

**Ex-Post Project Evaluation 2019  
Package IV-3 (Viet Nam, India)**

**February 2021**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**ALMEC Corporation**

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Socialist Republic of Viet Nam

FY2019 Ex-Post Evaluation of Japanese ODA Loan Project

“Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I) (II) (III)”

“Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project  
(I) (II)”

External Evaluator: Osamu Abe, ALMEC Corporation

## **0. Summary**

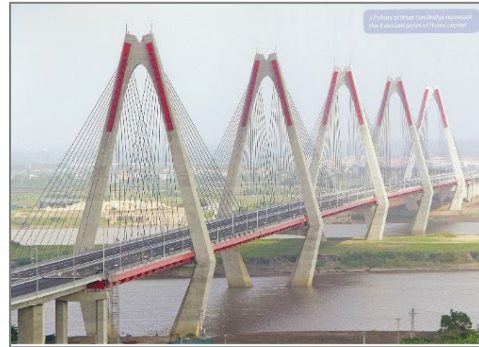
The implementation of the Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I) (II) (III) (hereinafter, referred to as “Nhat Tan Bridge”) and Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I) (II) (hereinafter, referred to as “Connecting Road”) aims to address the increasing traffic demand, to streamline logistics, to strengthen transportation capacity, and to alleviate traffic congestion. The construction of the Nhat Tan Bridge is under the Nhat Tan Bridge Project, which forms one end of the Ring Road 2, while the construction of the road connecting Nhat Tan Bridge to Noi Bai International Airport is under the Connecting Road Project. Both projects are in line with Vietnam's development policy and development needs, as well as Japan's ODA policy to support the development of the international airport and the urban ring road network. The relevance of the projects is high especially since the international airport is the gateway to economic growth infrastructure (tourism, logistics, etc.). Both the project costs and the project periods exceeded the original plans, so the efficiency is fair. Analyzing the quantitative impacts of both projects, the projects mostly achieved the target. In the interview surveys with beneficiaries, they mentioned the travel time from Hanoi city center to Noi Bai International Airport via the Connecting Road has shortened. It can be said that both projects have contributed to alleviating traffic congestion and improving the efficiency of logistics in Hanoi City. The effectiveness and impacts are also high after confirming the proper implementation of the response and monitoring to the natural environment, resettlements, and the land acquisition based on the relevant laws and regulations of Vietnam. Hanoi City carries out the operation and management (hereinafter, referred to as “O&M”) of both projects. When the Nhat Tan Bridge was turned over to the Vietnamese side, Hanoi City had no maintenance standards or supervision and management systems, so the Hanoi Department of Transport (hereinafter, referred to as “DOT”) provided training to improve knowledge and skills to strengthen their capacity. Hanoi City secures a yearly O&M budget for both projects and has a budgeting system for medium-scale repairs, and no major problems were observed in the institutional/organizational, technical, financial aspects, and status of the O&M system; therefore, the sustainability of the project effects is high.

In light of the above, both projects are evaluated to be highly satisfactory.

## 1. Project Description



Project Location



Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) and Noi Bai International Airport–Nhat Tan Bridge Connecting Road Construction Projects

### 1.1 Background

The road sector plays a central role in transportation, accounting for 67.6% of freight transport in 2004. The volume of freight and passengers by the transportation sector continues to increase sharply on the main roads that connect the urban centers of the metropolis and regional cities. Roads in Hanoi had been experiencing problems, such as the lack of a road network and insufficient road width. As the economy of the city further developed after introducing the Doi Moi policy. In 2001, the number of registered motorcycles and automobiles increased 1.5 times more in five years since 1996, creating more severe traffic congestion.

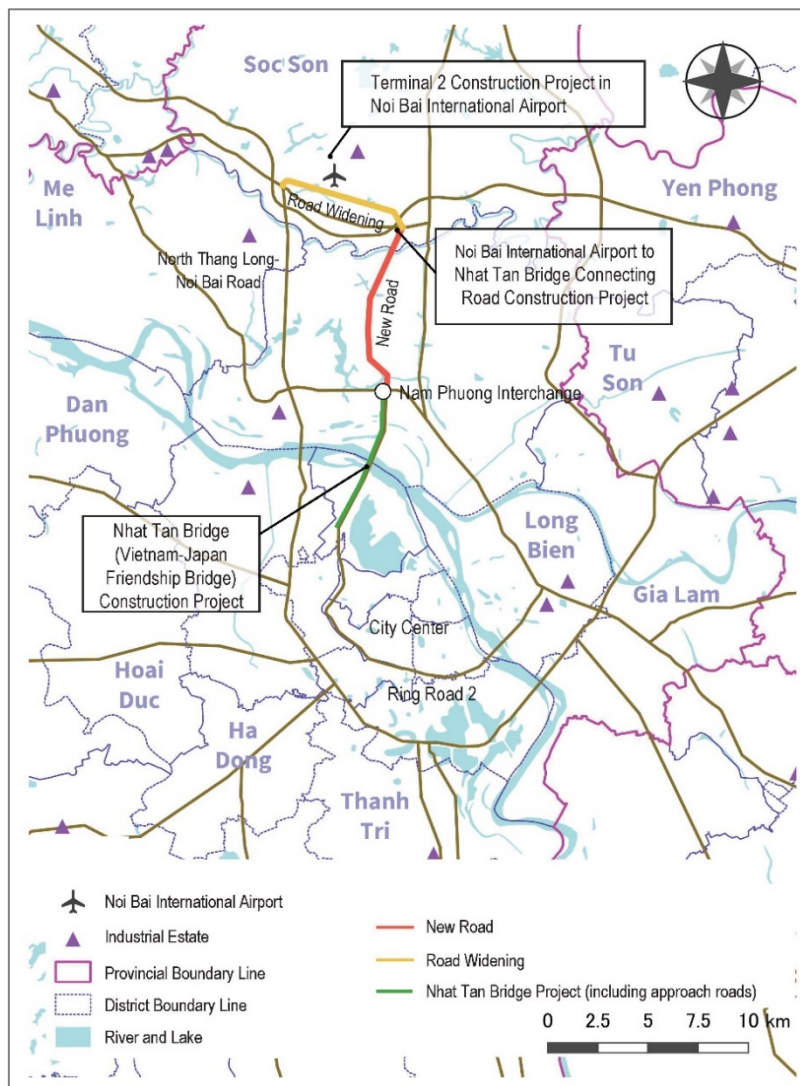
The Red River, which divides Hanoi into two, had only three bridges: Thang Long Bridge, Long Bien Bridge, and Trung Duong Bridge, starting from the upper stream. With few bridges, even if cargo vehicles needed to bypass the center of Hanoi, many were forced to pass through the center of the city, causing more traffic congestion. In terms of the Connecting Road, the traffic capacity of the existing North Thang Long–Noi Bai road was already saturated. It made access between the city center in the south and the Noi Bai International Airport, industrial parks, and newly developed areas in the north inefficient, further adding to traffic congestion.

Alleviating traffic congestion in the city and surrounding areas and improving the efficiency of logistics by connecting Noi Bai International Airport and the northern part of Hanoi via both projects from Ring Road 2 became urgent issues to address.

## 1.2 Project Outline

Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I)(II)(III): The objective of this project is to respond to the increased transport demand, streamline logistics and alleviate traffic congestion by constructing a bridge over the Red River flowing through Hanoi City and approach roads, thereby contributing to promotion of economic development of Hanoi City and the northern regions of Vietnam and the strengthening of international competitiveness.

Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I)(II): The objective of this project is to develop a new high-standard road that connects Noi Bai International Airport and Nhat Tan Bridge (Vietnam-Japan Friendship Bridge), to enhance transportation capacity from central Hanoi to the airport, thereby contributing to promotion of economic growth and enhancement of international competitiveness of the country.



**Figure 1 Location Map of the Projects**

<p>Loan Approved Amount/ Disbursed Amount</p>	<p>Nhat Tan Bridge Construction Project 13,698 million yen / 13,487 million yen (Phase I) 24,828 million yen / 24,423 million yen (Phase II) 15,637 million yen / 12,010 million yen (Phase III) Noi Bai International Airport-Nhat Tan Bridge Connecting Road Project 6,546 million yen / 6,515 million yen (Phase I) 11,537 million yen / 10,405 million yen (Phase II)</p>																																													
<p>Exchange of Notes Date/ Loan Agreement Signing Date</p>	<p>Nhat Tan Bridge Construction Project March 2006 / March 2006 (Phase I) January 2011 / January 2011 (Phase II) March 2013 / March 2013 (Phase III) Noi Bai International Airport-Nhat Tan Bridge Connecting Road Project March 2010 / March 2010 (Phase I) March 2013 / March 2013 (Phase II)</p>																																													
<p>Terms and Conditions</p>	<p>Nhat Tan Bridge Construction Project</p> <table border="0"> <tr> <td>Interest Rate</td> <td>0.40%</td> <td>(Phase I)</td> </tr> <tr> <td></td> <td>0.20%</td> <td>(Phase II)</td> </tr> <tr> <td></td> <td>0.01%</td> <td>(Phase II Consultant)</td> </tr> <tr> <td></td> <td>0.20%</td> <td>(Phase III)</td> </tr> <tr> <td></td> <td>0.01%</td> <td>(Phase III Consultant)</td> </tr> <tr> <td>Repayment Period</td> <td>40 years</td> <td></td> </tr> <tr> <td>(Grace Period)</td> <td>10 years</td> <td></td> </tr> <tr> <td>Conditions for Procurement</td> <td colspan="2">Tied (Special Terms for Economic Partnership (STEP))</td> </tr> </table> <p>Noi Bai International Airport-Nhat Tan Bridge Connecting Road Project</p> <table border="0"> <tr> <td>Interest Rate</td> <td>1.20%</td> <td>(Phase I)</td> </tr> <tr> <td></td> <td>0.01%</td> <td>(Phase I Consultant)</td> </tr> <tr> <td></td> <td>1.40%</td> <td>(Phase II)</td> </tr> <tr> <td></td> <td>0.01%</td> <td>(Phase II Consultant)</td> </tr> <tr> <td>Repayment Period</td> <td>30 years</td> <td></td> </tr> <tr> <td>(Grace Period)</td> <td>10 years</td> <td></td> </tr> <tr> <td>Conditions for Procurement</td> <td colspan="2">General Untied</td> </tr> </table>	Interest Rate	0.40%	(Phase I)		0.20%	(Phase II)		0.01%	(Phase II Consultant)		0.20%	(Phase III)		0.01%	(Phase III Consultant)	Repayment Period	40 years		(Grace Period)	10 years		Conditions for Procurement	Tied (Special Terms for Economic Partnership (STEP))		Interest Rate	1.20%	(Phase I)		0.01%	(Phase I Consultant)		1.40%	(Phase II)		0.01%	(Phase II Consultant)	Repayment Period	30 years		(Grace Period)	10 years		Conditions for Procurement	General Untied	
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Borrower / Executing Agency	The Government of the Socialist Republic of Vietnam / Ministry of Transport (for both projects)
Project Completion	Nhat Tan Bridge Construction Project December 2014 Noi Bai International Airport–Nhat Tan Bridge Connecting Road Project December 2014
Target Area	<ul style="list-style-type: none"> <li>• Nhat Tan Bridge Construction Project Tay Ho District, and Dong Anh District in Hanoi City</li> <li>• Noi Bai International Airport-Nhat Tan Bridge Connecting Road Project Soc Son District and Dong Anh District in Hanoi City</li> </ul>
Main Contractor(s) (Over 1 billion yen)	<ul style="list-style-type: none"> <li>• Nhat Tan Bridge Construction Project Package 1: IHI Infrastructure Systems (Japan) / Sumitomo Mitsui Construction (Japan) (JV) Package 2: Sumitomo Mitsui Construction (Japan) / Vietnam Construction &amp; Import-Export Corporation (Vietnam) (JV) Package 3: Tokyu Construction (Japan)</li> <li>• Noi Bai International Airport–Nhat Tan Bridge Connecting Road Project Package 1: Civil Engineering Construction Corporation No. 4 (Vietnam) Package 2: KUKDONG Engineering &amp; Construction (Republic of Korea) Package 3: Hanshin Engineering &amp; Construction (Republic of Korea) Package 4: Guangxi Road &amp; Bridge Construction (China) Package 5: Keangnam Enterprises (Republic of Korea) / Civil Engineering Construction Corporation No. 4 (Vietnam) (JV)</li> </ul>
Main Consultant(s) (Over 100 million yen)	<ul style="list-style-type: none"> <li>• Nhat Tan Bridge Construction Project Chodai (Japan) / Nippon Engineering Consultants (Japan) / Transport Engineering Design Incorporation (Vietnam) (JV)</li> <li>• Noi Bai International Airport-Nhat Tan Bridge</li> </ul>

	<p>Connecting Road Project Stanley Consultants (USA) / CTI Engineering (Japan) (JV)</p>
<p>Related Studies (Feasibility Studies, etc.)</p>	<ul style="list-style-type: none"> <li>• Nhat Tan Bridge Construction Project Nhat Tan Bridge Project (Pre-Feasibility Study) (2003) Nhat Tan Bridge Project Feasibility Study (August 2005)</li> <li>• Noi Bai International Airport–Nhat Tan Bridge Connecting Road Project Feasibility Study (7.85 km: Km0+00-Km7+85 section) (February 2009) Feasibility Study (1.115 km: Km0+85-Km12+10 section) (October 2009)</li> </ul>
<p>Related Projects</p>	<ul style="list-style-type: none"> <li>• Terminal 2 Construction Project in Noi Bai international Airport (JICA)</li> <li>• Hanoi Urban Transport Development Project (Construction of Ring Road 2) (World Bank)</li> </ul>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Osamu Abe, ALMEC Corporation.

