

Socialist Republic of Viet Nam

FY2022 Ex-Post Evaluation of Japanese ODA Loan

“Hanoi-HCMC Railway Line Bridges Safety Improvement Project (I-III)”

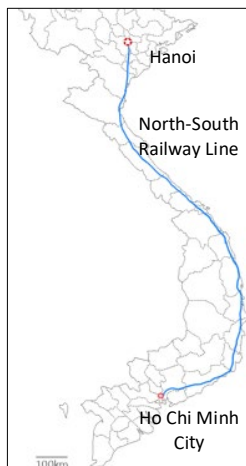
External Evaluator: Takako Haraguchi, i2i Communication, Ltd.

0. Summary

This project aimed to ensure the safety of rail service, shorten passenger and freight transport time, and boost transportation volume by replacing 44 severely age-worn bridges on the rail line between Hanoi and Ho Chi Minh City (the North-South Railway Line, total length: 1,700 km). The project plan aligns with Viet Nam’s development policy and needs, as well as Japan’s aid policy, making its relevance and coherence high. As a result of the project implementation, speed restrictions on the bridges were lifted, allowing trains to run safely at normal speeds. Additionally, improvements to level crossings and grade separations have led to a decrease in accidents at railway-road intersections. Although the volume of railway transportation fell short of expectations due to the rapid development of air and road transport, the project objective was largely achieved as the key outcome of ensuring safety was fully met. The anticipated impact of contributing to sustainable economic growth in the regions along the line could not be confirmed. However, the acquisition and utilization of Japanese technology and the improvement of convenience for residents through the construction of side roads and the utilization of existing bridges were confirmed. Therefore, the effectiveness and impacts are high. Efficiency is low because the project cost exceeded the plan and the project period significantly exceeded the plan. Regarding the operation and maintenance of the project, there are some technical and financial issues due to the lack of formalization of standard operating procedures in Viet Nam for the maintenance of parts using Japanese technology and products. However, there are prospects for addressing these issues, and other aspects are mostly good, making the sustainability high.

In light of the above, this project is evaluated to be satisfactory.

1. Project Description



Project Location



Image 1: Do Len Bridge in Thanh Hoa Province
(source: Photographed by the ex-post evaluator)

1.1 Background

Railways in Viet Nam began construction during the 19th-century French colonial era. Completed in 1935, the North-South Railway Line (initially the Hanoi-Saigon Line, currently the Hanoi-Ho Chi Minh City Line, total length: approximately 1,700 km) held the largest share in terms of distance and passenger and freight transportation volume, making it the country's most critical route. This line had suffered extensive damage during the war years from 1946 to 1975 but had been in operation since its reopening in 1976, thanks to ongoing bridge replacements, repairs, and track improvements. However, due to budget and material shortages and technical issues, these repairs and improvements were merely stopgap measures. The line also had structural problems, such as sharp curves, steep gradients, and small tunnel cross sections, posing significant safety challenges. Particularly concerning were the bridges, many of which had deteriorated significantly over the years. Speed restrictions of 40 km/h or lower had to be imposed for safety reasons, making their renovation an urgent issue for ensuring railway safety and enhancing transport capacity.

Out of the total 1,452 bridges (with a combined length of 370 km) on the North-South Railway Line, 1,064 bridges (260 km) had been renovated by 2003. This included emergency repairs to 19 particularly deteriorated bridges under the preceding ODA loan projects "Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (1-3)" (loan agreements signed in 1994, 1995, and 1996). However, of the remaining 388 bridges (110 km), urgent renovations were still needed for 237 bridges (75 km). Under such circumstances, the Government of Viet Nam requested an ODA loan project targeting 44 relatively large-scale bridges with high urgency, leading to the implementation of this project. In the first phase of this project, 17 bridges in the northern region were prioritized among the 44 bridges, and all 44 bridges were targeted in the second and third phases.

1.2 Project Outline

This project aims to ensure the safety of rail service, shorten passenger and freight transport time, and boost transportation volume by replacing 44 severely age-worn bridges on the rail line between Hanoi and Ho Chi Minh City (the North-South Railway Line, total length: 1,700 km), thereby contributing to the sustainable economic growth of the regions along the line.

		Phase 1	Phase 2	Phase 3
Loan Approved Amount / Disbursed Amount		8,222 million yen / 8,078 million yen	11,737 million yen / 11,481 million yen	13,790 million yen / 12,582 million yen
Exchange of Notes Date / Loan Agreement Signing Date		March 2004 / March 2004	March 2007 / March 2007	March 2013 / March 2013
Terms and Conditions	Interest Rate	0.75%	0.40%	0.20% (0.01% for the consulting services and interest during construction)
	Repayment Period	40 years	40 years	40 years
	(Grace period)	(12 years)	(10 years)	(10 years)
	Conditions for Procurement	Tied (Special Terms for Economic Partnership (STEP))		
Borrower / Executing Agency		The Government of the Socialist Republic of Viet Nam / Ministry of Transport	The Government of the Socialist Republic of Viet Nam / Vietnam Railways	The Government of the Socialist Republic of Viet Nam / Ministry of Transport
Project Completion		November 2017		
Target Area		Between Hanoi and Hue	Between Hanoi and Ho Chi Minh City	
Main Contractors (Over 1 billion yen)		<u>Phase 1</u> Yokogawa Bridge Corporation (Japan) / Tekken Corporation (Japan) / Thang Long Construction Corporation (Viet Nam) (JV), Mitsui Engineering & Shipbuilding Co., Ltd. (Japan) / Rinkai Construction Co., Ltd. (Japan) / Civil Engineering Construction Corporation No. 1 (Viet Nam) (JV) <u>Phase 1 to Phase 3</u>		

	<p>Taisei Corporation (Japan) / Mitsui Engineering & Shipbuilding Co., Ltd. (Japan) / Civil Engineering Construction Corporation No.1 (Viet Nam) (JV), Taisei Corporation (Japan) / Mitsui Engineering & Shipbuilding Co., Ltd. (Japan) / Rinkai Construction Co., Ltd. (Japan) / Civil Engineering Construction Corporation No. 1 (Viet Nam) (JV)</p> <p><u>Phase 2</u></p> <p>Yokogawa Bridge Corporation (Japan) / Marubeni Corporation (Japan) / Tekken Corporation (Japan) / Thang Long Construction Corporation (Viet Nam) (JV), Itochu Corporation (Japan)</p> <p><u>Phase 2 to Phase 3</u></p> <p>DPS Bridge Works Co., Ltd. (Japan) / Mitsui Engineering & Shipbuilding Co., Ltd. (Japan) / Civil Engineering Construction Corporation No. 1 (Viet Nam) (JV)</p> <p><u>Phase 3</u></p> <p>Mitsui Engineering & Shipbuilding Co., Ltd. (Japan) / Tekken Corporation (Japan) / Thang Long Construction Corporation (Viet Nam) (JV), Rinkai Construction Co., Ltd. (Japan) / Railway Construction Corporation Joint Stock Company (Viet Nam) (JV), Taisei Corporation (Japan) / Mitsui Engineering & Shipbuilding Co., Ltd. (Japan) / Civil Engineering Construction Corporation No. 1 (Viet Nam) (JV)</p>
<p>Main Consultants (Over 100 million yen)</p>	<p><u>Phase 1 to Phase 3</u></p> <p>Japan Railway Technical Service (Japan) / Chodai Co., Ltd. (Japan) / Oriental Consultants Co., Ltd. (Japan) (JV)</p> <p><u>Phase 2 to Phase 3</u></p> <p>Japan Bridge and Structure Institute, Inc. (Japan) / Tonichi Engineering Consultants, Inc. (Japan) / Oriental Consultants Co., Ltd. (Japan) (JV)</p>
<p>Related Studies (Feasibility Studies, etc.)</p>	<ul style="list-style-type: none"> • “Special Assistance for Project Implementation for the Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project, I and II” (translated from Japanese), Japan International Cooperation Agency (JICA) or the former Japan Bank for International Cooperation (JBIC), 1997 • “Feasibility Study Report,” Railway Investment & Construction Consultant Company (RICCC), 2001 (targeting 34 bridges)

	<ul style="list-style-type: none"> • “F/S Review Study for the Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (translated from Japanese),” Japan Transportation Consultants, Inc., 2003 (Feasibility Study (F/S) review, information gathering on the F/S statuses of additional ten bridges, etc.) • “Feasibility Study Report,” RICCC, 2003 (F/S including the additional 10 bridges) • “Special Assistance for Project Implementation (SAPI) for Vietnam Railways,” JICA, 2008
<p style="text-align: center;">Related Projects</p>	<p><u>JICA Technical Cooperation</u></p> <ul style="list-style-type: none"> • National Transport Strategy Study for the Socialist Republic of Vietnam (VITRANSS) (1999-2001) • Comprehensive Study on the Sustainable Development of Transport System in Vietnam (VITRANSS2) (2007-2010) <p><u>ODA Loan</u></p> <ul style="list-style-type: none"> • Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (1) (January 1994) • Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (2) (April 1995) • Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (3) (March 1996)

2. Outline of the Evaluation Study

2.1 External Evaluator

Takako Haraguchi, i2i Communication, Ltd.

