

## ЖЕР АСТЫНДАГЫ БОШ МЕГАПОЛИС ЗАМАНБАП БАГЫТТАР ӨНҮКТҮРҮҮ

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**Өзөктүү сөздөр:** жер астындагы курулуш, жер астындагы мейкиндиги, тобокелдиктер жана багыттар

**Аннотация:** Бул макалада мегаполистердеги жер алдындагы кендиктерди комплекстуу колдонуу багыттары, ар кандай куралдарды кандайча, кандай коломдо башкача айтканда жаны заманга шайкеш колдонуу каралды. Айрыкча, системалоо жер астындагы иш чарбаларды, курал жабдыктарды орнотуудагы коопсуздук иштерине да озгочо коңул бурулду. Жер астындагы кендиктерди рационалдуу колдонуу, социалдык, экономикалык, мегаполис шаар куруу озгочолукторун эске алуу, транспортту жер астына жайгаштыруу булардын баары калктын жашоо шартына он таасирин тийгизет.

## MODERN TENDENCIES THE USING OF UNDERGROUND SPACE IN THE MEGAPOLISES

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**Keywords:** *underground construction, underground space, risks, megapolis, development, tendencies.*

**Annotation:** *The article discusses the current trends in the integrated use of underground space of megapolises, taking into account the various types, purposes and scale of underground structures. Particular attention is paid to systematization and accounting of various types of risks that invariably arise in the process of erecting underground structures both under the conditions of the existing development and under the conditions of the planned development of underground territories.*

*It is shown that the rational use of underground space, taking into account the social, economic, urban features of megapolises, provides rational development and use of territories, creates favorable conditions for the population, improves the environment and leads to effective use and cost savings spent on urban planning.*

*The relevance of the topic under study is determined by the increase in the population of megapolises and the area of ground construction, an increase in the level of urbanization, the density of traffic, the need to transfer numerous engineering systems and structures under the ground and other processes accompanying the development and functioning of big cities.*

*It is shown that the choice of priority development of underground space, taking into account the qualitative and quantitative assessments of its use, is an indispensable condition for the development of modern urban planning.*

# СОВРЕМЕННЫЕ ТЕНДЕЦИИ ОСВОЕНИЯ ПОДЗЕМНОГО ПРОСТРАНСТВА МЕГАПОЛИСОВ

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**Ключевые слова:** *подземное строительство, подземное пространство, риски, мегаполис, тенденции.*

**Аннотация:** *В статье рассмотрены современные тенденции комплексного использования подземного пространства мегаполисов с учетом различных типов, назначений и масштабов подземных сооружений. Особое внимание уделено систематизации и учету различных видов рисков, неизменно возникающих в процессе возведения подземных сооружений как в условиях существующей застройки, так и в условиях планового освоения подземных территорий.*

*Показано, что рациональное использование подземного пространства с учетом социальных, экономических, градостроительных особенностей мегаполисов, обеспечивает рациональное освоение и использование территорий, создает благоприятные условия для проживания населения, улучшает состояние окружающей среды и приводит к эффективному применению и экономии средств, затраченных на городское планирование.*

*Актуальность исследуемой темы определена повышением численности населения мегаполисов и площади наземного строительства, увеличением уровня урбанизации, плотности транспортных потоков, необходимостью переноса многочисленных инженерных систем и сооружений под землю и другими процессами, сопровождающими развитие и функционирование мегаполисов.*

*Показано, что выбор приоритетного освоения подземного пространства с учетом качественной и количественной оценок его использования является неременным условием развития современного градостроительства.*

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Nowadays, the situation with the increase in population is becoming increasingly tense. The number of people grows and as a result, the needs grow too. In particular, this process is observed in large cities.

The situation with the lack of land resources is caused by the increasing urbanization, the number of floors of the building achieve critical size, the increase of density and the development of land transport and its flows, the shortage of urban areas and a number of other reasons.

