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Difficulties and challenges in urban railway connection in Vietnam

Quan Vu Doan
Faculty of Civil Engineering, Campus in Ho Chi Minh City, University of Transport and Communications, Vietnam

Abstract
Developing the urban railway system is considered a key solution to solving traffic congestion and developing the economy in "megacities", especially Hanoi and Ho Chi Minh City. However, how to connect the urban railway project with the city space and integrate it into urban life to promote its role are the questions that arise, creating difficulties for those who need urban planners and managers. Besides, currently, urban railway projects mainly pay attention to financial and technical feasibility and have paid attention to the development of urban space but not high and drastic. This study shows the current state of planning and connection of the railway system, thereby providing recommendations to help managers have a basis to evaluate the feasibility and necessity of planning work in future railway plans.

Keywords: Difficulties and challenges, urban railway, connection, Vietnam

Introduction

Current data shows that road density in Ho Chi Minh City and Hanoi is still low. Density in Ho Chi Minh City is 2.1km/km2, in Hanoi it is 3km/km2, while the ideal level should be 10km/km2. Furthermore, there is a lack of walking space and many spontaneous developments are "dense patches" in the urban area, making it almost impossible for vehicles to pass through, making public transport difficult to access. The very special trio of "townhouse landscape", "sidewalk economy" and "motorcycle culture" can be considered quite typical of Vietnamese urban areas. Motorcycles are still maintaining the number 1 position in urban transport and promise to continue to be a "very strong competitor" of urban railways.

Besides, currently, urban railway projects mainly pay attention to financial and technical feasibility, and have paid attention to the development of urban space, but not yet highly and drastically. Although the general plan lists a series of requirements for urban railway construction and development, it pays little attention to feasibility. Therefore, urban railway projects seem to be just an imported system, a pure addition of a new type of transport into the existing urban space.

Meanwhile, for an urban railway system to exist and be effective in the true sense of being a means of mass public passenger transport, it needs to have a correspondingly large number of passengers. The urban railway system can only attract a large number of riders when it is truly convenient. That depends mainly on the convenience and suitability created by connections between urban railway stations and urban areas. Specifically, the connection between urban railway stations with walking routes, crowded centers, public spaces, parking lots, transit vehicles, connecting buses, etc.

In Vietnam today, the XIII Politburo has issued directions related to this issue such as Resolution 15 on Capital development, and Resolution 31 on City development. Ho Chi Minh City or Resolution 06 on sustainable urban development and Resolution 30 on the development of the Red River Delta, recently Conclusion 49 of the Politburo on developing Vietnam's railway system.

Literature review

The urban railway is assumed to be an infrastructure that can be implemented and implemented independently through specialized transport projects of HAIDEP, TEDI, and other units, while the coverage and quality of these projects really matter. Rather, in order to effectively promote the urban railway system, it is necessary to combine the station system planning with the renovation and urban planning - which includes land fund preparation, space system development planning. public and walking routes, crowded areas such as markets, supermarket centers, service centers, offices, hospitals, schools, etc. Doing so will enhance the attractiveness, comfort, and reasonable of walking spaces, making Hanoi really suitable for walking lifestyle and public transport, in line with the current trend of green, sustainable, and energy-saving development of the world.

At the second session, the 14th National Assembly, giving comments on the development of the (amended) Railway Law, raised 3 major issues of opinion, including the issue of urban railways. Accordingly, the Railway Law (amended) needs regulations on planning and connection. Specifically, urban development planning must be associated with transportation development planning, in which the urban railway system must be the backbone of urban transportation; Focus on developing transit and multi-modal stations, creating policy mechanisms for urban railway enterprises to commercially exploit stations, creating a source of compensation to support the reduction of subsidies from the budget; Ensuring urban railway connection with interprovincial transport (bus stations), intra-city transport (buses), etc.

In the Railway Law (amended), there also needs to be regulations on the investment, construction, exploitation, and operation of urban railway projects. Currently due to constraints on loan capital, urban railway projects in Hanoi

and Ho Chi Minh City are using different technologies. Urban railway projects are all deployed for the first time, without experience, "crossing the river to find rocks", completely without regulations, technical standards, economic and technical norms, and investment rates so in reality, the projects are overcapitalized and encounter many difficulties. Projects have different technologies, so operating, connecting systems, maintaining, and training human resources will be more difficult and costly. In addition, urban railways require a very high level of operational safety, giving rise to many concerns. Therefore, to reduce costs and avoid errors, it is necessary to quickly issue the above standard and regulatory documents.