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October 2022-January 2024

Duration of the Field Study: December 4-31, 2022 and April 16-22, 2023

3. Results of the Evaluation (Overall Rating: B¹)

3.1 Relevance/Coherence (Rating: ③²)

3.1.1 Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Viet Nam

The national and sector development plans at the time of the appraisal for each phase and of the ex-post evaluation aim for economic growth through the development of transportation infrastructure. Therefore, the consistency of the project with the country's development plans is high. First, regarding the national development plans at the time of the appraisals, the *Five-Year Socio-Economic Development Plans* (2001-2005 and 2006-2010) focused on modernizing transportation infrastructure, including railways. The *Five-Year Socio-Economic Development Plan* (2011-2015) aimed for the early completion of ongoing transportation infrastructure projects. Second, regarding the transport sector development plans, the 10-year master plan for the railway sector developed through the National Transport Development Strategy for the Socialist Republic of Viet Nam (VITRANSS, 2000), at the time of the appraisals for Phase 1 and 2, designated the renovation of aging bridges as one of the top-priority projects. At the time of the appraisal for Phase 3, the *Transport Development Strategy up to 2020 with a Vision Toward 2030* (Prime Minister's Decision No. 35 of 2008) set forth objectives for the railway sector including improvements to existing infrastructure to meet both Vietnamese and regional railway standards, along with the construction of a North-South high-speed railway and the development of urban railways. Regarding the railway sub-sector development plans, the *Railway Development Master Plan* (Prime Minister's Decision No. 6 of 2002, revised by Prime Minister's Decision No. 1436 of 2009) aimed to modernize railway transportation, including facilities and rolling stock, and to increase speed by 2020. It also sought to improve the share of railway transportation among all modes of transport. The rehabilitation of bridges on the North-South Railway Line was designated as one of the top-priority projects. Also, in the *Railway Development Strategy up to 2020 with a Vision Toward 2050* (Prime Minister's Decision No. 1686 of 2008), the goals included enhancing railway transport capacity through improvements to existing lines and new constructions, increasing operational speed, and expanding both passenger and freight transportation volumes.

At the time of the ex-post evaluation, the focus of railway development in the national development plan, the *Five-Year Socio-Economic Development Plan* (2021-2025), shifted to the development of urban railways and preparations for the North-South high-speed railway. However, in the transport sector development plan, namely, the revised version of the *Transport Development Strategy up to 2020 with a Vision Toward 2030* (Prime Minister's Decision No. 355 of 2013), the improvement and modernization of the North-South Railway Line continue to be targeted goals. Furthermore, the railway sub-sector development plan,

¹ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

² ④: Very High, ③: High, ②: Moderately Low, ①: Low

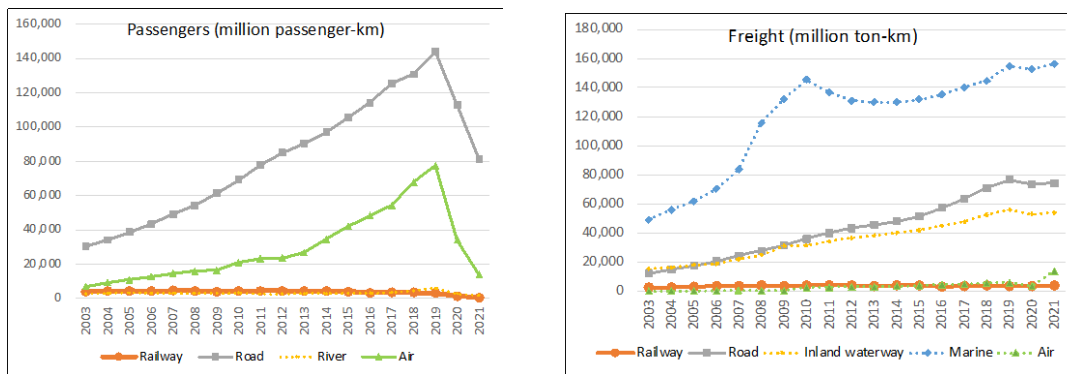
known as the *Master Plan on the Railway Network to 2030 with a Vision Toward 2050* (Prime Minister’s Decision No. 1769 of 2021), aims to renovate and upgrade existing railway routes for more efficient operation and uninterrupted connections with international railway routes. It targets the improvement of infrastructure for seven existing lines, including the North-South Railway Line, to enhance railway safety.

3.1.1.2 Consistency with the Development Needs of Viet Nam

From the time of the appraisal for Phase 1 to the time of the ex-post evaluation, the need for safe operation of the North-South Railway Line has remained high, and this project is consistent with that need. At the time of the appraisals, as stated in “1.1 Background,” there was an urgent need for the safe operation of the North-South Railway Line through the renovation of its aging bridges. The share of railway transport on the North-South Railway Line in the country’s total railway transport has increased from 59% to 73% for passengers and from 83% to 93% for freight between 2003 and 2019.³ This highlights the continued importance of maintaining safe operations on this railway line. According to the Railway Project Management Unit (PMU-Rail) under the Ministry of Transport (MOT), the executing agency, the North-South Railway Line has 1,504 bridges (with a total length of 40.4 km), of which approximately 400 smaller bridges still require renovations, as of the time of the ex-post evaluation. Therefore, the PMU-Rail continues to carry out renovations of about five bridges annually using funds from the Vietnamese government. As a result of these efforts, as of December 2022, there are no bridges on the North-South Railway Line where speed limits of 40 km/h or lower have been set.

While it does not affect safety needs, quantitatively speaking, the proportion of railway transport in Viet Nam’s transportation volume in all modes has decreased: from 2003 to 2019, the share decreased from 9.2% to 1.4% for passengers and from 3.4% to 1.3% for freight. The transportation volume itself is also declining, specifically for passengers. This is due to a significant increase in the volume of road and air transport, which have advantages over railway in terms of convenience and travel time (Figure 1). According to the MOT and the Department of Transport (DOT) of the provinces visited, the connectivity between railway and other modes of transport is not sufficiently established and remains a future challenge (also mentioned in “3.3.2.1 Intended Impacts”).

³ To exclude the impact of COVID-19 on transportation volume (particularly, the sharp decline in passenger transportation volume in 2020 and 2021 is believed to be due to pandemic-related travel restrictions), trends up to 2019 are being considered. Note that all transportation volume data in this section are based on passenger-km for passengers and ton-km for freight.



Source: Created based on data provided by the executing agency.

Figure 1: Passenger and freight transportation volume by mode of transport in Viet Nam

3.1.1.3 Appropriateness of the Project Plan and Approach

The project logic (common to all phases) appears to be appropriate. However, the operation and effect indicators set for the project objectives of “shortening transport time” and “boosting transportation volume” could not adequately capture the direct effects of the project. For the objective of “shortening transport time,” the set indicator “travel time between Hanoi and Ho Chi Minh City” is not closely related to the time reduction due to bridge replacements. (Therefore, the effectiveness and impacts (discussed in “3.3.1.1 Quantitative Effects”) were verified by examining the changes in speed limits for each target section and the factors affecting them.) For the objective of “boosting transportation volume,” the set indicator “annual railway transport volume between Hanoi and Ho Chi Minh City” may have had target values that were based on overly ambitious assumptions on the annual growth rate of transportation volume when viewed in the context of the railway transportation trends at the time.⁴ However, this issue is not considered to be a factor that hinders the realization or sustainability of the project’s effects, and it therefore does not impact the sub-rating for relevance.

Phase 3 of this project was implemented due to a funding shortfall caused by an economic downturn in Viet Nam after the appraisal of Phase 2, necessitating an additional loan (see “3.2 Efficiency”). JICA considered the implementation of Phase 3 to be a reasonable measure at the time. No issues were identified in the risk analysis, implementation structure, and work plans at the appraisals of Phase 1 and Phase 2, and the additional loan is considered to have been an unavoidable response.

