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# ГРАДОСТРОИТЕЛЬСТВО. ПЛАНИРОВКА СЕЛЬСКИХ НАСЕЛЕННЫХ ПУНКТОВ

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## FEATURES OF PLANNING FOR THE DEVELOPMENT OF URBAN UNDERGROUND SPACE IN VIETNAM

ОСОБЕННОСТИ ПЛАНИРОВАНИЯ С ЦЕЛЬЮ РАЗВИТИЯ ГОРОДСКОГО  
ПОДЗЕМНОГО ПРОСТРАНСТВА ВО ВЬЕТНАМЕ

*Developing countries such as Vietnam lead the way in terms of urban population growth. As you know, the territories of large cities are rapidly expanding, so city authorities are faced with the task of meeting the growing demand for infrastructure and public spaces. The relevance of the work is due to the fact that in the context of economic development, the local land fund is increasingly narrowing, with the trend of developing green, clean, beautiful and sustainable cities. In recent years in Vietnam more attention has been and is being paid to the advantage of urban underground space. This paper examined the legal, scientific and practical aspects of planning in Vietnam, including issues of underground construction and underground space planning. According to the development trend, construction, reconstruction and urban development activities in Vietnam should be closely related to the use of underground urban space. Effective use of underground space, saving land resources and proper organization of underground work contribute to the development of cities, improving the quality of people's life and economic growth.*

*Развивающиеся страны, такие как Вьетнам, являются лидерами по темпам прироста городского населения. Как известно, территории больших городов интенсивно расширяются, поэтому перед городскими властями стоит задача обеспечить растущий спрос на инфраструктуру и общественные пространства. Актуальность работы обусловлена тем, что в условиях экономического развития земельный фонд на местах все больше сужается, с тенденцией развития зеленых, чистых, красивых и устойчивых городов. В последние годы во Вьетнаме уделяется большое внимание преимуществу городского подземного пространства. В данной работе рассмотрены правовые, научные и практические аспекты планирования во Вьетнаме, включая вопросы подземного строительства и планирования подземного пространства. Отмечено, что в соответствии с тенденцией развития деятельность по строительству, реконструкции и городскому развитию во Вьетнаме должна быть тесно связана с использованием подземного городского пространства. Эффективное использование подземного пространства, экономия земельных ресурсов и правильная организация подземных работ способствуют развитию городов, повышению качества жизни людей и экономическому росту.*

**Keywords:** Urban population, urban territory, urban planning, underground space, construction, urban planning solutions

**Ключевые слова:** городское население, городская территория, городское планирование, подземное пространство, строительство, градостроительные решения

## Introduction

Developing countries, including Vietnam, are the places where most of the world’s urban population growth occurs. Cities are expanding rapidly, so city authorities must meet the growing demand for infrastructure and public spaces [1,2].

Nowadays, the urbanization process in Vietnam is developing more and more, which leads to the formation of an increasing number of urban areas throughout the country. Knowing that the growing concentration of population in urban areas leads to overload of both urban infrastructure and public space, especially in two large urban areas, Hanoi (the capital, north) and Ho Chi Minh City (south). Thus, urban infrastructure such as housing, urban transport and urban public spaces are under great pressure [4]. Meanwhile, land reserves for development are increasingly depleted, and the number of green spaces is decreasing. Consequently, to meet these needs, urban areas must take advantage of both the height and depth of urban space [5].

In recent years, underground space planning has become relevant for large cities such as Hanoi and Ho Chi Minh City in the context of the need to deploy underground parking projects and metro development projects, as well as the need to renovate the central business district while preserving the unique landscape.

Based on the growing demand for underground construction, which is proportional to the increase in land use value and the lack of land areas for construction, in addition to public underground parking projects. All of them are being implemented slowly due to many legal procedures and lack of funding. This confirms that planning the construction of underground spaces in large cities is a very urgent need to guide construction investment and ensure long-term vision and efficient use of space in the future [8, 9, 11, 12].

In the context of active economic development, there is a tendency towards a reduction in urban land resources. In recent years, Vietnam has been increasingly focusing on the benefits of using underground space to create green, clean and sustainable cities. Therefore, the research topic should be recognized as relevant.

