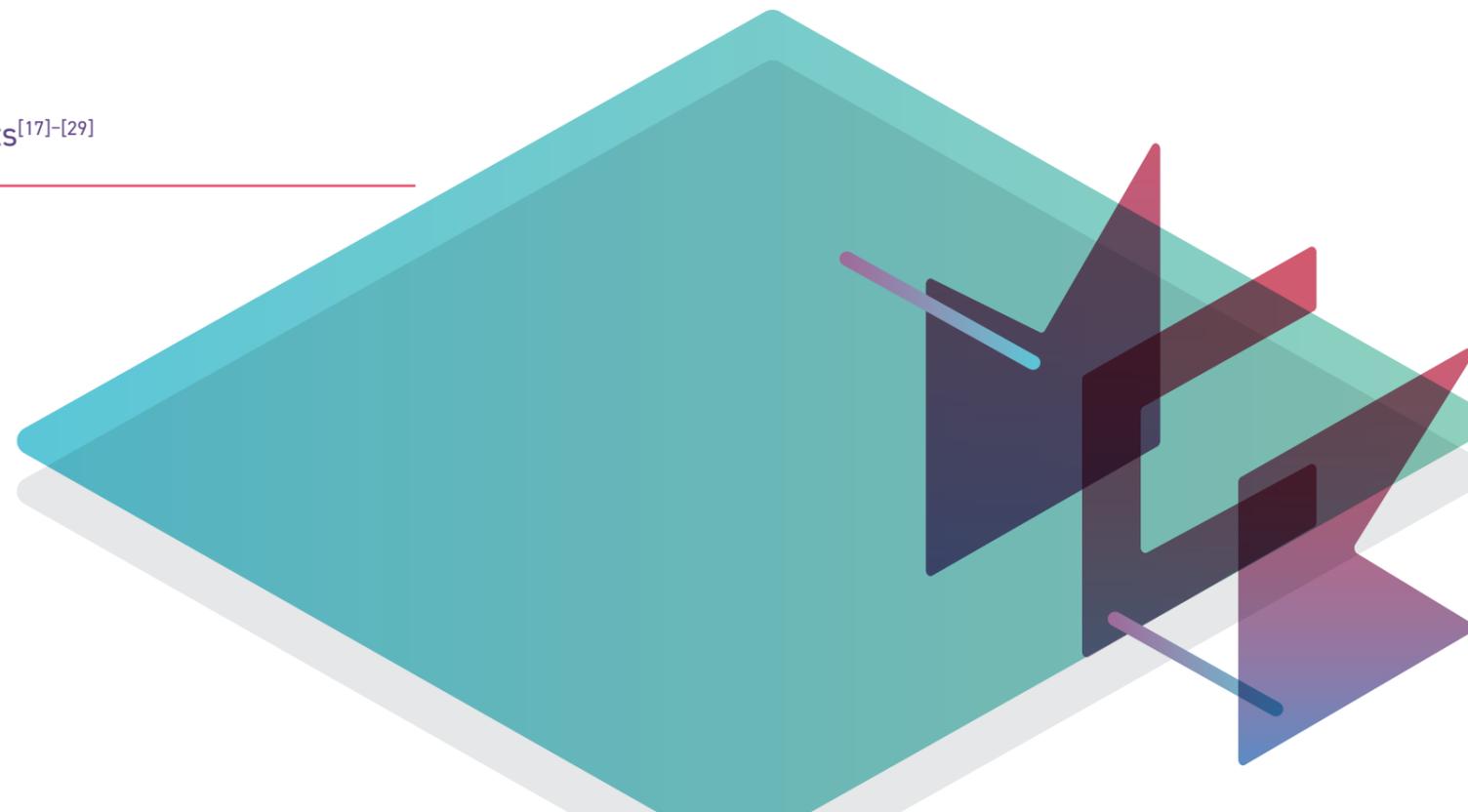
To use digital technologies for sustainable enhancement of citizens' living standards and favorable conditions for entrepreneurship and other activities



To implement centralized, comprehensive, and transparent city governance on the basis of Big data and Artificial intelligence technologies



To boost efficiency of government expenses also through implementing public and private partnership in information and digital technologies and communications



Smart city concepts



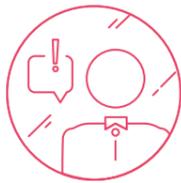


Concept 1.

Smart city for humans

The basic concept of the 'Smart city – 2030' strategy is focusing on humans and creating conditions for full-fledged, high-quality, and happy life of all categories of residents.

The goal of the new digital environment is to essentially improve the urban environment and the conditions for life, work, and leisure of city residents; reduce unproductive losses of time for transit across the city; make simpler administrative procedures, applications for documents, and rendering of services. The new digital technology will facilitate more efficient usage of time in such productive life areas as health care, education, tourism, and leisure..



Concept 2.

Participation of residents in city governance

Shaping the open digital government, active involvement of residents in social life and making decisions on citywide issues, and easier access to city data will facilitate continuous city innovations and sustainable economic growth.

Moscow will continue to actively develop digital tools for maintaining a regular dialog between executive-power agencies, citizens, and business community; platforms will be improved for polling opinions of city residents, public supervision of the operations of city services, and conducting electronic referenda from voting on apartment house management to megalopolis governance. The functionality of the existing systems for electronic referenda and feedback collection from city residents, crowd sourcing, and Open data platform will be extended. New tools will be developed on the basis of advanced technologies, primarily AI, Big data analytics, and blockchain.

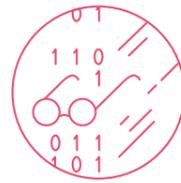


Concept 3.

Artificial intelligence for fulfilling city's tasks

AI is becoming a leading driver in digital transformation of economy and social life. Social fabric, organization of production, and provision of services are changing. Routine operations will be performed by robotic devices and decisions will be made on the basis of AI technologies.

AI will help preventing managerial errors and facilitate making optimal decisions in all areas of city economy and governance. The city administration and corporative management will obtain quality professional tools for making decisions using the most recent advances in AI and Big data analytics.



Concept 4.

Digital technologies for creating fully barrier-free environment in all life areas

This strategy aims at:

- providing equal opportunities in all areas of activities for all citizens and primarily for disabled and impaired-mobility residents;
- enhancing safety, comfort standards, and environment-friendliness of public transport system;
- saving time of city residents and reducing duration of trips owing to an intelligent public transportation system, car sharing, and digital services

- enabling citizens to attend city events, training, and lectures in a virtual way
- developing public services in a digital form.