### 2.2 Duration of Evaluation Study

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

Duration of the Study: December 2019 – November 2020

### 2.3 Constraints during the Evaluation Study

Because of the impacts of the coronavirus disease 2019 (hereinafter, referred to as “COVID-19”), the external evaluator was unable to conduct the field survey in Hanoi, but field survey assistants managed to collect information mainly through written questionnaires. As a countermeasure to the spread of the COVID-19, the Government of Vietnam implemented a lockdown in the capital city for some time, resulting in a drastic decrease in traffic volume. The traffic survey was conducted in November 2020, awaiting a certain level of normalization of traffic volume, but the extent of the impact of COVID-19 was unavoidable. Since the rehabilitation work of Thang Long Bridge, one of the survey points of the traffic survey, started in September 2020, the traffic volume survey could not be carried out completely because the traffic was restricted to motorcycles. Therefore, traffic analysis used a traffic model. It was



calibrated to calculate the traffic volume on the Thang Long Bridge and the North Thang Long–Noi Bai Road leading to the Thang Bridge. As for the resettlement and land acquisition, the field survey assistants interviewed the Ministry of Transport (hereinafter, referred to as “MOT”), Hanoi City, and local government agencies in the target areas, but could not manage to obtain the detailed information.

### 3. Results of the Evaluation (Overall Rating: A<sup>1</sup>)

#### 3.1 Relevance (Rating: ③<sup>2</sup>)

##### 3.1.1 Consistency with the Development Plan of Vietnam

At the time of ex-ante evaluation, *the Master Plan for the Development of Road Transport Sector up to 2010 and Directions to 2020* (2002–2010), enacted in 2002, and *the Eighth Five-Year Plan for Socio-Economic Development* (2006–2010), formulated in 2006, focused on the road rehabilitation and new construction and cited development directions, such as the development of ring roads in major cities. *The Strategy for Transport Development to 2020 and Vision to 2030* (2009–2020), enacted in 2009, pointed out the importance of developing key roads, especially in urban areas such as in the cities of Hanoi and Ho Chi Minh. In *the Hanoi Master Plan for Transport Development until 2020* (2011–2020), both projects were determined as high priority in the development of the northern region of Hanoi. Additionally, *the Ninth Five-Year Plan for Socio-Economic Development* (2011–2015), enacted in 2011, identified the further construction of the entire infrastructure system, including the improvement of transportation infrastructure, as a top priority issue to achieve the development goal of sustainable development under high growth.

The ex-post evaluation confirmed the importance of the development of key roads in urban areas in the abovementioned *Strategy for Transport Development*, and the high priority of both projects in the development of the northern region of Hanoi in the abovementioned *Hanoi Master Plan for Transport Development*. In addition, *the General Construction Plan of the Hanoi City up to 2030 and Vision to 2050*, enacted in July 2011, emphasizes the importance of road infrastructure development in the urban transportation network connecting Noi Bai International Airport, the Trans-Asia Economic Corridor, the gateway to the northern region of the metropolitan area, and the sub-centers of the northern region. The project is consistent with the development policy. As mentioned above, the consistency between the projects and the development policy is high during both the ex-ante and ex-post evaluations.

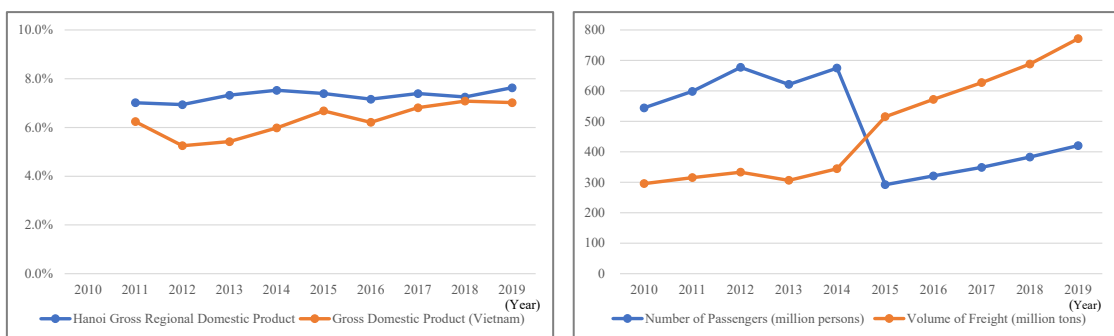
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<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ③: High, ②: Fair, ①: Low

### 3.1.2 Consistency with the Development Needs of Vietnam

During the ex-ante evaluation, the Nhat Tan Bridge project was part of Ring Road 2 of Hanoi, connecting central Hanoi City with the northern part of the city as well as with the extension of National Highway 5 and the Connecting Road in the northern part of the city, in order to ease traffic congestion and improve traffic efficiency in Hanoi City by directing traffic towards the city center to the Nhat Tan Bridge. Also, from the perspective of developing the northern area of Hanoi City by connecting the existing central city on the south side of the Red River with the newly developed area, including Noi Bai International Airport and industrial parks on the north side, the early construction of the Nhat Tan Bridge to connect the two areas in the shortest possible time was highly needed for development in terms of transportation networks.



Source: Ha Noi Statistical Yearbook 2010–2020. Statistics Office of Ha Noi City. Statistical Publishing House.

Note: Figure 3. The significant drop in passengers and freight volume in Hanoi in 2014–2015 is attributed to a statistical methodology change.

**Figure 2 GRDP and GDP Growth Rate Figure 3 Number of Passengers and Volume of Freight**

Construction of the Connecting Road was significantly needed to reduce the traffic load on the existing North Thang Long–Noi Bai road from the Hanoi city center to the Noi Bai International Airport, which is already saturated with traffic capacity.

Since the North Thang Long–Noi Bai Road was the only arterial road that connects the center of Hanoi City and Noi Bai International Airport, there was a need to construct a new road that would connect the Noi Bai International Airport and Nhat Tan Bridge with a perspective of securing an alternative route in the event of a disaster. The economic growth rate of Hanoi City was high at the time of the ex-post evaluation, averaging at more than 7% per year compared to the national gross domestic product. Its passenger and freight traffic volume of road transport was trending upwards. Therefore, the importance of both projects was maintained during the ex-post evaluation.

### 3.1.3 Consistency with Japan’s ODA Policy

According to the *Overseas Economic Cooperation Operations (FY2005)*, support for international and domestic trunk transport traffic (northern and southern priority areas for economic growth and north–south trunk transport) and urban transport (Hanoi City and Ho Chi

Minh) was emphasized. The Nhat Tan Bridge project is part of the Ring Road 2 that connects Hanoi City with its northern area, a priority supporting area for urban transport, as indicated in the policy. As for the Connecting Road, the assistance policy in the *Country Assistance Plan for Vietnam*, formulated in July 2009, lists "urban development, transportation, and communication network development" as the priority development issues. The ODA policy states that support for "urban ring roads, intra-urban and peripheral bypass roads, and other networks" and "inter-urban arterial transportation networks" would be prioritized to cope with the increasing demand for transportation. Constructing a new high-standard road connecting the center of Hanoi with Noi Bai International Airport is in line with this plan. The applicability of both projects is highly relevant to the Japan's ODA policy.

Both projects have been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

The outputs were compared with the plan of the final phase and the actual results of each project, while the project costs and project periods were compared with the initial plans and the final phase plans, and the actual results since both are financed with loans for several loan periods. Between the plans of the ex-ante evaluation and the actual results, there were no changes in the major outputs. Some changes included the alignment of the northern approach road because of the implementation of the Connecting Road construction project after the Nhat Tan Bridge construction project started. Another is the removal of the toll station in the Connecting Road due to the abandonment of toll collection. The reasons for both changes were deemed reasonable.

Plan (Phase III)	Outputs
Nhat Tan Bridge Construction Project	
(a) Bridge Construction Total length: 3,080 m (main bridge 1,500 m, north approach bridge 1,240 m, north embarkment ridge 340 m) Structure: Cable-stayed bridge Traffic lane: Three lanes on each side and one mixed lane Roadway: Roadway width (one lane) 3.75 m (b) Approach Roads (1) South Approach Road	(a) Bridge Construction In accordance with plans (b) Approach Roads (1) South Approach Road In accordance with plans (2) North Approach Road In accordance with plans

Plan (Phase III)	Outputs
<p>Total length: 1,251 m (South approach road 576 m, Phu Thuong Interchange 400 m, south approach bridge 275 m)</p> <p>Traffic lane: Three lanes on each side and one mixed lane</p> <p>Roadway: Roadway width (one lane) 3.75 m</p> <p>(2) North Approach Road</p> <p>Total length: 4,800 m<sup>3</sup></p> <p>Traffic lane: Three lanes on each side and one mixed lane</p> <p>Roadway: Roadway width (one lane) 3.75 m</p> <p>This approach road includes the construction of three interchanges<sup>4</sup></p> <p>(c) Consulting Services</p> <p>F/S review, detailed design, bidding support, construction management, monitoring during the defect liability period, HIV/AIDS prevention program, and environmental and social considerations monitoring program</p>	<p>(c) Consulting Service</p> <p>In accordance with plans</p>
<p>Noi Bai International Airport–Nhat Tan Bridge Connecting Road Project<sup>5</sup></p>	
<p>(a) Road Construction</p> <p>(1) New high standard road</p> <p>Total length: 7.85 km (from Nam Hong Interchange to the beginning of Noi Bai Airport road)</p> <p>Traffic lane: 6 lanes (3 lanes on each side)</p> <p>Width: 31.0 m</p> <p>(2) Widening of existing road</p>	<p>(a) Road Construction</p> <p>(1) New high standard road</p> <p>In accordance with plans</p> <p>(2) Widening of existing road</p>

<sup>3</sup> The plan was to connect the end of the road to National Highway 3 until the detailed design (October 2007). But in February 2009, the decision was to connect it to the Noi Bai International Airport–Nhat Tan Bridge Connecting Road Project. The alignment changed. Data provided by JICA.

<sup>4</sup> “In April 2007, a toll booth was designed to construct in the feasibility study. However, it was later decided that it would be built under the Noi Bai International Airport–Nhat Tan Bridge Connecting Road project (MOT No. 059/BGTVT-KHDT/2007). In July 2012, it was decided to abandon the construction of the toll booth (Prime Minister’s Office No. 4345/VPCP-KTN/2012).” Data provided by JICA.

<sup>5</sup> Construction of a new high-standard road (7.85 km) and widening of the current road (4.25 km) from Nam Hong Interchange to the beginning of North Thang Long–Noi Bai Road via Noi Bai International Airport.

Plan (Phase III)	Outputs
Length: 4.25 km (Noi Bai Airport road) Traffic lane: 6 lanes (3 lanes on each side) Width: 52.5 m (including 25.0 m median strip) (3) New side roads running parallel to the main road (4) Other structures: 6 bridges and a toll booth	In accordance with plans  (3) New side roads running parallel to the main road  In accordance with plans (4) Other structures: 6 bridges and a toll booth
(b) Consulting Services Construction management, implementation of safety measures related to construction, implementation of HIV/AIDS measures, monitoring of environmental and social considerations	The construction of the toll booth was abandoned  (b) Consulting Services In accordance with plans

### 3.2.2 Project Inputs

(For details, see “Comparison of the Original and Actual Scope of the Projects” on the last part of the report).

#### 3.2.2.1 Project Cost

##### 1) Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project

The project cost was 51,668 million yen in the initial plan (of which the yen loan portion was 39,027 million yen) and 75,449 million yen in the final phase plan (of which the yen loan portion was 54,163 million yen), while the actual cost was 62,640 million yen (of which the yen loan portion was 49,908 million yen) or 121% of the planned cost of the initial plan, or 83% of that of the final phase. The change in the bridge substructure (from embedded piles to steel pipe sheet pile foundations), the south approach bridge, the embankment elevated road, and the design change in the interchange and the Tiep Bridge contributed to the increase in the project cost. The project cost resulted in exceeding the initial plan; however, it was still within the final phase planned cost partly due to the influence of foreign currency exchange rates.

##### 2) Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project

The project cost was 32,267 million yen in the initial plan (of which the yen loan portion was 21,603 million yen) and 26,957 million yen in the final phase plan (of which they yen loan portion was 18,083 million yen), while the actual cost was 24,168 million yen (of which the yen loan portion was 16,588 million yen) or 75% of the planned cost of the initial plan, or 90% in the final phase. Due to the design changes, such as no toll booth to build, the project cost ended up within the plan.

In comparing the total project cost of both projects, the actual cost was 86,808 million yen against the initial plan of 83,935 million yen, or 103% of the plan, and the evaluation of the sub-rating for the project cost was ②.

#### 3.2.2.2 Project Period

##### 1) Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project

While the initial project period planned during the ex-ante evaluation was from March 2006 to December 2012 (82 months) and the project period planned in the final phase plan was from March 2006 to December 2014 (106 months), the actual project period was from March 2006 to December 2014 (106 months), or 129% of the initial plan and 100% of the final phase plan. Although the land acquisition, resettlement, bidding, and contracting by the government took longer than initially intended, the construction period was shortened and completed before the facility began its operations in January 2015.