From the perspective of consideration for marginalized people, there was no specific mention in the appraisal documents and the ex-ante evaluation report. However, given the

⁴ The effectiveness of this project was evaluated based on the actual performance against the target values set at the appraisal of Phase 3. According to materials provided by JICA and VNR, the annual average growth rate of transportation volume on the North-South Railway Line up to the time of the Phase 3 appraisal was 1.4% for passengers and 6.6% for freight in actual terms (from 2005 to 2012), whereas the projections (plans) for the same period had been 3.7% for passengers and 10.6% for freight.

nature of this project, which involved the replacement of railway bridges, it is believed that there are no particular points that need to be examined.

3.1.2 Coherence (Rating: ②)

3.1.2.1 Consistency with Japan's ODA Policy

The support for the North-South mainline transport is explicitly stated in the development cooperation policies at the time of each phase's appraisal, making it consistent with this project. At the time of the appraisal for Phase 1, JICA (formerly JBIC) stated in its *Medium-Term Strategy for Overseas Economic Cooperation Operations* (April 2002) that under the priority area of "Infrastructure Development for Economic Growth," it would continue to "implement support for the development of economic and social infrastructure to promote economic growth." In the corresponding *Country Assistance Strategy*, it was stated that in the transportation sector, while keeping in mind the construction of a comprehensive distribution system for freight and passenger transport, support would be implemented for projects where infrastructure development, institutional reforms, and human resource development organically bring about effects, taking into account projects' economic viability and urgency. Furthermore, the role of the railway sector was expected to expand for the improvement of intermodal balance and the reduction of logistics costs between the North and South. Support was planned for the repair and replacement of bridges with a high degree of urgency to restore safety.

At the time of the appraisal for Phase 2, JICA (formerly JBIC) followed the same approach as outlined in the above-mentioned *Medium-Term Strategy for Overseas Economic Cooperation Operations* in its updated version (April 2005). In the corresponding *Country Assistance Strategy*, it emphasized support for the development of economic infrastructure, such as transportation, as a priority area for achieving sustainable economic growth. The *Japan's Country Assistance Program for Viet Nam* (April 2004) stated that it would focus on support related to international and domestic trunk line transport (priority economic growth areas in the North and South, and the North-South mainline) as well as urban transport (Hanoi and Ho Chi Minh City). At the time of the appraisal for Phase 3, the *Country Assistance Program for Viet Nam* (July 2009) highlighted "Urban Development, Network Development for Transport and Communications" as key development issues. It stated that in order to meet the increasing demand for inter-city transport, support would be provided with due consideration for appropriate prioritization and road maps, with a focus on selectivity and concentration, while also taking into account the perspective of logistics efficiency, for arterial roads (including the North-South expressway), railways (including the North-South high-speed railway), ports, and airports. In Phases 2 and 3, compared to Phase 1, the focus in railway development shifted more toward urban railways and the North-South high-speed railway. However, it is evident that support for the existing North-South Railway Line continued to be included as a target for assistance.

3.1.2.2 Internal Coherence

In this project, no specific collaboration or coordination with other JICA projects took place.⁵

3.1.2.3 External Coherence

In this project, there was no specific collaboration or coordination with projects conducted by other Japanese agencies, other donors, or international frameworks.

Thus, while this project did not have specific collaboration or coordination with other projects, it shows consistency with Viet Nam's development plans and development needs and appropriateness in project planning and approach. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ①)⁶

3.2.1 Project Outputs

The outputs of this project consisted of civil works and equipment procurement (replacement of 44 bridges on the North-South Railway Line, renovation of bridge approach sections including track construction, construction of ancillary facilities, and procurement of operation and maintenance (O&M) equipment), as well as consulting services. While there were some modifications, these were largely completed as planned, and no issues were identified with the changes.

The civil works and equipment procurement were largely completed as planned, as detailed in the table below. This was also confirmed through visual inspection at the time of the ex-post evaluation.⁷ The main scope changes included some design modifications during the detailed design phase (such as changing the location of the new Nam O Bridge to the same position as the existing bridge to reduce the area for involuntary resettlement, altering some PC girders to

⁵ Among those mentioned as related projects in "1.2 Project Outline," VTRANSS (1999-) and VTRANSS2 (2007-), which proposed transportation plans, could be said to be related to the relevance of this project in the sense that they supported the formulation of Viet Nam's development policies. However, the need for bridge renovation on the North-South Railway Line had been recognized even before the implementation of these projects, and there was no specific collaboration or coordination with them, nor did they bring about any synergistic effects for the achievement of this project's objectives. Additionally, the Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (1-3) (1994-) contributed to the achievement of the project objectives through mutual complementation with this project. However, since they are preceding projects to this project, they are excluded from the consideration of internal coherence.

⁶ For the sub-rating of efficiency, the comparison between planned and actual results was primarily based on the plan at the time of the Phase 2 appraisal. This is because Phase 1 targeted only 17 bridges for replacement, and the plan to replace all 44 bridges was made at the time of the Phase 2 appraisal. However, when confirming the project period—a component of inputs—the starting point for the planned value, defined as the scheduled loan agreement signing date, was based on the scheduled date for the Phase 1 loan agreement signing.

⁷ In this ex-post evaluation, the evaluator visually confirmed 11 out of the 44 bridges, as well as the tracks and ancillary facilities near them. The remaining 33 bridges were confirmed through interviews with the PMU-Rail, VNR, and their subsidiaries, the regional management maintenance companies (RMMCs) responsible for infrastructure maintenance in different sections.

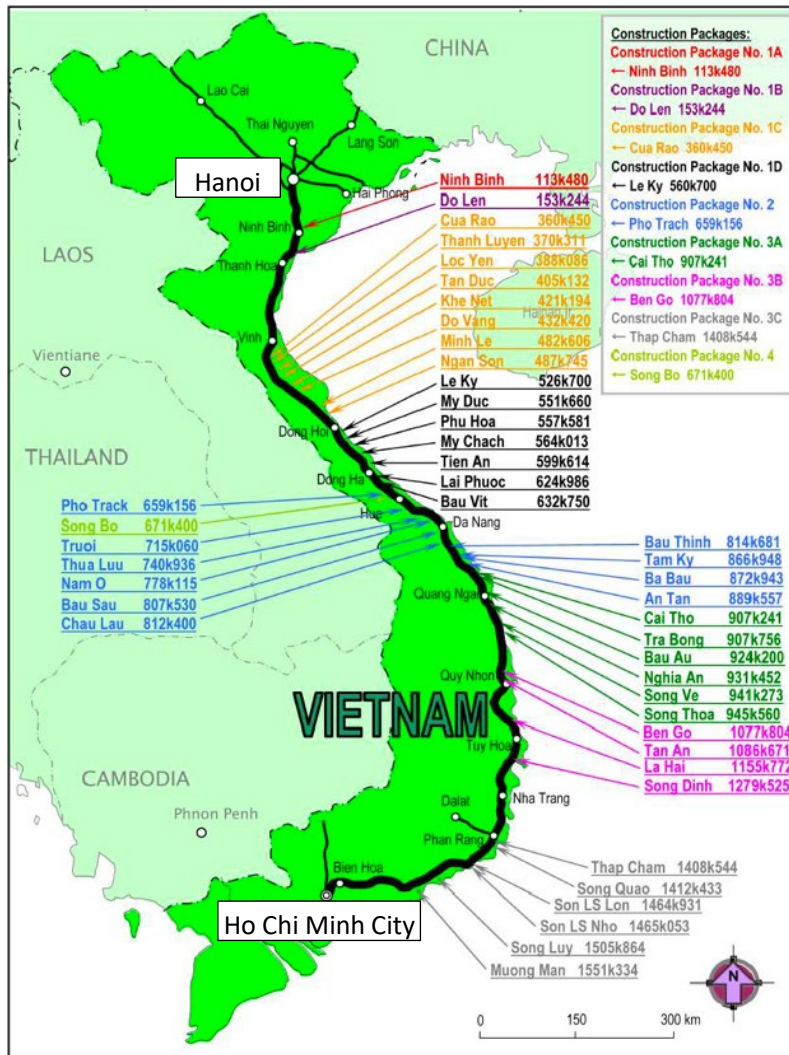
embankments in multiple bridges for cost reduction, and modifying the alignment in multiple bridges, thereby shortening the extension of track repairs, etc.), as well as some design changes at the time of the Phase 3 appraisal (such as canceling the construction of a new north abutment for the Tan Duc bridge for cost reduction and utilizing the existing one, and reevaluating and canceling the necessity of some ancillary facilities, etc.). All of these changes were concurred as non-issues by JICA. As will be discussed later, the total project cost had significantly increased; therefore, the scope revisions aimed at cost reduction are considered to be reasonable responses.

