

# High-speed rail investment on the North - South axis: Benefits and challenges

## Đầu tư đường sắt tốc độ cao trục Bắc - Nam: Lợi ích và thách thức

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### ABSTRACT

As a great pride of the country, high-speed rail provides flexible, time-efficient, safe, courteous, on-time, high-capacity and environmentally friendly transportation. High-speed rail promotes regional connectivity by promoting socio-economic benefits and supporting transportation goals and policies. One of Vietnam's most significant strategic projects is the high-speed rail project, which spans 20 provinces/cities from Hanoi to Ho Chi Minh City on the North-South axis. However, the project faces significant challenges, including a high investment cost (over 65 billion USD, nearly one-sixth of Vietnam's annual GDP), financial risks and difficult-to-quantify impacts like spatial development restructuring and changes in transportation sector market shares. Meanwhile, cheaper maritime and inland waterway transportation remains underutilized; road transportation, despite being expensive, currently dominates. Thus, careful evaluation and consideration are vital for the feasibility and balance of the transportation system on the North-South axis. This article studies the imbalance in the North-South transportation system, the direction of Vietnam Government on High-Speed Rail development, thereby evaluating the benefits and challenges, providing valuable reference material for project refinement.

**Keyword:** The North-South transportation; Freight transportation; passenger transportation; unbalanced development; investment costs; new technology.

### TÓM TẮT

Đường sắt tốc độ cao là niềm tự hào của một Quốc gia với phương thức vận tải an toàn, văn minh, đúng giờ, năng lực vận tải lớn, tiết kiệm thời gian, linh hoạt và thân thiện với môi trường; nó mang lại lợi ích kinh tế - xã hội, có thể hỗ trợ các mục tiêu, chính sách vận tải và gắn kết giữa các nước trong khu vực với nhau. Dự án đường sắt tốc độ cao trên trục Bắc - Nam đi qua 20 tỉnh/thành phố, từ Hà Nội đến TP.HCM là một trong những dự án quan trọng, mang tầm chiến lược của Việt Nam. Tuy nhiên, chi phí đầu tư rất lớn (hơn 65 tỷ USD, chiếm gần 1/6 GDP một năm của Việt Nam), nhiều rủi ro, hiệu quả tài chính không cao, nhiều yếu tố tác động lớn nhưng khó lượng hóa như tái cấu trúc không gian phát triển, thay đổi cơ cấu thị phần của các chuyên ngành vận tải... Trong khi vận tải đường biển, đường thủy có chi phí thấp hơn nhiều chưa được tận dụng; vận tải đường bộ với chi phí đắt đỏ hiện đang ở vị thế áp đảo. Vì vậy, việc đầu tư đường sắt tốc độ cao cần được nghiên cứu toàn diện, cân nhắc kỹ lưỡng để đảm bảo tính khả thi của dự án và tính cân đối của hệ thống giao thông vận tải trên trục Bắc - Nam. Bài báo nghiên cứu về sự mất cân đối của hệ thống GTVT trên trục Bắc - Nam và những hệ lụy nền kinh tế-xã hội phải gánh chịu; phân tích định hướng của Chính phủ; từ đó đánh giá các lợi ích, các thách thức khi đầu tư xây dựng đường sắt tốc độ cao Bắc - Nam, là tài liệu tham khảo, có ý nghĩa quan trọng góp phần hoàn thiện dự án.

**Từ khóa:** Hành lang vận tải Bắc - Nam; vận tải hàng hóa; vận tải hành khách; phát triển mất cân đối; chi phí đầu tư; công nghệ mới.

### 1. THE IMBALANCE IN THE NORTH-SOUTH TRANSPORTATION SYSTEM

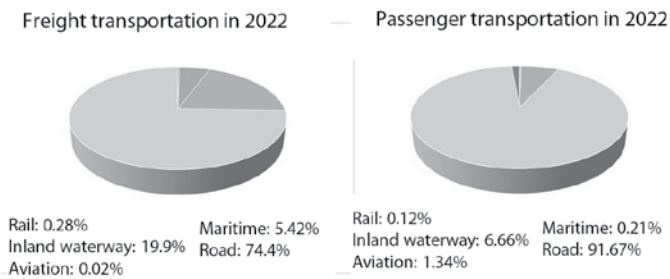
Vietnam, with its narrow width and long stretch from North to South and two major economic centers in Hanoi and Ho Chi Minh City, urgently needs to develop transportation connections between these areas, linking cities, industrial zones, export

processing zones and tourist areas along the route. Rail, particularly suited to Vietnam's terrain, is identified as one of three strategic breakthroughs needing priority investment for socio-economic development, national defense, security, climate change adaptation and sustainable growth [1]. However, the rail sector faces significant challenges due to outdated infrastructure, lack of

investment in upgrades, inefficient management and price pressures, etc.