##### 2) Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project

While the initial project period planned during the ex-ante evaluation was from March 2010 to October 2013 (46 months) and the project period planned in the final phase plan was from March 2010 to June 2015 (64 months), the actual project period was from March 2010 to December 2014 (58 months), or 126% of the initial plan and 91% of the final phase plan. Even with the longer required time for the acquisition and delivery of the land and the bidding for Contract Package 5, the construction period for the other contract packages was almost on schedule or completed ahead of schedule. The facility began service in January 2015, the same month as the Nhat Tan Bridge.

#### 3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

##### 1) Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project

At the time of the ex-ante evaluation, the calculation of the Economic Internal Rate of Return (hereinafter, referred to as “EIRR”) assumed the project life is 30 years, and the benefits are the reduction in travel time, travel costs, while the costs are the project construction costs (excluding taxes), and the operation and maintenance costs. The EIRR was at 17.91% during the phase I ex-ante evaluation and at 21.36% during phase III ex-ante evaluation. It was recalculated in this ex-post evaluation. As the ratio of automobile traffic was higher than that of the traffic demand forecast during the ex-ante evaluation, the benefit became higher, resulting in an EIRR of 23.49%. (The project has no toll revenue, so calculating the financial internal rate of return is not required).

## 2) Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project

Similar to the above, the calculation of the EIRR assumed a project life of 30 years. The result during the phase I and II ex-ante evaluation was 17.25%. When recalculated in this ex-post evaluation, the EIRR was 22.74% because the proportion of automobile traffic was higher at the ex-post evaluation than the traffic demand forecast, and the benefits became higher. The financial internal rate of return was also not calculated for this project because the government decided not to collect tolls.

Both the project cost and project period exceeded the plans. Therefore, the efficiency of the projects is fair.

### 3.3 Effectiveness and Impacts<sup>6</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)<sup>7</sup>

###### 1) Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project

Table 1 shows the baseline, target, and actual figures for operation and effect indicators. The basis of the actual annual average daily traffic volume is the traffic count survey conducted by Hanoi City in 2017, and the traffic survey results is from the traffic survey<sup>8</sup> conducted by the ex-post evaluation team in November 2020.

The results of the traffic count survey in 2017 shows that the annual average daily traffic volume has reached the target volume in 2016. The results of the 2020 traffic survey indicate that the annual average daily traffic volume is on an increasing trend. Connecting the center and northern part of Hanoi is found to address the traffic demand. The reduction in travel time and travel cost became significantly higher than that in the ex-ante evaluation due to the higher ratio of car traffic to total traffic. The traffic volume is also higher than in the traffic demand forecast during the ex-ante evaluation.

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<sup>6</sup> Sub-rating for effectiveness is to be put with consideration to the impacts.

<sup>7</sup> As for the operation and effect indicators, the final phase plans have higher targets than the initial plans, so the comparison were with the former.

<sup>8</sup> The method for the traffic analysis was by updating the traffic model created in 2013 to 2019 data. The impact of the COVID-19 was adjusted by referring to the Google Mobility Report. The primary reason for the high proportion of private vehicles was the increase in car ownership. Looking at the passenger share by vehicle type, the number of general buses decreased by 60% compared to 2013. It is thought that the impact of the COVID-19 decreased the number of general bus (shared ride) users and increased the use of private cars that, in turn, increased the traffic volume. Furthermore, the ratio of private cars to the total traffic volume was higher than the traffic demand forecast.

**Table 1 Operation and Effect Indicators (Nhat Tan Bridge Project)**

	Baseline	Target *1	Actual	
	(2010)	(2016)	(2017) *2	(2020)
		2 Years After Completion		Traffic Survey Results
Annual average daily traffic (PCU/day)*3	-	65,821	69,257	139,398
Time saving cost (billion VND/year)*4	-	582.163	2,293.41	4,232.95
Vehicle operation cost saving (billion VND/year)	-	1,209.27	3,492.50	6,273.34

\*1 Source: Document provided by JICA.

\*2 Source of annual average daily traffic: Results of traffic count survey in December 2017 by Hanoi DOT. The calculated shortened travel time and reduced travel costs are based on the traffic count survey results.

\*3 There is no baseline for the subject project because it is a newly built bridge.

\*4 Calculated based on the comparison with the time taken on the North Thang Long–Noi Bai Road and before the construction of the bridge.

## 2) Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project

The target values of the operational and effects indicators two years after the completion of the project (2017) were obtained by traffic analysis based on the results of the traffic survey.<sup>9</sup> The traffic survey results are based on the traffic survey conducted in November 2020. The annual average daily traffic volume is considered to have reached the target value in 2017 based on the results of the traffic survey in 2020. While the annual average daily traffic volume at Nhat Tan Bridge is 139,398 (refer to Table 1), the annual average daily traffic volume on the newly built road between Nam Hong IC and Noi Bai International Airport is 74,507 (refer to Table 2). It shows that half of the traffic passing through Nhat Tan Bridge uses the connecting road. From this situation, it can be concluded that the objective of enhancing the transportation capacity from the center of Hanoi to Noi Bai International Airport has been achieved to a certain extent. The travel time saving, and the reduction of vehicle operation costs were significantly greater than those in the ex-ante evaluation because the ratio of vehicles traffic to total traffic was higher than the traffic demand forecast at the time of ex-ante evaluation, as well as the traffic volume.

<sup>9</sup> There were no actual traffic survey data.



**Table 2 Operation and Effect Indicators (Connecting Road Project)**

	Baseline	Target	Actual
	(2011)	(2017)	(2020)
	Actual Results	2 Years After Completion *1	Traffic Survey Results
Annual average daily traffic (PCU/day)	58,985 Existing Road (North Thang Long- Noi Bai Road)	29,046 Existing Road (North Thang Long-Noi Bai Road at Noi Bai Section)	15,153 *2
	- *3	49,258 New Road (Nam Phuong IC- Noi Bai International Airport)	74,507
Travel time (minute) *4	60–90 Existing Road (North Thang Long- Noi Bai Road) (2008 actual figure)	30 New Road (This project section)	16–22
Time saving cost (billion VND/year) *1	-	78.9	1,816.2
Vehicle operation cost saving (billion VND/year) *1	-	370.3	2,595.2
Average speed (km/hour)	50 Existing Road (North Thang Long- Noi Bai Road) (2008 actual figure)	80 New Road (This project section)	50–70 *5

Source: Document provided by JICA, and Traffic Survey Results in 2020.

\*1 Ex-ante Evaluation: Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (II)

\*2 Traffic volume was low due to traffic restrictions for vehicles other than motorcycles for the repair of Thang Long Bridge, which affected the traffic volume on the existing road (North Thang Long–Noi Bai Road) leading to Thang Long Bridge.

\*3 There is no baseline because the subject project is a newly built road.

\*4 The baseline of the travel time is from Ho Chi Minh Mausoleum to Noi Bai International Airport via the existing road, while the target value and the results of the traffic survey show the travel time from Nhat Tan Bridge to Noi Bai International Airport via the connecting road.

\*5 The target travel speed is the legal maximum speed of the connecting road (later changed to 90 km/h), while the traffic survey results are the actual measured travel speed. In general, the actual driving speed will not be the maximum speed due to the influence of traffic volume, entering and exiting the expressway, etc.

### 3.3.1.2 Qualitative Effects (Other Effects)

The assumption was that the qualitative effects of both projects would improve the logistics efficiency by ensuring smooth road transportation, reduce traffic congestion, and promote economic development in Hanoi and the northern region of Vietnam. To verify the assumptions, taxi drivers, logistics companies, logistics industry association, tourism companies, and the chambers of commerce and industry were interviewed (23 responses in total). The "promotion of economic development in Hanoi and the northern region of Vietnam" was determined to be an impact, so it was decided to analyze it in the impact section below.

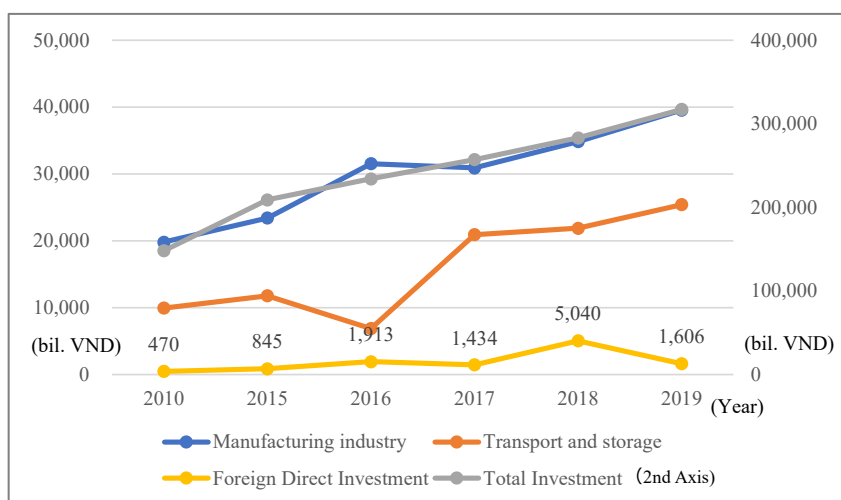
As a result of the survey, most respondents (19 out of the 23 interviewed) reported that the travel time from the city center to Noi Bai International Airport via the Connecting Road was lesser than that of the trip through Thang Long Bridge. Respondents replied it took one hour and a half to get from the city center to Noi Bai International Airport through Thang Long Bridge while some responded up to two hours at the longest. But through Nhat Tan Bridge–Connecting Road, the time reduced to 30-45 minutes. This indicates that the projects have ensured smooth road transportation and improved the efficiency of logistics. Some respondents (16 out of 23 interviewed) stated that the traffic congestion on the road to the airport through Thang Long Bridge has improved after the construction of both projects. The benefits mentioned other than time saved were comfortable driving environment (pavement surface, scenery), fuel cost savings, and more frequent trips between the city and the airport (according to the taxi drivers).

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

At the time of the ex-ante evaluation, the assumed impact of the two projects would be the promotion of economic development and the enhancement of international competitiveness in Hanoi and the northern region of Vietnam. While verifying a direct cause-and-effect relationship between the economic development and the enhancement of international competitiveness could be difficult because factors other than the two projects have an impact, the GRDP of Hanoi and the trend of the increase in domestic and foreign direct investment were verified to confirm the assumptions made at the time of the ex-ante evaluation.

Since 2015, the GRDP (see Figure 2) has remained largely flat but slightly higher than the national GDP. Domestic and foreign direct investments have shown an increasing trend. The transport and warehousing sector showed a drop in investment in 2016, but investment has continued to rise since. The volume of land cargo in Hanoi has shown a steady increase since 2014 and, according to a survey by the logistics industry, the volume of logistics to and from Noi Bai International Airport has increased yearly by 11.4% since 2015.



Source: Ha Noi Statistical Yearbook. (2010-2020). Statistics Office of Ha Noi City. Statistical Publishing House.

**Figure 4 GRDP, Domestic and Foreign Direct Investment in Hanoi**

Both projects not only connect Noi Bai International Airport to the logistics center but also to other provinces, which was pointed out in the interview surveys in the logistics industry, meaning a potential for growth in land freight transportation. As for the linkage from the center of Hanoi to the northern provinces, the projects have connected National Highway 3, which connects the center of Hanoi to the northern part of Vietnam, and the Noi Bai–Halong route, the Hanoi–Lao Cai Expressway, National Highway 2, and National Highway 18, which extends from east to west. The respondents also pointed out the improved road network to the north of Hanoi. In addition, new companies have begun to rent land to build facilities and distribution centers targeting the northern region of Hanoi. The expansion of the transportation network and new investments play an important role in the growth of the logistics industry, according to a response from a logistics industry association.

Respectively, this shows both projects contribute to the development of the local economy to a considerable extent.

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

Both projects fall under major road sector projects and influential characteristics (Category A) as stated in the Japan Bank for Cooperation Guidelines for Confirmation of Environmental and Social Consideration established in April 2002.

The implementing agency prepared environmental monitoring plans in accordance with the Environmental Impact Assessment reports. It also conducted environmental monitoring during the project implementation periods based on the said plans. The environmental monitoring reports were submitted as an appendix to the project progress reports, and it was confirmed that the projects were generally implemented as planned. In addition, the monitoring results of air

quality, noise, water quality, and soil erosion and sedimentation in the same report showed that no significant standard value was exceeded, and no particular environmental problems occurred during the project implementation period.

## 2) Resettlement and Land Acquisition

The implementing agency formulated resettlement plans complying with the Vietnamese law. The process of resettlement and land acquisition included in the appendix of the project progress reports expressed that, although there were some delays in land acquisition and resettlement, the projects were implemented properly overall. The reasons for the delay are as follows: (i) the residents did not cooperate with the government thinking that the land prices it offered were lower compared to the market price; (ii) time-consuming preparation for the asset inventories for land acquisition (buildings, etc.), determination of the appropriate price, and completion of the administrative procedures; and (iii) complicated and time-consuming removal of existing infrastructure facilities. Resulting from the actions of the implementing agencies and Hanoi City (reviewed the compensation within the scope of the law, charged agencies continued to negotiate with the residents, and held regular monitoring meetings at the working level), the land acquisition was deemed appropriately carried out. As described in "2.3 Constraints during the Evaluation Study," the evaluator could not confirm the minutes of the meetings of the relevant agencies about the resettlement and land acquisition or interview the residents on the current situation.

