UDC 711.4.01:72.01

DOI: 10.17673/Vestnik.2022.01.2

M. A. VAVILONSKAYA

CONCEPT OF LARGE CITIES INTELLECTUALIZATION

The article analyzes the emergence of the idea of smart cities, reveals their difference from smart cities. The intellectualization of a large city is understood as the integration of an innovative component into various fields of activity to improve the quality of life and manage urban infrastructure. The author proposes the concept of the development of the city of Samara as a territorial-spatial innovation system that expresses the diversity of areas of activity of citizens. The following are distinguished as agents of the development of an intelligent city: an administrative hub that provides state support for innovation; innovation hub - the head object of an intelligent city, from where its systems and facilities are managed; scientific and educational hubs where innovative ideas are generated; an industrial hub where these ideas are implemented and brought to life. This provides a closed cycle of intellectualization of a large city. A gradual and uniform innovative development of urban areas is expected due to interconnected specialized hubs, covering all the main areas of activity of citizens.

Анализируется возникновение идеи «интеллектуальных городов», раскрывается их отличие от «умных городов». Интеллектуализация крупного города понимается как интеграция инновационного компонента в различные сферы деятельности для повышения качества жизни и управления городской инфраструктурой. Предложена концепция развития города Самары как территориально-пространственной инновационной системы, выражающей многообразие сфер деятельности горожан. В качестве агентов развития интеллектуального города выделяются: административный хаб, обеспечивающий господдержку инноватики; инновационный хаб – головной объект интеллектуального города, откуда осуществляется управление его системами и объектами; научный и образовательный хабы, где генерируются инновационные идеи; индустриальный хаб, где эти идеи реализуются и воплощаются в жизнь. Это обеспечивает замкнутый цикл интеллектуализации крупного города. Поэтапное и равномерное инновационное развитие городских территорий предполагается за счет взаимосвязанных между собой профильных хабов, охватывающих все основные сферы деятельности горожан.

Keywords: *large city, intellectualization, introduction of innovations, spatial innovation system, development agents, specialized hub*

Ключевые слова: *крупный город, интеллектуализация, внедрение инноваций, территориально-пространственная инновационная система, агенты развития, профильный хаб*

Energy crisis of the 1970s made us consider the problems of saving natural resources for the first time, a significant part of which was spent on the construction and operation of buildings. In response to these global challenges in the 1980s, companies specializing in the design and construction of "smart houses" are emerging. In 1992, the UN declared the concept of sustainable development, following which the "smart home" became a subject of interdisciplinary research.

Initially, the idea of a "smart city," similar to a "smart home," was associated with new construction, but for a city, building it from inception is considerably more difficult. Examples of cities designed according to the principles of a "smart city" are the South Korean Songdo [1], where over 400 smart buildings are planned, and the Russian Skolkovo. A significant number of "smart cities" in the world are being built through the intellectualization of existing settlements with a complex, multifunctional structure that continues to operate. The establishment of new "smart cities" and the intellectualization of existing urban planning systems are two primary interdisciplinary and intersectoral tasks of the Russian economy, each with its specifics. In this regard, the term "smart city" would be logical concerning new planned settlements or parts thereof, initially developed according to the "smart city" scenario, and "smart city" should be used related to established cities. The intellectualization of established cities is a complex, contradictory, and somewhat conflicting task. This work focuses on this problem.

The problem of intellectualization in urban planning science began being seriously discussed in the second decade of the 21st-century. The scientific works by G.V. Esaulov, E.A. Akhmedova, G.I. Kuleshova, G.A. Vlaskin, I.V. Dianova-Klokova, V.N. Knyaginin, E.B. Lenchuk, D.L. Lobodanova, S. McQuire, D.A. Metanyev, I. Samson, L.P. Kholodova, D.E. Fesenko, D.A. Khrustalev, and K. Kurle, as well as architectural polemics covering

practical aspects of the intellectualization of cities (V. Bykova, E. Volynkin, A. Ilnitsky, I. Kuleshov, A. Erzovsky, G. Lukyanchikov, A. Shchukin) are focused on various aspects of smart cities. The work by G.I. Kuleshova "Territories of Innovation: Technoparks – Technopolises – Regions of Science" (2019), is closest to the problems of this study [2]. Notably, the problem has been poorly studied in architectural and urban planning science, and there is a substantial need for finding answers to the global challenges of the time associated with the search for a concept for the intellectualization of established large cities. Architectural debates are dominated by articles on introducing "smart technologies;" however, the infrastructure of the smart city has not been defined yet.