Besides rail, the North-South transportation corridor's demand is distributed across four modes: road, air, maritime and waterway. For passenger transportation, road and inland waterway are predominant. In freight transportation, focus lies on road, inland waterway and maritime transportation (Figure 1). The growing strength of road, air and maritime transportation further limits the competitive edge of rail, leading to a decline in market share (The freight transportation market share accounted for 0.31% in 2019, 0.28% of the entire sector in 2022. Passenger transportation market share accounts for 0.17% in 2019, 0.12% of the entire sector in 2022) [2].

By 2030, the North-South travel demand is forecasted to reach about 195 million passengers/year, while the maximum capacity of road, air, maritime and waterway transportation will only be about 138 million passengers/year [3]. To effectively utilize these transportation modes, their strengths must be combined and leveraged.



**Figure 1.** Transportation market share by each sector in 2022 [4]

#### (1) Rail transportation:

This sector has many advantages, but it is currently a bottleneck in the transportation system. Rail transportation is efficient in moving large, concentrated volumes of freight quickly domestically; it also efficiently transports passengers along corridors with high density demands (inner and outer suburbs and between densely populated areas at close distances) with relatively quick travel times, low cost and high safety.

The current national rail network has a total length of 3,315 km, comprising three gauges: 1,000 mm (83.7% of the network, a gauge mostly not used globally anymore), 1,435 mm (7%), and mixed gauge (1,435 mm and 1,000 mm) (9.3%). The technical standards are low: many curves with too small radius, steep gradients, small load capacity; bridges and tunnels with over nearly 100 years of operation, suffering from erosion and water leakage; various types of sleepers; especially, the rails intersecting with roads and rural paths are very dense (a total of 1,464 legal crossings on over 4,000 self-opened rural paths, averaging 2.15 km per crossing) [4]. The average speed of 50-60 km/h for freight trains and 80-90 km/h for passenger trains is also a point of backwardness. Moreover, Vietnam's rail system is still on the second-generation technology, diesel technology (the first one being steam locomotive). Developed countries are using third-generation technology - electrification, and fourth-generation technology - electromagnetism. [2]

The interline connectivity and port connectivity of the rail lines are limited. Specifically, the two largest ports, Lach Huyen (Hai Phong) and the Cai Mep - Thi Vai port cluster, are not yet connected by rail. In terms of inland waterway connectivity, only two ports, Viet Tri and Ninh Binh, and one inland container depot (ICD) in Lao Cai, are connected by rail. International connectivity is similarly limited;

the connection point at Lao Cai faces restrictions due to different track gauges, and there is no connection with Laos and Cambodia yet. There is also no rail connection linking the Mekong Delta and Central Highlands regions. [2], [5]

In summary, the capacity and quality of rail transportation are poor, and their infrastructure is antiquated. The rail transportation sector runs the risk of going out of business if sufficient investment is not made.

#### (2) Road transportation:

Road transportation ensures connectivity and supports the aggregation of passengers and freight for other modes of transportation in the supply chain, proving highly effective for short distances. Currently, road transportation is the dominant mode across all distances, even for medium and long distances of thousands of kilometers. Roads currently handle 91.67% of the total passenger transportation volume and 74.4% of the total freight transportation volume. [4]

On the North-South corridor, National Highway 1 with four lanes from Hanoi to Can Tho has been completed and put into operation, capable of accommodating about 35,000 standard vehicles per day and night. However, transportation demand on sections like Nam Dinh - Ha Tinh, Quang Tri - Thua Thien Hue, Dong Nai - Khanh Hoa reaches up to 42,100 standard vehicles per day and night, exceeding the capacity of National Highway 1. Overloaded vehicles, congestion and traffic accidents are becoming serious issues, resulting in an average speed of only 50 km/h on these national highways [6]. Moreover, due to passing through many densely populated urban areas with mixed traffic organization and a high proportion of heavy vehicles, etc., National Highway 1 cannot be a long-term arterial transportation axis to drive socio-economic development.