## 3) Unintended Position/Negative Impacts

A fatal accident occurred in 2012 involving a worker falling from a high place. The contractor submitted reports on the "Response Measures for Main Bridge Accident" and "Improvement of Temporary Facilities for Approach Bridge<sup>10</sup>," which were checked by the consultant and submitted to the implementing agency. The contractor took all possible safety measures per the response measures. No accidents involving a falling or a fatal accident occurred afterwards.

As described above, the implementation of the projects has generally produced the outcomes as planned. The impact of the projects, such as contributing to the development of the local economy to a certain extent, was also verified. Any negative impacts on the environment and society were also not observed, so the projects were considered to have achieved the objectives. Therefore, effectiveness and impacts of the projects are high.

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<sup>10</sup> Specific measures included tidying up framed scaffolds, putting up protective nets without gaps, improving the horizontal tension of scaffolds (to eliminate gaps), installing more handrails, having two people work on ladders, raising workers' safety awareness, and reviewing and complying with safety management procedures.

### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

Hanoi City is responsible for the O&M of Nhat Tan Bridge and the Connecting Road. The O&M is outsourced to maintenance contractors selected through a bidding process. The Transport Infrastructure Maintenance Board (hereinafter, referred as to “TIMB”) under the Hanoi DOT is responsible for making a contract with external service providers and supervising them on the O&M of the Nhat Tan Bridge and the Connecting Road. TIMB reviews the maintenance management plan every three months and has a system in place to check the activities of the contractors every month.

The selection basis of the bidding for the Nhat Tan Bridge and the Connecting Road is on the quality and cost. Commissioned service providers are responsible for the daily inspection and maintenance of the bridge and roads (patrolling, cleaning, painting, periodic bridge inspection, general inspection, repair of bridge components, etc.). During the handover of the Nhat Tan Bridge, the building contractor turned over to Hanoi DOT the necessary technical documents, such as the maintenance procedures, guidelines, handbooks, etc. On the other hand, TIMB prepared the bidding documents to outsource the maintenance according to these guidelines. The board also supervises and manages the maintenance of the bridge and roads.

According to TIMB, at the time of the ex-ante evaluation, the plan for the first medium-scale inspection was five years after the bridge is put into service. But based on the management of other bridges by Hanoi DOT, medium-scale inspections only happen 10 years after bridge construction. Therefore, the procedure is to conduct regular inspections and maintenance according to the guidelines until the 10 year after construction completion and to prepare a repair plan for any deficiencies or defects found during an inspection. After the 10 years of construction, TIMB plans to commission a contractor with extensive expertise in bridge inspection to conduct an overall inspection and then prepare for the repair plan. After that, preparation of an inspection and repair plan will be at a five to seven-year interval. The plan will be reported to the Hanoi DOT and the Hanoi People's Committee to implement the maintenance. In the same way for the Connecting Road, the basis for the necessary maintenance is the daily and regular inspections. The inspections will record any required repairs. In the same manner, the Connecting Road will also have a repair plan, and Hanoi City will allocate its budget and carry out repairs. The city has since budgeted the cost of maintenance and repair. Based on the above, no major problems have been found in the O&M management system of both projects.

#### 3.4.2 Technical Aspects of Operation and Maintenance

The Nhat Tan Bridge is the first cable-stayed bridge<sup>11</sup> in Hanoi, and there was a lack of

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<sup>11</sup> A cable-stayed bridge is a type of bridge where its cables stretched straight from the main towers directly support the bridge girders.

experience in its maintenance and management. But before its turnover to the Vietnamese side, the building contractor provided the MOT and the Hanoi DOT with the technical transfer of maintenance and management knowledge and skills, including inspection, maintenance, and repair methods. At that time, Hanoi City did not have maintenance and management standards or a supervision and management system, so producing those were necessary. The Hanoi DOT formulated the inspection and maintenance management standards and, in cooperation with the MOT and the contractor, provided training to the department's internal staff and TIMB staff. Currently, TIMB has responded that there are no technical problems in daily and periodic inspections as well as with the Connecting Road since it has the same road maintenance by Hanoi City.

TIMB is planning to outsource medium and larger scale inspections and repairs to external contractors with specialized skills. When contracting out inspections and repairs, specialized expertise is required for the preparation of technical specifications and evaluation of technical proposals, and it is essential to enhance the expertise and technical capabilities of TIMB staff. It has been conducting regular training courses on O&M of transportation infrastructure to improve the expertise and technical capabilities of its staff. In addition to TIMB, the bridge and road maintenance division staff of the DOT also have participated in the training. Based on the above information, the O&M knowledge and skills of both projects are believed to be without major problems.

### 3.4.3 Financial Aspects of Operation and Maintenance

Supposedly, MOT was to secure the O&M budget for both projects. Since the O&M was transferred to Hanoi City, the city budgets it. Compared to the estimated annual daily maintenance budget of 3.38 billion VND for Nhat Tan Bridge at the time of the ex-ante evaluation, the average maintenance expenditure of Hanoi was 9.3 billion VND for the period 2016–2020 (5 years). The average expenditure for the past five years was 1.8 billion VND, compared to the 2.2 billion VND estimated for the annual daily maintenance of the Connecting Road at the time of the ex-ante evaluation. The expenditure for Nhat Tan Bridge is more than the expected before the construction, and the expenditure for O&M of the Connecting Road is almost the expected amount.

**Table 3 O&M Expenditure for the Nhat Tan Bridge and Access Roads**

Year	2016	2017	2018	2019	2020
Budget amount (billion VND)	8.920	9.040	9.174	9.520	9.840

Source: Hanoi DOT

**Table 4 O&M Expenditure for the Connecting Road**

Year	2016	2017	2018	2019	2020
Budget amount (billion VND)	1.910	1.832	1.289	1.989	1.995

Source: Hanoi DOT

Based on the above, there are no major problems with the finances for O&M.

#### 3.4.4 Status of Operation and Maintenance

According to the results of the quarterly monitoring conducted by the TIMB, there have been no major problems in O&M so far. If there are any defects or deficiencies that need repairs, as mentioned above, a system is in place. TIMB formulates a repair plan based on the report of external contractors, Hanoi City budgets for the repair, and the repair will be implemented. In addition, none of the questionnaire survey responses (from a total of 23 from taxi, logistics, and tourist transportation companies) pointed out any deterioration or defects in the Nhat Tan Bridge or the Connecting Road. The field survey assistants did not find any problems in the condition of the Nhat Tan Bridge and the Connecting Road; therefore, the current maintenance and management system is considered to function well. Based on the above, it is concluded that there are no problems with the status of the O&M system.

No major problems have been observed in the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

## **4. Concussion, Lessons Learned and Recommendations**

### 4.1 Conclusion

The implementation of the Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I) (II) (III) and Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I) (II) aims to address the increasing traffic demand, to streamline logistics, to strengthen transportation capacity, and to alleviate traffic congestion. The construction of the Nhat Tan Bridge is under the Nhat Tan Bridge Project, which forms one end of the Ring Road 2, while the construction of the road connecting Nhat Tan bridge to Noi Bai International Airport is under the Connecting Road Project. Both projects are in line with Vietnam's development policy and development needs, as well as Japan's ODA policy to support the development of the international airport and the urban ring road network. The relevance of the projects is high especially since the international airport is the gateway to economic growth infrastructure (tourism, logistics, etc.). Both the project costs and the project periods exceeded the original plans, so the efficiency is fair. Analyzing the quantitative impacts of both projects, the projects nearly achieved the target. In the interview surveys with beneficiaries, they mentioned the travel time

from Hanoi city center to Noi Bai International Airport via the Connecting Road has shortened. It can be said that both projects have contributed to alleviating traffic congestion and improving the efficiency of logistics in Hanoi City. The effectiveness and impact are also high after confirming the proper implementation of the response and monitoring to the natural environment, resettlements, and the land acquisition based on the relevant laws and regulations of Vietnam. Hanoi City carries out the operation and management of both projects. When the Nhat Tan Bridge was turned over to the Vietnamese side, Hanoi City had no maintenance standards or supervision and management systems, so the Hanoi Department of Transport provided training to improve knowledge and skills to strengthen their capacity. Hanoi City secures a yearly O&M budget for both projects and has a budgeting system for medium-scale repairs, so it is deemed that no major problems have been observed in the institutional/organizational, technical, financial aspects and status of the O&M system. Therefore, the sustainability of the project effects is high.

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

#### 4.2 Recommendations

##### 4.2.1 Recommendations to the Executing Agency

None

##### 4.2.1 Recommendations to JICA

None

#### 4.3 Lessons Learned

##### Considerations for setting operational and effect indicators

Both projects were funded for multiple phases, and the operation and effect indicators have changed during the project periods. There was, however, no explicit explanation of reasons in the ex-ante evaluations or the documents exchanged with the recipient government. In case the operation and effect indicators change, it is important to explain the reasons in writing during the evaluation of each phase.



Comparison of the Original and Actual Scope of the Projects

Item	Plan	Actual
<p>1. Project Outputs</p>	<p>Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I)(II)(III)</p> <p>(a) Bridge Construction                      Total length: 3,080 m (main bridge 1,500 m, north approach bridge 1,240 m, north embankment ridge 340 m)                      Structure: Cable-stayed bridge                      Traffic lane: Three lanes on each side and one mixed lane                      Roadway: Roadway width (one lane) 3.75 m</p> <p>(b) Approach Roads                      (1) South Approach Road                      Total length: 1,251 m (South approach road 576 m, Phu Thuong Interchange 400 m, south approach bridge 275 m)                      Traffic lane: Three lanes on each side and one mixed lane                      Roadway: Roadway width (one lane) 3.75 m                      (2) North Approach Road                      Total length: 4,800 m                      Traffic lane: Three lanes on each side and one mixed</p>	<p>Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I)(II)(III)</p> <p>(a) Bridge Construction                      In accordance with plans</p> <p>(b) Approach Roads                      (1) South Approach Road                      In accordance with plans                      (2) North Approach Road                      In accordance with plans</p> <p>(c) Consulting Service                      In accordance with plans</p>

Item	Plan	Actual
	<p>lane</p> <p>Roadway: Roadway width (one lane) 3.75 m</p> <p>This approach road includes the construction of three interchanges</p> <p>(c) Consulting Services F/S review, detailed design, bidding support, construction management, monitoring during the defect liability period, HIV/AIDS prevention program, and environmental and social considerations monitoring program</p>	
	<p>Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I)(II)</p> <p>(a) Road Construction</p> <p>(1) New high standard road Total length: 7.85 km (from Nam Hong Interchange to the beginning of Noi Bai Airport road) Traffic lane: 6 lanes (3 lanes on each side) Width: 31.0 m</p> <p>(2) Widening of existing road Length: 4.25 km (Noi Bai Airport road) Traffic lane: 6 lanes (3 lanes</p>	<p>Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I)(II)</p> <p>(a) Road Construction</p> <p>(1) New high standard road In accordance with plans</p> <p>(2) Widening of existing road In accordance with plans</p> <p>(3) New side roads running parallel to the main road In accordance with plans</p> <p>(4) Other structures: 6 bridges and a toll booth The construction of the toll booth was abandoned</p>

Item	Plan	Actual
	<p>on each side)  Width: 52.5 m (including  25.0 m median strip)  (3) New side roads running  parallel to the main road  (4) Other structures: 6  bridges and a toll booth</p> <p>(b) Consulting Services  Construction management,  implementation of safety  measures related to  construction,  implementation of  HIV/AIDS measures,  monitoring of environmental  and social considerations</p>	<p>(b) Consulting Services  In accordance with plans</p>
<p>2. Project Period</p>	<p>Nhat Tan Bridge (Vietnam-Japan  Friendship Bridge) Construction  Project (I)(II)(III)  March 2006–December 2012  (82 months)</p> <p>Noi Bai International Airport to  Nhat Tan Bridge Connecting  Road Construction Project (I)(II)  March 2010–October 2013  (46 months)</p>	<p>Nhat Tan Bridge (Vietnam-Japan  Friendship Bridge) Construction  Project (I)(II)(III)  March 2006–December 2014  (106 months)</p> <p>Noi Bai International Airport to  Nhat Tan Bridge Connecting  Road Construction Project (I)(II)  March 2010–December 2014  (58 months)</p>
<p>3. Project Cost</p> <p>Amount Paid in Foreign  Currency</p> <p>Amount Paid in Local  Currency</p>	<p>Nhat Tan Bridge (Vietnam-Japan  Friendship Bridge) Construction  Project (I)(II)(III)</p> <p>23,390 million yen</p> <p>28,278 million yen  (2,884,495 million VND)</p>	<p>Nhat Tan Bridge (Vietnam-Japan  Friendship Bridge) Construction  Project (I)(II)(III)</p> <p>48,278 million yen</p> <p>14,362 million yen  (1,967,547 million VND)</p>

Item	Plan	Actual
Total	51,668 million yen	62,640 million yen
ODA Loan Portion	39,027 million yen	49,908 million yen
Exchange Rate	1 VND = 0.00703 yen (As of October 2005)	1 VND = 0.00538 (October 2005–December 2015 Average)
	Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I)(II)	Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I)(II)
Amount Paid in Foreign Currency	2,228 million yen	2,976 million yen
Amount Paid in Local Currency	30,039 million yen (5,383,333 million VND)	24,001 million yen (6,067,205 million VND)
Total	32,267 million yen	26,957 million yen
ODA Loan Portion	21,603 million yen	16,588 million yen
Exchange Rate	1 VND = 0.00558 yen (As of October 2009)	1 VND = 0.00477 yen (September 2009–May 2015 Average)
4. Final Disbursement	<p>Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Construction Project (I)(II)(III) August 2014 (Phase I) February 2016 (Phase II) March 2020 (Phase III)</p> <p>Noi Bai International Airport to Nhat Tan Bridge Connecting Road Construction Project (I)(II) July 2015 (Phase I) March 2020 (Phase II)</p>	

