Prospects for creating a «smart» village

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Abstract. This article provides an analysis of the prospects for creating "smart" villages that meet international standards of quality of life. The relevance assessment is carried out within the framework of the Digital Economy of the Russian Federation project in order to modernize agriculture, as well as to increase productivity taking into account population density in various regions of the country. Examples of successfully implemented projects of "smart" villages outside the Russian Federation are presented as a basis for analysis. In conclusion, the conclusion is made about the possibility of forming "smart" villages in the Russian Federation.

1. Introduction

According to global trends, extensive urbanization is taking place on the territory of the Russian Federation. Analysts predict that by 2030, about 60% of the world's population will live in cities. This, in turn, will lead to the emergence of many new problems: environmental, transport and infrastructure. In addition, as the pandemic of the COVID-19 virus has shown, the high population density in urban settings does not always allow maintaining social distance between people, which significantly increases the likelihood of contracting the virus.

In order to solve some of the problems associated with urbanization and support the development of rural areas in Russia, a national program “Digital Economy of the Russian Federation” was created. This document was developed as part of the implementation of the Decree of the President of the Russian Federation dated May 7, 2018 No. 204 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024" [1-2].

2. Digitalization as a way to expand opportunities for the development of settlements

Digitalization has greatly expanded the capabilities of many sectors. For example, the business sector is already making full use of the possibilities of information and communication technologies, mobile communications and the Internet to increase the competitiveness of business. Thanks to this, organizations that widely use digitalization in their work achieve significantly greater results than competitors. In addition, at the moment, employees working remotely are in demand. The 2020 quarantine measures in major cities have forced employers to move their businesses to a new digital level. Therefore, we can already talk about the formation of an innovative economic sector in a city.
Unfortunately, this cannot always be said about rural areas, where often even telephone communications and the Internet are not always stable. In today's economy, office workers have no clear advantage over people working remotely. The lack of digitalization of the village is one of the reasons for the urbanization of the Russian Federation and prevents the construction of a smart village.

In order to identify the main tasks in the digitalization of a tree, it is necessary to understand how the digitalization of the urban environment took place.

It should be noted that the Smart City project implements both infrastructure development and an integrated approach, which includes the following goals [3]:

1. **Raising the human standard of living.**
   - Creation of the necessary life benefits and conditions for a comfortable living of a person and meeting needs at a level that meets modern safety and quality requirements.

2. **Manufacturability of the environment.**
   - Equipping the living environment with the latest technologies that contribute to the development of technologies and the standard of living of the population.

3. **Improving the quality of resource management.**
   - Transition from an extensive development path to an intensive one. Rational use of resources, development of waste-free production and development of alternative energy sources.

4. **Security.**
   - Creation of production facilities that meet modern environmental requirements, reducing the level of environmental pollution by introducing new technologies and modernizing equipment.

5. **Cost-effectiveness.**
   - An increase in the ratio of the results of human activity, the amount of products produced and the resources spent on production.

The main method for achieving results is digitalization, that is, the introduction of technologies, engineering solutions that meet modern standards [4-8].

One of the most important challenges in developing smart villages is the issue of infrastructure. At the moment, not all villages have access to the Internet and cellular communications [9].

From the message of the head of the Ministry of Finance M.I. Shadayev, it follows that on November 2, 2020, more than 12 thousand settlements throughout the country were provided with high-speed Internet. This was achieved using optical networks. However, according to the author of work [1], climatic conditions on the territory of Russia do not always allow the use of this type of networks. At the same time, it is proposed to use fiber-optic cables in climates with low temperatures, for example, in the Arctic latitudes.

Another rather important issue that needs to be resolved when creating a "smart village" is the provision of modern technologies to rural schools and kindergartens. The formation of a modern standard of living in the rural environment, including high-quality education and modern medicine, is one of the key challenges, the author of the work is sure [10]. There is no doubt that for these purposes there should be stable funding, but at the same time, it is necessary to raise the level of education in general. Therefore, in the near future, specialists who are able not only to fulfill their official duties, but also to use the significant potential of digitalization are in demand as never before.

Under the manufacturability of the environment is meant a set of different technologies, which, in their interaction, provide the necessary tools for the creation, storage, exchange and use of various information.

One of the components of the adaptability of the village environment is the possibility of a stable energy supply. Based on the works [11-15], it can be concluded that without digitalization and the creation of autonomous networks, large-scale construction of "smart" villages is rather difficult both from a technological point of view and from an economic point of view.

One of the trends in the digitalization of energy is the formation of bioenergy villages. That is, spaces that provide their own energy supply with their own sources. In order for a village to be considered bioenergetic, it is necessary that at least 70% of the electricity and heat for its own consumption it produces itself, says the work [16].
3. **Analysis of international experience**

The huge potential for the development of alternative fuel sources is also discussed in other works [17-20].

For example, in the articles [21-26] they conclude that waste processing for the purpose of obtaining energy is one of the most feasible ways of transition to alternative energy. Thus, the development of "green" industries in the village and the development of an alternative source of fuel will not only make it energetically independent, but will also raise the standard of living of the population for the light of creating new jobs.

An example of the implementation of the concept of a smart village can be the settlement described in article [27].

The concept of a smart village in Poland is shown in Figure 1 [27].

![Figure 1. The concept of a smart village in Poland [27]](image1)

The map of the smart village in the Masovian Voivodeship of Poland is shown in Figure 2 [27].

![Figure 2. Map of a smart village in Poland [27]](image2)

Another example of the implementation of a smart village is the system described in [28]. Its structure is shown in Figure 3 [28].
One of the ways to solve the problems associated with the creation and development of "smart" villages can be the development of information products that help make people's lives more comfortable and safe. The authors of the work [29] consider the creation of a "smart" settlement from the point of view of the information technologies being implemented. Thus, the use of information
technology to analyze route data allows pedestrians to better navigate the terrain. The composition of information technology services for indoor navigation is shown in Figure 4 [29].

4. Conclusion

Summing up, we can say that the formation of "smart" villages on the territory of the Russian Federation is quite feasible. Moreover, numerous attempts are being made to create conditions for the transition of the village to a new level, to create comfortable conditions for life, to form and manage resources. One of the fundamental parts of building smart villages is the modernization and digitalization of the energy sector. By creating its own alternative energy sources, the village will be able to enter a semi-autonomous regime, become less dependent on the city and raise the standard of living of the population by creating new jobs and improving infrastructure.

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