## Materials and methods

The aim of this study is to synthesize aspects of the multi-purpose use of underground space within such disciplines as economics, sociology, politics, law and ideology of urban areas, including the adaptation of underground spaces for public use and improving Vietnam’s economic value.

The research tasks that need to be solved to achieve the stated objective:

- Analyze the shallow and deep use of the city’s underground space;

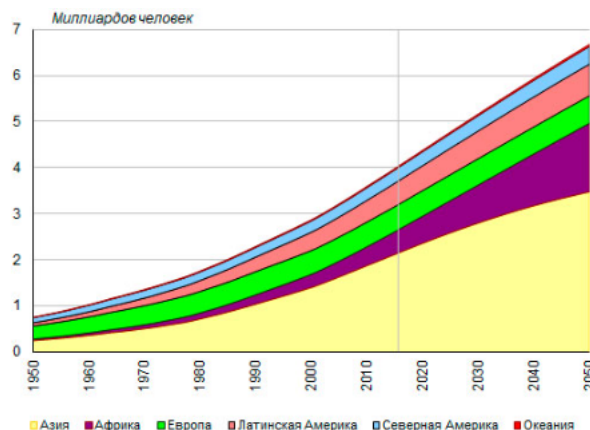


Fig. 1. Data on the urban population in the main geographical regions of the world for the period from 1950 to 2050 are presented in billions of people [3]

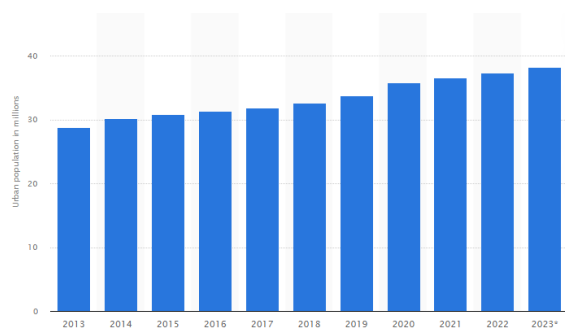


Fig. 2. Vietnam Urban Population 2013-2023 (in millions) [6]

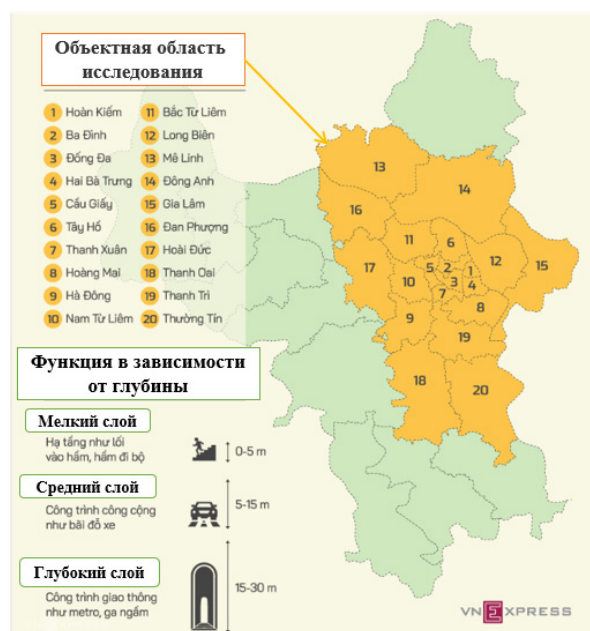


Fig. 3. Planning of underground urban development in the center of the capital city of Hanoi [7]

- Evaluate the planning of connecting the underground space with key road infrastructure and other construction facilities.
- Review the current trends of urban planning and underground space organization in Vietnamese cities that are given attention.
- Present some proposals for underground space management in the near future and draw conclusions.

This paper was conducted on the legal, scientific and practical aspects of planning in Vietnam, including underground construction and underground space planning. The study also includes an analysis and processing of survey data.

### Results and discussion

One of the features of the urban microclimate is the emergence of a «heat island», or «urban heat island». In this «island», the share of technogenic heat can reach half the value of solar radiation (fig. 4). In order to create green spaces that will

contribute to the effective cooling of the urban environment, it is necessary to pay more attention to the spatial dimension of such areas for each specific area when planning them.