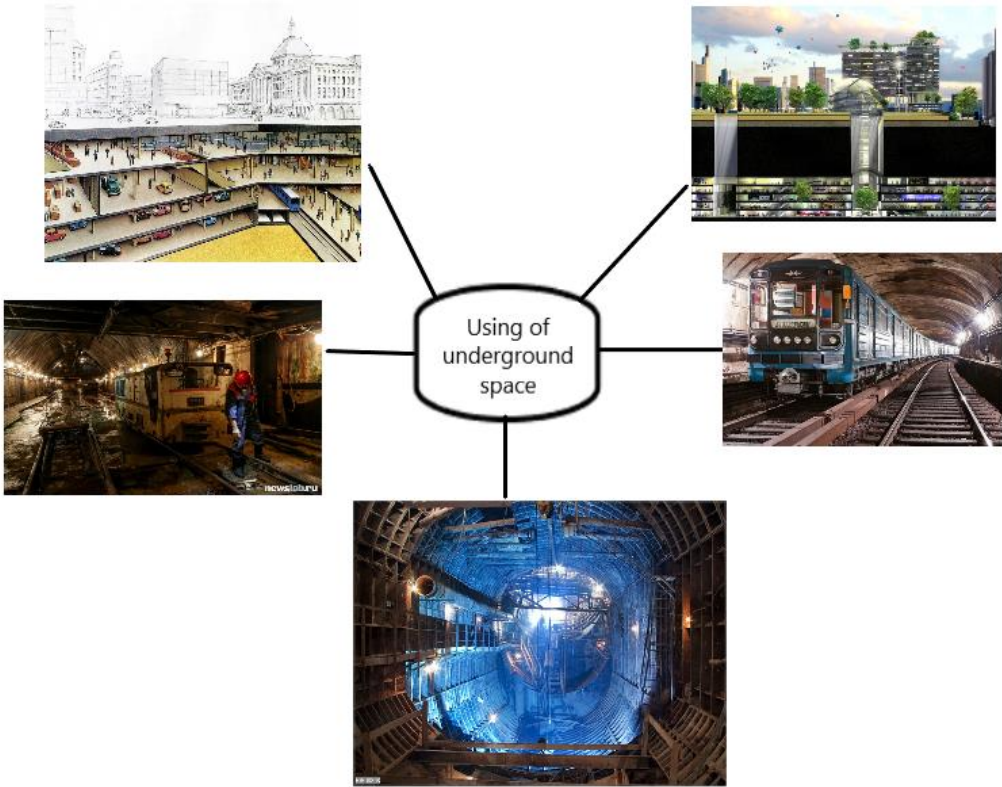
The area of the earth's surface occupied by housing, industrial, economic, social and cultural facilities, energy and other types of utilities is actively used for human needs [1].

Therefore, the most promising is the mastering of underground space, which helps to improve the living conditions of people and the interaction of various infrastructures, by transporting transport communications, engineering networks and other objects to the ground.

The development of underground spaces in megalopolises is an indispensable condition for the development of modern urban planning, which predetermines the possibility of efficient use of the urban area, improving the environment, preserving the architectural and spatial integrity of the historically established areas of the city, preserving the aesthetic appearance of megacities, and solving, much other complex including socioeconomic tasks.

To increase the efficiency of using underground space, it is necessary for each individual city to develop long-term programs for the development of underground space, taking into account the geographical location of the city, climatic conditions, topography, geological features of the area, etc. The most important part of the strategy of transition from traditional land-based to underground construction is zoning of underground space [2].

It is necessary to set the purpose and function of the work. Since the underground space can be used in different directions.



*Picture 1. Scheme of using of underground space*

Underground space is most often used for construction: metro, underground parking, for laying sewage pipelines, engineering systems and also for public purposes, as shown in the (pic.1).

The purpose of work is to systematize the sequence of selection of priorities for the development of underground space of megacities, and on this basis to give

a quantitative assessment of the effectiveness of the completeness of the use of underground space.