However, this is not a simple task and depends much on the economic potential of the city. What should be done in the immediate future is to identify outstanding factors that are likely to have a fundamental effect on the task performance - in order to develop appropriate control solutions.

Currently, the main public transport system of the city is the bus and fast bus (BRT) with a total of 112 routes, the coverage reaches 68.5% and only meets 10% of travel needs people's back. In the future when the population as well as the planned target of public transport use increases, public transport needs to be further developed. Otherwise, Hanoi will easily fall into the situation of "no way to go".

Research Content

Transport planning

With the Hanoi Transport Plan to 2030, with a vision to 2050, the metro system with 9 routes is expected to be the backbone of the city's transportation, linked to buses and other roads. Other modes of public transport. When completed, the metro system will form the main axes of the public passenger transport network in the capital. A complete metro system will connect, help travel between residential areas, industrial parks, schools, hospitals, etc as well as between the nuclear city and the surrounding satellite cities become easier [1, 2]. Easy, more convenient. Metro also contributes to the socio-economic development of areas and urban areas along the route.

Fig 1: Railway line No. 3 (Hanoi).

With a transport capacity of up to 30,000 passengers/hour/direction, the metro will meet the needs of large and long-distance transport [2]. Due to the use of a private road, the metro is not affected by congestion, flooding (with a flood level below 60 cm) or other traffic incidents, passengers will always be present at the destinations according to the scheduled schedule.

Ho Chi Minh City currently has about 9 million people, with an area of over 2,100 km2, a GDP per capita of about 6,863 USD, and is one of the largest and most populous cities in Vietnam. With high population density, developing a railway system is extremely necessary to ensure the future development of the city. In addition, the rapid pace of urbanization along with the high density of personal vehicles participating in traffic during rush hours, makes the development of a metro system that meets the needs of people extremely important.

According to planning, the Ho Chi Minh City urban railway system has 8 metro lines, with a total length of 220 km, with a total investment cost of about 25 billion USD. Metro line No. 1 is in the process of construction and completion and is expected to be put into operation in 2023. Metro line No. 2 has been designed, the project is in the process of site clearance as well as relocation of technical infrastructure for handover premises for contractors in 2023 - 2024. Particularly, metro line No. 5.1 is in the process of proposing investment and the remaining metro lines are in the process of calling for investment.

On the master plan, there is metro line No. 1 from Ben Thanh to Suoi Tien; Metro line No. 2 from Ben Thanh towards Tay Ninh bus station, National Highway 22; Metro line 3a from Ben Thanh to Tan Kien is an extension of metro line 1; Metro line 3b from Hiep Binh Phuoc to Tan Kien; Metro line No. 4 from Thanh Xuan to Nha Be; Metro line 4b connects Tan Son Nhat airport; Metro line 5 goes around from Thao Dien to the new Can Giuoc bus station; Metro line 6 connects metro lines 2, 3 and 3a.

Overall length, Metro Line 1 is 19.7 km long, Metro Line 2 is about 48.1 km, Metro Line 3a is 19.58 km long, line 3b is about 12.2 km, metro line 4 is about 35.75 km, 4b is 5.2 km, line 5 is 23.4 km and line 6 is 6.8 km. There are also plans for monorail lines No. 2, No. 3, and Tram Away 1.

Fig 2: Railway line No. 1 (Ho Chi Minh City).

Moreover, the ship has a large space to create relaxation for users. The train moves smoothly with a stable speed so passengers can comfortably relax during the journey. The system is designed to be friendly to the elderly, pregnant women, and people with disabilities.

The bus system includes BRT and small buses with the advantage of flexibility, able to connect short routes to meet the needs of moving between points, not on the railway.

The bus system is classified into 3 types: Class 1 bus route with the capacity to transport about 80 passengers/vehicle; secondary bus route with the carrying capacity of 40-60 passengers/car and the tertiary bus route, enters small roads with the carrying capacity of about 30 passengers/vehicle. These three bus hierarchies will be a complete addition to the urban railway system [2].

With their own characteristics, the two metro and bus vehicles complement each other, making the pair greatly increase the capacity as well as the utility of the city's public transport system [3]. Not only meeting the travel needs of the people of the capital, but urban railways also help improve the green living environment, improve the quality of life while helping to reduce the number of individual cars.