In terms of cost, road transportation is much more expensive than other modes like waterway, rail and maritime transportation. The cost of transporting a 40-foot container from Hanoi to Ho Chi Minh City is about 40 million VND, which is 9.7 times more expensive than by sea and more than 2.5 times more than by rail. Despite this, businesses still choose road transportation due to its direct connectivity with ports, airports and stations, its adaptability to all terrains and flexibility in transportation timing. [7]

#### (3) Aviation transportation:

Vietnam has 26 airports, of which 21 are in operation, evenly distributed across various regions. Particularly in the North-South corridor, there are 12 airports, including 07 international airports, accounting for 70% of the total number of international airports in the country. Air transportation ensures the transportation of passengers for international intermodal transportation and domestic long-distance transportation (effective for distances >1,000 km). In recent years, the aviation sector has developed significantly in terms of scale and capacity, with about 90 million passengers per year, a 2.5-fold increase compared to 2010 [6]. However, the proportion of transportation is low. Due to limitations in rail transportation and the rapid development of low-cost airlines, a large number of passengers are attracted, leading to overloading, delays, and flight cancellations, which are increasing in frequency.

#### (4) Inland waterway transportation:

The inland waterway transportation is primarily responsible for transporting traditional goods in large quantities that do not require fast delivery and have low transportation costs. Vietnam's inland waterway network currently has about 17,253 km of rivers and a canal system capable of exploiting 41,900 km. Due to the unique geographical terrain, inland waterway transportation

activities mainly concentrate in three areas: the North, Southeast, and Mekong Delta. In the Mekong Delta, with its advantage of rivers and canals, inland waterway transportation currently accounts for over 70% of the region's freight market share. Recently, the project of Mekong Delta transportation infrastructure development (WB 5) and the project of Northern Delta transportation infrastructure development (WB 6) have facilitated inland waterway trade, reducing transportation costs. The market share of waterway transportation in Vietnam is increasing by about 4% per year, in line with the restructuring orientation of the transportation sector. [6]

*River-Sea Transportation:* For Vietnam, developing river-sea transportation for domestic cargo transportation is an advantage and highly effective. However, this mode of transportation has not received sufficient investment attention and has not yet fully exploited its potential.

*(5) Maritime transportation:*

The maritime transportation leverages strengths in international ocean cargo transportation. With a coastline over 3,200 km long, Vietnam has potential for port development. Currently, there are 44 seaports with 284 berths, evenly distributed from North to South, with a total design capacity of about 500 million tons per year. Although maritime cargo transportation accounts for a small proportion of the transportation structure (divided by transportation mode), it has a relatively high turnover rate. In 2022, maritime cargo transportation accounted for only 5.42% of the total cargo volume but made up 53.4% of the turnover volume.

For the North-South corridor, recent investments have modernized two international gateway ports, Lach Huyen and Cai Mep - Thi Vai, along with other port development projects, handling 80%- 90% of import and export cargo volume. The total cargo volume through these ports in 2020 was twice that of 2010, growing at an average rate of 9.18% per year. However, maritime policies and maritime law are not yet fully harmonized with the law of some related sectors; maritime security and safety are not yet assured; and there are difficulties and shortcomings in applying science, technology and maritime manpower training. [6], [8]

These analyses reveal unsustainable and unbalanced development among transportation sectors, leading to significant consequences for Vietnam's socio-economic situation:

- *High logistics costs:* Vietnam's logistics costs are very high compared to the region and the world, accounting for 20.8% of GDP, while Thailand is at 10.7%, China at 15.4%, and the world average at 11.7%. [4]

- *Traffic accidents:* Although there has been a significant reduction in the number of accidents, deaths, and injuries, the rate remains high. Traffic accidents in Vietnam cause about 2.9% of GDP in damages, ranging from 5 - 12 billion USD. One of the fundamental reasons for this situation is the over-reliance on road transportation.

