

Smart city technologies in the context of ensuring environmental safety and political stability

Oleg Evgenyevich Grishin^{1,2}, *Olga Alekseevna Nesterchuk*^{1,3}, *Sergey Ivanovich Popov*¹, *Alexander Vladimirovich Tolochko*⁴, and *Olga Viktorovna Levashova*⁴

¹Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

²Russian State Social University, Moscow, Russia

³Russian Academy of National Economy and Public Administration under the President of the Russian Federation, Moscow, Russia

⁴Bunin Yelets State University, Yelets, Russia

Abstract. The article analyzes the problems of formation and implementation of technologies of "smart cities" through the prism of ensuring environmental safety and maintaining the political stability of a large city. It has been established that there are various aspects of the development of smart cities. An increased interest on the part of scientists, engineers, ecologists, politicians, government and international structures and institutions in the technologies of "smart cities" is noted. The focus of the study is on the fact that the range of real problems of a modern city includes the solution of problems of safety, ecology, harmonious formation of infrastructure, logistics and other aspects of its effective development. The effect of use of such technologies in the environmental sphere is considered in the context of maintaining political stability. The problem of radiophobia in Moscow is illustrated. The costs of the media functioning when covering environmental issues are indicated. The role of information and communication technologies as a toolkit contributing to development of smart cities is outlined. An example of Moscow metropolis radiation-ecological monitoring system is given. It is offered to replicate technologies of an integrated automated system for environmental monitoring of urban space. The authors complement the existing approaches to the study of smart city technologies in key aspects of ensuring environmental safety and maintaining political stability.

1 Introduction

Relevance of study of implementation and application of smart city technologies is due to the progressive development of scientific and technological progress, including digitalization, robotization, technologization, algorithmization, and automation of the life of the planet's population. Wherein, scientists are concerned with finding solutions to environmental and political problems that can potentially arise as a result of these processes. Currently, the topical objects of study of scientists are becoming – human ecology [1], environmental risks [2], environmental comfort [3, 4], environmental safety [5, 6]. The

concept of a livable smart city emphasizes the imperative of functionality and integrated resilience in sustainable cities of the future. It is based on the needs of people and their natural environment, leading to the broader definition of urban sustainability. This concept offers many opportunities for residents of smart cities and is an attractive future market for innovative products and services [7]. Innovative offers in the context of implementation of smart city technologies are developing all over the world. The experience of using such technologies is just emerging. Currently, as a rule, there are no universal standards for classifying the maturity levels of initiatives and transformation models for implementation of a particular smart city. We focus on environmental safety in the context of the Smart City concept through the prism of ensuring political stability.

2 Materials and Methods

When studying implementation of technologies used in the innovative idea of smart cities in the context of ensuring environmental safety and political stability, the authors used a systemic, structural-functional and interdisciplinary approach to the problem under study. The study basis was formed by publications of domestic and foreign authors – specialists in the field of smart city technologies, environmental safety and political stability. The study methods were content analysis of mass media, participant observation, event analysis, case studies.

3 Results and Discussion

Modern society is riddled with many forms of environmental degradation that pose innumerable risks to human life. Hazardous waste, industrial disasters and environmental health risks are the original synthesized complex of this rapidly developing area of interdisciplinary study. An interdisciplinary approach is in demand for the critical study of environmental problems. It is essential to consider the key themes of power, justice and environmental sustainability and safety in the context of maintaining political stability.

It is stated that there are various aspects of development of smart cities, theoretical concepts and empirical studies, as well as examples of implementation of smart city programs and, on their basis, formation of the ability to create environmental values for citizens. There is a growing interest in this topic, supported by both national governments and international organizations [8]. Use of information and communication technologies in urban areas for the sustainable development of social and environmental living space involves implementation of projects to increase mobility, use smart water and energy systems, develop social networks, increase entrepreneurship, protect the environment and improve environmental safety and quality of life, as well as increased participation in political life [9].

The state of protection of the vital needs and interests of the individual and society as a whole determines a complex system of multi-vector tools for providing sanitary-epidemiological, educational, hygienic, technical and technological and others. This state is interpreted as absence of environmental hazard [10]. Environmental safety is becoming decisive conditions for survival of modern civilization. To reduce the environmental load on the Earth, it is necessary to change the strategy of technogenesis and solve many other pressing issues.

We focus on the technological aspect. To improve the efficiency of urban management, many countries use smart city technologies. Introduction and active use of digital technologies in cities leads to an increase, as a rule, of positive effects from network interaction, and minimization of various kinds of costs and obtaining peripheral socio-political, economic, logistic and other effects [11]. Some researchers believe that smart city

technologies are rapidly infiltrating the everyday life of city dwellers, allowing them to recreate better performance in urban settlements. Analysis showed that their implementation in some European cities contributes to increase in the overall degree of safety, including environmental safety. Wherein, the amount of harmful emissions into the atmosphere decreases, and the consumption of resources decreases [12]. It is noted that the range of real tasks of a modern city includes issues of safety, ecology, well-coordinated formation of infrastructure, logistics and many other aspects of its effective development. For each of the listed issues, the potential solutions on the information technology platform are possible. Engineering systems responsible for tracking potential threats to environmental safety, as a rule, are formed on the basis of sensors that measure the background radiation, the level of air, soil, water pollution, and etc. The analysis showed that smart city technologies, as a rule, are oriented towards the future provision of sustainable ecological development of cities. The authors believe that an integral part of political stability is the environmental safety of the population and the territories of its residence. Stability is a stable state that is not subject to significant changes. Stable development, therefore – the ability to constancy of any parameters of the dynamic state, preservation of basic elements within transition from one qualitative status to another, from the old to the new. As a rule, political stability is considered as a qualitative condition (property) of the system stability, that is, its state, when the potential is maintained to autonomously realize relative constancy within the system and to remain in its previous specified parameters. "Political stability is an opportunity that remains with the constancy of integratively significant parts (even under conditions of destabilization of some parts of the system), the likelihood of developing and adapting to transformations" [13]. The authors agree with this statement. Political stability, in general terms, implies a staged, progressive, step-by-step growth of certain indicators of the vital activity of society and the state characterizing them as an integral well and jointly functioning organism. Political stability can be viewed as a main factor for socio-ecological stability and safety.