Table 1: Planned and actual results of civil works

	Plan at Phase 2 Appraisal	Result
Replacement of 44 bridges	Without alignment changes: 36 bridges With alignment changes: 8 bridges	Without alignment changes: 36 bridges With alignment changes: 8 bridges
Construction of tracks	Without alignment changes: 11.8 km With alignment changes: 31.738 km	Without alignment changes: 15.247 km With alignment changes: 29.832 km
Construction of ancillary facilities	Level crossings: 25 locations Level crossing automatic warning systems: 9 units Level crossing barriers: 13 units Underpasses: 41 locations South road bridge at Ninh Binh Bridge Ninh Binh Station and tracks	Level crossings: 21 locations Level crossing automatic warning systems: 10 units Level crossing barriers: 9 units Underpasses: 41 locations South road bridge at Ninh Binh Bridge Ninh Binh Station and tracks

Source: Materials provided by JICA, materials provided by the executing agency

The civil works contract packages were more subdivided as compared to the initial appraisal plan. Originally, the appraisal plan included procurement for four packages (Packages 1-4), but due to the large scope of work per package leading to unsuccessful bidding, they were divided into nine packages (Packages 1A-1D, Package 2, Packages 3A-3C, Package 4). Along with one package for equipment procurement, a total of 10 packages were procured.



Source: Materials provided by JICA

Figure 2: Bridges targeted in this project



Image 2: Thap Cham Bridge and its side road in Ninh Thuan Province. The bridge used Japanese technology such as directly fastened track.
(source: Photographed by the ex-post evaluator)



Image 3: Improved level crossing (ancillary facility of Song Quao Bridge in Ninh Thuan Province)
(source: Photographed by the ex-post evaluator)

The consulting services consisted of Consulting Service 1 and Consulting Service 2, as shown in the table below. The scope of work was as planned, and the volume of work increased due to unsuccessful bidding, package division, and extension of the construction period.

Table 2: Outline of the consulting services

	Scope of Work	Work Volume
Consulting Service 1	<ul style="list-style-type: none"> • Detailed design (for 44 bridges) • Pre-qualification (P/Q) and bidding assistance and construction supervision for civil works (for 17 bridges between Hanoi and Hue) • Review of the resettlement plan, assistance in its implementation, assessment and implementation of livelihood recovery measures as needed, and monitoring • Technical support for environmental measures (conducting detailed Environmental Impact Assessments (EIA), monitoring) • Capacity-building support for O&M of bridges and tracks • Formulation of O&M plans for bridges and tracks 	Planned: 1,516 person-months Actual: 1,698.9 person-months
Consulting Service 2	<ul style="list-style-type: none"> • P/Q and bidding assistance and construction supervision for civil works (for 27 bridges between Hue and Ho Chi Minh City) • P/Q and bidding assistance for the procurement of O&M equipment 	Planned: 942 person-months Actual: 1,255.23 person-months

Source: Materials provided by JICA, interviews with the consultants

3.2.2 Project Inputs

(For details, see the final section of the report, “Comparison of the Original and Actual Scope of the Project.”)

3.2.2.1 Project Cost

The amount of the planned total project cost at the time of the Phase 2 appraisal was 23,868 million yen (of which the ODA Loan was 11,945 million yen for the amount paid in foreign currency and 8,014 million yen for the amount paid in local currency, for a total of 19,959 million yen). The actual amount of the total project cost was 34,606 million yen (of which the ODA Loan was 13,970 million yen paid in foreign currency and 18,171 million yen paid in local currency, for a total of 32,141 million yen), which exceeded the plan (145% against the plan⁸).

Among the main reasons for the increase in project costs, factors unrelated to this project included the global surge in construction materials and fuel prices that occurred after the Phase 2 appraisal in November 2006. Factors within the project were the need for measures against softer soil than anticipated at some sites, and the subdivision of construction packages due to unsuccessful bidding. The Vietnamese government addressed these issues as much as possible through its own funds, but an additional loan was still needed for the remaining shortfall, leading to the implementation of Phase 3.

⁸ For reference, if the planned amount of 210 million yen for the scope that was canceled for cost reduction is excluded from the planned amount, the ratio to the plan is 146%.

The Vietnamese side explained at the time of the Phase 3 appraisal that the breakdown of the additional project costs was as follows: 65% for addressing the rise in prices of construction materials and fuel, as well as labor costs;⁹ 26% for changes such as the subdivision of packages; and 9% for additional measures against soft soil conditions. In this context, the increase in project costs was discussed based on an analysis of the additional expenses needed beyond Phase 2, as well as considering the Viet Nam side’s own efforts to mitigate these costs. Given these factors, the increase in project costs seems unavoidable. Additionally, during the appraisal for Phase 3, the total project cost was estimated to be 40,699 million yen, which was over 170% of the plan at the time of the Phase 2 appraisal. However, due to efforts to reduce costs, the actual figure was kept at 145%, as mentioned above, which is commendable.

3.2.2.2 Project Period

The project period for this project was defined as the period from the signing of the loan agreement to the end of the guarantee period (one year after the completion of construction work). According to the plan at the time of the Phase 2 appraisal, this was expected to be from March 2004 (the date of the Phase 1 loan agreement) to December 2012, a total of 106 months. By contrast, the actual period was from March 2004 to November 2017, a total of 165 months, significantly exceeding the initial plan (156% of the plan).

The delay was attributed to design changes, unsuccessful bidding, and the subdivision of construction packages, which resulted in delays across various stages of the project. However, as shown in the table below, some construction packages included bridges that were replaced relatively early, in years such as 2012 and 2013. Some bridges even became operational in 2011.

Table 3: Construction period for each construction package

Construction Package	Number of Target Bridges	Plan at Phase 2 Appraisal	Result
CP1A	1	April 2009-September 2011	May 2012-October 2015
CP1B	1		May 2011-July 2013
CP1C	8		July 2011-January 2014
CP1D	7		December 2011-February 2014
CP2	10	July 2009-December 2011	May 2010-October 2012
CP3A	6	July 2009-December 2011	December 2013-December 2015
CP3B	4		February 2014-August 2016
CP3C	6		February 2014-November 2016
CP4	1	July 2009-December 2011	February 2013-September 2015

Source: Materials provided by JICA, materials provided by the executing agency

Note: CP stands for Construction Package.

⁹ This price surge is not considered to be severe enough to be regarded as an “external factor,” defined as a “severe economic crisis such as hyperinflation” that could be taken into account in the sub-rating for efficiency. Therefore, the sub-rating was based on the “145% of the plan” mentioned in the main text. For reference, if one were to consider the price surge as an external factor and subtract the portion attributable to this factor (65%) from the additional project costs, the resulting figure compared to the plan would be 113%, slightly exceeding the plan.

3.2.3 Results of Calculations for Internal Rates of Return (Reference Only)

The Economic Internal Rates of Return (EIRR) calculated at the Phase 2 and Phase 3 appraisals were 11.5% and 8.0%,¹⁰ respectively. The project life was set at 40 years, and the costs included project expenses (excluding taxes) as well as O&M costs. The benefits accounted for the reduction in travel and transportation time for passengers and freight, as well as reduced maintenance costs. Using the same assumptions for the ex-post evaluation and substituting the actual figures for project costs and transportation volumes, the recalculated EIRR was 0.7%. The reason for the lower value compared to the appraisal estimates is believed to be that the actual project costs were higher, and the transportation volumes of passengers and freight, which serve as the basis for benefit calculations, were lower than initially anticipated.

The Financial Internal Rate of Return (FIRR) was not calculated during the appraisal because subsidies were being provided to Vietnam Railways (VNR), the entity responsible for railway operations, by the Vietnamese government. It was not recalculated during the ex-post evaluation due to the same circumstances.

Therefore, efficiency of the project is low.

