efficiency, competitiveness, and the urban position in the national and regional urban system. Sustainable UD, with key focus points, will create breakthrough successes.

6) Expanding urban areas and increasing urbanization rate based on healthy population development

Expanding urban areas and increasing urbanization rates based on healthy population development, improving community health, stabilizing urban-rural settlement, promoting housing programs, especially for low-income people; implementing urban upgrading projects, synchronously renovating existing residential areas in urban and suburban areas. Allocate, connect, and complete public centers, recreational areas, and green spaces and water systems in urban areas to create open spaces, general landscapes, and air environment regulation, meeting the environmental needs for living, working, travellingand recreation for individuals and the entire society.

7) Promoting environmental protection planning and implementation

Formulate and implement environmental protection plans, propose solutions, plans, and roadmaps for construction planning combined with environmental protection and water source protection. Environmental legislation in Vietnam is being completed, but it still needs supplements in fields such as green growth; water quality and aquatic ecosystems; water supply and drainage - land - groundwater, air and climate change; waste and recycling; health/chemicals; nature and national parks; international cooperation, etc. Simultaneously, implement policies such as waste classification at the source, recycling waste to save resources, generating new energy, and useful products like fertilizers, methane for electricity production. Encourage CO2 reduction measures: saving electricity, coal, oil, or using technologies that produce less emissions. Support and encourage businesses and communities to implement policies and economic tools in environmental management and protection.

8) Developing urban transportation and enhancing investment in public transportation

For urban transportation development, increase investment in public transportation development, apply smart traffic management techniques with electronic, telecommunications, broadcasting, and road vehicle control functions; this is smart traffic infrastructure, processing updated traffic information to optimize traffic equipment and relieve traffic congestion.

Conclusion

Sustainable UD in Vietnam is currently recognized as a key driver of economic growth for provinces, regions, and the nation as a whole. Cities are expected to strive to affirm their assigned roles and functions. To achieve this, local and central authorities must shift their perceptions, avoid redundancy and diffusion, refrain from arbitrary impositions, and seriously adhere to urban construction planning with specific implementation strategies. Vietnam's UD must serve the country's industrialization and modernization efforts. Achieving an urbanization rate of 50% or higher is synonymous with Vietnam surpassing the middle-income threshold, positioning the country for economic breakthroughs and transition to a new phase of development with high income levels comparable to international and regional standards.

With the resolute commitment and vigorous engagement of the entire political system, all levels of government, various sectors, and the support of the international community, Vietnamese cities are poised for robust and breakthrough development. Urban economies are expected to grow rapidly, efficiently, and sustainably. The quality of urban life is projected to advance to high levels, ensuring that basic housing and infrastructure needs of urban residents are met. Urban architecture is anticipated to develop in a modern, green, smart, and culturally rich manner, with distinctive cultural elements preserved and promoted./.

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Risk management experience in Urban underground construction: Lessons for Vietnam

Bui Thi Ngoc Lan

Abstract

In the world, urban underground works have been developing for a long time, particularly in countries like Russia and China, where underground urban structures are highly developed and complex. Vietnam's urbanization rate is increasing as the urban system grows in size, quality, and scale. Urban subterranean works in Hanoi and Ho Chi Minh City, where the rate of urbanization is rapid, land finances are depleted, and traffic is congested, primarily include station systems, vehicle exit stations, subway parking, road traffic cellars, high-rise basements, commercial cultural centers, diverse technical underground systems, massive drainage systems, and civil defense buildings [1]. Urban underground construction involves the construction of underground works with numerous challenges, complexity, and high risk; thus, risk management is an essential and inseparable component of urban underground construction. The article investigates risk management practices in urban underground construction in Russia and China, with some lessons for Vietnam.