There is a problem of radiophobia in society that is often politicized. So, for example, in February of 2020, Moscow residents, about 400 people, came to a gathering against the construction of the Southeast Expressway. The reason was that its construction took place in potential dumping sites for radioactive waste of the second half of the 20th century. Deputy of the State Duma of the Russian Federation V. Rashkin, as well as supporters of other left-wing forces came to the gathering. The main demand of the inhabitants of the megalopolis was to cancel construction of the Expressway according to the approved project that involved felling of trees, demolition of garages ... [14].

The analysis showed that the quality of the information provided by the electronic media, sometimes due to the free interpretation of facts and figures by journalists, namely, regarding implementation of measures to prevent potentially dangerous situations related to the radiation safety of the population and the city's territory, can create panic, for example, focusing on places of mass recreation of Moscow residents. It can be stated that the electronic media sometimes do not provide solid and understandable explanations for Moscow residents, using vaguely evasive formulations and "everyday" terminological apparatus (for example, "burial ground", "get infected with radiation" instead of being polluted, and etc.).

Achieving environmental sustainability through rapid industrialization is currently a major global challenge. Industrial plants are key factors in the economy, but also major pollutants. There is now an urgent need to find environmentally friendly, socially and politically sustainable solutions for management of industrial waste and to develop sustainable methods for treating waste before it enters the environment.

In modern conditions of progressive development of the information society in Russia, the information policy of enterprises whose operation is associated with ensuring a safe environmental situation and its monitoring is focused on constant and timely information to

the public through the media, conferences, inserts, and etc. Consider, in this regard, the activities of Radon Federal State Unitary Enterprise.



Fig. 1. Radon Federal State Unitary Enterprise stand at the exhibition-conference "Clean City", Moscow, June of 2011.

A comprehensive automated environmental monitoring system has been deployed in the capital. So, for example, Radon Federal State Unitary Enterprise also conducts a systematic inspection of construction sites, potentially radiation-hazardous facilities and the state of the urban space of the environment, conducts environmental education work with the population. The radiation safety system created in Moscow on the basis of Radon Federal State Unitary Enterprise is unique and can be replicated in other regions.

In the territory of the city, there are several dozens of stationary radiation monitoring stations, information from which is accumulated in a single information center. Residents of the city can familiarize themselves with the indicators of some sensors on their own, since they are located on the streets, and also online [15] (Fig. 2). This system can become the basis for formation of the state system of radiation safety at the regional and federal levels.



Fig. 2. Online monitoring of the radiation background in Moscow.

4 Conclusion

It has been established that modern researchers analyze the concept of the smart city phenomenon from a global and regional point of view, with an emphasis on its implementation throughout the world. Consider the role of a complex of information and communication technologies as a toolkit for promoting development of smart cities, and the role of such technologies for ensuring environmental safety in the context of ensuring political stability. The concept of an urban smart platform that allows stakeholders to measure human ecology as a value is studied separately.

It was revealed that insufficient research and, as a result, the lack of harmonious formation and implementation in the environmental sphere can lead to impoverishment of the population (poverty) and environmental degradation. A clear conceptual framework is necessary to understand the underlying challenges of sustainable urban growth in developing and developed countries. It is necessary to use interdisciplinary and holistic approaches to assessing the interdependencies between environmental threats, industrial activities, environmental risk, poverty and social vulnerability to facilitate development and adoption of effective socio-political decisions in the context of ensuring the political stability of a particular urban community.

It is shown that environmental risks, as a rule, accompany development of urban space. Modern economic development has accelerated environmental pollution, has resulted in the loss of natural habitats and altered landscapes. These ecological changes in natural systems degrade ecosystem services and, as a result, increase environmental risks to humans. Environmental risks are not only risks to human health from pollution, climate anomalies and natural disasters, but also the degradation of ecosystem services for people. It is impossible to completely eliminate risks, because you cannot achieve zero environmental impact, but it is important to find tools that minimize environmental risks to humans in a sustainable manner.

The analysis showed that environmental safety management requires decision-makers to weigh additional risks with the potential consequences of implementation of environmental policy considering both positive and negative effects that can arise as a result of various socio-political actions of both authorities and government, and the population of cities. Innovative developments in use of economically effective methods for assessing environmental risks, especially in the context of a lack of budgetary resources, are necessary. This is especially important for assessing environmental risks in developing countries, given the underdeveloped regulatory institutions and limited resources. Overcoming environmental risks contributes to preservation and maintenance of the political stability of communities.

It was demonstrated that Moscow uses components of the "smart city" technology (radiation and environmental monitoring system) in the context of ensuring environmental safety. Such technologies are being modernized based on achievements of scientific and technological progress, forming the ecological comfort of the city residents and reducing the degree of socio-ecological conflicts.

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