Concept 5.

City developing jointly with business and scientific community as mutually beneficial partnership

To develop a smart megalopolis, business and academic/applied-science research institutions are to be fully incorporated into city projects.

Application of digital technologies in all areas of municipal infrastructure catalyzes development of partnership relations between city administration agencies, scientific community, and business. This interaction will continue in the following areas:

- partnership in development and promotion of digital infrastructure and digital services
- development of new marketplaces for digital economy
- development of the existing digital economy scope
- support to convergence of public and commercial services through usage of citywide data platforms and unified mechanisms for authorization, authentication, and accounting policy
- promotion of research conducted by young researchers and identification of promising advancements in digital technologies that may be employed by the city
- reduction in administrative barriers and creation of the conditions favorable for development of digital economy in the city



Concept 6.

Digital documents prevailing over its hard-copy counterparts

Pursuing this concept enables the city to fully employ all the advantages provided by digital technologies:

- rendering public services will be more transparent, compliance with the timeframes set for rendering those services will be put under control, and deviations will be identified
- administrative procedures will be optimized, timeframe for rendering public services will be reduced, and time spent by city residents will be saved
- resources will be used in a more efficient way; funds of the Moscow city budget will be saved

However, as per the laws in effect ^[17], city residents will still be able to obtain public services in standard (other than digital) forms that are more familiar to some groups of citizens.



Concept 7.

Comprehensive technologies in all areas of city life

Key technology trends that may potentially be used in Moscow:^{[6], [14], [23]}

Big data and predictive analytics

Expert-analysis systems on the basis of Big data and AI will be widely used in city governance, law-enforcement agencies, manufacturing, personalized health care

for diagnostics and development of individual medical treatment, public transport, and municipal infrastructure.

The city generates a vast amount of information that may be categorized as Big data; those data are to be actively used to boost efficiency of city governance, optimize consumption of resources, detect misdemeanors, etc. A citywide data platform is to be created to support rapid and justified decision making and offer new services on the basis of city data.

Virtual, augmented, and mixed reality technologies

Users will accumulate immersive experience, i. e. an experience in human interaction with digital and real environments using virtual, augmented, and mixed reality (VR/AR/MR) tools. Mass implementation of VR/AR/MR is expected in law-enforcement agencies, education, and health care. The VR/AR/MR technologies will be actively used in Moscow schools in teaching biology, astronomy, and physics and in museums, parks, and tourist objects. The scope of VR/AR/MR application will be expanding on a continuous basis.

New communication technologies and the Internet of Things

5G/IMT-2020 networks, mobile communication technology, and next-generation telecommunications will be deployed. The advanced communication technologies feature qualitatively new characteristics including super-high transmission rates, high density of user devices, and super-low delays in data transmission. Those breakthrough parameters will radically change the quality of services. Owing to new communication technologies new business areas will appear: 'smart' infrastructure, the Internet of Things, self-driving vehicles, and digital manufacturing.

According to forecasts, the Internet of Things will be applied to a large scale; the application scope will include networks of physical facilities equipped with built-in sensors and information and communication technologies to interact with each other and the

environment. The Internet of Things may employ communication technologies belonging to different generations and standards, in particular, GSM, LTE (NB-IoT), LPWAN, and 5G.

Sensors and other elements of the Internet of Things are already in active use in Moscow's public transport, municipal infrastructure, and health care. The Internet of Things will be further used in those areas and analytics of data collected by those devices will be developed. The Internet of Things will also be employed to enhance the quality of environment monitoring and forecasting in the city.

Blockchain

According to forecasts, the blockchain (distributed registry) technology will be used more widely; the number of platforms for developing decentralized blockchain-based technology will be growing, and alternative forms of digital assets will be created.

New 'man-machine' interaction interfaces

Development of neurosciences and biotechnologies will result in occurrence of new tools and interfaces for 'man-machine' interaction. According to forecasts, neurointerfaces will be widely used in health care.

New safety technologies including cyber safety

It is expected that new technologies will appear that will maintain information security including continuous adaptive assessment of risks and trust in real time. To boost the security of Moscow's information-and-telecommunication infrastructure, it is planned to enhance security of the data center, telecommunication systems and networks, video monitoring systems, public alert and notification system, firefighting system, city information systems and mobile applications, and the Internet-of-Things devices.

Computer simulation, 3D scanning and print

According to forecasts, 'digital copies' of real-world items (computer models of ecosystems, cities, devices, and humans) will be widely used. In manufacturing, 3D scanning and printing technologies will be applied. It is proposed to initiate new citywide projects relating to application of 3D technologies in different areas - urban planning (digital city), municipal infrastructure (simulation of utility infrastructure), security systems, etc. - to boost efficiency of city governance.



Concept 8. Digital technology solutions developed in Russia

This strategy assumes a balanced approach to import substitution, employment of best practices, and targeted support to city development solutions created in Russia

To implement this concept, competence centers will be established that will promote digital technology solutions developed in Russia.