Factors affecting urban railway

Capital: Capital is often considered the most important factor in the construction of urban infrastructure, especially the urban railway system. In fact, the rate of return on capital is important [4]. The key issue is the guidelines and mechanisms that allow the exploitation of the benefits that can be generated from urban railway projects. This is something many experts have mentioned. Of these, the approved urban railway network plays a decisive role in the future, because once the planned roads are built, there are not many opportunities to change or adjust.

With the option of arranging major urban railways in parallel with the main roads, these urban roads basically do not open more opportunities for land fund development and urban improvement but only enhance add accessibility to developed buildings, have good access along the big road - which is not a major concern for the owners [4, 5]. Therefore, it is difficult for urban railway projects to exploit capital from the added value of the land lots that urban railways go through.

Technology and management: In official statements, the role of technology and management of urban railways are often overemphasized, considering these as the most important factors. These should only be considered as project-specific issues.

For urban and urban futures, it is important to be consistent with the level of operation, efficiency, and impact of the urban railway system. Thus, a system of requirements is the basis for management and development; specific mechanisms to encourage development; and specific concrete support commitments - which are really necessary to ensure the competitiveness, relevance, and future of railway development.

The prominent impact of urban railway on transport Station and the link between urban railway and urban areas

This is a matter that many experts consider to be the most important to promote the efficiency of urban railway system but little is mentioned in practice - mostly due to the lack of Prepared in advance, the limited purpose of urban railway projects, as well as the complexity of the problem. In the long run, the efficiency and revenue of the urban railway system depend largely on the comfort and suitability of the connections between the urban railway station and the urban area, namely: walking routes, crowded and operating centers, parking lots, transit systems [4]. Although it may not be done, right now we have to consider the development of the area around the station for the next 20 years to take appropriate control measures.

Leaving private vehicles and using public transport

Most studies on this issue agree that the main reason people use motor vehicles (especially motorbikes) is due to their flexibility, convenient, suitable for the travel purpose of the majority of people. Therefore, besides the "negative" measures to make it difficult for individual vehicles to become more inconvenient - the main problem is to build a public transport system that is flexible, convenient, and more suitable for the Daily travel destination of different

objects [3]. When the quality of transport means and directions of the public transport (except urban railways) can be adjusted without much difficulty - the quality of public transport walking and parking spaces is actually a more decisive factor the tendency to abandon personal means in the long run.

Spacewalk

Supporting the development of pedestrian spaces is the policy of Hanoi government and planning with the recent result of the establishment of more walking streets in the center of Hanoi. However, for people to really walk every day, walking spaces must exist everywhere, must meet the daily travel needs of many people, connect well with public transportation, and are comfortable and convenient that people find walking really more appealing.

In addition to many design principles of walking space organizations can be easily found in specialized documents. Particular attention should be paid to the development of walking space in Hanoi in particular and Vietnam in general as the negative effects of a hot and humid climate. Without a solution to make the walk spaces dry, cool, shady, every other effort would not make much sense - because walking in the sun, in hot and humid climates, is a pain for everyone [4]. This explains why most people often walk, practice running in the early morning or late afternoon; or just like to stroll around the large lake with many trees.

Certainly, Hanoi will need a lot of time and effort to build a quality walking space system for people to switch to walking [5]. For the future, from now on, Hanoi needs to set up a plan of the pedestrian space network in combination with the organization of public transport system, tourism, social infrastructure, and trade in services - with important goals being standard the land fund, orientation for renovation and new construction [6]. Regulations need to be built on the construction of pavement roofs or independent walkways to provide a consistent basis for urban management.

Difficulties during construction

Some issues related to the development of metro lines 1 and 2, Vietnam does not have a system of technical standards and technology specifically for urban railways. Therefore, the technical and technology standards are all Japanese and are fully applied to metro line No. 1. For example, earthquake resistance standards are completely applied to Japanese standards for metro lines. Number 1, this causes waste because Vietnam's geological conditions are much different from those of Japan, leading to the design and construction of walls and tunnel linings with thickness exceeding the necessary level, making the High costs, a waste of resources.

In Vietnam, it is not possible to be self-sufficient in TBM tunneling technology (tunnel construction machine with excavation shield). Metro line No. 1 only has 2 km underground but had to buy and build a completely new TBM system and it is almost impossible to reuse this system for other projects. If Vietnamese businesses can autonomously design, install, and operate TBM machines, they can be completely reused for upcoming metro lines 2 and 5.1, which will save costs as well as improve investment efficiency.