The process of urban intellectualization is multifactorial and is only partially related to the concept of a "smart home." To intellectualize cities, centralized systems for managing all urban resources, utilities, municipal transport, traffic, public safety systems, medical care, and education are required. Thus, the intellectualization of cities affects all spheres of human life and activity. Concurrently, an intelligent city does not imply several disparate systems, but rather their integration and interconnection with each other.

In this study, city intellectualization is the integration of an innovative component into various fields of activities to improve the quality of life and manage urban infrastructure, such as trade and food, business, recreation and tourism, education, entertainment, healthcare, housing and public utility systems, management, science, culture, sports, construction, and production. The city intellectualization concept is based on the fact that intellectualization processes consistently cover all fields of human activities, but the introduction of innovations in various fields of activities is not uniform. Innovation is being introduced actively into some areas of activity and slowly and gradually into others. Based on the experience of intellectualization in established cities, we can draw a conclusion about how intellectualization manifests itself in various fields of activities. There is a direct relationship between intellectualization and the growth of the population's living standards. Judging by the current pace of intellectualization, it can be predicted that by 2040, almost all major fields of activities will be covered by intellectualization, which will result in a significant increase in the standard of living of the population (Fig. 1).

The process of intellectualization of cities in our country was launched in 2008. Despite this, in Russia, only two of the existing cities (Moscow and St. Petersburg) are regularly mentioned in the annual rankings of the Center for Global Competitiveness as intellectuals [3]. Judging by world rankings, intellectualization processes cover cities with metropolitan status first. There are significantly more such cities in the global rankings than regional centers, based on the fact that intellectualization processes are directly related to urbanization [4, 5] and the smaller the city, the more difficult and slower the intellectualization of its infrastructure and vice versa, the larger the city, the faster its intellectualization. To accelerate the intellectualization of regional centers, such as Samara, development catalysts are required, namely, specialized objects with which the intellectualization of cities can be correlated and identified. We suspected that sooner or later, all fields of activities will be influenced by the intellectualization processes. To coordinate these processes, it is necessary to create key elements responsible for the intellectualization of a particular field of activity. Such key elements can be considered as specialized hubs, each of which is responsible for coordinating and propagating innovation in the field of activity for which it is responsible.

Since the Samara region was selected in 2018 as a site for testing the federal innovation project "Smart City. Successful Region," designed for the period until 2022 and promoted within the national project "Housing and Urban Environment" and the national program "Digital Economy," issues of intellectualization in relation to Samara are of extreme relevance.

This study aimed to develop, using Samara as an example, a concept for the rapid intellectualization of large cities through planning and systematic expansion of a territorial-spatial innovation system with infrastructure managed from a single center, an innovation hub. When developing the concept of Samara as an intellectual city, the sociological survey method, graphic-analytical method, and theoretical modeling method were used. Experimental-perceptual research was used to substantiate the creation, using the example of Samara, of a territorial-spatial innovation system, as well as the location, content, and volume-spatial solution of components of its core hubs (Fig. 2).

The proposed concept for city intellectualization, namely the planning and infrastructure concept, is aimed at the continuous development of urban areas. Historically, the development of a city is associated with the consolidation of certain functions within its territory. If earlier in architectural science the question of frame stability compared with the city pattern was discussed, currently, we can confidently state that the consolidation of functions in the territories also demonstrates special stability and continuity. In the postindustrial era, when traditional forms of economic management are replaced by sectoral fields of management, new city-forming functions in large cities are relegated