- *Environmental pollution:* The environmental impact of the transportation system is alarming due to the rapid development of personal transportation vehicles. In the structure of air pollution, up to 70% of pollution is caused by traffic. The amount of CO and CO<sub>2</sub> emissions from cars and airplanes per passenger unit is many times higher than that of high-speed rail transportation. Meanwhile, these types of vehicles have been rapidly developing in recent years. Vietnam currently ranks 131st out of 180 countries in terms of high dust pollution in major cities. [9]

Therefore, the North-South corridor serves as the "backbone," forming the foundation for the development of the entire country. However, the road and air transportation systems only meet the

needs within their effective operational ranges. The North-South rail infrastructure is outdated, and its capacity is nearly saturated; even with upgrades and renovations, it will not be able to meet transportation demands after 2030. The high-speed rail (HSR) system, with its superior advantages in capacity, environmental friendliness, safety, and reliability, would be a completely suitable solution, helping to reestablish harmony and sustainable development of the North-South transportation system.

## 2. THE DIRECTION OF VIETNAM GOVERNMENT ON HIGH-SPEED RAIL DEVELOPMENT

The rapid socio-economic development along the North-South corridor has led to an increasing demand for transportation in the immediate period until 2030 and is expected to continue rising rapidly in the following years. This necessitates the continuous enhancement of the transportation system's capacity to meet these demands. High-speed rail has several advantages over other modes of transportation, such as large freight capacity, high travel speed, short overall travel time, safety, reliability, convenience and environmental friendliness. It is expected that high-speed rail will create a breakthrough, serving as a new driving force for the socio-economic development of the regions where the project is deployed.

While high-speed rail (HSR) systems have developed worldwide for nearly six decades, in Vietnam, high-speed rail with operational speeds of 200km/h to 300km/h are an entirely new research area. No similar project has been approved, initiated, or constructed. The concept of "high-speed rail" officially appeared in the Rail Law No. 06/2017/QH14 on June 16, 2017. In 2019, in the "Feasibility Study Report for the North-South High-Speed Rail Project," the Ministry of Transport proposed investing in the development of a new high-speed rail line along the North-South corridor, spanning 1,559 km, double track, standard gauge of 1,435 mm, electrified, passenger transportation, with a design speed of 350 km/h and an operational speed of 320 km/h. The estimated total investment for the project is around 58.71 billion USD [11]. After review, the project's consulting and appraisal unit proposed adding a mixed-use exploitation plan, a maximum design speed of 250 km/h for high-speed passenger and freight trains, 180 km/h for regional passenger trains and high-speed freight trains. This led to debates among experts regarding feasibility, substantial capital requirements, and the effectiveness of both plans.

In 2021, in the Rail network planning for the period 2021-2030, with the vision to 2050, the North-South high-speed rail was identified as the most important route, considered as the "backbone," linking the trade activities of urban chains and economic zones across the entire territory. This affirms the Vietnam government's determination to develop the HSR system. [1]

In April 2023, the Politburo concluded that by 2025, they aim to complete the approval of the investment policy for the North-South high-speed rail project; they plan to start construction on the Hanoi-Vinh and Ho Chi Minh City-Nha Trang sections during the 2026-2030 period; and before 2045, the entire line should be completed [12]. However, there are still uncertainties regarding the investment necessity, development scenarios, transportation objects, technology selection and transfer, investment resources, special policies, environmental concerns, workforce training and project efficiency.

## 3. RESEARCH METHODOLOGY

Secondary data collection method: The authors gathered information to support their research by searching through

documents such as reports from the Ministry of Transport, official research projects on HSR in Vietnam, and articles from conferences and specialized journals on transportation. This helped the authors synthesize and analyze the current capacity of the transportation system along the North-South axis. Documents from research projects by domestic and international organizations and experts on HSR, provided by the International Union of Railways, assisted the authors in evaluating the advantages and challenges for Vietnam government.

Additionally, secondary information for this research was collected from legal documents and government policies to affirm the government's commitment to investing in the development of the HSR system. Based on this, recommendations are proposed to ensure the effectiveness of investment and operation of high-speed rail.