During project implementation, many difficulties were encountered regarding tunnel diameter. Vietnam does not have standards or limits on tunnel sizes or general dimensions of train types. Each project purchases ships from different countries, so the ships have different sizes, leading to different tunnel diameters. Because there are no fixed standards, defining the module sizes used during construction is difficult. Each construction line is a new investment, not inheriting the experience and construction technology of the previous metro line.

Another part is because they depend too much on foreign investment capital, so they must completely comply with foreign standards and regulations. Like metro line No. 1 (Ho Chi Minh City) invested by JICA, the use of capital as well as construction technology, standards, and regulations is from Japan. Because there is only one contractor, prices are high, there is no competition, and equipment for operation and maintenance also depends on the Japanese contractor, this greatly affects costs and operations in the future.

Regarding radio frequencies to control the metro system, it is also important to pay attention and receive direction from the Ministry of Information and Communications, because this is an important issue in operation. Ho Chi Minh City and Hanoi metro lines also need attention from state agencies in creating legal corridors, standards, and regulations to promote the development of metro lines in the future.

Discussion

Development context

Hanoi is now a combination of planned areas interspersed with spontaneous development zones and large constructions or clusters built on blocks old land [6]. With a large area, narrow roads following the fishbone network structure, and a very high density of construction, spontaneous development zones act as "solid areas" in urban areas, which are nearly impossible for vehicles to travel through.

As a result, vehicles are often forced to use main roads, causing them to overload, causing congestion. Most of the large-scale constructions on old plots only contribute to increasing traffic pressure. Building multiple roads through spontaneous development zones is a basic solution to complete the Hanoi road network. However, due to the high cost of compensation, Hanoi is probably only able to clear the ground to open a number of main roads, spontaneous development zones will remain long-term. These areas will continue to hinder Hanoi's traffic - regardless of how the new urban area is built - if we don't know how to look it the other way.

Opportunities from the defects

The nature of the development of spontaneous zones is to cling to the outer rim traffic, constantly encroaching in the open alleyways until they occupied all the vacant land. From outside to inside, the economic value of land plots decreases; the level of solidification of works also tends to decrease. For most spontaneous development plots, the core is the cheapest and easiest place to buy land to create a large plot of land [4]. The only thing that prevents these plots from being purchased and developed into apartments, or commercial centers, is that there is no convenient transportation.

If both creating convenient transportation and arranging more quality services, this core will become the ideal new residential areas because they are located between the new urban areas and the old center of Hanoi.

Renovate the core of spontaneous development areas

In a nutshell, the idea of improving the core of spontaneous development zones is as follows:

Acquire, merge valuable land plots in the core to create a large plot of land with all alleys connecting to the main road;

On the newly created large lot, construction of underground car parks, a system of quality walking spaces (indoors and outdoors) with quality, urban railway station, play and entertainment spaces, service works, high-rise apartment buildings (serving both the needs of resettlement on the spot);

Improve alleys to create quality walking spaces, connecting with other walking spaces;

If possible, the urban railway station is located as close to the main road as possible to limit changes to urban railway lines, while still being well connected to the walk space system in the core;

In areas with very high construction density, especially the outer rim, the urban railway stations can be connected by monorail with small capacity going high and connected to the urban railway station.

Theoretically, this solution can significantly increase accessibility and core value. Due to the ability to gather large land funds at the core, it is possible to form a quality and safe walking space system for the area, which will not only be conveniently connected to the urban railway stations but also to the translation works [5, 6]. Service and parking are further developed at the core. Doing it this way can not only create urban areas that really adapt to walking and public transport but can also help improve the quality of life, create more jobs, vitality, and attractiveness for the spontaneous development of urban areas. The core of spontaneous development zones is likely to become a chain of new centers, becoming a place to attract users from the old Hanoi center and from new urban areas, mainly through the walk and the urban railway system.

After many enthusiastic proposals and recommendations from National Assembly delegates, the 14th National Assembly passed the Railway Law (amended). Compared to the 2005 Railway Law, the (amended) Railway Law has many new points. Notably, the Railway Law (amended) has devoted a chapter (Chapter VII) to regulations on urban railways with specific contents such as General requirements for urban railways; types of urban railways; rights and obligations of urban railway enterprises; ticket control system; urban railway safety management; requirements for urban railway infrastructure; urban railway development policy; Responsibilities of the Provincial People's Committee in investing in construction and management of urban railways.

The Railway Law (amended) has created an important legal corridor, serving as a basis for a smooth investment, management, and exploitation process of urban railways. Since then, the urban railway system has been developed, contributing to solving traffic congestion in big cities. In particular, creates conditions for people to enjoy the benefits of a safe, friendly, convenient, punctual, and effective railway service; Enterprises have an open, transparent, and healthy competitive environment to maximize efficiency, focus on investment, and profitable business.