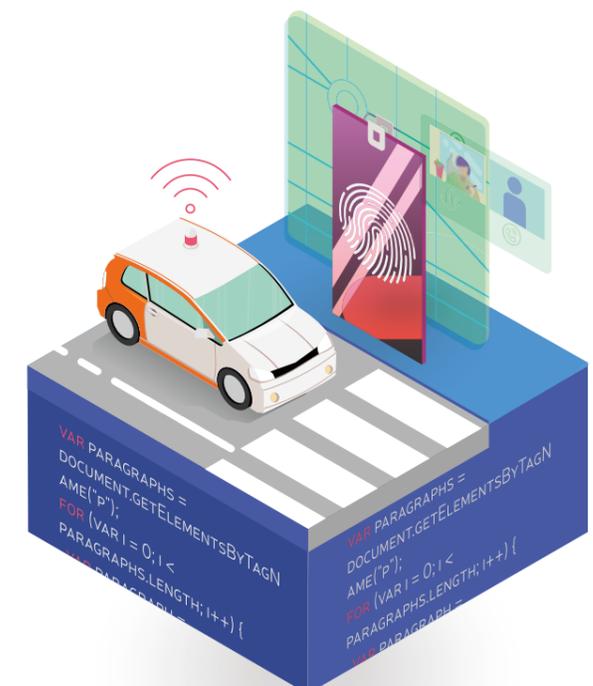


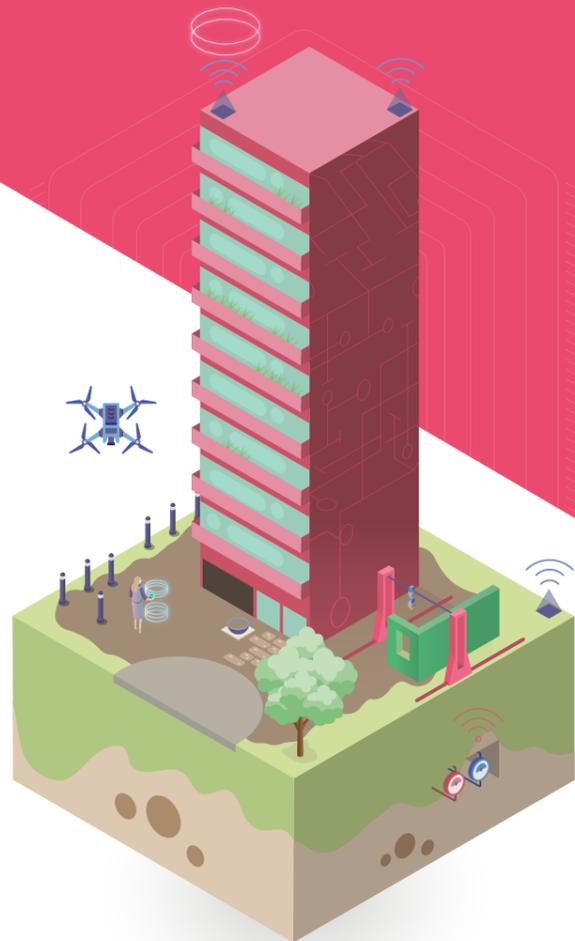
Concept 9. 'Green' digital technologies

For the city to develop, new 'green' technologies are to be used that enable creating new smart governance models, enhance the quality of the analysis of the urban system as a whole, reduce amounts of waste and emissions, and allow reusing resources to the maximum extent possible.

The list of priority areas includes:

- recycling of decommissioned equipment
- balanced application of comprehensive technologies for environmental protection and eco-monitoring
- large-scale usage of comprehensive technologies for forecasting





Smart city's architecture

To combine approaches to development, upgrade, and operation of city digital systems, applications, and services, a unified four-tier architecture is used^[29]:

Level 1. Consumers and interfaces

At this level, requirements for the entire ecosystem and interfaces to the city's digital economy are shaped by residents, business, scientific community, and city administration agencies. At this level as well, city residents control the quality of the digital services rendered to them and participate in the governance of the megalopolis.

Level 2. Services

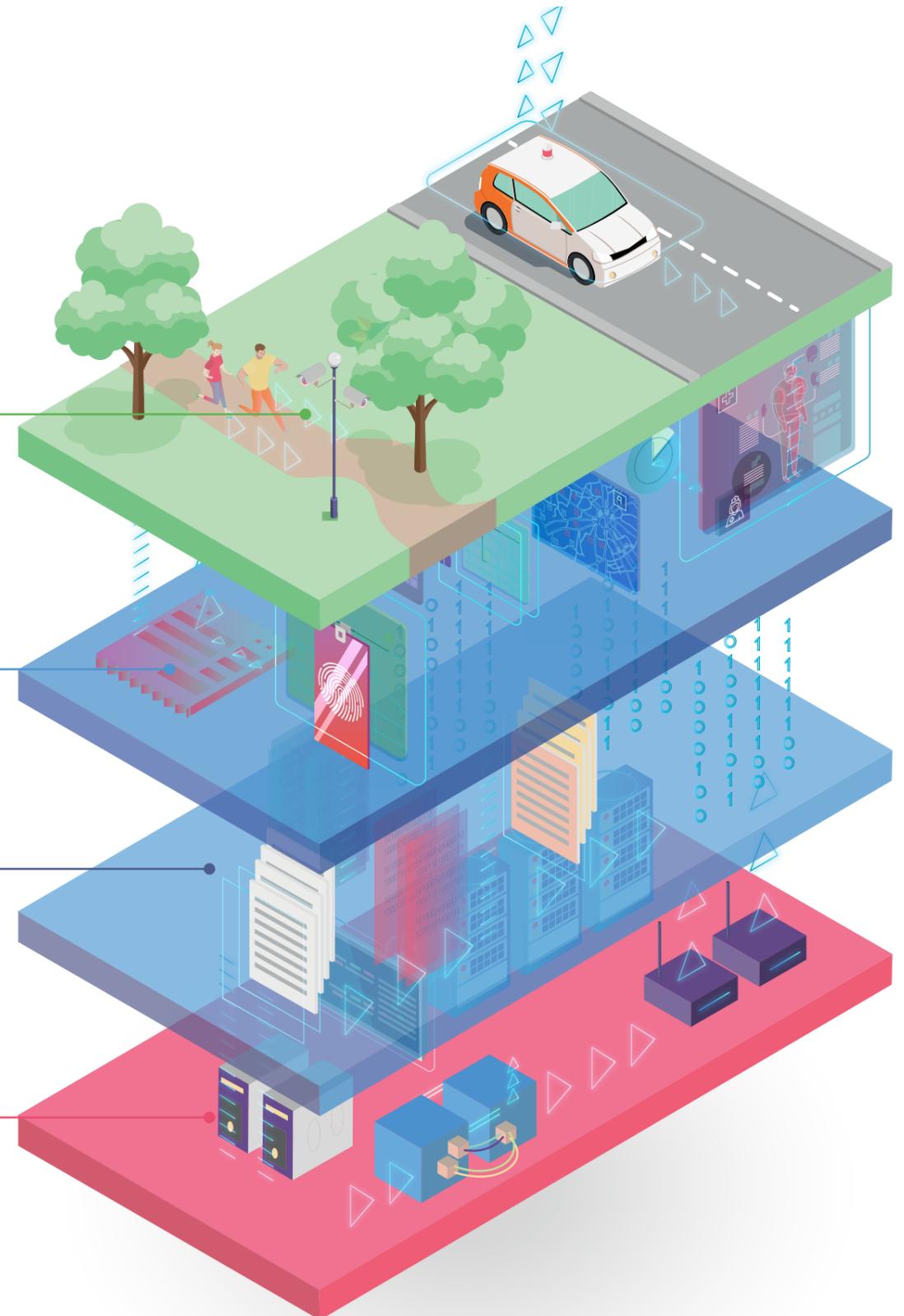
This is the level where information systems, applications, and electronic services relating to all areas of digital economy and social services are located.

