

**AIRPORTS AND THEIR INFRASTRUCTURE**

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**Dmitry Prusov****THE SYSTEM OF RISK ASSESSMENT CRITERIA AND  
CONSEQUENCES PREDICTION OF URBAN AREAS TRANSFORMATION**

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**Abstract.** *The concept of risk assessment and consequences prediction of urban areas transformation has been developed based on the analysis of the characteristics of urban areas, structure and condition of existing buildings, new construction options, and the introduction of risk factors transformation of urban areas and to predict the mutual influence of geotechnical situation of the surrounding buildings and the planned construction, that has provide the basis of forward planning reforms of urban areas to ensure their sustainability sustainable operation and use with regard to the conservation and development of building.*

**Keywords:** consequences prediction; risk assessment; territory planning; transformation of urban areas.

**1. Introduction**

The historic center of the city can not stop its development. The current building is included in the epicenter of the population. That duality (historicity and utility) features the historical center necessitate reconstruction.

Effective form of reconstruction of the city is a complete transformation of the existing building. The concept of complexity is seen as the interaction of economic and social development, on the one hand, and urban – with another that ensures completeness urban design. Complexity also should be considered as a means to achieve a high quality living environment. Complexity as a reconstruction method is the simultaneous implementation of measures for the territory planning, construction of new residential and public buildings, with the activities for the areas protection with dense housing and complex geological conditions, as well as carrying out all the reconstruction processes of urban development in a relatively short time. Thus it can be concluded that in Ukraine is necessary to develop approaches to urban planning and design of residential neighborhoods reconstruction, urban master plans for reconstruction of the entire quarter as a whole, especially given the progressivity of complex reconstruction of residential buildings [1].

**2. Statement of the problem**

Comprehensive building most of the major cities of Ukraine is typical disproportionate development and unfinished residential areas and neighborhoods, and in modern terms a comprehensive reconstruction of

urban residential development is an important part of solving the housing problem through the sealing construction (infill development, quarterly buildings), that implies the construction of new buildings or structures in historically developed residential neighborhood, and is usually carried out through the construction of new, not previously provided for the object in the historically established residential neighborhood [2].

In each specific case it is necessary the adoption of urban planning decisions considering the development of the territorial reserve development through its consolidation and analysis of the geological situation of the area, the technical inspection of apartment buildings surrounding buildings, comprehensive assessment of the impact of all the processes that accompany new construction, and integrated scientific and technical analysis capabilities construction of new high-rise buildings, based on the proposed methodology with the appropriate measures development of areas engineering preparation, design schemes and protecting systems, ensuring the basis carrying capacity, conducting reliable construction of new buildings and the safe operation of existing buildings.

Thus, on the basis of scientific and technical support of the reconstruction process of development by taking into account the additional exposure and study the stability of "new construction – the basis of territory – surrounding buildings" should be made approaches to strategic planning and reconstruction of residential groups and evaluation of territorial

resources and construction aim to increase the density of housing and population.

The recommendations could identify the relationship of urban residential development features, established and its spatial development with the account of stability and bearing capacity of foundations and territorial-building resources, and in urban planning and spatial planning to predict the spatial development of residential housing, housing density and population it at the expense of the new building construction and use of potential local resources – minimum placement areas and reserves planning residential groups – to increase the area of housing.

### **3. Analysis of the latest research**

In planning of urban areas transformation of exceptional importance zoning municipalities to identify territorial zones and establishing planning regulations to carry out reconstruction areas.

The transformation of urban territory with dense building and difficult geological conditions could be carried out on the basis of analyzing the characteristics of urban areas, structure and condition of existing buildings, new construction options, and the introduction of risk factors for transformation of urban areas and predicting the effects of the mutual influence of geotechnical situation of the surrounding buildings and the planned construction.

Planning the urban areas transformations should be provided considering the degree of risk reduction, and to ensure sustainability of the area, due to conservation and development construction. Accordingly it is necessary to develop principles of zoning of urban areas for planning and safe conduct of their transformation and forecasting the possible effects depending on the geotechnical properties of the site, the characteristics of existing buildings and new construction options. The concept of zoning has come out with degrees of risk influence the transformation process based on criteria for assessing the possible effects of the reconstruction and the extent of the required engineering preparation [3, 4].

This concept should be reflected in the Urban Master Plan and detailed project planning areas as key documents that define and solve complex problems of spatial planning, with a requirement for scientific and technical analysis of the possibilities of remodeling areas urban area through the creation and development of efficient methods calculation and research facilities of urban development and implementation of further scientific and technical

support process engineering training transformation of urban areas, and adequate planning of urban development [5].