The main results of the research are presented as follows:

- Urban underground space is an important city system, considered an effective additional solution to solving urgent urban development problems (fig. 5). However, the use of urban underground space also has potential negative impacts (deformation, displacement, subsidence...) on urban development;

- It should be stated that underground space (or subsurface) is a geological area with diverse and complex geological characteristics, physical and chemical states. Depending on the level of development of each city, underground resource extraction activities could and will be carried out at different levels;

- Given the development trend, construction, reconstruction and urban development ac-

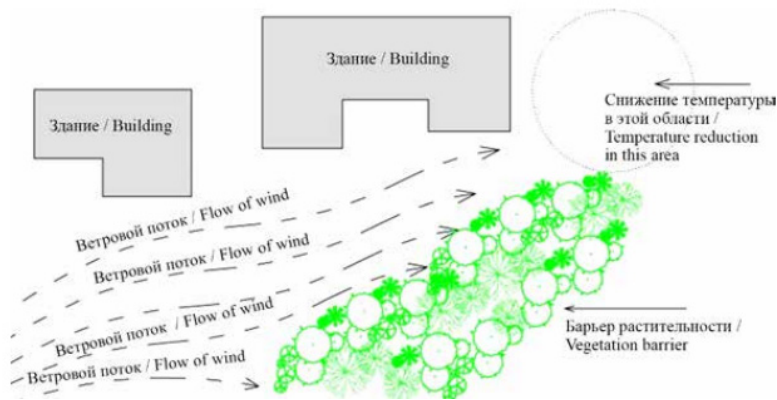


Fig. 4. Landscape and buildings act as a barrier to wind [10]

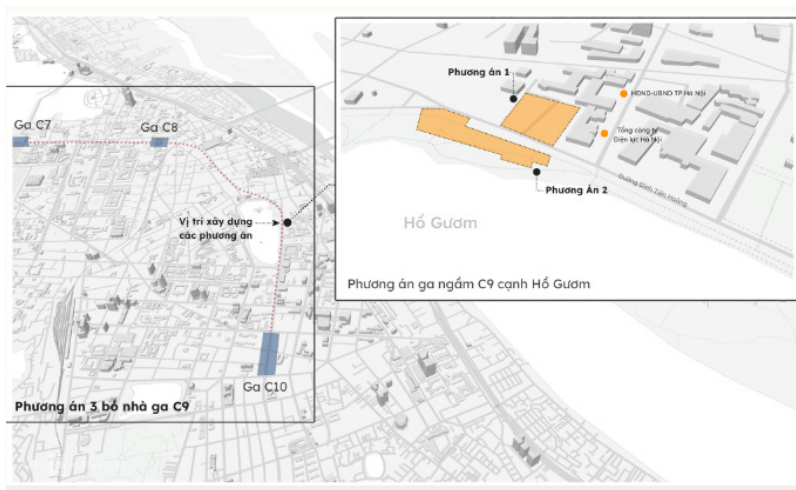


Fig. 5. Three options for metro station near Hoan Kiem Lake, Hanoi (Northern Vietnam)

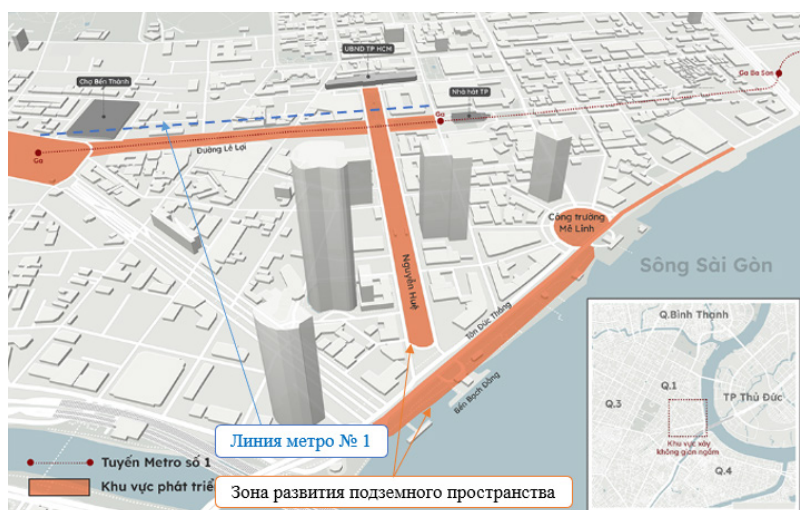


Fig. 6. Three Underground Spaces in Ho Chi Minh City of the Future (South Vietnam)