Level 3. Data

This level comprises citywide data platforms and analytic systems that collect, process, verify, structure, analyze, consolidate, and enrich data obtained from the city's information systems and resources and from independent sources. This level is intended for fulfilling needs of the city's executive agencies, business community, and Moscow residents.

Level 4. Digital infrastructure

This level comprises telecommunication networks and systems, data storage and processing centers, information security centers, video monitoring systems, and alarm systems.



Smart city's development domains





- 1 Human and social resources

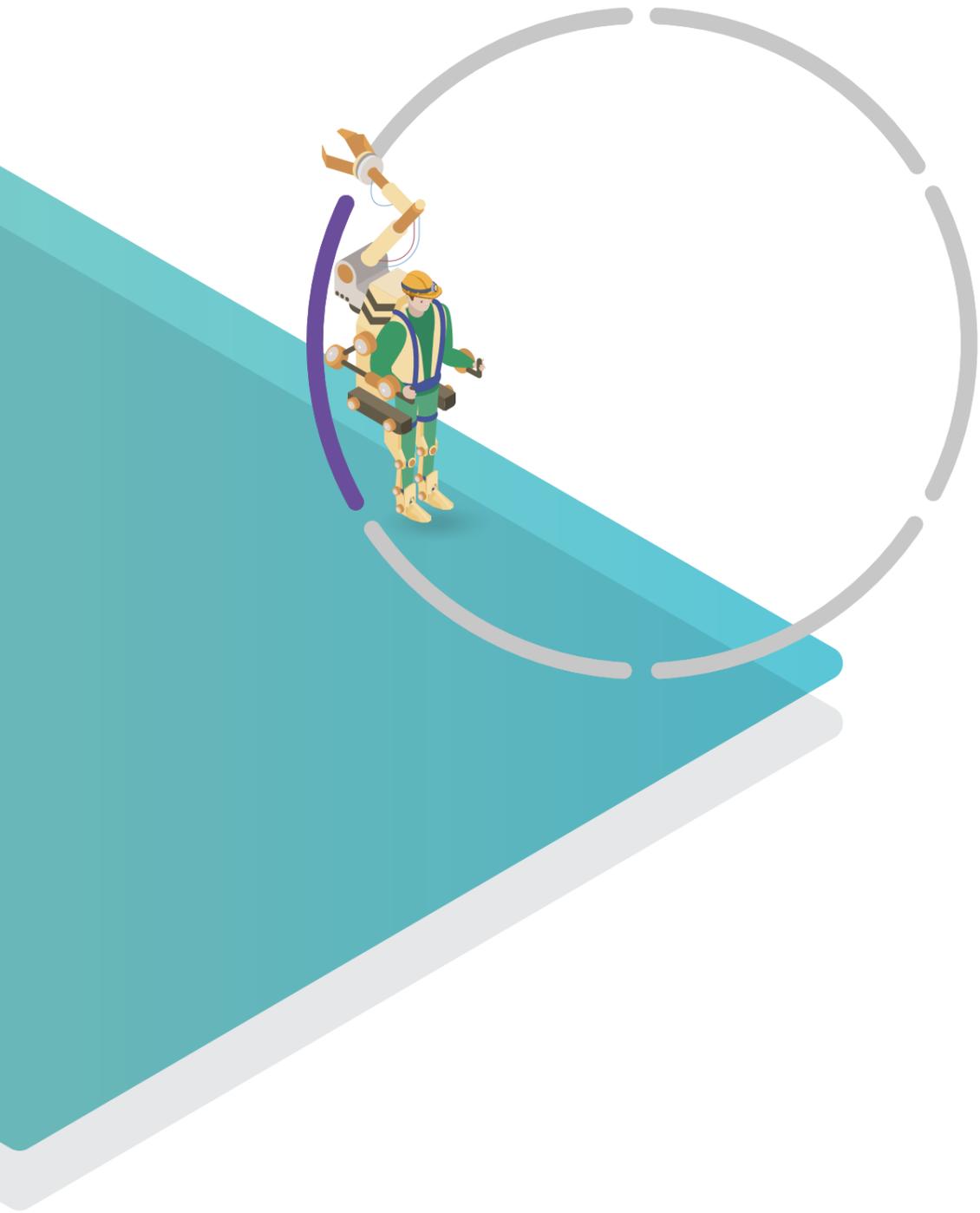
- 2 Urban environment

- 3 Digital mobility

- 4 City economy

- 5 Safety and ecology

- 6 Digital government



1. Human and social resources

Moscow in 2030 is a Smart city the main mission of which is to develop human resources. To fulfill this goal, conditions and opportunities will be created than enable each city resident to determine and implement his/her life priorities. The main concept – equal opportunities for everyone – will be implemented using digital technologies.

Personalized approach to providing medical services will be implemented through analysis of data obtained from patients' handheld devices, electronic medical records, and biometric and genetic parameters processed using AI. Owing to this, it will be possible to forecast the risk of illnesses and diagnose and treat them at early stages.

The universally accessible educational environment will create opportunities for continuous training and professional fulfillment of every citizen. It will comprise, in particular, distance learning programs and individual training trajectories. Owing to processing and analysis of training results aggregated, using AI, into a combined Big-data array, abilities of each student will be developed in full. Employment of innovative technologies – gamification, VR/AR/MR, and 3D simulation and print – will make the process of training more informative, exciting, and creative.

Converting all documents and artifacts of significant cultural and scientific value into a digital form will make access to social, educational, scientific, and cultural services easier and will enhance leisure options.