Key words: Urban underground construction; Construction; Risk; Risk management; Lessons

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1. Introduction

Currently, under the conditions of socio-economic development and rapid urbanization, urban underground construction projects have been and are being cared for by many countries around the world and by scientists and major urban authorities in Vietnam. Underground construction is a component of urban engineering infrastructure that plays an important role in modern, sustainable urban development. Since the 19th century, countries around the world have invested in the construction of urban underground buildings. Along with increasing technological development, many complexes of commercial buildings and underground services have been built and developed, along with the development of transportation systems and architectural works [1]. With an urbanization rate of roughly 42.7%, there were 902 municipalities in Vietnam as of December 2023, with 02 special municipalities: 22 type I, 36 type II, 45 type III, 94 type IV, and 703 type V municipalities [2]. Large cities now have limits due to population growth and land depletion, putting pressure on technical and social infrastructure. In particular, there are increasing housing shortages, traffic congestion, flooding, environmental pollution, etc.; thus, the necessity to create and exploit urban underground buildings becomes the first priority objective of large municipalities. The article investigates the experience of risk management in urban underground construction in Russia and China, drawing lessons that can be applied to Vietnam to reduce the unfortunate risks associated with urban underground construction.

2. Literature review

In order to make use of the underground space for economic and social development, especially for the development of large urban areas, the world has been implementing various types of underground construction in urban areas. There are different ways to classify underground structures. At present, our country is very interested in underground construction and underground technical infrastructure, so here is a preliminary synthesis of the groups as shown in Figure 1, with the three main groups being underwater construction, underground engineering infrastructure, and other underground or special construction [3].

To make optimal use of resources in urban subterranean construction in a number of large municipalities for socioeconomic growth, it is required to investigate risk and risk management during the construction process. Urban underground construction carries a significant level of risk and difficulties in meeting project progress and quality standards. This is attributable to the underlying conditions of the construction process and a variety of risk factors [3].

Risk, defined as the likelihood of harm from any hazard, symbolizes the world's general predicament, in which the future cannot be accurately forecast [3]. Risk management seeks to: (i) reduce resource and project expenses; (ii) minimize injury and disadvantage to project participants; and (iii) promote project outcomes and partnerships. The risk of underground construction is associated with the possibility of uncertainty about technical progress and the cost of construction. Risk in urban underground construction is the quantitative assessment of risk arising from the implementation of the construction, operation, repair, and reconstruction processes of underground buildings [3]. Especially complex projects such as building underground corridors for metro operations involve risks in all phases of the project, from the feasibility phase to the operational phase. These risks have a direct impact on progress, cost, and performance. Reilly (2005), Reilly and Brown (2004), and Sinfield and Einstein (1998) conducted their research on underground tunnel projects. Reilly and Brown (2004) argue that the Underground Infrastructure

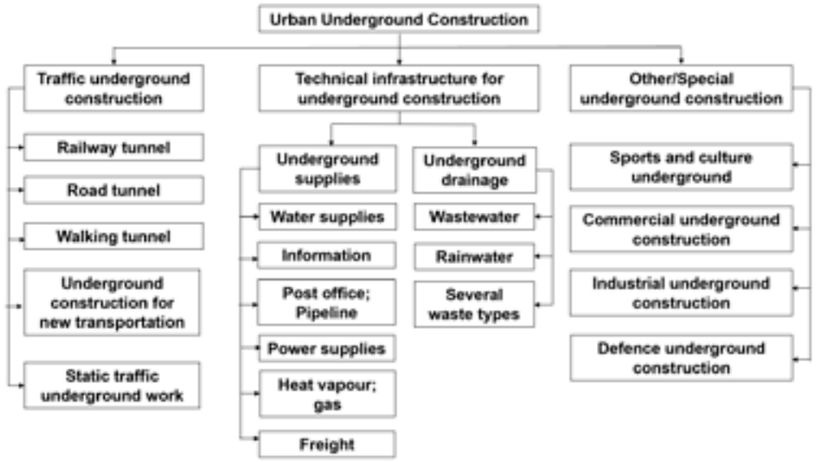

Figure 1. Different types of urban underground construction [3]

Project is essentially a complex project with many variables, including uncertain and changing ground conditions.

According to Reilly (2005), identifying hazards is critical at the early stages of a complex infrastructure project such as underground development. If an adequate risk reduction plan is developed for the identified risk, it will ensure that project objectives are completed more efficiently and effectively within the schedule, cost, and quality constraints. Furthermore, it will ensure improved construction and safety throughout the project's development and operation [4].