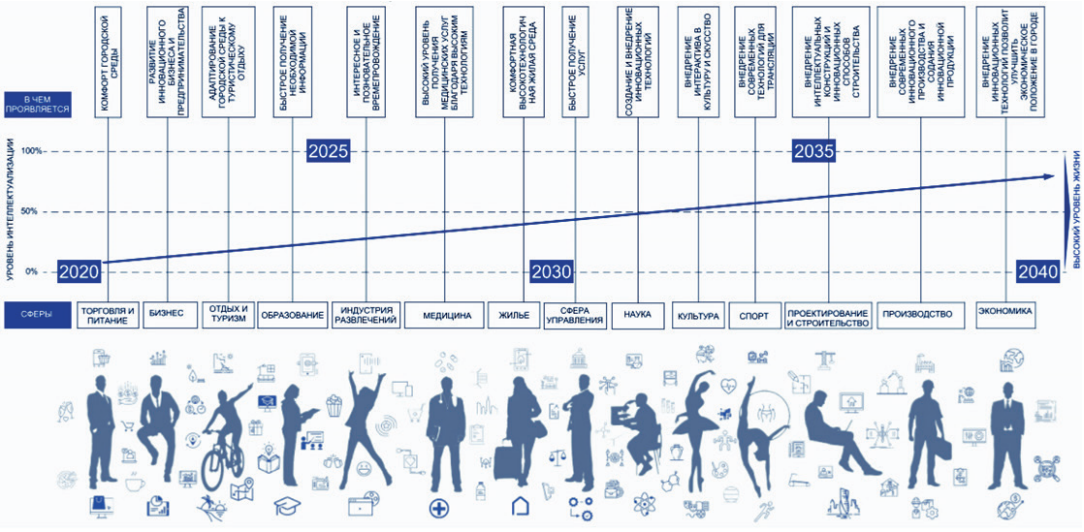

Fig. 1. Prognosis of the introduction of innovations in various fields of activity

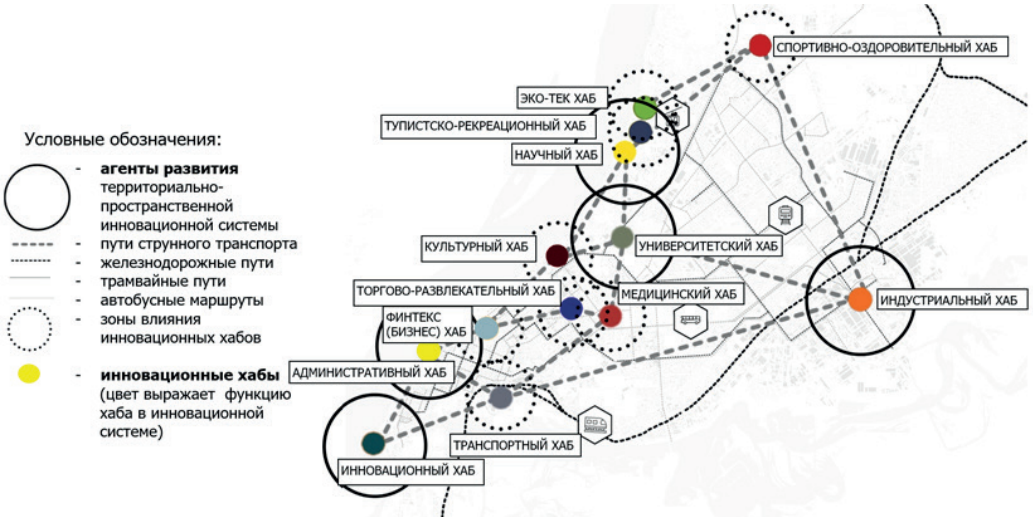

Fig. 2. Development concept of Samara as a territorial-spatial innovation system

to the former place. Therefore, it is relevant to create a unified infrastructure of an intelligent city with a location in territories historically associated with the development of certain forms of activity.

Designing an innovation system for an established large city is a planning task rather than an architectural task. Unlike new cities, in established cities, existing objects and territories can be adapted and refurbished to accommodate specialized hubs; therefore, the processes of intellectualization in some cases may not have a clearly expressed image in the subject-spatial environment, although innovation in architecture demands the architectural expressiveness of the appearance of buildings [6] and is often associated with "astro-architecture" [7]. The concept of "smart cities" is associated with innovative architecture, but such a formal perception does not reveal the full profundity of the architect's professional tasks in terms of creating a subject-spatial environment for the development of innovation.

Territories for the development of innovation in established large cities can be abandoned industrial enterprises and industrial zones, which, having a significant territorial resource, mostly represent degraded areas, the purpose of which has not yet been determined. Intellectual profile hubs responsible for the innovative development of each sec-

tor of the economy and representing key elements integrated into the city infrastructure can become indicators of the intellectualization of cities and catalysts for these processes in the future. Each of these hubs with different priority fields (profiles) can control certain spheres of activity.