tivities in Vietnam must always have a close combination between underground urban space and ground-level urban space. The effective use of underground space, land savings and proper organization of underground work contribute to urban development, improve people’s quality of life and serve economic growth.

### Conclusions

Based on the research conducted, the following conclusions can be drawn:

- The development of urban underground space is an inevitable necessity of the urbanization process. The development of underground areas is an important solution in the development and transformation of urban areas to meet future challenges;
- Using underground space to integrate services and transportation is a solution that meets the criteria for sustainable urban development: improving land use efficiency, significantly enhancing public service systems, combining territories helps reduce pressure on existing urban areas and improve the overall planning and architectural structure, while maintaining the form inherent in urban space;
- Effective use and integration of the urban underground space system is one of the solutions that can help improve the efficiency of the infrastructure system, especially transport infrastructure, save land and help to enhance the quality of life. The lives of city dwellers become safer and healthier, more convenient and comfortable;
- In short, using underground space should be considered an essential part of urban planning solutions. Underground space is a strategic part of modern urban structure and can provide the city with new creative and valuable spaces.

### REFERENCES

1. Shilin A.A. *Osvoenie podzemnogo prostranstva (zarozhdenie i razvitie)* [Development of underground space (origin and development)]. Moscow, Publishing House Mosk. state mining university, 2005. 303 p.
2. Gurbanov Y., Ashyrov A., Ashyrov E. Development of compact urban spaces with developed public infrastructure: an integrated approach. *Vestnik nauki* [Herald of Science], 2024, vol. 3, no. 6(75), pp. 1685–1688. (in Russian)
3. United Nations. Department of Economic and Social Affairs. Population Division. *World Urbanization Prospects*. 2014.
4. Smirnov O.O. Impact of high-rise development on the city and urban environment. *Zhilyshhnye strategii* [Housing strategies], 2019, vol. 6, no. 1, pp. 45–64. (in Russian) DOI: 10.18334/zhs.6.1.40471
5. Denisova Yu.V., Korenkova G.V. On the need to develop the underground space of cities. *Vestnik BGTU im. V.G. Shuhova* [Bulletin of BSTU named after V.G. Shukhov], 2016, vol. 1, no. 11, pp. 99–102. (in Russian)
6. Urban population of Vietnam from 2013 to 2023 (millions). Available at: [https://translated.turbopages.org/proxy\\_u/en-ru.ru.9939e298-6673dd4a-a71bf91e-74722d776562/https://www.statista.com/statistics/603397/vietnam-urban-population/](https://translated.turbopages.org/proxy_u/en-ru.ru.9939e298-6673dd4a-a71bf91e-74722d776562/https://www.statista.com/statistics/603397/vietnam-urban-population/) (accessed 05 June 2024).
7. Nguyen Tien Chung. *Inzhenerno-geologicheskij monitoring podzemnogo prostranstva istoricheskogo centra Hanoja (Socialisticheskaja respublika V'etnam)*. Cand, Diss. [Geotechnical monitoring of the underground space of the historical center of Hanoi (Socialist Republic of Vietnam). Cand. Diss.]. St. Petersburg, CPSU, 2018. 154 p.
8. Korosteleva N.V., Ganiev E.R., Nasirov R.K. Urban planning prospects for the development of underground space. urbanized areas. *Vestnik Volgogradskogo gosudarstvennogo arhitekturno-stroitel'nogo universiteta. Serija: stroitel'stvo i arhitektura* [Bulletin of the Volgograd State University of Architecture and Civil Engineering.