Contribution of this domain to fulfillment of high-level strategy goals

Goals of the 'Human and social resources' domain



Enhanced life standards



Transparent city governance



Efficient usage of city resources

Unified digital environment for enhancing health care standards, increasing longevity, providing social support, and boosting educational and cultural standards of citizens



Improved accessibility and quality of services provided in education, health care, and social and cultural areas owing to implementation of digital technologies



KPIs of the 'Human and social resources' domain

- Expected longevity
- Expected longevity of active life
- Portion of city residents practicing workout and sports on a regular basis
- World rank of Moscow schools not lower than
- Portion of city buildings accessible to disabled persons
- Portion of residents who completed professional re-training in the total number of applicants whose professional domain was automated/robotized



2. Urban environment

To enhance citizens' life standards, the main priority of the Strategy, a number of tasks is to be fulfilled. They are primarily related to planning and construction of city architecture, account and allocation of municipal infrastructure resources, and development of an ecosystem of personalized city services featuring a standardized and user-friendly interface.

According to the forecasts of the Federal State Statistics Service^[52], by 2030 the Moscow agglomeration population will be 22 mln (a medium scenario). Given the urbanization conditions, specialized digital services enable optimizing urban planning that also includes easier interaction between all process stakeholders, improved quality and efficiency of housing projects, and saving of resources and time.

The 'Smart City - 2030' strategy as applied to urban planning is focused on improvement of planning and housing development in Moscow on the basis of next-generation analytics and digital technologies. Owing to implementation of 'green' construction concepts and 'Smart house' technologies, a comfortable and healthy urban life environment will be created and destructive impact on ecology will be mitigated.

The 'Smart City - 2030' strategy as applied to municipal infrastructure assumes continuous implementation

of digital technologies in the city's activities with consideration for the condition of public utility infrastructure. It also focuses on providing citizens with comfortable dwelling and quality services and justified application of innovative technologies. Owing to the development of AI-based technologies and wide application of the Internet of Things, it will be possible to accurately determine the required amount of financing and allocation of resources. Municipal infrastructure will be managed to a significant extent using Big data combined with predictive analytics. Individual systems of power, heat, gas, and water supply will be united into a universal 'System of systems'.

New decisions regarding the city's life will be implemented on the basis of hands-on experience in pilot projects to be performed in Moscow's smart blocks. This approach assumes step-by-step implementation and gradual scaling on the basis of pilot projects covering various territories and functionalities. As a result, interdepartmental interaction will be improved on a continuous basis, initiatives, plans, standards, and documents of all levels refined, and promising directions in implementing Moscow city strategies will be identified and analyzed.

Contribution of this domain to fulfillment of high-level strategy goals

Goals of the 'Urban environment' domain	 Enhanced life standards	 Transparent city governance	 Efficient usage of city resources
Effective digitalization of the city's life including provision of comfortable dwelling and quality public-utility services to citizens	✓	✓	
Optimized city planning and housing development on the basis of next-generation analytics, Big data, and digital technologies	✓	✓	✓
KPIs of the 'Urban environment' domain	<ul style="list-style-type: none"> • Portion of city facilities constructed using BIM technologies⁶; • Minimal interaction of housing developers with authorities; • Upgraded infrastructure for collecting and recycling industrial and solid household wastes (number of facilities); • Number of emergency cases in public utility facilities. 		

⁶ BIM (Building Information Model) is a set of methods and tools intended for creating, collecting, storing, and using information about facilities that enable efficient fulfillment of urban planning goals. Application of BIM technologies assumes collection and comprehensive processing of the entire architectural, design, technology, economic, and other information about the facility including all the relationships between information components.