When determining the effectiveness of risk management organizations and the effective application of appropriate methods and risk management techniques in urban underground construction, we need to classify risk because each type of risk corresponds to a system of management methods. The risk of underground construction is divided into eight groups: construction, environment, management and operation, commercial, economic, contractual, social, and exploitation. Risk groups are often interrelated and have a significant impact on the functional stability of natural geological systems. Construction impacts, in terms of the impact that dominates the entire life cycle of underground construction, are construction risks [3].

Risk management is an essential and integral part of construction in general and underground construction in particular. Risk management can be effectively implemented by investigating and identifying the risks associated with each project activity and their impact and severity on the time and cost of the project.

Identification of risk in urban underground construction requires predicting the potential damage due to the level of danger that occurs during the construction and the probability of damage during the underground urban construction, in which the likelihood of damage is assessed through a number of factors, including: (i) the frequency and duration of the impact of the hazards on underground workers; (ii) the possibility of the occurrence of hazards and the history of harm to the health of underground personnel; and (iii) the ability to eliminate or mitigate damage.

It can be seen that the risk factors in the construction of urban underground buildings will cause negative

Figure 2. Risk groups associated with urban underground construction [3]

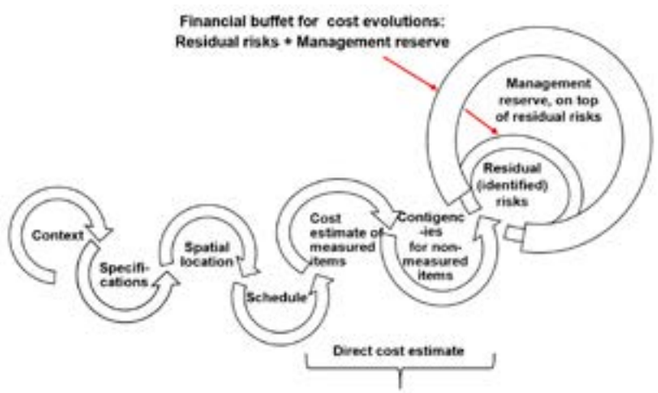

Figure 3. Risk dependencies [5]

consequences in the process of construction, affecting social life, causing economic damage, potentially concealing many dangers to humans, and can even affect human life through typical surface collapse, landslides, underground grassroots, etc. To solve this problem, it is necessary to identify hazardous incidents, assess the risks, and address these risks. Therefore, identifying the primary task of underground risk management is a very important task that needs to be taken into account, including the need to identify the causes of the risks during underground construction to avoid threats of damage to the building (Figure 5).

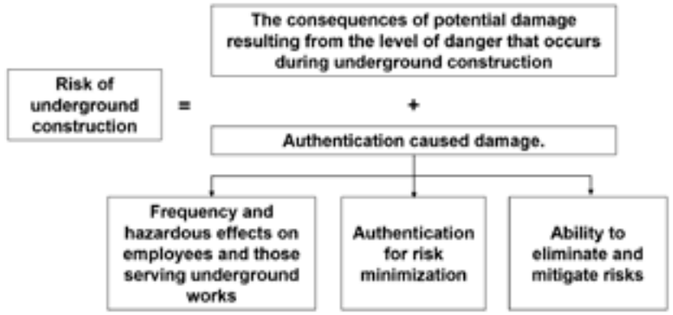

Figure 4. Risk factors in urban underground construction [3]

3. Experiences of countries with the risk management experience in urban underground construction

This essay examines risk management practices in urban subterranean development in Russia and China. The risk management experiences in urban underground construction are clearly documented in the analyzed content.

3.1. Russian experience

Based on the existing classification of geological and construction risks in the metropolitan cities of Moscow and St. Petersburg, it shows the need for continuous monitoring and risk management during the construction and development of underground buildings. The increasing population concentration in metropolitan areas and the continuous growth of the fleet of motor vehicles have created territorial, transport, environmental, and energy problems that hinder the sustainable development of modern Russian cities [7]. There are currently eight underground networks in operation in Russia in cities with a crowded population of over one million people: Samara, Yekaterinburg, Novosibirsk, Kazan, Volgograd (high-speed tram with underground elements), Nizhny Novgorod, St. Petersburg, and Moscow. In addition, the list of planned underground systems includes Chelyabinsk, Krasnoyarsk, Omsk, Perm, Rostov, and Ufa.