Series: Construction and Architecture], 2023, no. 3–4 (92), pp. 211–220. (in Russian)

9. SP 473.1325800.2019. Underground buildings, structures and complexes. Town planning rules. Moscow. Standartinform. 2020. 40 p.

10. Le M.T. The influence of the layout of the city on the emergence of heat islands in megacities with a tropical climate (Hanoi). *Vestnik MGSU* [MGSU Bulletin], 2019, vol. 14, № 2, pp. 148–157. (in Russian)

11. Generalov V.P., Generalova E.M. High-rise residential buildings-complexes as an element of creating a highly comfortable living environment. *Gradostroitel'stvo i arhitektura* [Urban Construction and Architecture], 2013, vol. 3, no. 2, pp. 12–16. (in Russian) DOI: 10.17673/Vestnik.2013.02.2

12. Veretennikov D.B. Technologies of Planning and Construction of High-Rise Complexes within the Concept of Development of «Vertical City». *Gradostroitel'stvo i arhitektura* [Urban Construction and Architecture], 2023, vol. 13, no. 2, pp. 163–171. (in Russian) DOI: 10.17673/Vestnik.2023.02.22

## БИБЛИОГРАФИЧЕСКИЙ СПИСОК

1. Шилин А.А. Освоение подземного пространства (зарождение и развитие). М.: Изд-во Моск. гос. горного ун-та, 2005. 303 с.

2. Гурбанов Ы., Ашыров А., Ашыров Е. Развитие компактных городских пространств с развитой общественной инфраструктурой: комплексный подход // *Вестник науки*. 2024. Т. 3, №6(75). С. 1685–1688.

3. United Nations. Department of Economic and Social Affairs. Population Division. World Urbanization Prospects. 2014.

4. Смирнов О.О. Влияние высотной застройки на город и городскую среду // *Жилищные стратегии*. 2019. Т. 6, №1. С. 45–64. DOI: 10.18334/zhs.6.1.40471.

5. Денисова Ю.В., Коренькова Г.В. К вопросу необходимости освоения подземного пространства городов // *Вестник БГТУ им. В.Г. Шухова*. 2016. Т. 1, №11. С. 99–102.

6. Urban population of Vietnam from 2013 to 2023 (millions) [Электронный ресурс]. URL: [https://translated.turbopages.org/proxy\\_u/en-ru.ru.9939e298-6673dd4a-a71bf91e-74722d776562/https/www.statista.com/statistics/603397/vietnam-urban-population/](https://translated.turbopages.org/proxy_u/en-ru.ru.9939e298-6673dd4a-a71bf91e-74722d776562/https/www.statista.com/statistics/603397/vietnam-urban-population/) (дата обращения: 05.06.2024).

7. Нгуен Тьен Чунг. Инженерно-геологический мониторинг подземного пространства исторического центра Ханоя (Социалистическая республика Вьетнам): дис. ... канд. геолог.-мин. наук / СПГУ. Санкт-Петербург, 2018. 154 с.

8. Коростелева Н.В., Ганиев Э.Р., Насиров Р.К. Градостроительные перспективы освоения подземного пространства урбанизированных территорий // *Вестник Волгоградского государственного архитектурно-строительного университета*. Серия: Строительство и архитектура. 2023. № 3–4 (92). С. 211–220.

9. СП 473.1325800.2019. Здания, сооружения и комплексы подземные. Правила градостроительного проектирования. М.: Стандартинформ, 2020. 40 с.

10. Ле М.Т. Влияние планировки города на возникновение островов тепла в мегаполисах с тропическим климатом (г. Ханой) // *Вестник МГСУ*. 2019. Т. 14, № 2. С. 148–157.

11. Генералов В.П., Генералова Е.М. Высотные жилые дома-комплексы как элемент создания высоко комфортной жилой среды // *Градостроительство и архитектура*. 2013. Т. 3, №2. С. 12–16. DOI: 10.17673/Vestnik.2013.02.2.

12. Веретеников Д.Б. Технологии планирования и строительства высотных комплексов в рамках концепции развития «вертикального города» // *Градостроительство и архитектура*. 2023. Т. 13, № 2. С. 163–171. DOI: 10.17673/Vestnik.2023.02.22.

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