#### 4. BENEFITS AND CHALLENGES OF HIGH-SPEED RAIL INVESTMENT IN VIETNAM

##### 4.1. Benefits of High-Speed Rail

*Firstly*, high-speed rail can compete with airplanes for distances exceeding 300 km, especially for travel distances between 300 km and 800 km. HSR with operational speeds above 200 km/h has proven to be superior in terms of time and convenience compared to airplanes. In terms of land use, HSR occupies much less land than the combination of five standard four-lane highways. [10]

*Secondly*, HSR plays a crucial role in urban restructuring and population distribution along the North-South corridor. The HSR system serves passengers with quick access to major city centers, creating continuous, uninterrupted links between cities by strategically locating convenient rail stations. This allows for more stops than airports, which are often located far from city centers. It eliminates geographical constraints, shortens travel distances, promotes tourism, and contributes to the urbanization process along the North-South axis, sharing commercial advantages and development resources among regions. [13]

*Thirdly*, HSR meets the sustainable transportation needs along the North-South economic corridor. HSR enables the efficient transportation of both freight and passengers compared to road and air transportation. Rail freight transportation is an effective method for moving goods over long distances, as a single train can carry an average of 300 containers in one trip, covering large distances. Therefore, a freight train can replace hundreds of container trucks, freeing up valuable space on roads, reducing accidents and traffic congestion, and significantly saving fuel and emissions. Compared to road transportation, rail freight transportation is usually more cost-effective and fuel-efficient by three to four times. Compared to maritime transportation, rail freight transportation with faster travel times is a perfect choice for high-value industrial products, such as automobiles, electronic devices, computers and advertising equipment.

The North-South high-speed rail, serving both passengers and freight, can handle a circulation volume of over 51 billion ton-kilometers per year, which is 20 times the freight transportation capacity of the existing North-South rail. It has the potential to change the overall market share of transportation sectors. This leads to a considerable reduction in logistics costs, enhancing the economic competitiveness of the country. [10], [14]

*Fourthly*, high-speed trains operate continuously on rails, without interruptions or delays due to climate conditions (e.g dense fog, storms, floods, landslides), while climate conditions significantly hinder air, maritime and road transportation.

*Fifthly*, electrified high-speed rail is an environmentally friendly transportation mode, significantly reducing carbon emissions. Rail freight transportation accounts for over 1/3 of the total inter-provincial freight transportation volume in a country, but high-speed rail emissions represent only about 2% of the total transportation-related emissions.

*Sixthly*, HSR aligns with related strategies and planning: HSR investment is fully consistent with the strategic development planning for transportation in general and rail in particular. It is also in line with the development planning of related sectors and regions. Therefore, high-speed rail investment is a long-term investment for the future, meeting Vietnam's development needs and aligning with global trends.

##### 4.2. Challenges of High-Speed Rail investment

*Firstly*, high investment costs are a significant challenge. In Vietnam, the proposed plan for passenger and freight trains involves a total investment of 61.76 billion USD, accounting for nearly 1/6 of Vietnam's GDP in a year. The investment capital rate of European countries is as follows:

**Table 1.1: Investment rate (Investment capital per Kilometer) of European countries and Vietnam [14, 15]**

Country	Investment rate per Kilometer according to 2017 prices (Million EURO/km)	Index CPI 2022 / CPI 2017	Investment rate per Kilometer according to 2022 prices	
			(Million EURO / km)	(Million VND / km)
France	5.5 – 22.0	1.01	5.58 – 22.31	133,347 – 533,390
Germany	17.7 – 34.1	1.03	18.34 – 35.33	438,512 – 844,817
Japan	20.6 – 31.9	1.01	20.82 – 32.24	497,770 – 770,818
Spain	9.7 – 24.9	0.96	9.31 – 23.90	222,638 – 571,515
China			16.01 – 17.60	382,831 – 420,851
Laos			5.9 – 10.0	141,081 – 239,120
Thailand			6.5 – 12.0	155,428 – 286,944
Vietnam			36.96 – 37.12	883,720 – 887,620

Note: Exchange rate on August 5, 2022 of Vietcombank (1 EURO = 23,912 VND)

This indicates that without a careful analysis and financial efficiency calculation for each section, along with operating speed and investment schedule, the Vietnam Government may have to invest in an extensive, expensive rail infrastructure system that spans decades with limited efficiency.