The scientific hypothesis of the study is the assumption that the intellectualization of established large cities can be implemented through the systematic formation of a network structure of specialized hubs evenly distributed throughout the city, which enables gradual coverage of the entire city with innovations. Each hub is responsible for introducing innovation into the area of activity that corresponds to its profile. As mentioned above, innovation covers different fields of activity in different ways; therefore, the importance of specialized hubs in the infrastructure of a smart city will also vary.

Among the hubs, the "development agents" [8] of the intellectualization of the established large city can be distinguished, including innovation, industrial, research, educational, and administrative hubs. The innovations in these fields of activity have begun and are increasingly developing. The development agents in the territorial-spatial system of an intelligent city provide a closed cycle of intellectualization of the city according to the scheme of generating ideas in scientific and educational hubs – production of experimental samples in an industrial hub – implementation of experimental samples in specialized hubs – management of an innovative city. A model of "development agents" was developed, which reveals their interaction with the urban community (Fig. 3a).

The development of specialized hubs is secondary to the development of the above. Consequently, the infrastructure of an intelligent city acquires signs of hierarchy and among the "agents of development," the innovation hub is of paramount importance. With such objects, the development of new "smart cities" and the intellectualization of existing urban settlements begins. Thus, the main object of the smart city is the innovation hub, presented as a single control center for the remaining specialized hubs and all objects, systems, and forms of the "smart city," i.e., its infrastructure. The innovation hub is responsible for the correct operation, data processing, competent creation, and production of innovative technologies, as well as their implementation in the city structure.

The innovation hub is a new type of facility, designed for various fields and types of activities, and categories of the population. This hub is distinguished by its versatility and integrativeness and is considered the main object and indicator of intellectualization, where new technologies are developed and their implementation and correct operation are monitored. Most smart cities already have such facilities.

To ensure a rapid response to changes in external conditions wherein the processes of intellectualization of large cities are developing, it is necessary to interact promptly between hubs at the virtual and territorial levels. In this regard, all hubs can be interconnected through string transport, thus ensuring their rapid interconnection and contribute to the intellectualization of the city transport infrastructure.

Therefore, the main elements of the territorial-spatial innovation system of a large city, which serves its programmatic intellectualization through planning, regulation, and control over the introduction of innovation into its existing structure, are the main object of the intellectual city (an innovation hub), agents of innovation development (industrial, research, educational and administrative hubs), other specialized hubs by industry.

Within the proposed concept, the fundamental stages of the intellectualization of established large cities are defined (Fig. 3b). Stage 1 is the formation of development agents, namely administrative, innovation, industrial, research, and educational hubs. Stage 2 is the development of innovative technologies on the platform of development agents. Stage 3 introduces intelligent small forms into the subject-spatial environment, thus creating visual markers of innovation.

Stage 4 introduces intelligent systems that are not visualized in the spatial environment but provide the convenience and comfort of an intelligent city. Stage 5 is the construction of public, transport, and other hubs, which ensures maximum coverage of innovation in various fields of activity of citizens and further forms the urban framework of an intelligent city. Stage 6 is the construction of intelligent residential facilities, which involves the massive introduction of innovation into the urban pattern. Stage 7 is the construction of self-sustaining facilities, when innovation brings the construction of architectural objects, buildings, and structures to a new quality level in the concept of sustainable development. Stage 8 is the final stage of the formation of an intelligent city as an integral territorial-spatial innovation system that provides for the absolute majority of the population's needs [9].

Thus, the intellectualization of cities is primarily associated with changes occurring in their functional structure, which experiences the introduction of new intelligent systems. Combining intellectualized objects of various fields of activity into a single territorial-spatial innovation system will create a multifaceted manageable mechanism that enables rapid response to various urban problems arising in each sphere of human activity, such as trade and food, business, recreation and tour-

Fig. 3. Basic provisions of the concept: (a) agents of intelligent city development; (b) stages of the intellectualization of established cities

ism, education, entertainment industry, medicine, housing, management, science, culture, sports, design and construction, manufacturing, and economics.