3.3 Effectiveness and Impacts¹¹ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The operation and effect indicators set at the time of the appraisals for this project were: 1) the annual railway transport volume between Hanoi and Ho Chi Minh City, and 2) the travel time between Hanoi and Ho Chi Minh City. Among the project objectives, “to ensure the safety of rail service, shorten passenger and freight transport time, and boost transportation volume,” Indicator 1) can be categorized as an effect indicator for measuring the increase in transport volume, and Indicator 2) as an effect indicator for measuring the shortening of transport time for passengers and goods. On the other hand, the main outcome of this project is considered to be “ensuring the safety of rail service.” This is mentioned in the project name and as the first item in the project objectives. It also logically has a direct causal relationship with the project’s output. This understanding is shared by the Vietnamese executing and related agencies. However, no indicators related to this particular outcome had been set. Therefore, this evaluation examined 3) the speed limits of the 44 target bridges and 4) the number of railway accidents as supplementary indicators (effect indicators). The following describes the

¹⁰ The EIRR calculated at the time of the Phase 3 appraisal was 10.5%. However, this calculation had set the starting point of the project life as the planned year of operation commencement, which was 2016. When recalculating the EIRR during the ex-post evaluation, the starting point for the project life was revised to be the year of the Phase 1 loan agreement signing, which was 2004, resulting in an EIRR of 8.0%.

¹¹ When providing the sub-rating, Effectiveness and Impacts are to be considered together.

achievement status of each: 1) was achieved to a limited extent, 2) was substantially achieved to a large extent, and 3) and 4) were fully achieved.

1) Annual railway transport volume between Hanoi and Ho Chi Minh City

The achievement level for railway transport volume for the target year (2018) was limited, with 42% based on the number of passengers, 53% based on passenger-km, 20% based on tonnage, and 48% based on ton-km, averaging 41%. The volume of transport continued to decline in 2019, and in 2020 and 2021, it decreased significantly, especially in passenger transport, due to the reduction in the number of train operations caused by the impact of the COVID-19 pandemic. The factors for not achieving the targets include setting high target values compared to the actual demand for rail transport (see “3.1.1.3 Appropriateness of Project Plan and Approach”), a rapid increase in air transport and a change in preferences for long-distance rail travel for passengers (according to VNR, sleeper cars with private compartments have become more popular than seat cars, reducing the capacity per train), and a rapid increase in road transport for freight.

In other words, the operation of the outputs from this project is being sustained, but the situation is such that it has not reached the level anticipated in terms of quantity. It should also be noted that although not reflected in these indicators, the project has upgraded bridges and tracks, increased load-bearing capacity, made it possible to transport passengers and freight without reducing speed on bridges, and reduced risk of operational restrictions due to bridge deterioration. Therefore, it can be said that the project has enhanced latent transport capacity.

Table 4: Annual railway transport volume between Hanoi and Ho Chi Minh City
(operation and effect indicators)

	Baseline value	Target value	Actual value					
	2005	2018 2 Years After Completion	2016 Completion Year	2018 2 Years After Completion	2019 3 Years After Completion	2020 4 Years After Completion	2021 5 Years After Completion	2022 6 Years After Completion
Passenger Transport Volume (Thousand People/Year)	6,671	16,500	6,984	6,873	6,278	2,951	1,116	2,310
Passenger Transport Volume (Million Passenger-km/Year)	3,889	6,205	3,075	3,314	2,965	1,437	560	1,168
Freight Transport Volume (Thousand Tons/Year)	2,915	12,801	2,213	2,519	2,221	2,157	2,204	2,663
Freight Transport Volume (Million Ton-km/Year)	1,650	6,128	2,356	2,958	2,722	2,689	2,782	3,497

Source: Materials provided by JICA, materials provided by the executing agency

Note: The target values are those set at the time of the Phase 3 appraisal. For both target and actual values, the term “completion (year)” refers to the year of construction completion (i.e., one year prior to the end of the guarantee period), not the year when the guarantee period ends, which is used for evaluating the efficiency of the project duration. The same applies to the tables for other indicators that follow.

2) Travel time between Hanoi and Ho Chi Minh City

For the target year (2018), the travel time for passenger trains did not decrease but rather increased, whereas for freight trains, the travel time was significantly reduced, exceeding the

target. Therefore, if looking solely at these numbers, the achievement is partial. However, according to the executing agency, the baseline value of 29.5 hours for passenger trains was the travel time for a specific express train, and the average travel time was around 35-36 hours. The average travel time after 2018 has been 31-32 hours, indicating a reduction of approximately 4 hours compared to before the project. Thus, considering the significant reduction in travel time for freight trains from 60 hours to 38-39 hours, it can be said that the reduction in travel time has been largely achieved in practical terms.

The factors determining travel time are not solely the speed of the train but also include the number of stops, train passing, and the impact of construction work (the PMU-Rail continues to renovate bridges and tracks with government funding even after this project), among other things. Particularly for passenger trains, VNR places emphasis on transporting more passengers, and the increase in travel time in 2022 was explained to be partly due to the addition of more stops. Furthermore, the aim is to reduce the travel time for all trains, not just specific ones, and as of the time of the ex-post evaluation, there were no passenger trains operating at 29.5 hours. Considering these factors, along with the increased speed limits on bridges (discussed in the following section), this indicator may not directly reflect the impact of bridge replacements, but it can be said that this project has contributed to the reduction of travel time.

Table 5: Travel time between Hanoi and Ho Chi Minh City (effect indicators)

	Baseline value	Target value	Actual value					
	2005	2018 2 Years After Completion	2016 Completion Year	2018 2 Years After Completion	2019 3 Years After Completion	2020 4 Years After Completion	2021 5 Years After Completion	2022 6 Years After Completion
Passenger Trains (Hour)	29.5 (Average: 35.5)	24	31	31	31	31	31	32
Freight Trains (Hour)	60	54	38	38	38	38	38	39

Source: Materials provided by JICA, materials provided by the executing agency

3) Speed limits of the 44 target bridges

For the outcome “ensuring the safety of rail service,” changes in speed limits were checked as supplementary indicators at the effect indicator level for all target bridges. First, according to the executing agency, all speed restrictions imposed on the target bridges for safe operation have been lifted. This suggests that the safety of trains operating at regular speeds has been secured. Second, the speed limits for sections that include the 44 bridges (totaling approximately 545 km, which accounts for about 32% of the railway extension between Hanoi and Ho Chi Minh City) exceed the planned speed limits for the target bridges. Although such speed sections include tracks and bridges that are not part of this project, before the project, trains had to reduce their speed to an average of around 30 km/h on the target bridges, creating a bottleneck in those sections. This issue has been resolved by the project, allowing trains to

pass at an average speed of 75 km/h, which can be attributed to the project’s effectiveness.¹² Additionally, comments from the regional management maintenance companies (RMMCs, subsidiaries of VNR) indicated that the project has made the track alignment more linear,¹³ allowing for higher speeds.

Table 6: Speed limits of the 44 target bridges
(supplementary indicators at the effect indicator level)

	Baseline value	Target value	Actual value
	2003	Post-project	2022 Post-project
Passenger Trains (km/h)	Average: 34	Average: 70	No speed restrictions on bridges Speed limit for a section including each bridge: 30-100 Average: 75
Freight Trains (km/h)	Average: 30	Average: 59	No speed restrictions on bridges Speed limit for a section including each bridge: 30-100 Average: 75

Source: Materials provided by JICA, materials provided by the executing agency

4) Number of railway accidents

As another supplementary indicator at the effect indicator level for the outcome “ensuring the safety of rail service,” the number of railway accidents was examined. According to data from VNR, the number of accidents on the North-South Railway Line was 457 in 2005, 174 in 2019, and 160 in 2022, showing a consistent decrease in both the number of incidents and casualties. The number of accidents on the bridges targeted by this project has been zero both before and after the project. In terms of the effects of bridge replacement, it can be considered effective in the sense that no accidents have occurred even when trains operate at regular speeds, thus ensuring the safety of train operations.

While data on the number of accidents by cause were not available, VNR indicated that most of them occurred at level crossings and intersections. Feedback from multiple RMMCs confirmed that improvements to level crossings and the construction of grade-separated intersections undertaken by this project have contributed to the reduction in accidents. Additionally, there was a case where the slope protection implemented alongside bridge construction prevented landslides, thereby mitigating risks to railway operations, which can be cited as another positive effect.

¹² The ex-post evaluator rode a section of the North-South Railway Line (from Thap Cham Station to Hue Station, covering 720 km) during the on-site survey on December 20, 2022. Using a mobile phone app for a simple speed measurement, the evaluator confirmed that the train was running at speeds generally close to the speed limits on and around the bridges targeted by this project.

¹³ In this project, the track alignment before and after certain bridges was changed as needed for the bridge replacements. During this process, curves with a radius of less than 200 meters were improved to have a radius of 200 meters or more, in accordance with Vietnamese regulations.