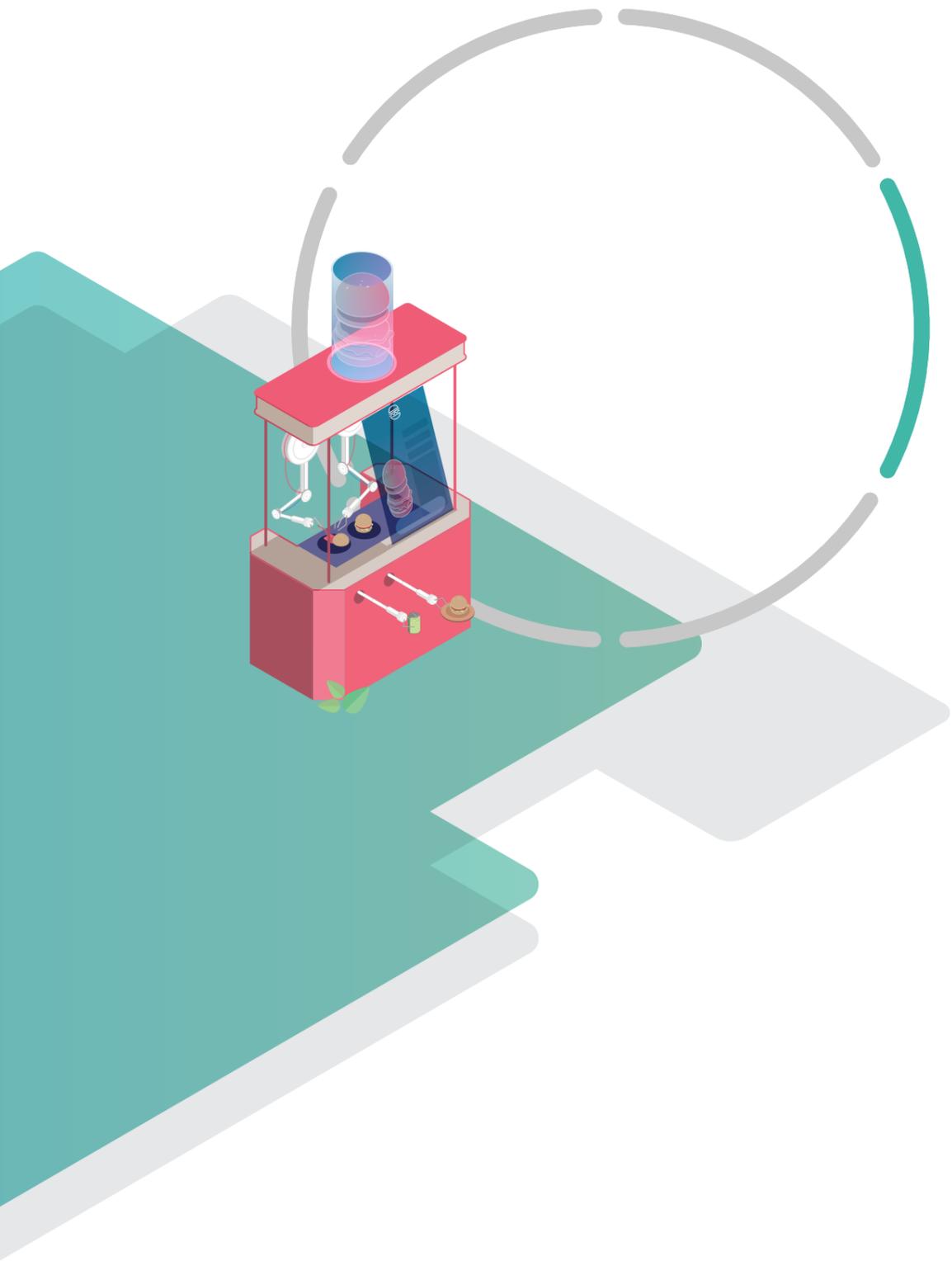
3. Digital mobility

Contribution of this domain to fulfillment of high-level strategy goals

Like every other megalopolis, Moscow, is crammed with vehicles. Road infrastructure sometimes fails to cope with traffic load; traffic congestion and low velocity are the city's major problems. Owing to digital technologies, private cars and public transport will be used in a more efficient way. In a long-term perspective, mobility of Moscow residents, safety, and comfort of trips in the city will be enhanced and, as whole, traffic flow management will be optimized.

The 'Smart City - 2030' strategy as applied to the mobility domain focuses on switching from standard transportation schemes to intelligent mobility systems.

Goals of the 'Digital mobility' domain	 Enhanced life standards	 Transparent city governance	 Efficient usage of city resources
Virtual presence of a citizen becomes equivalent to his/her physical presence	✓		
Time needed for moving in the city is slashed	✓		
Comfortable digital environment for transit trips and domestic and international tourism	✓	✓	✓
Opportunities for development of new communication technologies	✓	✓	✓
KPIs of the 'Digital mobility' domain	<ul style="list-style-type: none"> • Average duration of a trip in public transport in morning peak hours from a residential area near the Moscow Ring Highway to the city's downtown; • Satisfaction of passengers with public transportation services; • Portion of vehicles provided by car-sharing services that feature 'zero' emission; • Share of information and computer technologies in Moscow's gross regional product; • Annual number of foreign nationals coming to Moscow as tourists; • Annual number of Russian citizens coming to Moscow as tourists. 		



4. City economy

Moscow is one of the world's largest megalopolises. The contribution of the city's economy to Russia's GDP is about 26%. Moscow is Russia's financial center: more than half of the banks registered in the country are operating here.

To boost competitiveness of the city's economy, special attention is paid to three areas:

1. innovations
2. industry
3. financial technologies

Innovative business models and digital technologies are main drivers of digital transformation in all economy areas and social services. A key success factor will be development of a system supporting applied research in digital economy, i.e. digital platform research infrastructure.

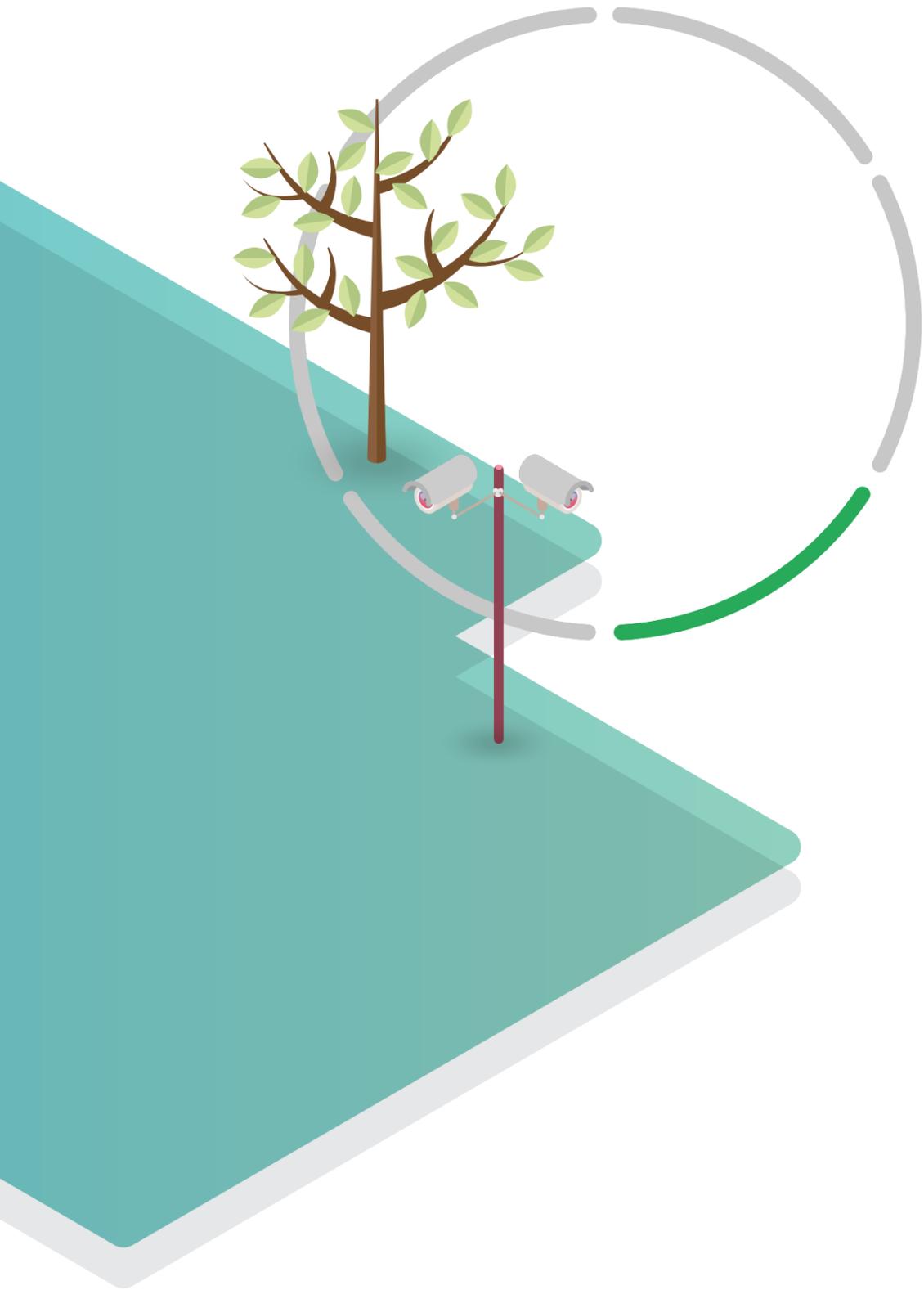
The forecasted 'fourth industrial revolution', referred to as Industry 4.0, involves massive implementation of so called cyber-physical systems in manufacturing; in other words, it assumes combination of real and