*Secondly*, the use of new, modern and complex technology demands high precision. If the mastery of technology and the localization of component production are not gradually achieved, the maintenance of the rail system and the operation of the information signaling system can become costly. This could lead to annual deficits of tens of billions USD to subsidize operating expenses. In Vietnam, it is estimated that 50-60% of the high-speed rail equipment can be manufactured domestically, as current rail

sleepers for foreign countries are capable of running at speeds of 320 km/h. However, mechanical engineering enterprises need supportive policies to confidently invest in machinery and technology and take an active role in operations. [16]

Thirdly, compared to road transportation, rail vehicles have limitations in directly accessing delivery and pick-up locations according to individual schedules. To maximize the efficiency of rail transportation, it is necessary to connect with road networks through crossroads and establish transfer logistics services to transport passengers and freight to rail station areas.

**5. PREREQUISITES FOR ENSURING EFFECTIVE INVESTMENT AND EXPLOITATION OF HIGH-SPEED RAIL**

Firstly, to ensure the efficient investment and exploitation of high-speed rail projects, there must be a very high political determination from the State and the Government. The prerequisite is a plan for capital allocation, developing the capital structure and mobilizing various resources to sequentially invest according to the planned schedule.

Secondly, the institutions and policies to attract enterprises to invest should be completed. High-speed rail technology is entirely new to Vietnamese enterprises, so when implementing the project, international bidding is mandatory. In this context, there should be incentives in the Bidding Law to encourage domestic contractors to participate in bidding in joint ventures with foreign contractors, while also undertaking at least 25% of the work value of the package.

Although the demand for high-speed rail is extremely sensitive to economic cycle fluctuations and competition from other modes of transportation, the Investment Law should allow investors and companies managing rail infrastructure to control variables affecting financial equation changes (e.g passenger volume fluctuations, inflation, ticket prices or interest rate changes). In this scenario, investors have the right to adjust their strategies to increase demand and revenue.

To attract foreign investors to invest in high-speed rail, there should be no discrimination against any rail system in the world, and it should be encouraged to invite and develop new technologies to optimize operations, exploitation and energy-saving in train operations.

Thirdly, it is necessary to supplement policies related to the ability to connect high-speed rail with local transportation networks; and urgently develop a legal corridor for the TOD (Transit Oriented Development) model, taking the development orientation of the high-speed rail system as the basis for urban development planning. This includes reviewing, updating and supplementing regional planning, focusing on exploiting suitable land funds to connect with station areas, depots, developing cities, and functional areas, creating added value when auctioning real estate in TOD urban spaces to generate capital and attract business investment in high-speed rail.

Fourthly, it is also necessary to allocate resources and attract investment capital outside the budget. Using the entire State capital is not feasible when Vietnam's GDP in recent years averages 401 billion USD and public debt is 43.1% of GDP. The Ministry of Transport proposes investment in the form of PPP (Public-Private Partnership). Therefore, a special mechanism of the National Assembly is needed for types of investment, along with the State's participation in capital ratios; at the same time, diversify forms of concession for exploiting the upper structure (above the rails) and transportation concession. It is necessary to identify State capital as a leading role in investing in rail infrastructure development (including land clearance, foundation construction, tunnel works, viaducts and rail and sleeper systems). Capable domestic and foreign investors participate in investing in supplying carriage equipment, control systems, and investing and exploiting services around station areas and depots.

Fifthly, the operating speed is the central criterion, influencing and deciding the success or failure of the Project. In the current global context, train design technology capable of speeds up to 250km/h has become very familiar and will soon be outdated and replaced in the next 10-20 years. Thus, as a late-developing country that has inherited modern industry, Vietnam needs to soon aim for high-speed ranges of 350km/h to attract passengers to the high-speed rail network. Only then will HSR become an attractive market share to compete with air transportation. Therefore, the selection of technology and the speed range for exploitation need to be analyzed and compared right from the project preparation phase; and continue to be reviewed and adjusted in subsequent phases to find optimal technology in terms of operation, exploitation and energy-saving in train operation. [17]