Vietnam

FY2019 Ex-Post Evaluation of Japanese ODA Loan

“Terminal 2 Construction Project in Noi Bai International Airport (I) (II) (III)”

External Evaluator: Nobuko Shimomura, Luong Huong GIANG, Almec Corporation

## 0. Summary

This project is intended to respond appropriately to the sharp rise in air passenger demand and enhance convenience and safety by building a second passenger terminal for the use of international passengers at Noi Bai International Airport in Vietnam’s capital, Hanoi, thereby contributing to the promotion of Vietnam’s economic growth and its international competitiveness. At the time of appraisal, the Five-Year Socio-Economic Development Plan (2001–2005) stated the need for investment in modern aviation transport. Constructing a second passenger terminal in the Noi Bai International Airport has been one of the most essential policies to sustain Vietnam’s economic growth. This project complies with the policies and the development needs as the plan to further expand the terminal building at Noi Bai International Airport has been under consideration during ex-post evaluation. It corresponds with the Country Assistance Policy of Japan for Vietnam at the time of appraisal, which considers the promotion of economic growth and international competitiveness as one of the priority areas of assistance. Hence, the relevance of the project is high. The main output complies with the planned level and the project cost was within the plan. Due to the extended preparation period, the overall project period was slightly longer than planned, though the construction period has shortened considerably. The efficiency of the project is fair. The project has contributed to the significant increase in international passengers. Additionally, the Fuel Hydrant System (FHS),<sup>1</sup> which was the first to become operational in Vietnam, contributes to the competitiveness as well as safety at the Noi Bai International Airport. The intended impacts, such as economic growth, increase in Hanoi City tourists, etc., were fully demonstrated. The effectiveness and impacts of the project are high. Its sustainability is also high as there are no significant problems in terms of institutional / organizational, technical, financial aspects, and status. In light of such findings, this project is evaluated to be highly satisfactory.

## 1. Project Description

### 1.1 Background

Since Vietnam introduced its doi moi reform policy in 1986, the expansion of exports and foreign investment has been the driving force in moving the nation onto a course of economic growth. To maintain this progress, a transportation network, which appropriately accommodates the swelling demand for transportation and rapid urbanization, must be provided so as to ensure the smooth and safe passage of goods and people.

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<sup>1</sup> Aviation Fuel Facility that refuels aircraft directly from the pipe, not by the refueler.



Project Location(s) Noi Bai International Airport Passenger Terminal 2

Regarding passenger transportation volume, road transport has been the most dominant mode (covering 80% to 90% of the total passenger volume), followed by water transport and railway. Air transport used to have the least passenger volume. However, the air transport sector is becoming significantly important owing to the long land with a north-to-south distance of 1,650 km. In 2009, the passenger transportation volume of both railway and air became equivalent to approximately 11 million. On the other hand, passengers-kilometre (km)<sup>2</sup> in air transport exceeded the railway since 1996 when statistics became available. The growth of passengers-km in air transport was outstanding between 2001 and 2010 as shown in Figure 1. In 2010, the share of passengers-km in air transport was over 20% next to road transport. The demand of air transport has been expanding.

**Table 1 Trend of the Transport Passengers-km by Modes**

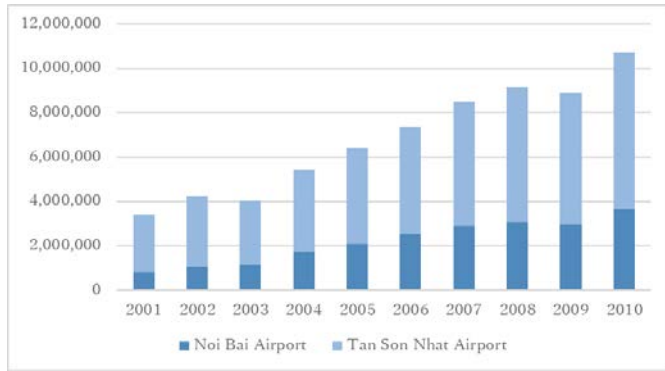
Year	Passenger-km (Million)					Annual Growth Rate					Share by Modes			
	Total	Railway	Road	IWT	Air	Total	Railway	Road	IWT	Air	Railway	Road	IWT	Air
2001	35,624	3,426	23,395	2,693	6,111	10%	7%	5%	7%	39%	10%	66%	8%	17%
2002	39,354	3,697	25,598	2,957	7,101	10%	8%	9%	10%	16%	9%	65%	8%	18%
2003	44,379	4,069	30,459	2,739	7,112	13%	10%	19%	-7%	0%	9%	69%	6%	16%
2004	51,167	4,376	34,266	3,158	9,367	15%	8%	12%	15%	32%	9%	67%	6%	18%
2005	57,696	4,563	38,602	3,407	11,124	13%	4%	13%	8%	19%	8%	67%	6%	19%
2006	63,909	4,334	43,569	3,189	12,817	11%	-5%	13%	-6%	15%	7%	68%	5%	20%
2007	71,865	4,660	49,372	3,151	14,682	12%	8%	13%	-1%	15%	6%	69%	4%	20%
2008	78,180	4,560	54,221	3,246	16,152	9%	-2%	10%	3%	10%	6%	69%	4%	21%
2009	85,203	4,138	61,509	3,048	16,508	9%	-9%	13%	-6%	2%	5%	72%	4%	19%
2010	97,932	4,378	69,197	3,195	21,162	15%	6%	13%	5%	28%	4%	71%	3%	22%

Source: Vietnam General Statistics Office (GSO), IWT: Inland Waterways Transport

Vietnam has 22 civilian airports, but Noi Bai International Airport (NIA), located to the north of the center of the capital Hanoi as the gateway for Vietnam’s northern region, the Da Nang

<sup>2</sup> Cumulative total of the number of passengers carried (passengers) multiplied by the distance travelled by respective passengers (kilometers).

International Airport in central Vietnam, and Tan Son Nhat International Airport in Ho Chi Minh City account for 89% of Vietnam’s air passengers (in 2007). Moreover, the volume of air passenger transportation at these major airports has risen sharply with an average of 19% annual increase from 2001 to 2010 for NIA and 12% for the same period at Tan Son Nhat International Airport.



Source: Civil Aviation Administration of Vietnam (CAAV)

**Figure 1 Trend of the International Passengers of the Two Major International Airports in Vietnam**

As shown in Figure 1, the passenger increase at NIA has been drastic. The total number of passengers in both domestic and international was 9.52 million in 2010, which substantially exceeded the airport capacity of 6 million per year. It was urgently required to expand the handling capacity of passengers to meet the rapidly increasing demand as well as to improve efficiency and safety. Furthermore, the World Airport Awards<sup>3</sup> ranked NIA lower than 200, based on the limited facilities and poor quality of services compared to the airports in neighboring countries. Reformation and capacity building were confirmed necessary as well, in terms of operation and maintenance.

### 1.2 Project Outline

This project is intended to respond appropriately to the sharp rise in air passenger demand and enhance convenience and safety by building a second passenger terminal for the use of international passengers at Noi Bai International Airport in Vietnam’s capital, Hanoi, thereby contributing to the promotion of Vietnam’s economic growth and its international competitiveness.

Loan Approved Amount/ Disbursed Amount	59,253 million yen / 55,246 million yen (Total Amount from Phase I to Phase III)
Exchange of Notes Date/ Loan Agreement Signing Date	March 2010 / March 2010 (Phase I) March 2012 / March 2012 (Phase II) December 2013 / December 2013 (Phase III)
Terms and Conditions	Interest Rate 0.2% (Phase I, II) 0.1% (Phase III) 0.01% (consulting services)

<sup>3</sup> The World Airport Awards is based on the annual Skytrax (England) Airport customer satisfaction surveys. They are regarded as a quality benchmark for the airport industry, assessing customer service and facilities across over 550 airports. (Reference: Skytrax World Airport Awards. [December 2020]. <https://www.worldairportawards.com/>)

	Repayment Period 40 years: (Grace Period) (10 years) Conditions for Tied (Special Terms for Procurement Economic Partnership (STEP))
Borrower / Executing Agency(ies)	The Government of the Socialist Republic of Vietnam / Airports Corporation of Vietnam (ACV)
Project Completion	December 2014
Target Area	Hanoi City
Main Contractor(s) (Over 1 billion yen)	Taisei Corporation (Japan)/ Vietnam Construction & Import-Export Corporation (Vietnam) Joint Venture
Main Consultant(s) (Over 100 million yen)	Japan Airport Consultants, Inc.
Related Studies (Feasibility Studies, etc.)	<ul style="list-style-type: none"> <li>• Feasibility Study on Terminal 2 (T2) Construction Project in Noi Bai International Airport, 2004, JETRO</li> <li>• Feasibility Study on T2 Construction Project in Noi Bai International Airport, August 2009, NAC (Northern Airport Corporation)</li> <li>• Establishment of the Programs for Operation &amp; Maintenance, Management in Noi Bai International Airport (2010)</li> <li>• Preparatory Study for the Project for Support on Establishment of the Programs for Operation &amp; Maintenance, Management in Noi Bai International Airport (2011)</li> </ul>
Related Projects	<p><b>【ODA Loan】</b></p> <ul style="list-style-type: none"> <li>• Nhat Tan Bridge (Vietnam-Japan Friendship Bridge) Project (I), (II), (III) (January 2011)</li> <li>• Noi Bai International Airport to Nhat Tan Bridge Connecting Road (I), (II) (March 2010)</li> </ul> <p><b>【Technical assistance related to ODA Loan】</b></p> <ul style="list-style-type: none"> <li>• Project for Support on Establishment of the Programs for O&amp;M in NIA Technical Cooperation Project (Terminal Management) (Fuel Hydrant System) (2012–2015)</li> </ul>



	<ul style="list-style-type: none"> <li>Dispatch of Experts for Supporting the Management of the New Terminal of Noi Bai International Airport (2012–2013)</li> </ul>
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## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Nobuko Shimomura / Luong Huong GIANG, Almec Corporation

### 2.2 Duration of Evaluation Study

The schedule of the ex-post evaluation study is as follows.

Duration of the Study: October 2019–January 2021

Duration of the Field Study: March 1–11, 2020

### 2.3 Constraints during the Evaluation Study

Due to the impact of the COVID-19, flights were reduced due to travel restrictions and low demand. The work schedule of the ACV staff in charge of the project were consequently affected. In addition, restrictions were imposed on the movement of citizens within Hanoi, which exacerbated the status of the interview survey for the tourism industry to confirm the effectiveness and impact of the project. From the outset, people in tourism reluctantly collaborated with the survey due to the severe impacts caused by the pandemic, thus it had to be conducted much later than planned without doing a face-to-face interview.

Regarding the impact of land acquisition, evaluation was conducted within the scope of available materials as the Hanoi People’s Committee, the authority responsible for the procedure, could not accommodate the request for collaboration due to their full engagement against the COVID-19. The second field survey, which was scheduled to be conducted, was done remotely via online conference.

## 3. Results of the Evaluation (Overall Rating: A<sup>4</sup>)

### 3.1 Relevance (Rating: ③<sup>5</sup>)

#### 3.1.1 Consistency with the Development Plan of Vietnam

At the time of appraisal, the Eighth Five-Year Socio-Economic Development Plan (2006-2010) aimed to lose its status as a low-income country by 2010 by expanding the knowledge-based economy that would lay the foundation for high growth, improved living conditions, industrialization and modernization, and achieve political, social and legal stability to bolster its position in international society, all centered on the economy, society and the environment. The plan states the need for investment in modern aviation transport as one of the strategies to upgrade the transportation sector. The Hanoi Transport Master Plan prioritizes with urgency the

<sup>4</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>5</sup> ③: High, ②: Fair, ①: Low

construction of Terminal 2 (hereafter T2)<sup>6</sup>. The Master Plan for Air Transportation (2020–2030)<sup>7</sup>, as well, stresses the need to upgrade Noi Bai International Airport.

During the ex-post evaluation, the Tenth-Year Socio-Economic Development Plan (2011–2020) states the need for investment in modern aviation transport as one of the strategies in the transport sector. Both the Master Plan of the Air Transportation sector for the period 2020–2030 and Vietnam’s Airport System Development Master Plan for the period 2021–2030 and Vision to 2050 state the necessity of further expansion of the NIA. There is no change in the policy for NIA that further investment is needed based on this project.

### 3.1.2 Consistency with the Development Needs of Vietnam

The annual passenger volume in NIA has increased drastically owing to the rapid economic growth, reaching 9.5 million in 2010 from 2.2 million in 2001. NIA Terminal 1 already exceeded the capacity in 2007 as its original design can service approximately 6 million passengers per year. Since NIA is the only international gateway in the national capital city of Hanoi, the construction of T2 was one of the most desirable projects for the Government of Viet Nam.

The growth rate of foreign visitors, according to the statistics of Hanoi City, was 11% per year between 2010 and 2015. Such fast business and tourism demand growth progressed the rapid air transportation along with the Vietnamese economic growth, as expected. In effect, the average annual increase of foreigners staying in hotels between 2016 and 2019 was 18%. The construction of the new terminal was in compliance with development needs.

