

# Analysis and assessment of urban planning safety to achieve sustainable development of urban planning environment

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**Abstract.** The urban planning environment is multiple-element and multifaceted. As the urban planning environment develops, its originally incorporated elements are changing, which determines its quality level. To achieve sustainable development of the urban planning environment, it is proposed to analyze the urban planning security of the territory. The analysis of urban planning security involves the analysis of various factors of the urban planning environment. As a result of the assessment of the urban planning environment, the level of development of the urban planning system is determined, as well as the possible direction of its development, to obtain an effective result.

## 1 Introduction

The urban planning environment has been and continues growing and developing, which, as a rule, presupposes urbanization. The growth and development of the urban planning system are limited to a certain point of optimal development [1, 2]. The point of optimal development assumes the degree of sustainability of the urban planning system. Upon reaching this point, the growth of the urban planning system is no more effective, as the existing infrastructure, both transport [3] and engineering, becomes overloaded. Likewise, the planning structure of the urban planning environment is not effective, as the technogenic burden on the environment increases and becomes unbearable. The possible development of the urban planning environment can also burden it with man-made sources of impact. Therefore, it becomes necessary to determine the optimal balance between the development and growth of the urban planning environment, which can fully be considered a sustainable development of the urban planning environment.

With a fairly rapid pace of development of society and large-scale globalization of cities, the overall development of the urban planning environment requires close attention. Presumptive development of society, city, industrial base and directly urban environment. The cumulative development of these industries and spheres of life will ensure the sustainable development of the urban development environment. Sustainable development should not be understood as the formation of a certain economic base; ensuring

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sustainability also includes environmental and social factors that determine the quality aspect of the sphere of life. Maintaining a balance between all the components mentioned earlier, as well as the natural environment, presupposes the sustainability of the urban planning system.

The sustainability of the urban planning system implies the formation of a high-quality urban planning environment. The quality of the environment is directly related to the safety of the environment. "Safety" is considered within the framework of A. Maslow's concept as one of the vital human needs. Safety is formed by the primary needs of a person, and accordingly determines the quality of life. The modern urban planning environment presupposes an urbanized environment. A person is exposed to many factors that shape this environment. Realizing the impact of the technogenic environment on a person, it is necessary to make it safe both for a person and for the environment itself. Therefore, the need arose to form the concept of "urban planning safety" [4]. The main task of urban planning safety is the formation of high-quality, favorable living conditions in the territory, which contributes to the achievement of sustainable development of the considered territory.

## **2 Urban Planning Safety Assessment. Material and Methods**

The concept of urban planning safety was introduced by V.D. Olenkov. [5.6]. The author considers this concept as a state of protection of the population when choosing a construction site. The authors proposed to expand this concept to determine more accurate characteristics of the urban planning environment. Considering that the urban planning environment is quite diverse and can be characterized by architectural and engineering elements, natural and climatic, man-made (anthropogenic, urbanization) and social factors [7], the key directions were set. Within these directions, the degree of urban planning environmental safety can be determined given its operation [8, 9]. Thus, the key directions for assessing urban planning safety are natural factors, architectural, social, technogenic, and urban planning. Each of the directions of factors includes the main groups of indicators, which allow for a more detailed assessment.

Natural factors are geophysical, geological, climatic, and geochemical. These indicators characterize the existing environment the urban planning system operates in. They can be favorable and unfavorable for a sustainable urban planning environment. Architectural indicators imply an analysis of the value, composition, structure, and integrity of the development. Social factors determine, first of all, the living conditions of the population and the efficiency of the urban planning environment in terms of the population. The group of social factors includes statistical data on the socio-economic development of the urban planning environment. Man-made factors are the results of anthropogenic impact on the environment. Analysis of these factors requires assessing the ecological parameters of the urban planning environment. When analyzing urban planning factors, it is necessary to assess the elements of the urban planning environment (infrastructure, functional development and zoning of the territory, landscaping, etc.).

Indicators included in these groups of factors can be divided into regulated and unregulated. Regulated indicators are usually exposed to external factors. The unregulated factors are almost impossible to change. These factors include the natural and climatic features of the analyzed area, making the group of natural indicators. These factors form the peculiarities of the territory exploitation. However, under the influence of technogenic impact, these factors may change.

All factors can be divided into relative and absolute. According to the generally accepted definition, the relative indicators as an assessment are defined descriptively. Otherwise, the absolute indicators are determined numerically. The relative indicators

should include indicators included in the group of natural. For a preliminary assessment of natural conditions and further detailing of urban planning safety, an urban planning site should be classified into three groups: simple natural conditions - favorable, with a high level of urban planning safety; moderately complex sites- with a relatively low level of urban planning safety, and requiring a detailed study of the natural conditions [10]. Based on a comparison of descriptive characteristics, points are determined, which will then be summed up to assess the overall urban planning safety of the territory.