virtual environments in industry. The 'Industry 4.0' concept includes active employment of such innovative technologies as robotics, AI, 3D simulation, scanning and print, the Internet of Things, augmented and virtual reality, and blockchain. The new technologies are already transforming manufacturing all over the world; full-scale implementation of those technologies into global economy may have in the future an impact on production efficiency and labor market that may be compared to that of previous industrial revolutions. The companies that will leverage value production using 'Industry 4.0' technologies will gain sustainable competitive advantage and strengthen their positions on both Russian and international markets.

Financial area - banks, microfinance organizations, insurance companies - are also rapidly changing in response to global challenges. Those changes include banks that lose their monopoly on provision of standard services, non-financial institutions that gain a significant role on the financial market, occurrence of new technologies, and enhanced transparency of financial transactions.

Contribution of this domain to fulfillment of high-level strategy goals

Goals of the 'City economy' domain	Enhanced life standards	Transparent city governance	Efficient usage of city resources
Development of and support to Moscow's ecosystem for digital economy	✓	✓	
Favorable conditions for entrepreneurship in Moscow's digital economy	✓		✓
Increased production efficiency and strengthening of market positions owing to digital transformation of business in Moscow	✓		
Gaining leadership in developing AI systems/other advanced digital technologies	✓		✓
KPIs of the 'City economy' domain	<ul style="list-style-type: none"> • Portion of digital economy in Moscow's gross regional product; • Contribution of digital technologies to Moscow's total economy; • Number of those employed in small and medium digital-technology businesses; • Portion of export of digital products and services in Moscow's export; • Portion of public services for legal entities wherein offers are automatically generated in a proactive (predictive) way; • Portion of government contracts that are concluded using digital technologies (smart contracts and other technologies) and fully exclude generation of hard-copy documents. 		



5. Safety and ecology

Owing to state-of-the-art technologies, by 2030 Moscow will become a smart city offering a comfortable – environment-friendly and safe – life environment. To this end, the environmental monitoring system, firefighting system, and law-enforcement and security systems are to be upgraded. This modernization will use advanced digital technologies for monitoring, supervising, informing, and decision making based on the AI-analysis of the city's Big data.

The efforts will concentrate on forecasting and preventing unfavorable and emergency situations rather than on mitigating damage. The unified platform to be created for collecting, monitoring, controlling, and processing data will reduce the time needed to inform and notify residents and the emergency agencies to respond to alarm signal and take remedial actions.

High standards of safety in real and virtual life will be ensured by the advanced infrastructure for video monitoring, video analytics, and face recognition, alarm and firefighting systems, remote monitoring systems, and state-of-the-art cryptography and speech recognition systems.

The comfortable environmental situation in the city will be maintained by:

- a comprehensive system of environmental monitoring – information from sensors will be transmitted in real time using advanced communication technologies
- employment of 'green' architecture elements
- promotion of electric public transport and digital services based on shared usage

Contribution of this domain to fulfillment of high-level strategy goals

Goals of the 'Safety and ecology' domain



Enhanced life standards



Transparent city governance



Efficient usage of city resources

Environmental situation in Moscow improved; quality and reliability of environmental condition assessment enhanced owing to application of digital technologies



Moscow's natural resources used in a more efficient way



Adaptation to climatic changes



Transition from standard to intelligent security systems



Decreasing dynamics of the main types of crimes and time needed for responding to emergency situations reduced as a result of applying digital technologies