The risks of abnormal situations during underground construction are caused, first of all, by specifically very complex engineering, geological, hydro-geological, and urban planning conditions of the facility location, which include such things as: (i) the presence of a powerful layer of man-made soils, karst soils, high activity of groundwater and water-logging of underground construction sites, etc.; and (ii) significant man-made loads on the engineering and geological environment, which, provoking negative fast-flowing geological processes, worsen the conditions of the construction and operation of underground facilities [7].

In urban subterranean works, the degree of risk is a variable rather than a fixed one. If risk assessment alone, together with the existence of possible hazard sites and procedures, is insufficient, then ongoing monitoring of the risk levels that might alter during the underground work's development or operation is required. In Russia, geo-technical surveillance during the construction of underground buildings solves geotechnical and geoecological tasks, the main purpose of which is to ensure the overall safety of the underground works and to reduce the negative impact on the environment, both during construction and operation. The main surveillance methods used by the geotechnical observation system in the construction of underground buildings in Russia include: (i) geometric observations and surveys, including the use of satellite imaging; (ii) seismic observation; (iii) geophysical observations; (iv) geo-organic observances; (v) hydrological geometric surveys; and (vi) environmental monitoring systems (including the control of chemical and biological substances with strong environmental influence) [7].

The work of the Geotechnical Surveillance Project is carried out during the construction of the underground site until it is put into operation. Direct and indirect methods for determining controlled parameters allow the following: (i) predict the technical and geological conditions of the

	Causes	Probability of occurrence	Impact
Avoid threats	Recognise and eliminate	Minimise	Minimise and control
Utilise opportunities	Recognise and promote	Maximise	Optimise or maximise

Figure 5. Key tasks of project risk management [6]

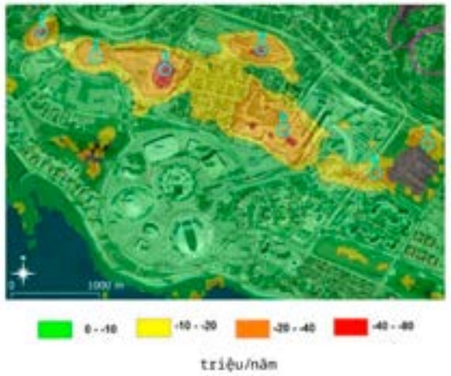

Figure 6. Maps of average vertical displacement velocities on the territory of St.Petersburg based on Google Maps for 2020 [7]

subsurface with sufficient accuracy; (ii) identify qualitative and quantitative indicators of the voltage-deformation state of the "corpuscular lining"; (iii) determine the deformation characteristics and actual strength of the surrounding body; (iv) determine deformations of the enclosed body from the suburban lining to the day surface; (v) determine the maximum permissible concentrations of pollutants in the air, water, and landfill. The results obtained during the geotechnical monitoring process help in the construction process to determine the impact of the work on the activation of hazardous processes, adjust the process parameters of the mining operation, and make recommendations to reduce the negative impact on the environment [7]. Among them, Russia uses XRS intersectional methods (XRS radar with synthesis aperture, abbreviated InSAR, used in international documents), which are effective both in the construction and operation of underground works and very effective in monitoring dense urban development [7].

3.2. Chinese experience

In China, in the early years of the 21st century, the construction of urban underground buildings gave a strong impetus to economic and social development. However, due to various risk factors associated with the complex project environment, violations of safety rules occur frequently during underground construction, resulting in serious problems during project operation [8]. The Chinese Government is interested in risk management in underground construction and developing new strategies for risk management for underground safety based on six aspects, including: (i) management systems and policies; (ii) legal countermeasures; (iii) administration; (iv) economics; (v) education; and (vi) engineering [8].

