“Smart City”: Comfortable Living Environment

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Abstract. This article dwells on elaboration of a conceptual framework for sustainable development of urban territories. Dynamic changes of urban environment determined by fulfillment of multiple residential and public edifices, reclamation of vast spaces, massive reformation of former industrial, warehouse and port edifices, carry considerable possibilities for current formation of architecture and urbanization of spaces of increased comfort with optimal functional organization. Special attention in the article is paid to the developed technique of a complex assessment of urban environmental situation in the reconstruction area. This technique is based on the calculation of the habitat quality index and drawing up the urban environmental passport of the territory. The stages of this technique and algorithm of the urban-environmental measures selection for improving the habitat quality is also presented in the article.

1. Introduction

Under the rapid growth of the built-up urban territories, the new problems arise as a possible outcome of social, economic, and technical changes. The most obvious and noticeable of these happen in urban environment state deterioration, which in this country are due to insufficient spreading of modern technologies of household and industrial waste treatment, lack of resources, and air pollution. These are the reasons of health problems among the city dwellers, deterioration and degradation of urban environment infrastructure [1, 4].

While considering the essence of the «SMART City» concept, a set of specific factors necessary for understanding the projects implemented within the framework of this concept must be highlighted. These factors can be divided into external and internal ones, influencing different stages of elaboration, introduction, and operation of the solutions found within the framework of urban space intellectualization [5]. The project activities aimed at the creation of a «SMART City» must be oriented at the establishment of an urban space infrastructure, and comprehensive systems based on the modern technologies and capable of flexible reaction to the problems that arise [3].

It is unlikely that all cities will be "like that," but the vectors for implementing the idea are absolutely clear: the preservation of the region's cultural heritage and the latest developments and technological achievements of various countries in Europe, Asia and the USA (alternative energy, environmentally friendly materials, deep waste recycling, desalination, eco-transport). With the approach that provides for the consideration of the possibilities of granting settlements with features of the "smart city", new approaches to the preservation of the historical and cultural heritage are emerging [11].

2. The elaboration technique of comprehensive programme for the environmental comfort enhancement.

To solve the urban environmental problems and to improve the level of comfort for the residents, a set of activities including elaboration, adoption and implementation of coordinated measures for the
integrated improvement of built-up areas, as well as planning of a system of improvement newly developed areas to ensure a satisfactory level of comfort must be implemented.

For an example we will consider the territory of Rostov-on-Don. Maps of the environmental comfort of residents of Rostov-on-Don, composed prof. V.V. Privalenko based on data on the total pollution of the environment, shows that most of the city's territory, in particular its densely populated center, is dangerous for living in terms of the environmental situation.

The elaboration technique of this comprehensive programme includes 4 stages. Each of these stages has a specific deliverable and is aimed at the solution of particular tasks:

1. Diagnostics of current state of urban environment from the viewpoint of sustainable development;
2. Elaboration of methods for a comprehensive evaluation of urban areas;
3. Elaboration of an information pattern for environmental comfort enhancement in the course of comprehensive urban areas improvement;
4. Elaboration of environmental comfort enhancement programmes based on the comprehensive ecological monitoring in the course of urban areas improvement.

At the same time, it is obvious that the search for project solutions with an orientation toward the "smart city" model and the application of new information and technological methods should be conducted taking into account the prevailing typology of Russian cities, their diversity and real state, with their taxonomic development trends, the possibilities of preserving the historical and cultural environment and updating existing buildings, creating the necessary level of comfort and ecological well-being [11].

Solution of the modern city environmental issues demands a systematic approach and shall include the sanation and preservation measures in respect of every component of the urban environment. One of the easiest and the least expensive measures which is nonetheless quite effective which can be taken in the course of comprehensive urban areas improvement is the increase of city greenery area [12,13].

This is the reason why the offered technique concerns the enhancement of environmental comfort of
residence via urban environmental measures aimed at the increase of greenery density in the built-up areas [14].

3. Technique of a complex assessment of urban environmental situation in the reconstruction area

Special attention should be paid to the developed technique of a complex assessment of urban environmental situation in the reconstruction area. The technique, which is based on the drawing up the urban environmental passport of the territory and calculation of the habitat quality index, includes 7 stages (Fig. 2).

| Stage 1       | Master plan analysis |
|---------------|----------------------|
| Stage 2       | Analysis of land use and development rules |
| Stage 3       | Analysis of the map of new housing construction |
| Stage 4       | Analysis of geological and ecological indicators |
| Stage 5       | Choice of sites of reconstruction |
| Stage 6       | The complex analysis of an urban-environmental situation in the territory of reconstruction |
| Stage 7       | Development of a measure complex for improvement of the reconstruction territory quality |

**Figure 2.** – Technique of a complex assessment of urban environmental situation in the reconstruction area

Technique of calculation of the habitat quality index (Ihq) is based on the method of integral evaluation of factors measured in a range of different scales and dimensions and converting them into non-dimensional parameters.

On the basis of calculated habitat quality index, it is determined to which zone the study area of the reconstruction refers – favorable, rather favorable, adverse, extremely adverse, and then the selection of urban-environmental measures for improvement of the habitat quality is performed (Figure 3).

The last step of technique is Development of a complex of actions for improvement of the reconstruction territory quality

The main objective – creating favorable conditions of accommodation in the reconstruction territory by realization of actions for complex improvement and planting of greenery

For each site the table containing the following information is formed:

- Area arrangement on the map and the satellite picture
- Main town-planning and ecological indicators of the territory
- Zone with indicator of the habitat quality
- Selection of a complex of urban environmental actions for improvement of quality of the habitat

This is the reason why the offered technique concerns the enhancement of environmental comfort of residence via urban environmental measures aimed at the increase of greenery density in the built-up areas [15].
Figure 3. – Algorithm of the selection of urban-environmental measures

For carrying out complex assessment of an urban environmental situation and drawing up the urban-environmental passport of the territory 3 sites of new housing construction in Rostov-on-Don located in extremely adverse, adverse and rather favorable zones on the habitat quality index have been chosen [16,17].

Conclusions

The modern city is a complex socio-economic and spatio-ecological system with many internal and external links. It is obvious that the reconstruction of urban territories requires a systematic approach, which allows identifying and solving the problems of the existing territory in the complex. In order to achieve normal living conditions and functioning of the existing urban territory, it is necessary to bring all the elements of the system to the normative level of quality, and also to take decisions on updating all elements of the reconstructed territory [18, 19, 20].

The proposed technique of complex assessment of urban environmental situation in the reconstruction area with the calculation of the habitat quality index and the compilation of the urban-environmental passport of the reconstruction area is an effective instrument of information support for the implementation of a comprehensive program of environmental comfort improvement for urban areas.
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