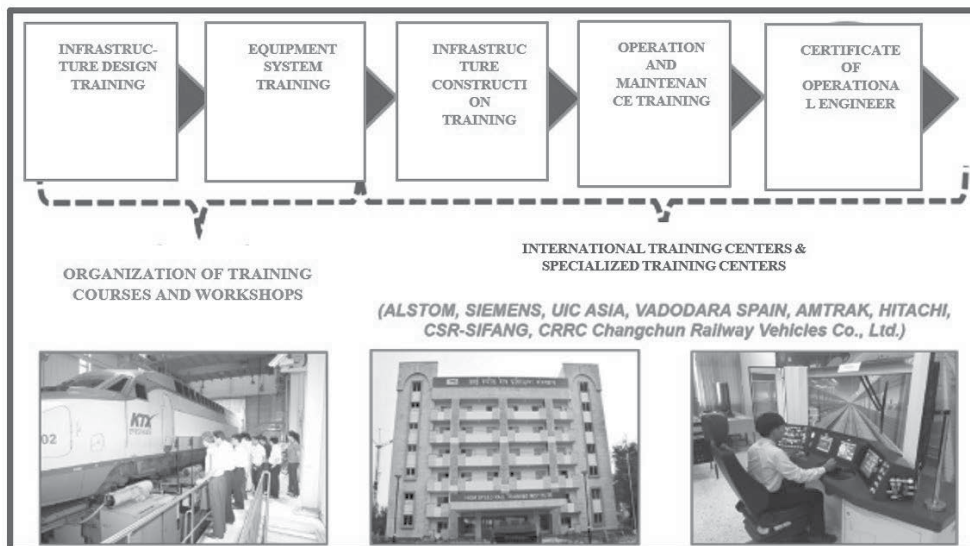


Figure 2. Human resource training model of "Design - Construction - Installation - Operation - Maintenance" for high-speed rail [14].

*Sixthly*, human resource training should be promoted. To deploy the project, preparing human resources is very important, from the investment preparation process, bidding work, construction to operation; all these tasks require a lot of time (5-10 years). Therefore, it is necessary to focus on training human resources from the current time, so that in 5-10 years there will be a team of engineers who can meet the project's requirements (Figure 2). Specifically, in the immediate phase of 2023-2030, there should be policies for recruiting and training additional young engineers, working in the fields of mechanics, locomotives and carriages, information technology and rail infrastructure. Simultaneously, collaborate with domestic universities and international organizations to develop training courses on rail infrastructure design, certification training on construction, assembly, operation and maintenance of high-speed rail equipment systems.

*Finally*, the decisive factor for socio-economic and financial success in investing in high-speed rail projects is the process of optimizing the costs of construction, operation and maintenance, providing time-saving value for each passenger and reducing environmental pollution costs. This also includes reducing the impact of noise, minimizing accidents and eliminating congestion in the existing transportation network. Moreover, these factors also bring broader economic benefits in creating a policy that encourages and promotes the development of the high-speed rail network.

## 6. CONCLUSION

High-speed rail is considered one of the most significant breakthrough technologies in the passenger transportation sector in the latter half of the 20th century. As of September 2022, 22 countries are operating HSR lines with a total length of 58,839km, and an additional 19,710km are under construction. However, the construction, maintenance and operation of HSR lines are very costly and involve huge expenses, potentially causing negative impacts on Vietnam's transportation policy and the development of the transportation sector for decades. It can be said that, besides the benefits in transportation capacity, speed, safety and reliability, the development of HSR presents many challenges to the Vietnam government, including feasibility, development scenarios, transportation objects, technology selection and transfer, investment resources, specific policies, environmental concerns, human resource training and project efficiency. Therefore, thorough evaluations are necessary beyond the excessive expectations about technology and demand forecast data.

This article clarifies the need to invest in the Project to address the imbalance of the transportation system along the North-South axis; to create a high-speed rail line that acts as a "backbone", playing a dominant role (transporting passengers and freight) and connecting with transportation hubs, while ensuring National Security - Defense, creating strategic breakthroughs and a new driving force for the socio-economic development of the localities where the Project is deployed. Thus, it highlights the benefits and challenges in investment and construction, aiming to provide useful reference information for State management agencies and relevant policy makers.

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