### **4. The concept of risk assessment and consequences prediction of urban areas transformation**

The concept of sustainable urban development must take into account all aspects of sustainable development of big cities and all the major components of its elements, and displays in public urban planning doctrine based on objective materials and scientific and technical analysis and engineering support, which has become the basis for develop effective urban policy, promising programs and urban master plans. Thus, there should be a balanced approach to solving urban problems relevant for urban policy development of free intra-territory, which is one of the most important and long-term objectives that will not only improve the structure of urban land use, but also functional and urban planning to streamline the existing building.

In this situation the exceptional importance is acquire the scientific and technical feasibility of urban redevelopment as the main stage of the contemporary spatial development of the city, significantly increases the effectiveness and the extent to which urban planning decisions based on the creation and development of effective methods of calculation and analysis of urban construction, the importance of the complex research as the basis of design and planning work to improve the quality and validity of their design decisions, effective use of limited resources in the development of cities, especially in the complex geology and dense housing.

To determine the possible extent of the reconstruction is necessary to conduct a comprehensive study of the degree of impact of new construction on the state of the foundations of existing adjacent buildings, which requires the solution of complex scientific problems associated with the methods of continuum mechanics in the overall approach to the proposed methodology research and technical justification for the reconstruction of urban areas. The solution to this complex problem of reliable analysis tasks associated with research combined space and the interaction of solid deformable bodies with the soil mass, based on the laws of the nonlinear theory of elasticity and plasticity, nonlinear soil mechanics, variational methods, wiring nonlinear programming and efficient

numerical methods and theories of risk and sets.

The system of risk assessment criteria and consequences prediction of urban areas transformation is based on a comprehensive analysis of the of the urban territory parameters and the extent of its conversion.

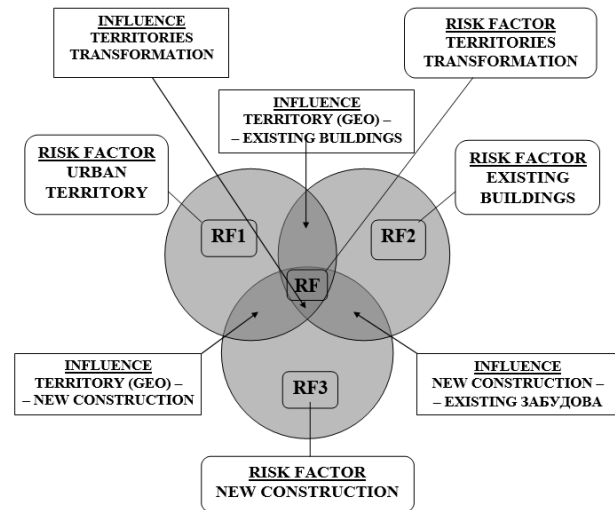
Carrying out the surveys and researches of the current state of urban areas in relation to the characteristics of engineering-geological situation, including the deposition of soils within the territory limits, its physical and mechanical properties, water saturation parameters, the presence and characteristics of groundwater, as well as considering the peculiarities of the relief, and other, and the introduction and determine the risk factors of urban area RF1.

Carrying out the surveys and researches of the current state of the existing surrounding buildings, the number of buildings within the territory limits, considering the availability and characteristics of engineering networks, the distances between buildings, years of development, category and status of buildings, their superficiality and the present state of development characteristics of buildings, including the types of foundations, their depth and sealing material, types and material of bearing constructions, walls, overlaps, and other, and the introduction and determine the risk factors of existing buildings RF2.

Analysing the planned construction, considering the parameters of the new object, including height and number of storeys, the size of the building in the plan, depth of the underground part, type of foundation and its depth, the required size of excavation in the plan and its depth, distances to existing buildings, type of strengthening structures, technology of its arrangement, organization of the fortifications construction, and the introduction and determine the risk factors of new construction RF3.

On the basis of generalization all the criteria for assessing the possible effects of the reconstruction and the extent of the required engineering preparation it can be introduced and defined the general risk factor of the hazards transformation.

The proposed system makes it possible to define the scope of activities of the engineering preparation of area and the preservation of historic buildings, prediction of consequences transformation of urban areas, and subsequently form the basis for the zoning of urban areas and their reconstruction planning.



**Fig. 1.** The criteria of risk assessment and consequences prediction of urban areas transformation

Risk measurement and consequences prediction of the urban areas transformation related to scientific and technical support of new construction and monitoring of the surrounding buildings and area, the main task is to ensure the resolution of urban, architectural, structural and engineering, construction and technical problems with minimal risk of error in terms of that are not regulated by applicable rules and standards, and in the absence of sufficient experience or direct analogies in the national and international practice.