### 3.1.3 Consistency with Japan’s ODA Policy

At the time of appraisal, Japan’s Country Assistance Program for Vietnam (July 2009) stated that “the promotion of economic growth and strengthening international competitiveness” was one of the four main pillars of Japan’s aid policy. Urban development and the establishment of a transport / traffic and communications network, which includes air transportation, were given priority. Moreover, JICA has responded to this plan by working for urban development and the establishment of transport / traffic and communications network to promote economic growth and strengthen the international competitiveness of Vietnam against four development issues listed in the policy for implementing aid to Vietnam. Aid for traffic / transportation and urban development is positioned as part of the Program to Build Trunk Road Network, and this project is implemented as part of this.

Considering the above, this project has been highly relevant with Vietnam’s development plan, development needs, as well as Japan’s ODA policy. The project’s relevance is high.

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<sup>6</sup> MOT and Transport Engineering Design Inc., Transport Development Master Plan of Hanoi Metropolitan City by 2020, March 2003.

<sup>7</sup> Decision No.21/QD-TTg (January 8, 2009)

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

The main output is to complete the terminal construction for international passengers and auxiliary facilities to meet the demand by 2020 (approximately 15 million air passengers a year). Specifically, the new terminal with a floor space of approximately 138,000 m<sup>2</sup> includes engineering work of the elevated bridge, roads, parking lot, etc.; airport facilities (baggage processing system, passenger boarding bridge, security systems, etc.); sewage system; and aircraft refueling facility. There were slight changes in the following areas due to the changes from the appraisal period.

- (1) Omission of two CT scanners and the revenue management system (RMS). These were regarded as over-scope because of the limited number of long flights.
- (2) Additional design change and its implementation: the redesign of the Noi Bai International Airport to Nhat Tan Bridge Connecting Road, or the so-called Vo Nguyen Giap Road. Due to the height difference between the road and the original design, the revision was necessary between the Project Management Units of the Connecting Road and T2 without causing a substantial delay in the construction schedule.
- (3) Redesign of the canteen in front of T2 and design of car parking: The change was proposed to improve the design and adjust the demand.

Adding to the changes is a consulting service for drafting the integrated development plan to reflect the drastic increase of passengers and flights. The reasons for those changes were deemed appropriate.



Departure Lobby



Shopping Area



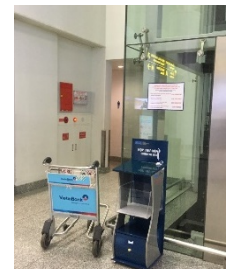
X-Lay Security System



Common Use Terminal Equipment (CUTE)



Flight Information Display



Stand for the Customer Satisfaction Survey Sheet



Electrical Facility



Baggage Handling System



Passenger Boarding Bridge



Arrival Area



Pond besides the Terminal Exit<sup>8</sup>



Parking Area for Airport Users



Cafeteria outside of T2 Building



Aircraft Fuel Hydrant System Facility



Sewerage Treatment Plant Facility

### Photo of the T2 Facilities Financed under the Project

#### 3.2.2 Project Inputs

##### 3.2.2.1 Project Cost

The original cost for the Project was 76,132 million JPY (with a loan amount of 59,252 million JPY), and the actual cost is 67,671 million JPY (with a loan of 55,245 million JPY). The actual cost is 89% of the plan. The main reason for the reduction of actual cost was the over-estimated price escalation, which was calculated by taking into account the inflation rate of 12.1% in 2010 (21.2% in 2011 the following year), but in reality, the inflation rate during the construction period settled down to approximately 6.4%, and it did not increase as much as expected<sup>9</sup>.

##### 3.2.2.2 Project Period

The project period exceeded for a month beyond the original period, while the inauguration of facilities was three months prior, as shown in Table 2. Normally, the airport starts operations

<sup>8</sup> The lotus wall painting received the golden award for the category of social design in the international design competition in Italy (2019).

<sup>9</sup> Inflation rate was referred to the World Development Indicators 2020, <https://databank.worldbank.org/> (Confirmed December 2020).

after a mastery period of three to four months. This project, however, had to respond to the irregular request of the Vietnamese Government approximately six months prior the project completion, to start operations the day after the completion of the construction to respond to the rapid increase in passenger demand. Establishing a strict schedule, such as construction concurrent with an operational test, the contractor fulfilled the request.<sup>10</sup>

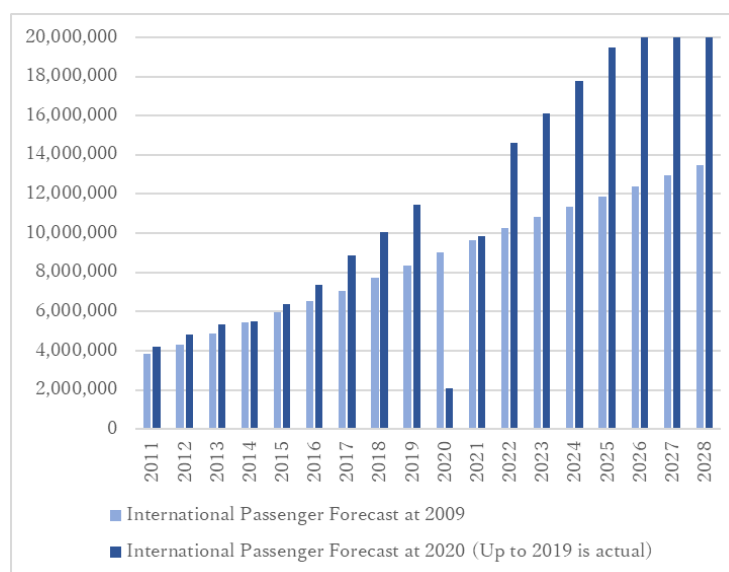
**Table 2 Comparison of Planned and Actual Project Implementation Period Major Works**

Items	Original Plan	Actual
Total project implementation	March 2010 / November 2016 6 years and 9 months, 81 months	March 2010 / December 2016 6 years and 10 months, 82 months
Detailed Design & Tender Assistance	Sep. 2009–Mar. 2011	Sep. 2009–Nov. 2011
Supervision	Apr. 2011–Jan. 2015	Feb. 2012– Dec 2016
Selection of contractor(s)	Jan. 2010 – Mar. 2011	Apr. 2010– Dec. 2011
Construction Period	Feb. 2012–Dec. 2014	Feb. 2012–Dec. 2014
Inauguration of Facilities	Apr. 2015	Jan. 2015
Defect Liability Period	Dec. 2014–Nov. 2016	Jan. 2015 –Dec. 2016

Source: Documents provided by JICA, and ACV

### 3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

During the conduct of the F/S, the estimated Economic Internal Rate of Return (EIRR) was at 18.5% and Financial Internal Rate of Return (FIRR) at 0.9 %, setting the project life at 40 years. The basis was the conditions of FIRR costs (project cost and Operation and Maintenance: O&M cost) and its benefits (landing fee, passenger boarding bridge (PBB) charge, aircraft parking charge, airport use fee, tenant fee, vehicle



Source: Forecast at 2009: Feasibility Study on T2 Construction Project in Noi Bai International Airport, August 2009, NAC, forecast at 2020 provided by ACV.

**Figure 2 International Passenger Forecast of F/S and at the time of Ex-Post Evaluation (2020) for the Noi Bai International Airport**

<sup>10</sup> The joint efforts of the implementing agency, tenants, contractors, and supervising consultants that materialized the inauguration the day after the terminal construction were highly appreciated. Consequently, the team was awarded a distinguished service prize—an encouragement special prize—by the Engineering Advancement Association of Japan in 2016.

parking fee, etc.). As for EIRR, the costs excluded taxes and benefits contributed to the tourism industry. ACV calculates the FIRR at 17.6% based on the passenger volume in 2020 as 80% lower than the forecast and setting the project life up to 2030. At the time of ex-post evaluation, the recalculated EIRR was at 36.1% and FIRR at 16.4% based on the project life of 40 years, referring to the actual incomes of the international passenger terminal after more than 5 years of operation and forecast obtained from the ACV. It clearly shows the effectiveness of the tourism industry. The reason for achieving higher FIRR and EIRR values is predominantly because the actual passenger volume is higher than the forecast level at the time of appraisal, as shown in Figure 2.

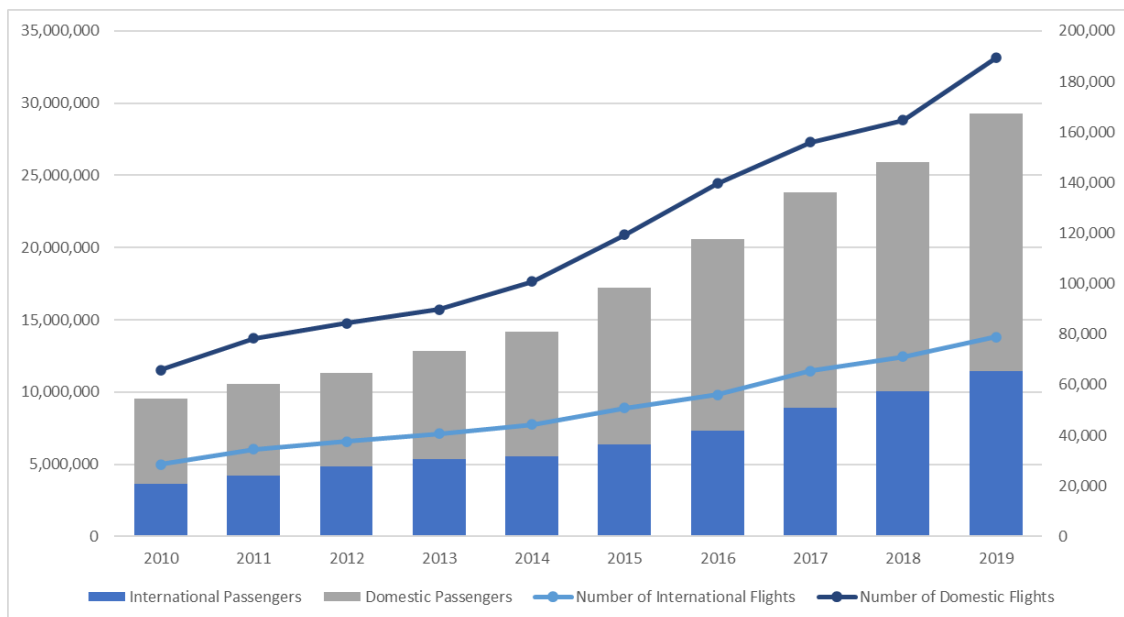
Although the project cost was within the plan, the project period exceeded one month against the plan. The efficiency of the project is fair.

### 3.3 Effectiveness and Impacts<sup>11</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

In order to grasp the quantitative effects beside using the annual number of international passengers and annual number of landings and takeoffs for international flights as indicators, the number of domestic flights as well as domestic passengers were set as reference indicators as the existing Terminal 1 becomes the sole domestic airport.



Source: ACV

Note: Terminal 1 (T1: Domestic terminal) built an annex for the Low-Cost Carrier Lobby in 2013, which also influenced the increase of the domestic flights.

**Figure 3 Number of International and Domestic Passengers and Flights of the Noi Bai International Airport**

<sup>11</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

**Table 3 Number of Flights of the Noi Bai International Airport**

	Baseline	Target	Actual		
	2010	2017	2015	2017	2019
	Actual	2 Years After Completion	Completion Year	2 Years After Completion	5 Years After Completion
Annual international passengers	3,675,000	7,700,000	6,389,323	8,886,786	11,445,998
Annual landings and takeoffs for international flights (times)	28,555	58,000	50,823	65,424	79,000
(Reference)					
Annual Domestic passengers	5,866,910	N/A	10,824,392	14,937,614	17,858,633
Annual landings and takeoffs for domestic flights (times)	37,346	N/A	68,526	90,575	110,288

Source: The documents provided by ACV and JICA

The number of the annual tourists was also set as a reference indicator. In addition, the number of visitors was also set as an indicator, but only in terms of the number of visitors booked in hotels in Hanoi because of difficulties confirming tourist data (Figure 4).

As shown in Table 3, the actual figures surpassed the 2-year target after completion. The number of domestic flights (times) as well as domestic passengers increased substantially owing to the expanded space of the T1 that solely services domestic flights, as shown in Figure 3, while the growth of international and domestic passengers from 2010 to 2014 was approximately at 10%. The rate of international airport passengers quickly increased by 15.7% for international and 13.3% for domestic from 2015 to 2019. The number of visitors that stayed in Hanoi increased annually by approximately 10% since 2015, as shown in Figure 4. Foreigners, meanwhile, increased by over 20%, considering tourists as well as business customers.<sup>12</sup> Moreover, the total number of Vietnamese who travelled to foreign countries increased from 60,000 in 2014 to 169,000 in 2019.

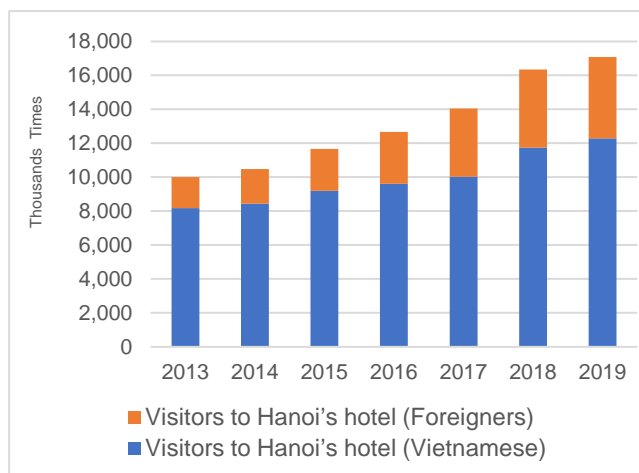
The number of weekly flights increased drastically when the data between 2012 and 2019 were compared, especially for the short distance flights to and from Asian countries. Destinations of long-distance flights were Moscow, Frankfurt, and Paris prior to the construction of T2. Since the operation of the T2, the respective flights were increased, and more destinations, such as London, Sydney, Dubai were added to the long-distance flight service (Table 4).