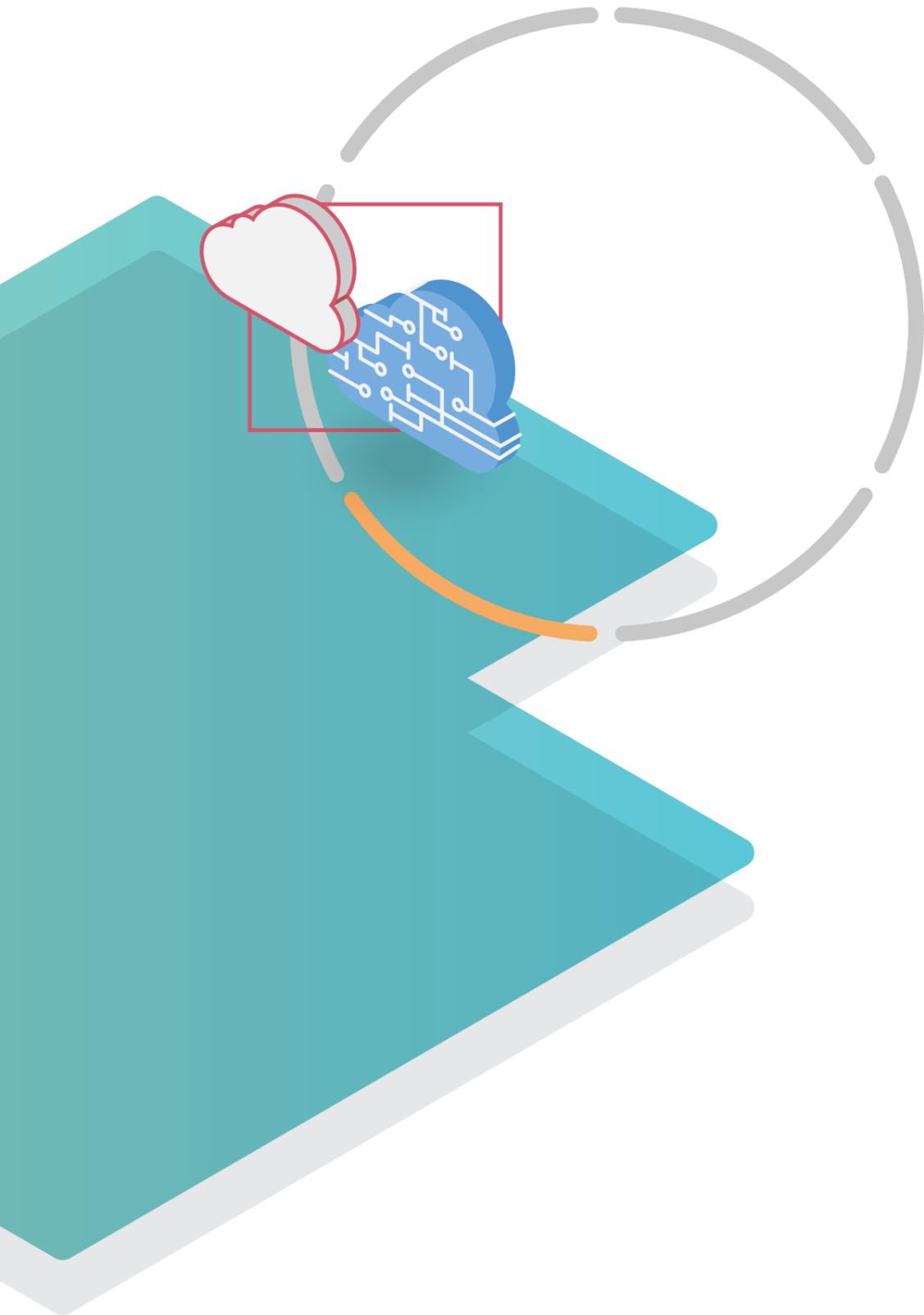


Increased efficiency of counteraction to cyber-threats and enhanced security of city and personal data



KPIs of the 'Safety and ecology' domain

- Portion of Moscow city administration's agencies and their subordinate organizations that use standards of safe information exchange;
- Total amount of pollution emission into atmosphere;
- Area of the shoreline and water surface of rivers and reservoirs located in Moscow that have been cleaned from garbage and maintained in the clean state
- Area of the city's green zones ^[16]



6. Digital government

By 2030 Moscow will become a data-driven city where decisions are made based on automatic processing and analysis of aggregated Big data. For this transformation to occur, multitude of sensors operating in power, heat, gas, and water supply systems, weather monitoring, and ecological monitoring systems are to interact in a reliable and efficient way. City infrastructure processes will be actively automated and robotized.

As a result of implementing supremacy of digital documents over hard-copy counterparts, residents, businesses, and city authorities will interact with each other in an electronic form.

Authorities and government agencies will operate in an efficient way that is open for civil society; they will fulfill their goals and provide public services to individuals and businesses in a digital form using the distributed-registry technology and smart contracts implemented in adopting city budget and allocating city resources. Owing to 'smart' city financing based on end-to-end digitalization of financial data, accountability and efficiency of spending budget resources will be significantly enhanced. At the same time the large amount of transaction costs that make a significant share in the current paradigm of city finance management will be slashed or fully removed.

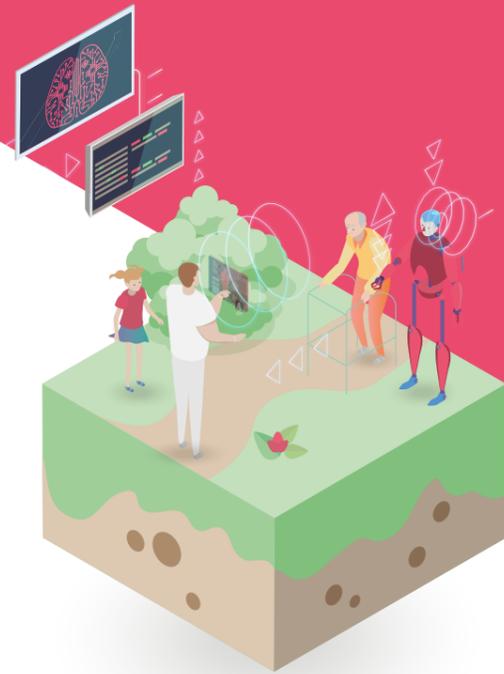
Digital governance is a comprehensive set of organizational, regulatory, and technological measures that includes both digital and analog elements:

- Digital elements:
 - Digital data and databases
 - Digital platforms
 - Digital interaction (data and document exchange)
 - Digital identification
 - Information portal and portal of services
 - Dedicated city applications
 - Digital interaction channels
 - Cyber-security and confidentiality
 - Digital industrial solutions
- Analog elements:
 - Laws and regulatory documents
 - Change management

Contribution of this domain to fulfillment of high-level strategy goals

Goals of the 'Digital government' domain	 Enhanced life standards	 Transparent city governance	 Efficient usage of city resources
Involvement of city residents in city management using the digital democracy platform	✓	✓	
Enhanced efficiency and transparency of city governance owing to application of Big data analytics, AI, and other digital technologies	✓	✓	✓
Number of standard procedures (verification and certification of documents) performed as part of administrative processes reduced owing to employment of blockchain technologies and smart contracts		✓	✓
KPIs of the 'Digital government' domain			<ul style="list-style-type: none"> • Usage of AI for fulfilling standard city management tasks; • Number of people who obtain public services using digital tools as compared to standard tools.

High-level strategy indicators



The classification of 'Smart City' domains was developed based on Smart Sustainable City, recommendations from the International Telecommunication Union^[29].

To monitor and assess fulfillment of strategic goals, one needs indicators that are clear-cut and measurable being at the same time comprehensive and encompassing all domains. They also need to be flexible since the strategy focuses on dynamic and 'live' development with consideration for changes in internal and external environments.

Two indexes are used as high-level indicators of Moscow's 'Smart City – 2030' strategy:

1. Life quality index^{[30]-[33]};
2. Urban environment quality index^{[19], [34]}.



Life quality index

The Life quality index is a compound indicator that measures accomplishments of countries and individual regions from the perspective of their capacity to ensure welfare to their residents. The index is calculated using a technique based on a combination of statistical data and polling results.



Urban environment quality index

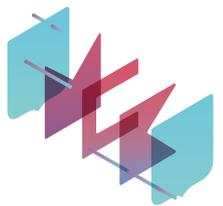
The Urban environment quality index assesses the capacity of urban environment to fulfill objective requirements and needs of urban dwellers in accordance with generally accepted norms and standards of life-sustaining activity. The index shows the extent to which the city is prepared to present-day challenges and fulfills residents' requirements.



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