China has made enormous efforts to manage risk in underground construction, including: (i) developing laws and regulations and a legal system for safe risk management with many levels of laws, regulations, and industry standards; (ii) Implement risk management, technical management, and risk control systems throughout the entire implementation process, including risk identification during the planning, surveillance, design, and implementation phases; risk assessment, control, and prevention of risk sources; implementation of the safety responsibilities of each stakeholder; monitoring of processes and on-site behavior during implementation; (iii) Information technology-based safety risk decision and management support systems, early warning decision support, and risk management in underground construction by applying significantly advanced information technology, including WiFi, 3G, GPS, and RFID, to set up risk management and identification systems, can perform real-time monitoring of staff and workers at the site, and (iv) can apply safety risk management, forecasting, and control measures for major accidents, natural disaster prevention, and underground project insurance [8].

4. Some lessons for Vietnam

Urban underground construction is the basis for the strong development of municipalities. The practice of urban underground development in the world shows the tendency to form underground complexes that combine metro stations and transit stations for various types of transport, business, cultural, historical, and shopping centers in order to liberate the city's daylight and ensure the comfort of the residents while moving [7].

In Vietnam, since the beginning of implementation of urban underground projects with works that have been and are being constructed, such as Thu Thiem Tunnel (HCMC), Nga Tu So pedestrian tunnel, Kim Lien tunnel (Hanoi), Nguyen Van Linh - Nguyen Huu Tho intersection tunnel project (District 7-Ho Chi Minh City), Ben Thanh - Suoi Tien metro station (HCMC), C9 underground station of the Southern Railway Project Thang Long-Tran Hung Dao (Hanoi), etc.

In the coming years, the construction of urban

Figure 7. The safety risk management system of underground construction in China [8]

underground construction systems in major municipalities will be more deployed and faced with many challenges and risks in the construction process. Among them, Hanoi Capital is mainly oriented to the underground transportation underground urban railway system, consisting of 6 lines with a total length of about 86.5 kilometers, an average depth of approximately 20 meters, 81 underground stations, 78 underground public parking lots with a total floor area of more than 104 hectares, mainly located in the area of 4 old inner city districts, and construction works from 3 to 4 basement floors [9]. HCMC will also implement projects such as Ton Duc Thang Road being grounded, Nguyen Hue street, Le Loi, and Bach Dang Park being oriented as an underground space for travel, shopping, entertainment, etc.[10]. Therefore, learning about risk management in the underground construction of countries, specifically Russia and China, and drawing lessons is essential, and specifically, some lessons for Vietnam are as follows:

The first lesson: Identifying, analyzing, assessing risk, formulate action strategies, and identify ground-related hazard scenarios to reduce the likelihood of accidents during underground construction or operation. This factor is determined by the reliability of the underground construction technology, its technological equipment, its ability to control and support its resources, the trustworthiness of the structure, and the efficiency of the management of the technological process. The underground works under construction are high-risk areas and, in the event of an accident, would pose a serious danger to the people there and the surrounding buildings. Implementing risk management in urban underground construction requires an understanding of the risks that may occur, classifying them, and controlling them in the most effective way. Therefore, it is necessary to focus on identifying and analyzing natural risks and negative risks to buildings, including: (i) identifying and analyzing the natural hazards to artificial underground buildings in the construction process, such as sewerage; the main negative natural characteristics of the area; groundwater currents and groundwater invasions; geological hazards in the region; especially hazardous weather phenomena; floods, etc, and (ii) Identify negative human-made risks such as the presence of existing buildings, defects caused by uneven rainfall; construction and other types of work (major repairs, reconstruction, demolition, etc.) near underground works, burials and burial sites of all kinds, etc.

The second lesson: Implement geotechnical surveillance at different stages of urban underground projects, especially during construction. The implementation of geotechnical inspections during the construction of underground works is a kind of work that is essential because the effectiveness of geo-technical surveillance is aimed at minimizing risks and is largely determined by the qualifications and experience of the design, construction, or operation organizations. Urban underground risk maps are not static frames but a set of images that change over time - animated frames [7] that require the establishment and use of automated geotechnical surveillance systems to assess and manage risk during urban underground construction. In order to achieve the objectives of geotechnical surveillance, the determination of deformation, voltage, temperature, and geodynamic parameters, forecasting technical and geological conditions, and predicting loads due to various pressure impacts as well as other environmental influences, it is necessary to use technical geo-monitoring systems in underground construction. Geo-technical surveillance methods include: (i) geo-monitoring and surveys (including the use of satellite imaging); (ii) seismic observations; (iii) geophysical observations; (iv) geomechanical observation; (v) hydrological geometry; and (vi) environmental monitoring systems, including the control of chemical and biological substances with strong environmental influences.