3.3.1.2 Qualitative Effects (Other Effects)

The qualitative effects expected at the time of the appraisals were 1) the improvement in the safety of the Hanoi-HCMC Railway Line and 2) the development of industries in the areas along the line due to enhanced transport capacity. Considering the content of each, 1) was evaluated for its effectiveness (in this section), and 2) was categorized as a point of confirmation in “3.3.2.1 Intended Impacts.” As for 1), the manifestation of effects has been confirmed as described above.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact “contributing to the sustainable economic growth of the areas along the [North-South Railway] Line,” which was intended at the time of the appraisals, could not be confirmed as an impact of the bridge replacements.¹⁴ Among the People’s Committees or DOTs of the four provinces/cities along the line that were interviewed (from north to south: Ninh Binh City, Da Nang City, Hue City, and Ninh Thuan Province), only the People’s Committee of Ninh Binh City, where a new station building had been constructed (refer to “3.3.2.2 Other Positive and Negative Impacts” for details), recognized that this project had a direct impact on the industrial and economic development of the area. Such a lack of impact manifestation was explained by them as being due to the inconvenience of connections to roads and ports (many railway stations lack cargo loading and unloading areas, and truck transport between ports and railway stations is more expensive than truck transport to the destination). However, both Da Nang City and Ninh Thuan Province are planning to construct railway feeder lines to Lien Chieu Port and Ca Na Port, respectively; therefore, the potential for future impact is anticipated.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment

This project was classified as Category B based on the *JBIC Environmental Guidelines for ODA Loans* (October 1999), as it was a project in the railway sector project that does not belong to Category A.

Regarding environmental permits, the Preliminary Environmental Impact Assessment (EIA) reports for this project had been approved by the Ministry of Natural Resources and Environment (MONRE; formerly known as the Ministry of Science, Technology and Environment) in February 2002 and October 2003, respectively. The Detailed EIA report had also been approved by the MONRE in February 2010. For pollution control measures, the

¹⁴ The evaluator obtained some data on the local GDP, investment amounts, and the number of industrial parks in the areas along the line, and confirmed that they are generally showing an increasing trend. However, taking into account the comments from the local governments as indicated in the main text, the evaluator determined that there is no connection with this project and chose not to use these metrics in the evaluation.

project planned to carry out noise and vibration mitigation, river pollution control through tree planting and the installation of noise barriers, and proper waste disposal during construction. These measures were addressed by the contractors through the formulation and implementation of an environmental management plan in accordance with the EIA, Vietnamese domestic laws, and the aforementioned JBIC's *Guidelines* (1999). The executing agency has reported that there were no negative impacts. For monitoring during construction, noise, vibration, air quality, and water quality were monitored by the consultant, who employed specialists and local consultants to carry out the work.

The specific status of environmental monitoring after the completion of the project could not be ascertained. However, the executing agency, through designing and implementing improvement works in adjacent sections or the like, and VNR, through conducting inspection and maintenance of the target facilities, have been monitoring the natural environment of the target sections. Based on these results, they have reported that there has been no negative impact on the environment post-completion. However, although not directly related to the impact of the facilities constructed in this project, it was found that the project has triggered a waste disposal issue in Ninh Binh City, Ninh Binh Province. Specifically, due to the track changes made by this project, an unmanaged area has emerged around the safety buffer zone alongside the railway, as the boundary between the city's land and VNR's land has not been clearly agreed on by both parties. Waste has been dumped in this area, and according to the city, no measures can be taken because the city's management responsibility is not clearly defined. Additionally, it was observed that waste has been discarded and not cleaned up under the road bridge constructed as part of this project. According to the city, they are unable to manage the area because the land has not yet been transferred from VNR. Additionally, it was observed that some construction waste from this project has also been left unattended. VNR's perspective is that the land boundaries have already been defined in accordance with railway laws, land laws, and other relevant regulations. They have instructed the responsible RMMC (a subsidiary) for the section in question to clean the area, but this has not yet been fully implemented. Furthermore, VNR admitted that they have not reached an agreement with the city regarding the division of management responsibilities for the same boundaries.

2) Resettlement and Land Acquisition

For this project, due to the alignment changes and the construction of grade-separated crossings, land acquisition for 44 bridges covering a total of 73 ha¹⁵ and involuntary resettlement of 234 households for 22 bridges occurred. In the provinces where land acquisition and resettlement occurred, Compensation Committees established at the provincial and sub-provincial administrative levels carried out detailed socioeconomic surveys of the affected residents, explained the acquisition process to them, assessed the assets eligible for compensation, calculated the compensation amounts, and made the payments, all while

¹⁵ In addition to this, approximately 53 ha were acquired for temporary use during the implementation of the project.

collaborating with the PMU-Rail. For the relocated residents, resettlement sites were prepared based on the Resettlement Action Plan, and essential infrastructure, electricity, water supply, and roads were developed. Support for lifestyle and livelihood was provided not only to those who relocated to the sites prepared by the project but also to affected residents who chose other locations. Resettlement monitoring was carried out by the consultant, who employed specialists and local consultants for the task.

Delays in the provision of resettlement information from the PMU-Rail and in the development of infrastructure at the resettlement sites were reported at some sites, but these issues were resolved by the time of the Phase 3 appraisal. Due to changes in socio-economic conditions, as well as survey results and design changes during the detailed design phase, the area acquired and the number of affected households increased compared to the plan at the Phase 2 appraisal. However, according to the executing agency and the resettlement officials from the local governments visited, explanations about the project overview, compensation policy, and compensation levels were provided to all affected residents, and agreements were reached. Compensation was determined and paid based on Vietnamese domestic laws, and after the payments were made, it was reported that there were no complaints regarding land acquisition or resettlement.

From the interviews with the People's Committee of Ninh Binh City during the site visits (Ninh Binh Bridge and Ninh Binh Station site in Ninh Binh Province, where the most extensive resettlement of 140 households occurred), as well as from the resettlement monitoring reports at other sites, it was reported that the resettlement locations were close to the original lands and had high convenience. There was no need for residents to change their means of livelihood, which contributed to the smooth execution of land acquisition and resettlement.



Image 4: Resettlement site near Ninh Binh Station. All affected residents were relocated to this site, and 80% of them are reported to still reside in the same location as of the time of the ex-post evaluation. (source: Photographed by the ex-post evaluator)

3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being, and Human Rights

These aspects are not specifically mentioned in the documents at the time of the appraisal, and the examination at the time of the ex-post evaluation did not find any results that could be considered in the evaluation. According to the executing agency, no specific groups or individuals have been negatively affected.

4) Unintended Positive / Negative Impacts

The executing agency and related organizations cited the following positive secondary effects:

- Reduction in bridge maintenance costs. According to the PMU-Rail and RMMCs, the frequency of component replacement has decreased due to the use of directly fastened track (rails directly fastened to the stringers, eliminating the need for sleepers),¹⁶ the use of concrete sleepers (more durable than wooden ones), and the use of durable paint.
- Bridge construction that does not affect the operation of existing lines. According to the PMU-Rail, the replacement of bridges was smoothly carried out using the construction procedure (technology) proposed by the Japanese consultants, and there was no impact on the operation of existing lines. The technology learned is also being utilized in bridge replacements being carried out with Vietnamese budget post-project.
- Improvement in bridge aesthetics. According to the PMU-Rail and RMMCs, the use of high-quality Japanese steel allowed for a more slender and aesthetically pleasing upper structure.
- Improved convenience for residents through side roads and utilization of an existing bridge. Side roads constructed parallel to the tracks on each bridge (for pedestrians and motorcycles) and underpasses have made it easier for residents to get around. Additionally, at Ngan Son Bridge in Quang Binh Province, the existing bridge has been retained for use as a road bridge at the request of the local government. This has led to the emergence of new social and economic activities, such as the construction of buildings on the opposite bank of the river.
- Impact on Ninh Binh City. According to the city, the establishment of the new Ninh Binh Station through this project has made it easier for tourists to access attractions such as the Trang An Scenic Landscape Complex (a World Heritage site) by train. Additionally, the road bridge constructed over National Highway 1 as part of this project has eliminated the need for level crossings, thereby facilitating smoother road traffic. A provincial project connecting the national and provincial roads is also underway. Moreover, according to the station master at Ninh Binh Station, the newly established loading area and warehouse have made it easier to load and unload goods such as cement, automobiles, rice, fertilizers, and construction materials for transport between the station and Ho Chi Minh City. While data were not available, this can be cited as an example of promoting industrial and economic development through improved rail freight transport.

¹⁶ Due to the rapid deterioration of sleepers, they were first introduced in Viet Nam during the first phase of the preceding project, the Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project, which was completed in December 2000.