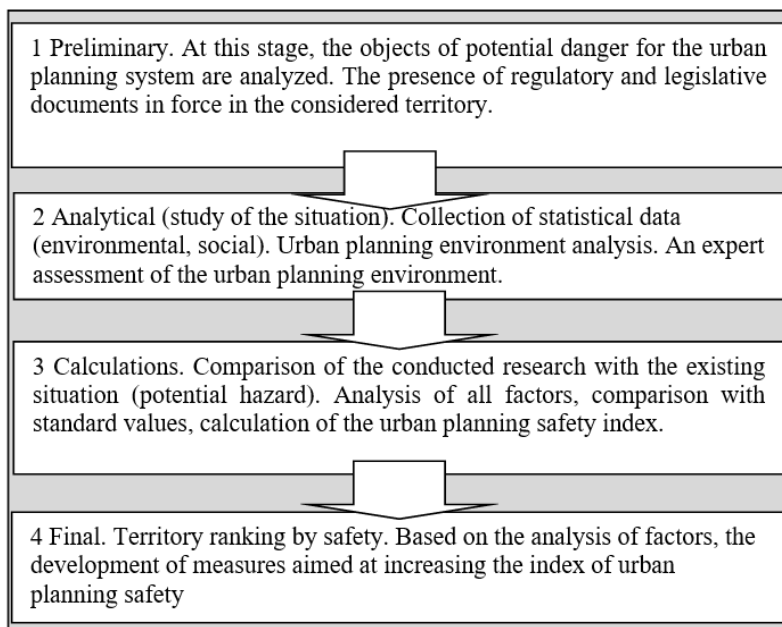
Assessment of absolute indicators requires analyzing statistical data on all factors included in the group of social and technogenic factors. For a more accurate description, a list of indicators has been determined that must be compared with the average indicator of several urban planning systems. As a result, the resulting coefficient is also summed up in the future to assess the urban planning safety of a separate territory.

The factors of the group of urban planning indicators can also be classified as relative. But to assess these indicators, the qualimetry method is recommended [11-13]. As a result of the assessment of indicators, a coefficient is also determined, which must be summed up in the future to assess urban planning safety.

The resulting comprehensive assessment of urban planning safety, based on the summation of all coefficients by groups, will determine the level of urban planning safety of the territory. A comparison of the levels of urban planning security between territories can determine the ranking of the territory. Accordingly, the higher the score is, the more secure and favorable in terms of living conditions the area and the higher the level of the quality of life within this area are.

### 3 Urban Planning Safety Analysis

Thus, the presented analysis of the factors that form the urban planning safety of the territory, as well as the methods for assessing these factors, made it possible to determine the urban planning safety assessment order (Figure 1).



**Fig. 1.** Stages of urban planning safety assessment

The presented assessment of urban planning safety should provide conclusions about the level of safety and favorable urban planning environment. Accordingly, the higher the level of urban planning security is, the more steadily the urban planning environment develops. Considering the presented methods for assessing urban planning security and further analysis of indicators, we can determine the weak points of the urban planning environment and then develop measures aimed at increasing the efficiency of specific areas and characteristics of the urban planning environment.

## 4 Conclusion

The concept of sustainable development in the modern world is usually determined by the quality of the urban planning environment. Another no less important element that characterizes the quality of the urban planning environment and determines its sustainability in development is the formation of safe living conditions. This article proposes a definition of urban planning safety. To assess urban planning safety, an analysis of the urban planning environment forming directions is proposed. Such key directions are natural factors, architectural, social, technogenic, and urban planning. Each of them consists of groups and subgroups of indicators. Such classification ensures a more detailed analysis of the urban planning environment and a more accurate assessment of urban planning safety.

Assessment of urban planning safety provides a comprehensive assessment of the urban planning environment. It uses both relative and absolute indicators. At the same time, a ranking scale has been defined for them. For example, for natural factors, a ranking scale has been drawn up in terms of the ease of construction and further development of the territory. Also, qualimetry is used to calculate architectural and urban planning factors. The rest of the factors are assessed based on comparison with the average. Average should be assigned based on the scale of the assessment, and depending on the federal classification of the urban planning environment (district, region, city/settlement). The results of the assessment allow for further analysis of all the factors that form urban planning security and determine the necessary elements of the urban planning environment that should be improved. Thus, assessing the urban planning security of the environment will not only assess the degree of favorableness of the territory but also determine its ranking position, which can further affect its investment attractiveness. The developed methods of improving the urban planning safety of the territory will make it possible to determine the further direction of its effective development, which, as a result, will contribute to the sustainable development of the urban planning environment.

## References

1. A. Khakee, *Omega*, **19(5)**, 459 (1991)
2. V.I. Krushlinskii, *The city, nature, and society. Interaction problems* (2017)
3. J. Nowakowska-Grunt, V. Chlad, *Transp. Res. Pr.*, **39**, 341 (2019)
4. O.A. Rastiapina, *In. Bul. VolgSASU*, **1-2**, 5 (2016)
5. V.D. Olenkov, *Urban planning safety*, 104 (2007)
6. V.D. Olenkov, D.S. Popov, *Bul. SUSU*, **22**, 60 (2007)
7. D.A. Varganovskaia, *Bul. MITU MASI*, **2**, 17 (2018)
8. O.A. Rastyapina, N.V. Korosteleva, *Proc. Eng.*, **150**, 2042 (2016)
9. H. Guo, L. Cheng, S. Li, H. Lin, *Proc. Saf. and Env. Prot.*, **143**, 361 (2020)

10. O.A. Rastyapina, *Bul. VolgSASU*, **54 (73)**, 187 (2018)
11. G.G. Azgaldov, A.V. Glichev, *Stand. and quality, Qualimetry - the science of measuring product quality*, **4**, 62 (2007)
12. G.G. Azgaldov, L.A. Azgaldova, *Quantitative assessment of quality (qualimetry)* (1971)
13. O.A. Rastyapina, E.N. Koronova, *IOP Conf. Series: Mat. Sc. and Eng.*, **463**, 6 (2018)