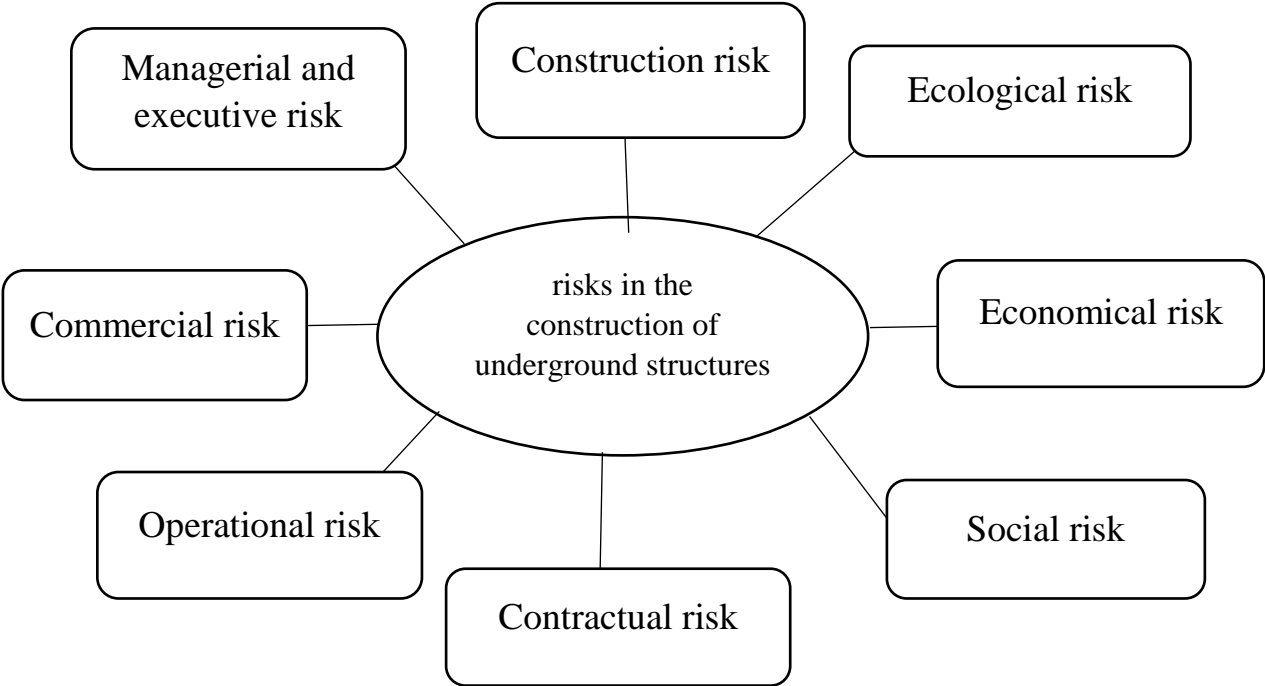
Each time the interest in the development of the underground space increases, this is due to the positive qualities of underground structures. The use of underground space for the placement of various facilities, in addition to improving the efficiency of subsoil use and saving territory, can significantly reduce energy costs for heating and cooling rooms, saving ground electrical network space. This allows you to reduce operating costs compared with the same objects on the surface, drastically reduce the influence of external climatic conditions on the indoor environment, etc. The underground facilities are well protected from direct exposure to atmospheric factors (temperature conditions of outside air, solar radiation, precipitation, winds, typhoons, tornadoes, extreme loads, etc.) [3].

But it is necessary to take into account the risks in this construction.

It is necessary to work to identify weaknesses in the “array - technology - underground structure - environment” system and, thus, provide a basis for the further development of environmentally friendly methods and design technologies with the greatest economic effect. Only taking into account the interaction and interaction of all natural, technical, technological factors is it possible to ensure the minimization of the negative effects of underground construction.

Before the start of construction, it is necessary to take into account without fail all risks in underground construction [4].

Such as illustrated on (pic.2): Ecological, commercial, economical, contractual, operational, managerial and executive, as well as construction risks.



*Picture 2. Scheme of all possible risks in underground construction*

The main trends and directions of the modern development of underground space are the integrated development of underground space (primarily megacities) by:

- Use of new accents, aspects and achievements in underground construction;
- construction of underground facilities of a new generation using high technologies and new space-planning and architectural solutions;
- management of properties and functions of underground facilities;
- increasing safety in underground construction, including preventing surface subsidence;
- search for new types of geosystems.

The development of underground space is most relevant in the central, characterized by dense buildings and the most visited areas of the city. Public centers of the megapolises include: the central zone of the city, main highways, major public transport hubs.

For example, in 2020, the Chinese plan to build an underground city in the capital of the Republic of China in Beijing. The area of the developed territory is about 90 million m<sup>2</sup>. On the territory of the city they plan to create several financial districts in which banks and other economic structures will be located, as well as transport interchanges, large shopping centers [5].

In recent years, transport facilities are increasingly being resolved in conjunction with service and trade institutions. Examples include the station in Rovaniemi in Finland in conjunction with a shopping center, the station in Hamburg, the station in Bergen (Holland), included in the shopping center, public transportation centers in Tokyo, cooperated with the shopping center, Munich and other cities.

In world practice, the development of construction of underground parking lots and garages is underway. The advantages of underground garages and parking lots are obvious. Underground facilities provide significant cost savings

The desire to create a complete system of underground structures serving the central zone of the city deserves attention.

The scale and types of urban objects located underground should be determined by social, economic, and town-planning considerations, based on the need to create the best conditions for serving the population, as well as to ensure the most rational use of urban areas and to increase the efficiency of capital investments in urban planning.

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