Conclusions. In conclusion, the provisions of the study that constitute its novelty can be noted and are contained in proposals for the following:

1) development of the city of Samara as a territorial-spatial innovation system, expressing the diversity of citizens' spheres of activity;

2) the formation of a closed cycle of city intellectualization as per the scheme of generating ideas in scientific and educational hubs – production of experimental samples in an industrial hub – implementation of experimental samples in specialized hubs – management of an innovative city;

3) establishment of an administrative hub as an agent for intellectual city development, providing state support for innovation; determination of an innovation hub as the main facility that manages all systems and objects of the smart city; scientific and educational hubs where innovative ideas are generated; an industrial hub where these ideas are implemented;

4) achieving gradual and uniform innovative development of urban territories through interconnected specialized hubs, covering the citizens' main fields of activity.

The tentative procedure for implementing the research results consists of reserving sites for testing innovative projects, compiling a list of development agents from existing organizations and enterprises of the city, and developing a comprehensive City Intellectualization Program and the "Intelligent City Code," which specifies all objects, systems, and small architectural forms recommended for implementation.

REFERENCES

1. Esaulov G.V. Smart" city in digital economy. *Academia. Arhitektura i stroite'lstvo* [Academia. Architecture and Construction], 2017, no. 4, pp 68–74. (in Russian)

2. Kuleshova G.I. T*erritorii innovacij tekhnoparki – tekhnopolisy – regiony nauki* [Territories of innovations: technoparks - technopolises - regions of science]. Moscow, Nauchnyj mir, 2019. 366 p.

3. *Rejting samyh umnyh gorodov mira* [Rating of the smartest cities of the world] Available at: https://nonews.co/directory/lists/cities/smart-city-index (accessed 25 January 2022).

4. Ahmedova E.A. IInnovative strategies in the architectural and urban planning comple. *Tradicii i innovacii v stroitel'stve i arhitekture. Arhitektura i gradostroitel'stvo: sbornik statej 78-j Vserossijskoj nauchno-tekhnicheskoj konferencii* [Traditions and innovations in construction and architecture. Architecture and Urban Planning: Proceedings of the 78th All-Russian Scientific and Technical Conference]. Samara, 2021, pp. 172–182. (in Russian)

5. Ahmedova E.A., Vavilonskaya T.V. Principles of phased reorganization of the architectural and spatial structure of the urban environment based on innovative technologies. *Gradostroitel'stvo i arhitektura* [Urban Construction and Architecture], 2019, vol. 9, no. 2, pp. 68–79. (in Russian)

6. Dianova-Klokova I.V., Metanev D.A. On architectural solutions of scientific and innovative objects. *Academia. Arhitektura i stroitel'stvo* [Academia. Architecture and construction], 2021, no. 1, pp. 64–73. (in Russian)

7. ZHujkov S.S., Holodova L.P. Prerequisites of Future Architecture: "Astro-Architecture". *Novye idei novogo veka: materialy mezhdunarodnoj nauchnoj konferencii FAD TOGU* [New ideas of the new century: materials of the international scientific conference FAD PNU], 2012, vol. 1, pp. 458–462. (in Russian)

8. Akhmedova E.A., Vavilonskaya T.V. Smart city. A triad of development agents. Urban Form and Social Context: from traditions to newest demands. proceedings of the XXV ISUF International Conference. Siberian Federal University, Institute of Architecture and Design, 2019, pp. 875–885.

9. Mityagin S., Vasil'ev V. Smart St. Petersburg: an integrated approach to the implementation of information technologies of megapolis management. *Control Engineering Rossiya* [Control Engineering Russia], 2019, no.1 (79, pp. 18–25. (in Russian)

About the autor:

VAVILONSKAYA Marina A.
Postgraduate Student of the Town Planning Chair
Assistant lecturer of the Reconstruction and Restoration of Architectural Heritage Chair
Samara State Technical University
Academy of Architecture and Civil Engineering
443100, Russia, Samara, Molodogvardeyskaya str., 244
E-mail: marinavavilonskaya@mail.ru

For citation: Vavilonskaya M.A. Concept of Large Cities Intellectualization.*Gradostroitel'stvo i arhitektura* [Urban Construction and Architecture], 2022, vol. 12, no. 1, pp. 11-17. (in Russian) DOI: 10.17673/Vestnik.2022.01.2..