Synchronously connect with other transportation systems

To be able to synchronously and interconnect urban railway lines, the trains are only the same in track gauge, the gauge limit is not enough, but also needs to be absolutely compatible in terms of axle load and distance between axles., length of the carriage, location, and size of boarding doors, number of carriages in the train, carriage floor height, whether traction power is a concentrated or distributed driving force, etc. because these parameters will be related to the design of bridges, roads, tunnels, platforms, platform gates, usable length of stations, axle counting systems, railway circuits, signal systems, etc. Signal reception and transmission systems Terminal signals on the train, under the station, the transportation operations center (OCC), and the communication system between the train driver, the station, and the OCC center must all be 100% compatible (including hardware and software), etc. The three main factors mentioned above in a forest of other problems are not simple to find solutions, to be able to "optimize" in the context of each route we are bound to the standard conditions stipulated in the Agreement loan decision of each donor.

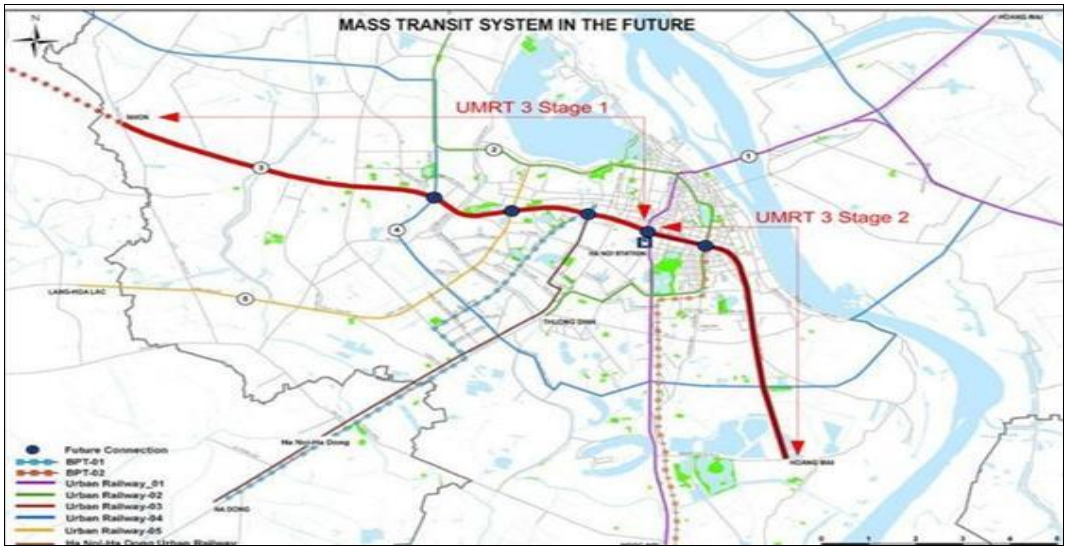

Fig 3: Expected development model of the transport network in Hanoi

To be able to connect synchronously, the next issue that needs to be considered is whether the operation is effective and safe. According to the approved plan, each route takes on a different role: Radial route, belt route, combined belt, and radial route. Along with that, the train schedule for each route has been built very closely and thoroughly. We all know that for urban railways using the next-to-last train operation method, the train interval during off-peak hours is 3 minutes/trip, so the train schedule must be built as accurately as possible every second, accompanied by equipment systems, software systems, and people for absolute safety control. Suppose this line receives trains from another line (occupying the section), it will reduce the operating frequency of that line as mentioned above, or even worse, cause unsafety. Countries with advanced metro systems limit this. Usually, they will apply the "channel to train" connection form, which means finding a way for passengers to transfer trains from one route to another in the most convenient way, such as two trains stopping at the same time, sharing the same platform station, or on two different floors of a station. This is as simple as changing bus routes within the city.

Conclusion

The Politburo points out that developing railways is not only the effort of the Ministry of Transport and the railway industry, but also requires unifying the awareness of the entire political system about its position, role, importance, and importance the necessity of rail transport; The construction of national railway infrastructure, urban railways, especially the North-South high-speed railway, creates an important driving force for the country's socio-economic development, promoting the above advantages strategic economic corridors, associated with ensuring national defense, security and international integration, protecting the environment, responding to climate change, promoting the process of industrialization and modernization of the country.

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