At the same time, the application of information technology (such as WiFi, 3G, GPS, GIS, etc.) to build early warning decision support systems and risk management in underground construction, set up risk management and identification systems for projects, build real-time monitoring systems for the safety of personnel in the construction area, data transmission, location techniques, and analysis of safety assessments of engineers and workers on the construction site. Collecting scientific information and measurements, identifying the characteristics of deformation, durability of the structures, and maximum permissible concentrations of pollutants in the air, water, and waste sites, from which to propose solutions and recommendations to improve the structure of the underground construction and construction technology to reduce labor intensity and material costs, as well as improve the quality of urban underground works.

The third lesson: Completion of legal texts and regulations on risk management, risk control regulations, management plans, and related technologies in urban underground construction. Currently, Decree No. 39/2010/ND-CP of the Government issued on April 7, 2010 on the management of urban underground construction spaces contains provisions on the safeguarding of underground urban construction that will significantly contribute to the reduction of risks in the construction process of suburban urban construction in Vietnam; Circular 11/2010/TT-BXD guidelines on management of underground urban construction databases issued by the Ministry of Construction on August 17, 2010. However, the legal text system on risk management during the construction process is incomplete and synchronous, so it is necessary to complete the legal text system for risk management. A number of important elements should be included in the legislation, including: (i) the cost of risk assessment, field surveillance, and environmental investigations should be budgeted; (ii) the technical and risk management of the entire underground construction process; and (iii) the implementation of the risk management responsibilities of each stakeholder; monitoring, control, monitoring measures, and standards of conduct should be implemented effectively.

5. Inclusion

Research has shown that risk management plays an important role in urban underground construction. The solutions in most cases involve geotechnical surveillance, the analysis of data from geological warnings, and the legal system guiding the implementation of construction and the exploitation of urban underground construction. Experience from a number of countries around the world, especially Russia and China, in risk management during urban underground construction is seen as a useful suggestion to find a solution for Vietnam.

Through the practical experience studied, the lessons learned will contribute to support Vietnam in identifying risk, probability of occurrence, spatial specification, potential damage, and other parameters necessary for solving specific problems and ensuring technical, technological, and environmental safety during urban underground construction, including: (i) Identify, analyze, assess risk, develop action strategies, and identify ground-

related hazard scenarios to reduce the likelihood of accidents during underground construction or operation; (ii) Implement geotechnical surveillance at different stages of urban underground projects, especially during construction and (iii) Complete legal instruments and regulations on risk management, risk control regulations, management plans, and related technologies in urban underwater construction. Since then, it has contributed to addressing some of the constraints encountered in unifying policies and regulations on the implementation and exploitation of urban underground buildings in future Vietnamese municipalities./.

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Some safety issues in construction of climbing formwork system...

(tiếp theo trang 60)

attention and level of control to each one. The risk is the chance that somebody could be harmed by these hazards, as well as the potential severity of harm.

Implement measures to control risk

The greatest risk should be addressed first. If you cannot eliminate a risk, you'll need to implement control measures to minimize it. The hierarchy of controls can help you select and implement more effective measures to control risks.

Communicate

Make sure everyone is aware of your risk management program. Provide managers, supervisors, and workers with orientation and training on how to identify hazards and what to do to control the risks. Document and share your safe work procedures and policies with workers.

Monitor and update

Monitor the effectiveness of the control measures in place and improve those that are not working as intended. Look for new or changing hazards and risks when you conduct your regular safety inspections, and make sure you are observing and supervising work activities that have a higher level of risk.

Partner Collaboration and Government:

Establish a collaborative environment among stakeholders including contractors, engineers, project managers, and government agencies. Effective collaboration ensures compliance with safety regulations and standards, as well as optimizing construction processes and project management.