<sup>12</sup> Approximately 80% of foreign visitors entered Vietnam via air (from the years 2015 to 2019). (Statistical Yearbook of Vietnam, 2019.)

**Table 4 Weekly Flights in 2012 and 2019**

	2012	2019
Long Distance (Europe, Middle East)	37	44
Short and Middle Distance (Asia, Oceania)	362	601

Source: Documents provided by the JICA expert and ACV



Source: Hanoi Statistics Yearbook 2014, 2019

**Figure 4 The Number of Visitors Stayed in the Hotels in Hanoi**

### 3.3.1.2 Qualitative Effects (Other Effects)

#### (1) Response towards the rapid increase of air transport passengers

The significance of the air transport sector has been the same after 2015 when T2 began operations. The number of passengers as well as passenger-km substantially increased thrice over compared to onset of the Project in 2010 (Table 5). The volume increased approximately 1.6 and 1.5 times, respectively, during the years 2015 and 2018. These substantial changes reflected the fact that NIA increased the number of domestic flights. The project responded to the rapid increase of air transport passengers in Vietnam.

**Table 5 Trends of Passengers and Passengers-km by Modes in Vietnam**

Year	Passengers (Million)					Passenger-km (Million)				
	Total	Railway	Road	IWT*	Air	Total	Railway	Road	IWT	Air
2009	2,017	11	1,844	151	11	85,203	4,138	61,509	3,048	16,508
2010	2,315	11	2,132	158	14	97,932	4,378	69,197	3,195	21,162
2015	3,311	11	3,105	164	31	154,665	4,150	105,382	3,065	42,068
2016	3,623	10	3,402	173	39	169,077	3,422	114,199	3,220	48,237
2017	4,027	10	3,793	180	45	185,308	3,658	123,494	3,474	54,683
2018	4,456	9	4,207	192	49	207,534	3,512	138,807	3,707	61,509

Source: Vietnam General Statistics Office (GSO), IWT: Inland Waterways Transport

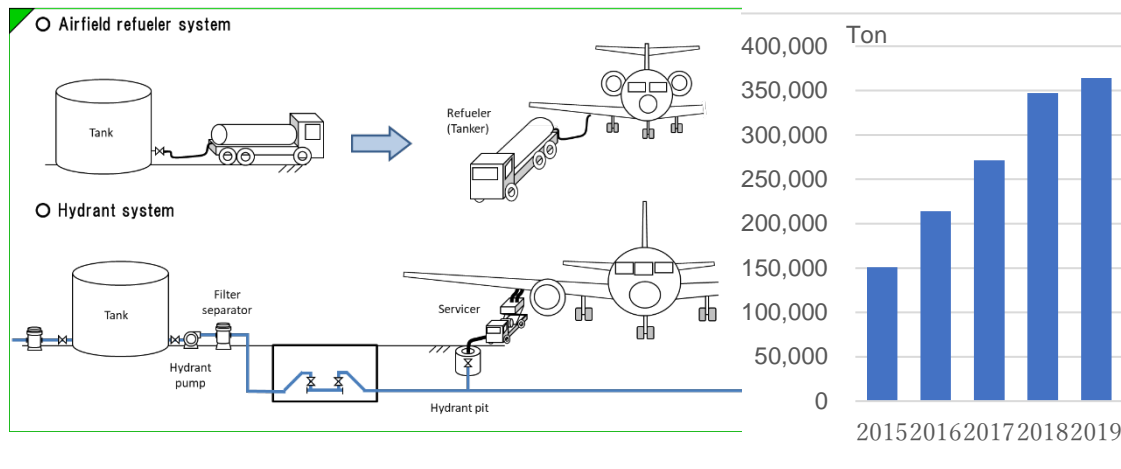
#### (2) Improvement of Convenience as well as Safety

##### 1) Introducing the state-of-the-art fuelling systems

The airfield refueler system used in T1 caused congestion at the apron during the peak flight hours, as fuelling larger aircrafts requires more than one refueler. The FHS



introduced in the project first became operational in Vietnam. The fuel from the newly built storage tanks were transported by underground pipelines, subsequently pumped to the apron area, and directly brought to the aircraft, as shown in Figure 5. Affiliated engineers of the Noi Bai Aviation Fuel Service Company (NAFSC), established by the ACV with a joint investment from petroleum companies, received hands-on training of the state-of-the-art fuelling techniques, such as operation and safety control manuals, monitoring, and supervision system from Japanese experts both in Japan and in Vietnam. Subsequently, T2 satisfies the stringent international standards for aviation fuel control by the Fuel Quality Pool (IFQP) of the International Air Transport Association (IATA), which is the prerequisite for serving long-distance flights at locations worldwide prior to the opening the T2 in December 2014. Since then, T2 never applied the airfield refueler system used in the domestic terminal. The application of FHS reduced the congestion of the apron, time for fuelling aircrafts, and substantially improved safety by avoiding the risk of refueler collision. The volume of fuelling jet oil significantly increased from 151,055 tons in 2015 to 364,285 tons in 2019 (Figure 6). Besides FHS, a leading-edge Japanese photocatalytic technology<sup>13</sup> was introduced for use in the toilets, etc. that is antibacterial and deodorizing. Additionally, setting more baggage handling systems shortened the time to pick-up checked-in baggage upon arrival.



Source: Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan

**Figure 5 Aircraft Refuelling Systems**

Source: NAFSC

**Figure 6 Fuelling Volumes by FHS**

2) Improving airport customer satisfaction (CS)

The concept of improving CS was first introduced at an airport in Vietnam by the Narita International Airport (NAA) experts assigned under the technical assistance related to this ODA Loan. Due to the terminal improvements and partly to the consecutive CS

<sup>13</sup> It is a catalytic substance that reacts when exposed to light and can decompose microorganisms and oxides.

training, the ranking of NIA at the World Airport Awards jumped to 82nd in 2016 from 218th in 2015. In the same year, it topped the World's Most Improved Airport rankings. Since then, NIA has kept its ranking in the 80s range. No other airports in Vietnam have ranked within 100 best airports yet.

### (3) Tourism industry Survey

To verify the effectiveness in quality of the project set at the appraisal, (i) response towards the rapid increase of air transport passengers and (ii) improvement of convenience and safety, a survey on the tourism industry was conducted.<sup>14</sup> The respondents<sup>15</sup> assessed the improvements using a five-point scale in five categories, namely terminal facilities, stores / services, airport staff, airport accessibility, and safety. They also described the appreciative aspects as well as problems through free-answer questions.

Table 6 shows the survey results. Appreciating the decreased transport time to the City Center by around 20 minutes, the “Getting to and from the airport, ease of access after the Nhat Than Bridge and Connecting Road construction” assessment received the highest point. The terminal facility assessment comes in second. The facilities and equipment received high assessments since the terminal was relieved of chronic congestion. With a renewed impression of the terminal, which was perceived as old and dark, the airport has become an attractive gateway to Hanoi in promoting the tourism industry. In addition, the airport staff who received CS training were highly-evaluated compared to the immigration officials. Three out of 29 responses in the free-answer questions commented that the airport staff became kind and cheery after the opening of T2.

However, there were also concerns expressed. More local products should be added to the airport shops while also considering quality and variety. Tourist information boards in the arrival area are not comprehensive. There were also some opinions regarding the airport surroundings, such as the often-congested roads in front of the airport since ride-hailing service cars parked at the area around the parking lot and the inconvenience when moving to the domestic terminal. Four respondents also commented that the bus boarding and alighting points were not in strategic locations for passengers and should be improved immediately. Private vehicles and taxis mainly occupy the front of the terminal. Passengers of the two bus lines with high fares board or get off right in front of the terminal, while those from four other bus routes have to walk for 150 to 200 m without roofs. It can be inconvenient when it rains. Based on the traffic survey of NIA in 2015,<sup>16</sup> the number of passengers using buses and minibuses to or from the

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<sup>14</sup> The survey method was a questionnaire survey (online and telephone), and the survey period is from August to September 2020.

<sup>15</sup> There are 2,427 tourism-related companies in Hanoi (Hanoi Statistical Yearbook 2019). Referring to a member list from the travel agency association and tourism industry group, the evaluator received referrals, accessed more than 30 companies, and received 29 valid responses.

<sup>16</sup> Transport Engineering Design Inc. (TEDI), Traffic Demand Forecast, Economic and Financial Evaluation and Opportunity for PPP on Line 6 Development.

NIA was at 15,000 per day at the start of operation of T2 in 2015. The inconvenient bus boarding/alighting points will become problematic again when international flights return to be normal. However, the ACV does not have a plan to improve this issue during the ex-post evaluation.

**Table 6 The Result of the Questionnaire Survey for the Tourism Industry**

Rating		5. Excellent		4. Improved very much		3. Fair		2. Not much Improved		1. Not at all improved		Average points
		No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	
Assessment Items		No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	
<b>Terminal Facility</b>	Space, comfort, atmosphere and design	6	20.7%	15	51.7%	6	20.7%	2	6.9%	0	0.0%	3.9
	Cleanliness of floors, seats, and public areas	2	6.9%	19	65.5%	6	20.7%	2	6.9%	0	0.0%	3.7
	Toilets (if well-equipped, and clean)	5	17.2%	15	51.7%	7	24.1%	2	6.9%	0	0.0%	3.8
	Elevators, escalators, moving sidewalk	7	24.1%	13	44.8%	6	20.7%	3	10.3%	0	0.0%	3.8
	Facilities for disabled and passengers needing special care (senior citizens, women with baby, and wheelchairs)	4	13.8%	10	34.5%	9	31.0%	6	20.7%	0	0.0%	3.4
	Check-in facilities and queuing systems	1	3.4%	12	41.4%	9	31.0%	6	20.7%	1	3.4%	3.2
	Wayfinding and terminal signages	4	13.8%	9	31.0%	11	37.9%	4	13.8%	1	3.4%	3.4
	Flight info screens (clarity and quality of information)	5	17.2%	12	41.4%	9	31.0%	2	6.9%	1	3.4%	3.6
	Ease of airport transit (to or from T1)	3	10.3%	5	17.2%	14	48.3%	6	20.7%	1	3.4%	3.1
Convenience of the baggage claim (e.g., display monitor, signages, trolleys, and space)	4	13.8%	13	44.8%	7	24.1%	4	13.8%	1	3.4%	3.5	
<b>Shops/ Services</b>	Availability of services inside and outside the airport (e.g., clinic, spa, cafes, ATM, etc.)	3	10.3%	11	37.9%	11	37.9%	2	6.9%	2	6.9%	3.4
	Shopping availability (e.g., Duty-Free and other stores)	3	10.3%	12	41.4%	6	20.7%	6	20.7%	2	6.9%	3.3
	Cafe and restaurant prices	2	6.9%	2	6.9%	3	10.3%	15	51.7%	7	24.1%	2.2
	Tourism information (in arrival area)	2	6.9%	3	10.3%	15	51.7%	8	27.6%	1	3.4%	2.9
<b>Staff</b>	Immigration and security (communication skills and decorum)	2	6.9%	2	6.9%	9	31.0%	8	27.6%	8	27.6%	2.4
	Airport Staff (friendliness)	3	10.3%	3	10.3%	13	44.8%	6	20.7%	4	13.8%	2.8
<b>Access</b>	Public transport options, conveniences, efficiency, and fare rates	5	17.2%	2	6.9%	16	55.2%	5	17.2%	1	3.4%	2.8
	Taxi availability and fare rates	0	0.0%	4	13.8%	12	41.4%	9	31.0%	4	13.8%	2.6
	Parking facilities	2	6.9%	8	27.6%	12	41.4%	4	13.8%	3	10.3%	3.1
	Getting to and from the airport and ease of access after the Nhat Than Bridge and connecting road construction	15	51.7%	8	27.6%	4	13.8%	2	6.9%	0	0.0%	4.2
<b>Safety</b>	Perception of security and safety standards	4	13.8%	13	44.8%	8	27.6%	3	10.3%	1	3.4%	3.6

Source: Evaluator

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

##### (1) Contribution to the Socio-Economic Development of Hanoi

Table 7 illustrates the data on Foreign Direct Investment (FDI) and Gross Regional Domestic Product (GRDP). The FDI number has fluctuated and registered capital has increased substantially. With the improved connectivity to international business centers through the increased number of international flights of NIA, Hanoi City (as well as the surrounding industrial estates) has become more convenient for the investors from overseas.

**Table 7 Economic Indicators of Hanoi City**

Items	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018
FDI - licensed projects in Hanoi City	Number	288	285	211	257	313	304	459	556	616
	Registered capital (million USD)	470	1,322	899	487	651	845	1,913	1,434	5,040
	Implemented capital (million USD)	4,270	1,129	900	871	1,017	1,091	1,200	1,012	2,300
GRDP of Hanoi City (at constant 2010 price)	Billion VND	310,703	332,495	355,560	381,598	410,316	442,668	478,964	709,516	760,014
	Annual Growth Rate %		7.00%	6.90%	7.30%	7.50%	7.90%	8.20%	7.30%	7.10%
GDP (National Level)	Annual Growth Rate %	6.40%	6.20%	5.30%	5.40%	6.00%	6.70%	6.20%	6.80%	7.10%

Source: Hanoi Statistics Yearbook 2014–2019

The project also benefited the tourism sector, as shown in Table 8.