Image 5: Gia Huu Bridge in Binh Dinh Province. Completed in 2021, the bridge was constructed using technology from this project and government funding after the project's completion. (source: Photographed by the ex-post evaluator)



Image 6: Newly constructed Ninh Binh Station and the freight warehouse (on the right). (source: Photographed by the ex-post evaluator)

Based on the above, this project has mostly achieved its objectives of ensuring the safety of rail service, shortening passenger and freight transport time, and boosting transportation volume. The safety of rail service, which is a particularly important and direct outcome, has been fully achieved. The anticipated impact of contributing to the sustainable economic growth of the regions along the line could not be fully confirmed, but numerous other positive impacts were observed. Therefore, the effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Policy and System

As discussed in “3.1.1 Relevance” in the Vietnamese government’s transportation/railway policy at the time of the ex-post evaluation, the improvements to existing railway infrastructure, including the North-South Railway Line, are highlighted. Therefore, policies and systems for operation and maintenance are in place.

3.4.2 Institutional/Organizational Aspect

The operation and maintenance structure of this project is largely as anticipated at the time of the appraisals. The facilities completed under this project are owned by the state, and their operation and management are carried out by VNR. VNR has established eight regional maintenance management companies (RMMCs)¹⁷ for different railway segments, and the maintenance of the bridges and tracks, among other facilities developed through this project, is being carried out by these RMMCs on a shared basis. The maintenance equipment procured through this project is owned and managed by respective RMMCs. VNR was initially under the jurisdiction of the MOT, but this changed in 2018 with the establishment of the Commission for

¹⁷ At the time of the ex-post evaluation, the formal name for an RMMC is Railway Joint Stock Company, but for convenience it is referred to as an RMMC.

the Management of State Capital at Enterprises (CMSC), an agency responsible for overseeing all state-owned enterprises. VNR now falls under the purview of this commission. Additionally, the regulation and supervision of the railway sector, as well as the formulation of development policies, are carried out by the Vietnam Railway Authority (VNRA; formerly known as the Vietnam Railway Administration or VRA at the time of project implementation) under the MOT. The roles and responsibilities of these agencies are clearly defined.

The organizational structure of RMMCs is largely uniform across the companies, with personnel allocated to teams, sub-teams, and sections for each railway segment.¹⁸ The number of employees at the seven RMMCs visited varies depending on the distance each company is responsible for, ranging from approximately 170 to 590 people. Of these, the number of maintenance staff ranges from about 120 to 240. All RMMCs have allocated the necessary number of personnel for the companies' tasks and have responded that they are adequately staffed for operation and maintenance.

Thus, the system and structure for operation and maintenance are well-established.

3.4.3 Technical Aspect

Based on interviews with RMMCs, their technical level in formulating track maintenance plans, implementing maintenance systems, and using maintenance equipment is sufficient for the maintenance of the target bridges. Staff with the necessary qualifications and skills have been employed and undergo regular skill checks and training. Training includes on-the-job training as well as dispatch to VNR's training institution, the College of Railway Occupational Training, and invitations to instructors.

Some challenges have been observed in the maintenance of elements that utilize Japanese technology and products. For the maintenance of tracks and bridges, including those sections, the railway operating procedures set by the VNRA (MOT Decision 2320/QD-BGTVT, 2015), the basic technical standards 05:2022/VNRA, and the maintenance manuals created for this project are being referred to. However, the technical standards and maintenance manuals have not been formalized into the Vietnamese government's standard operating procedures, making them inexecutable during maintenance work. Additionally, multiple RMMCs commented that they were not informed about the procedures for the 10-year inspection and repainting of the arches. The integration of these essential technical documents into standard operating procedures is being addressed by the VNRA and VNR at the time of the ex-post evaluation.

The training planned at the time of the appraisals to strengthen the equipment maintenance management system was carried out as part of the project's training related to the maintenance of procured equipment. It was noted that the maintenance equipment provided by this project is simple; therefore, advanced skills are not required for its operation.

¹⁸ At Nghia Binh RMMC, which is responsible for the project bridges in Quang Ngai Province and Binh Dinh Province, a new system has been implemented. In this system, maintenance personnel are divided into safety staff and maintenance staff, who are then assigned to sub-teams and sections.

Thus, while there are some minor issues with the technical aspect of operation and maintenance, there is potential for resolution.

3.4.4 Financial Aspect

The operation and maintenance costs for the North-South Railway Line are allocated as anticipated at the time of the appraisals. The budget is distributed from the MOT to VNR, and then reallocated to RMMCs. Each RMMC submits a budget request to VNR for funding for the maintenance and repair of railway infrastructure. They receive maintenance budget allocations from the general revenue and a certain percentage of VNR's railway fare income.

Budget data was provided by three of the seven RMMCs visited. The annual budget received by RMMCs through VNR ranges from approximately 107 billion Vietnamese dong (VND) to 166 billion VND, with an average of around 128 billion VND. The maintenance budget per kilometer was 792 million VND.¹⁹ All seven RMMCs responded that the maintenance budget allocated to them covers only 50-65% of the required amount. However, they emphasized that the cost of materials needed to ensure safety is prioritized and secured. Additionally, if there are operational issues due to budget constraints, they report to VNR, which then reviews the situation and allocates emergency funding if necessary. Therefore, although the budget allocation is not sufficient, it can be said that the safe operation of the North-South Railway Line is not compromised.

Similar to the technical aspect mentioned earlier, there are issues with the maintenance budget for elements that utilize Japanese technology and products. Specifically, the maintenance budget is calculated based on the cost norms approved by the government, which, as of the time of the ex-post evaluation, follow the per-kilometer unit price stipulated in the *Cost Norms for the Maintenance Costs of National Railway Infrastructure* (MOT Decision 2291/QD-BGTVT) from 2010. However, according to both the VNRA and the visited RMMCs, there are no established costs for maintaining long rails, directly fastened tracks, paint, and resin-injected adjusting pads for rails introduced in this project, making it impossible to request a budget for these items. As of the time of the ex-post evaluation, safe operation has been maintained through the procurement of alternative products within the scope allowed by the existing cost norms. However, a revision of these cost norms will be necessary before more extensive maintenance becomes required in the future. Similar to the technical aspect, the VNRA and VNR are addressing these challenges.

Thus, while there are some minor issues with the financial aspect of operation and maintenance, there is potential for resolution.

¹⁹ In terms of the exchange rate as of December 2022 (1 VND = 0.005614 yen), the annual budget ranges from approximately 607 million yen to 931.9 million yen, with an average of around 718.6 million yen. The maintenance budget per kilometer stands at about 4.4 million JPY.

3.4.5 Environmental and Social Aspect

The operation of the 44 bridges has not resulted in any negative environmental or social impacts, and given the nature of this project, these are not points of particular concern. As for the issue of littering around the Ninh Binh Bridge and station area (as detailed in “3.3.2.2 Other Positive and Negative Impacts”), VNR has given cleaning instructions to on-site personnel, and Ninh Binh City has also taken certain measures, such as setting up a new waste collection points in the vicinity and encouraging private waste collectors to bring in garbage. There is no current trend of worsening conditions.

3.4.6 Preventative Measures to Risks

No specific risks are found.

3.4.7 Status of Operation and Maintenance

All target bridges and ancillary facilities undergo regular inspections and maintenance in accordance with Vietnamese standard operating procedures. Based on responses from VNR and RMMCs, as well as visual inspections at some sites, most facilities are in good condition. However, some issues were observed as listed below. In each case, measures such as part replacement and the use of alternative items have been taken, ensuring that safe operations are maintained.

- Deterioration of resin-infused rail pads. In most of the bridges built under this project, which employed directly fastened tracks, the resin in adjusting pads placed under rails has deteriorated, making it difficult to maintain the height of the rails. Although the manufacturer recommended replacement after 10 years, deterioration began around two years after completion. Rubber pads and steel plates are being used as alternative items. Re-injecting the resin is challenging due to the lack of necessary equipment and the fact that the MOT does not approve budget requests for this purpose, as it is not listed in the cost norms.
- Difficulty in procuring rail joint components. The replacement parts for the compromise rails used at the connection points between the Japanese-made rails employed in this project and the rails from other countries used in other sections (which have different standards) are custom-made for each location. However, manufacturing these parts domestically is challenging, causing some concerns for future replacements.
- Rail wear. There are locations where rail replacement is necessary due to significant wear occurring much earlier than the expected life span. According to the consultants, the causes of wear vary and require individual measurements and investigations. Importing rails from Japan is also challenging for individual RMMCs due to the small lot sizes required, so rails from other countries are being used as replacements.