Conclusion and Future Directions:

In the future, continued research and development of new safety solutions are essential to ensure the safety of workers and the construction efficiency of high-rise buildings. Risk management and safety training will also play a crucial role in promoting progress and development in the construction industry in the future./.

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Social housing for workers and laborers in Ha Long city: status quo and solutions

To Thi Huong Quynh[1], Vu Phuong Ngan[2*]

Abstract

Ha Long City, the administrative, political, cultural, commercial, tourism, and service center of Quang Ninh Province, is experiencing rapid growth and urbanization, attracting many investors to implement projects that transform both urban and rural landscapes. However, in contrast to this development, many disadvantaged groups in society, such as workers and low-income laborers, are facing difficulties in accessing housing projects. Recently, housing for these groups has not received adequate attention, and efforts to support the implementation of social housing projects and attract high-quality human resources are still facing many challenges. This study investigates the current state of social housing for workers and laborers in Ha Long City. Based on the findings, the authors propose several solutions to help address the existing shortcomings in the development of social housing in Ha Long.

Key words: social housing, workers, low-income laborers, Ha Long

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1. Introduction

Housing is a construction project aimed at providing living spaces to meet the residential needs of families and individuals. It serves as a place for the reproduction of labor and the development of human resources. Addressing housing issues effectively contributes to social welfare, as housing needs are a top priority for households, especially for those seeking to improve their living conditions. In recent years, the Party and the State have placed significant emphasis on housing development, affirming that "Housing development is one of the crucial aspects of socio-economic development policy"[1].

Ha Long City boasts favorable conditions such as geographic location, land, mineral resources, and tourism. Coupled with decisive leadership and direction from the party committees and authorities at all levels, the city has achieved remarkable socio-economic growth. Alongside this growth, the demand for housing from residents, workers, and investors has increased significantly. In response, numerous commercial housing projects and new urban areas have been implemented and established, such as the Vu Dung Urban Area, Cao Xanh - Ha Khanh A, B, C Urban Area, Lan Be - Column 8 Urban Area, Hung Thang Urban Area, Staff and Worker Housing in Thong Nhat Commune, and the Residential Area in Cho Village, Thong Nhat Commune. This has led to the phenomenon of "hot development" of commercial housing projects and urban areas. However, this development contrasts with the fact that many disadvantaged groups (such as workers in concentrated industrial zones and coal industry workers) find it difficult to access commercial housing projects and new urban areas. To address this, Quang Ninh Province has simultaneously approved the Housing Development Program until 2030 [2],and the Housing Development Plan until 2025[3]for the entire province. The province is also researching and developing a proposal to build housing for workers, laborers in the coal industry and industrial zones, and attract high-quality human resources and skilled workers to live and work in Quang Ninh. Despite these efforts, the implementation of social housing projects has faced significant challenges. Therefore, the authors believe that studying the current state of social housing projects in Ha Long City is crucial to identifying the limitations and obstacles hindering their implementation. Based on this research, the authors propose several measures to promote the development of this type of housing.

2. Status quo and Limitations in Developing Social Housing for workers and laborers in Ha Long City

2.1 Status quo of social housing, housing for workers and laborers

In recent years, the workforce migrating to Ha Long City for living and working has been on the rise. Safe, stable, and long-term housing is essential for workers to focus on their jobs and maximize productivity. Among these groups, special attention needs to be paid to workers in key economic sectors, such as those in the coal industry, industrial zone workers, high-quality labor, low-income urban workers, service-tourism workers, and policy beneficiaries facing housing difficulties.

As of now, in the total number of social housing development projects for workers approved in the Social Housing Development Plan in Ha Long City for the 2015-2020 period according to Decision No. 2003/QD-UBND [4], only one project (a 5-story apartment complex in Cao Xanh Ward by Hon Gai Coal Company) has commenced construction but is not yet completed (one 5-story block remains unfinished). One project is in the preparation stage (the trade union facilities project on Thuy San Hill, Bai Chay Ward, Ha Long City - converted from a social housing project at plot N0 in Thuy San Hill Villa Area, Bai Chay Ward); one project has not