The processes of urban territories reconstruction with a dense housing related to the deep excavations arrangement and underground structures construction, one of the main issues which impact on the existing adjacent building is to ensure its preservation and normal operation.

Design and construction of buildings and structures in districts with dense urban construction with complicated engineering-geological conditions associated with the need to deal with complex geotechnical issues to ensure the normal operation of existing and newly built structures, and to prevent emergency situations. In the case complicated engineering-geological situation is necessary to develop appropriate measures for strengthening the soil bases and protecting surrounding territories. It is necessary the further development of normative documents regulating the implementation of the basic processes of construction engineering works and taking into account the current situation in the construction of urban environment and its impact on existing nearby buildings that have included a special section on scientific substantiation and scientific-

engineering support of the reconstruction. The whole complex of these measures when working in reconstruction areas of dense urban areas and complicated engineering-geological conditions should be included in the project design and regional planning schemes with appropriate scale reconstruction substantiation.

Thus, reconstruction of urban areas with dense building and complex engineering-geological conditions necessary stages of its implementation is the engineering survey and inspection of the adjacent building, design objects with all these factors with the development of appropriate engineering documentation of the construction and installation works and monitoring object development and territory and required scientific and technical support for the safe conduct of all the processes of reconstruction of urban areas with dense buildings with the aim of preserving and protecting areas.

## 5. Conclusions

Thereby, in the reconstruction of urban areas with dense buildings and the difficult geological conditions, final decision-making should take place at appropriate stages of the results of its implementation on the basis of the above mentioned factors, developing the appropriate engineering documentation of the construction and installation works and monitoring facility adjacent buildings and areas, and with the required scientific and technical support carrying for the urban, architectural, structural-engineering and construction-technological problems resolving, for safe carrying the all reconstruction processes of urban areas with dense buildings to preserve and protect the urban territories.

Based on the researches the concept of risk assessment and predict consequences of urban areas conversions has been developed to justify an integrated approach to planning the reconstruction of urban residential development, the need for scientific and technical support of its holding in order to preserve the surrounding buildings and structures and protection areas; development and the principles implementation of these approaches in the practice of urban engineering. This allows to develop urban buildings and the transition from the consideration of the construction of certain facilities to integrated

planning reconstruction of neighborhoods, and then to the reconstruction of the planning area and the city of arrays while ensuring the preservation of the existing building and its safe operation.

Subsequently, on the basis of risk assessment and forecast of the transformation of urban areas can be solved the problem of zoning of urban areas for planning and safe conduct of their transformation and prediction of consequences depending on the geotechnical properties of the site, the characteristics of existing buildings and new construction options with taking into account the degree of risk-based criteria for assessing the possible effects of the reconstruction and the extent of the required engineering preparation. This concept of zoning has become the basis of strategic planning transformations of urban areas in order to ensure sustainability of their operations and the use of rational, given the conservation and development of the building.

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**Д. Е. Прусов. Система критеріїв оцінки ризиків та прогнозування наслідків перетворення міських територій**

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Розроблено концепцію оцінки ризиків та прогнозування наслідків перетворення міських територій на основі аналізу характеристик міських територій, складу та стану існуючої забудови, параметрів нового будівництва. Розглянуто фактори ризику перетворень міських територій та прогнозування наслідків взаємного впливу інженерно-геологічної ситуації, навколишньої забудови і запланованого будівництва. Проаналізовано перспективне планування перетворень міських територій з метою забезпечення стійкості їх раціонального функціонування та використання з огляду на збереження та розвиток забудови.

**Ключові слова:** оцінка ризиків; планування території; прогнозування наслідків; реконструкція міських районів.

**Д. Э. Прусов. Система критериев оценки рисков и прогнозирования последствий преобразования городских территорий**

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Разработана концепция оценки рисков и прогнозирования последствий преобразования городских территорий на основе анализа характеристик городских территорий, состава и состояния существующей застройки, параметров нового строительства, и введения факторов риска преобразований городских территорий и прогнозирования последствий взаимного влияния инженерно-геологической ситуации, окружающей застройки и запланированного строительства, что должно стать основой перспективного планирования преобразований городских территорий с целью обеспечения устойчивости их рационального функционирования и использования для сохранения и развития городской застройки.

**Ключевые слова:** оценка рисков; планирование территории; прогнозирование последствий; реконструкция городских районов.

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