- Deterioration of the roofs at Ninh Binh Station. The plastic roofs have deteriorated due to the climate (high heat and humidity, storms, etc.) and have also been damaged by hail. As a result, they are being gradually replaced with more durable metal roofs (replacements are being made little by little due to budget constraints). The original design incorporated natural lighting, but the switch to metal roofs has necessitated the installation of new lighting.

In addition, there were issues such as missing contact information for suppliers and lost maintenance manuals in some RMMCs, but these can be immediately addressed by the PMU-Rail and VNR. Overall, the condition of the maintenance equipment is generally good.

Thus, while there are some challenges in the status of operation and maintenance, the overall condition is good.

Slight issues have been observed in the technical, financial, and environmental and social aspects; however, there are good prospects for improvement/resolution. Therefore, the sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed to ensure the safety of rail service, shorten passenger and freight transport time, and boost transportation volume by replacing 44 severely age-worn bridges on the rail line between Hanoi and Ho Chi Minh City (the North-South Railway Line, total length: 1,700 km). The project plan aligns with Viet Nam's development policy and needs, as well as Japan's aid policy, making its relevance and coherence high. As a result of the project implementation, speed restrictions on the bridges were lifted, allowing trains to run safely at normal speeds. Additionally, improvements to level crossings and grade separations have led to a decrease in accidents at railway-road intersections. Although the volume of railway transportation fell short of expectations due to the rapid development of air and road transport, the project objective was largely achieved, as the key outcome of ensuring safety was fully met. The anticipated impact of contributing to sustainable economic growth in the regions along the line could not be confirmed. However, the acquisition and utilization of Japanese technology and the improvement of convenience for residents through the construction of side roads and the utilization of existing bridges were confirmed. Therefore, the effectiveness and impacts are high. Efficiency is low because the project cost exceeded the plan and the project period significantly exceeded the plan. Regarding the operation and maintenance of the project, there are some technical and financial issues due to the lack of formalization of standard operating procedures in Viet Nam for the maintenance of parts using Japanese technology and products. However, there are prospects for addressing these issues, and other aspects are mostly good, making the sustainability high.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

1) The MOT is recommended to advance the approval process for the technical standards created by the VNRA/VNR and the maintenance manuals developed for this project, and to incorporate said manuals into the official maintenance guidelines. By doing so, it is desirable to secure the maintenance budget for the Japanese technology and products introduced in this project, ensuring that maintenance is carried out reliably.

2) VNR is recommended to reexamine the procurement methods for maintenance materials and parts for the bridges constructed under this project. The aim is to choose methods that are highly feasible, addressing the collective needs of multiple RMMCs, and appropriate to the current situation.

3) It is recommended that the PMU-Rail and VNR provide RMMCs with contact information for Japanese suppliers.

4.2.2 Recommendations to JICA

JICA could consider providing technical assistance for the maintenance capabilities of the 44 bridges under this project and the 19 bridges from the preceding project that utilize Japanese technology and products, if requested by the Vietnamese side. This could include technical cooperation specifically for repainting and inspection of the superstructure, and may encompass on-the-job training and equipment provision as needed.

4.3 Lessons Learned

1) Design with a focus on medium- to long-term maintenance when utilizing Japanese technology and products

The resin in the adjusting pads for the tracks and the plastic roofing material for the station building have deteriorated and broken just a few years after completion. Some rails have also worn out faster than their expected life span and require replacement. The project's sustainability could have been further enhanced if the design had considered the potential for accelerated deterioration due to Viet Nam's climate and usage conditions, as well as the medium- to long-term availability of replacement parts when selecting materials.

2) Ensured provision of supplier information to operation and maintenance organizations

In many of the RMMCs responsible for the maintenance of the project, the provision of information about Japanese product suppliers has not been ensured, and such information has not been fully retained even by the executing agency, the PMU-Rail. Especially when the executing

agency and the operation and maintenance organization are different, it is desirable for the executing agency to ensure that supplier information reliably reaches the end-level operation and maintenance organizations. Additionally, the executing agency itself should store the information so that it can respond to future inquiries.

3) Appropriate setting of operation and effect indicators for dispersed railway bridge replacements

The operation and effect indicators set for this project (transport volume and travel time for the entire North-South Railway Line) were not highly direct measures of the immediate effects of the project to improve 44 bridges and ancillary facilities out of approximately 1,500 bridges along the entire line. These indicators are also subject to various external factors. More direct measurement of the effects would be possible by adding indicators such as speed limits and passing time in the same speed sections that include the target bridges, as was done as supplementary indicators in this evaluation. These indicators can also serve to measure whether safety was ensured, as they demonstrate the ability to operate trains at higher speeds while maintaining safety. Furthermore, if the objective is to increase the overall transport volume and reduce travel time on the entire line, it would be desirable to set indicators and target values after considering and clarifying what external conditions exist outside of this project, such as the state and outlook of other modes of transportation and train operation policies.

The anticipated impact of this project (contribution to the sustainable economic growth of the areas along the railway line) has not been visibly manifested. While the safety of the North-South Railway Line operation has been assuredly improved through this project, multiple stakeholders have pointed out that the connectivity between the railway and roads or ports has not been adequately established. As the sole example, comments were heard that, while no data was obtained, the convenience for passengers and freight has increased at Ninh Binh Station, where a new station building, loading area, and warehouse were constructed. If the aim of the railway bridge improvement project is to contribute to the economic growth of the areas along the line, it is desirable to consider and specify what external conditions exist (such as the development of connectivity with other modes of transportation).

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

The evaluation confirms that JICA played roles expected for a project-related agency and contributed to the results. From the project documents, it appears that all necessary procedures were carried out. The implementation of an additional loan appears to have enabled the completion of the project, and no particular issues were observed in the series of actions taken for that purpose.

The evaluation also deems that the project had an adequate system of supervision, which took into consideration the changes in the project environment. There was a need to adapt to the fragmentation of procurement packages and to change the executing agency from VNR to the MOT due to the shift of VNR out from under the MOT. It appears that the procedures for these changes were carried out appropriately.

It appears that the maintenance of communication and the building of a cooperative relationship with the executing agency were carried out at a satisfactory level. Records of necessary communications are documented in the project files. The responsiveness of the JICA overseas office staff to this ex-post evaluation further indicates that close communication was maintained with the MOT and VNR.

5.2 Additionality

The added value of this project lies in the introduction of Japanese railway infrastructure and bridge replacement technologies, as well as providing support for railway infrastructure at a time when Viet Nam particularly needed it. Regarding the latter, comments from the executing agency indicated that while support from other donors primarily focused on the development of railway ancillary facilities, receiving support from Japan for the much-needed bridge replacements was crucial. Although the share of railway transportation in Viet Nam is very small compared to other modes of transport, the importance of maintaining safe operations is high, making this a meaningful project.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs 1) Civil Works and Equipment Procurement	Replacement of bridges: 44 bridges Construction of tracks: Approximately 44 km Construction of ancillary facilities: 25 level crossings, 9 level crossing automatic warning systems, 13 level crossing barriers, 41 underpasses, 1 road bridge, 1 station and tracks, procurement of maintenance equipment	Replacement of bridges: As planned Construction of tracks: Approximately 45 km Construction of ancillary facilities: 21 level crossings, 10 level crossing automatic warning systems, 9 level crossing barriers, 41 underpasses, 1 road bridge, 1 station and tracks, procurement of maintenance equipment
2) Consulting Services	Consulting Service 1: Total 1,516 person-months for detailed design for 44 bridges, P/Q and bidding assistance and construction supervision for 17 bridges, support for the resettlement plan, and support for environmental measures Consulting Service 2: Total 942 person-months for P/Q and bidding assistance and construction supervision for 27 bridges and P/Q and bidding assistance for the procurement of maintenance equipment	Consulting Service 1: Total 1,698.9 person-months for the same scope of work as planned Consulting Service 2: Total 1,255.23 person-months for the same scope of work as planned
2. Project Period	March 2004-December 2012 (106 months)	March 2004-November 2017 (165 months)
3. Project Cost	(Plan at Phase 2 appraisal)	
Amount Paid in Foreign Currency	11,945 million yen	13,970 million yen
Amount Paid in Local Currency	11,923 million yen (1,637,775 million VND)	20,636 million yen (3,752,000 million VND)
Total	23,868 million yen	34,606 million yen
ODA Loan portion	19,959 million yen	32,141 million yen
Exchange Rate	1VND = 0.00728 yen (As of November 2006)	1VND = 0.0055 yen (Average for 2005-2016)
4. Final Disbursement	July 2020	