**Table 8 Indicators Related to the Tourism Industry**

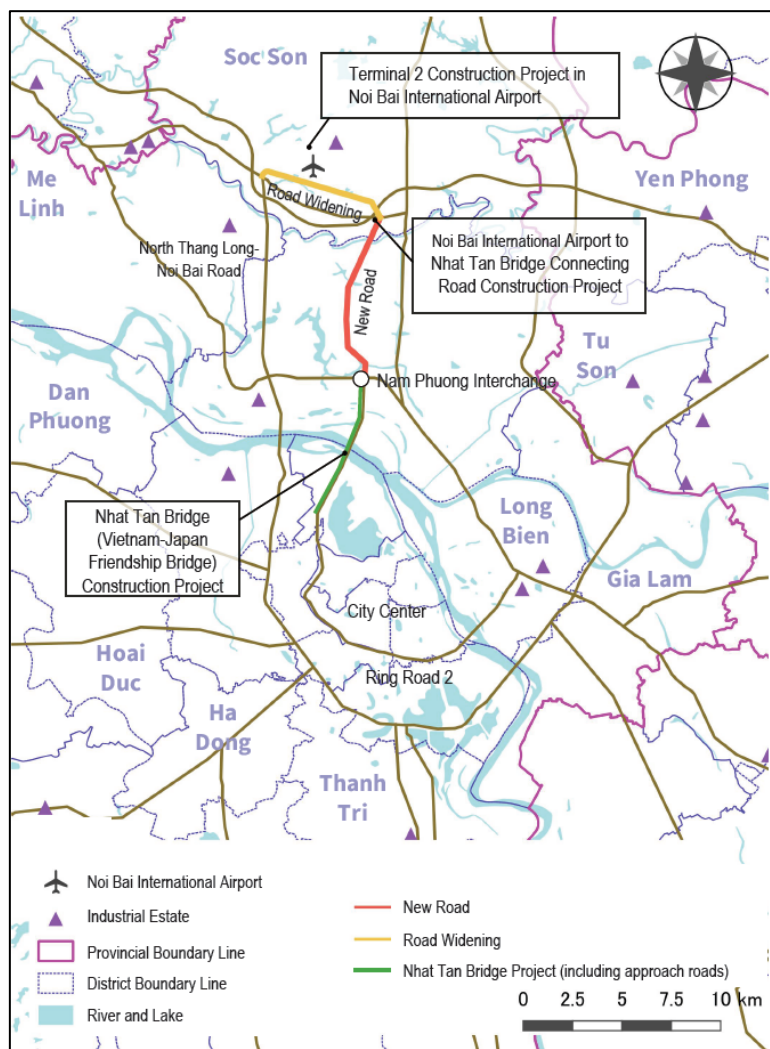
Items / Unit		2010	2015	2016	2017	2018	2019
Number of Hotel and Restaurant	Total	1,123	2,599	2,768	3,078	3,293	3,586
	of which non-state enterprises	1,044	2,513	2,657	2,959	3,121	3,400
	of which FDI	59	67	97	103	155	170
Number of Tourist Services	Total	793	1,807	1,685	1,937	2,123	2,427
	of which non-state enterprises	781	1,790	1,666	1,918	2,101	2,400
	of which FDI	5	9	13	13	15	20
Number of visitors serviced by travel agencies (Thousand persons)		-	745	816	910	940	1,051
Number of Labor in Accommodation and Food Service (persons)	Total	33,468	58,633	60,146	63,334	67,776	72,780
	of which non-state enterprises	20,894	45,300	46,489	49,451	53,234	57,500
	of which FDI	8,766	10,214	11,574	12,024	12,774	13,600
Number of Labor in Tourism Service (persons)	Total	7,134	11,975	11,858	14,404	18,127	19,355
	of which non-state enterprises	6,057	11,251	11,148	13,356	17,200	18,400
	of which FDI	154	219	420	702	695	730

Source: Hanoi Statistics Yearbook 2014,2019, 2020

## (2) Improved connectivity

The number of industrial estates discernibly increased in the neighboring areas of Hanoi City, as shown in Figure 7. Roads surrounding the Hanoi Capital Region have improved in recent years, including the access road (Nhat Tan Bridge and Connecting Road [Vo Nguyen Giap Road]) to NIA. Under these circumstances, the number of FDI cases and invested capitals increased considerably and surged the GRDP growth, as shown in Table 7. The location of NIA is convenient for the industrial estates in Vinh Phuc Province where Honda and Toyota have

located their factories as well as for Bac Ninh Province where electronic equipment manufacturers, such as Samsung and LG, have factories. Foreign investors certainly benefitted from the increased flights in T2 and improved connectivity. Together with the Nhat Tan Bridge and the Connecting Road that significantly reduces travel time from the urban districts of Hanoi City, the project contributed to various businesses, even in tourism, as shown in Table 8.



Source: JICA Evaluation Team, based on the existing maps.

**Figure 7 Location Map of the Projects with Existing Road Network in Hanoi City**

### (3) Contribution to the Development of Aviation Sector in Vietnam

The EU-Vietnam Free Trade Agreement (FTA) came into effect in August 2020. The elimination of approximately 99% tariff, after a gradual reduction for ten years, was decided upon that will significantly improve the business environment of European companies in Vietnam in the future. Introducing FHS created a safe and quick refuelling environment for long-haul flights in NIA. Consequently, the demand for long-distance cargo flights is expected to increase. After efforts of introducing CS, the NIA successfully ranked within 100 under the World Airport Awards besides infrastructure and facilities improvement. This also influences

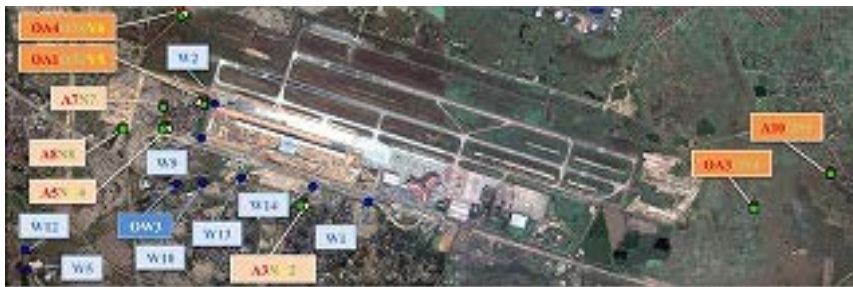
other airports in Vietnam. Long Thanh Airport, which will open in the future, will likely consider introducing more advanced equipment and facilities based on the experience of NIA.

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the Natural Environment

The project does not correspond to the large-scale aviation sector specified in the JICA Guidelines for Confirmation of Environmental and Social Considerations (established in April 2002). It also does not have significant harmful effects on the environment nor any attributes specified in the guidelines that would impact or easily affect a region. Therefore, the project corresponds to Category B.

Environmental indicators were monitored during the construction period around the airport construction (shown in Figure 8) for noise, vibration, air quality, and water quality. The noise occasionally exceeded the standard, but it was obvious that it was caused not by the construction, but the traffic generated by airport vehicles and residents around the airport. The monitoring data of environmental indicators after the project completion was not provided<sup>17</sup>.



Source: Report on Environmental Monitoring for November 2014 The Contractor Taisei Vinaconex Joint Venture, The Monitoring Service Supplier EPRO Consulting Joint Stock Company

Note: “A” is air quality sampling, “N” is noise measurement and “V” is vibration measurement, “W” is water quality sampling, and “O” is monitoring points.

**Figure 8 Monitoring locations for Environmental Impact**

#### (2) Resettlement and Land Acquisition

The project involved the land acquisition of around 101 ha and relocation of 856 graves. Due to COVID-19, the Hanoi City Officials responsible for the survey of land acquisition and determining the target residents could not accommodate the interview request. However, it was confirmed that the procedure complied with the requirement of the Vietnamese Law. ACV provided employment opportunities and continuously supports local events and poor children as part of the consideration for the residents. Having maintained a good relationship with the residents, the ACV has received no complaints since it began its T2 operations

Since the access to NIA from Hanoi City improved because of the Nhat Tan Bridge and the Connecting Roads, access to neighboring areas has become convenient and drawn attention for

<sup>17</sup> ACV provided the monitoring data of environmental indicators after the project in January 2021. However, the evaluator could not confirm the facts due to time constraints.

future development. Since NIA Terminal 3 is also under consideration for the medium to long term, coordinating with related organizations would be important in acquiring surrounding land and zoning measures.

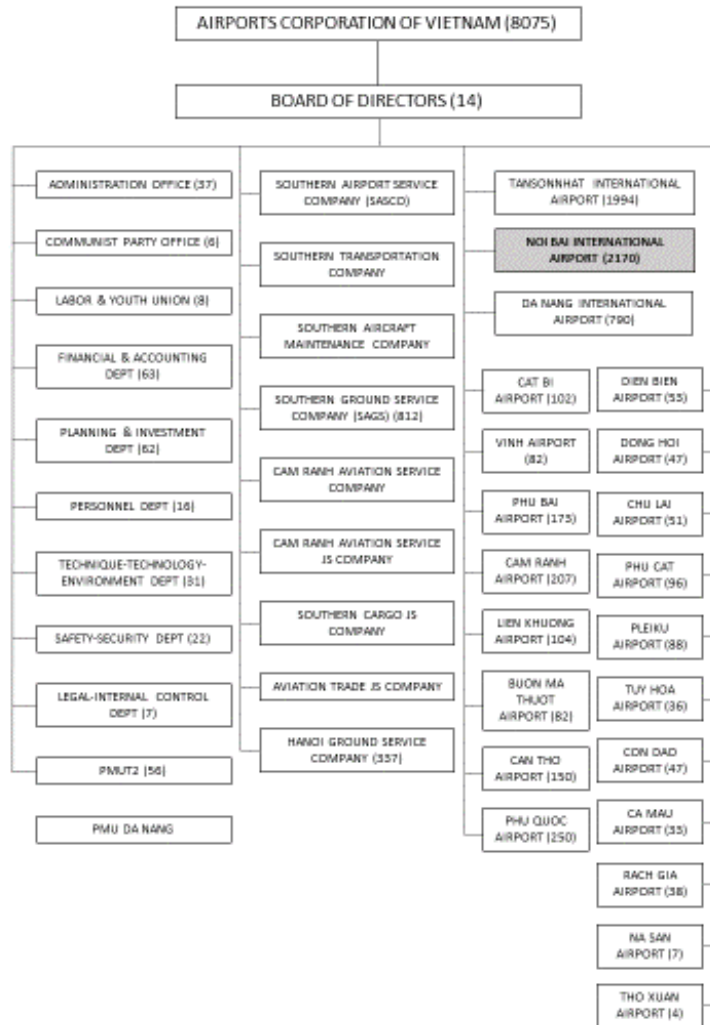
As explained earlier, this project achieved the target indicators such as the number of international passengers and increased demand for domestic flights, which was limited by the capacity of the old terminal (T1). The rate of increase in foreign tourists in Hanoi since 2015 has also been remarkable. Improvement in access to the surrounding industrial parks and real estate around the project area has attracted more visitors and investment, as well as improved business opportunities. The ranking of the World Airport Awards has also improved substantially.

The project has achieved mostly its objectives; therefore, the effectiveness and impacts of the project are high.

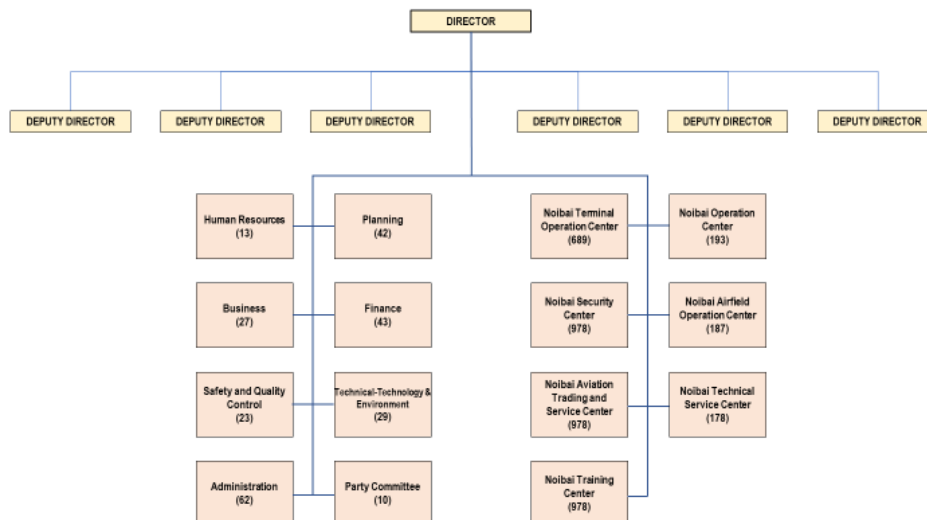
### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Institutional / Organizational Aspects of Operation and Maintenance

Airports Corporation of Vietnam (ACV) officially became a public company (and listed on the stock exchange in 2016) after the merging of Northern Airport Corporation, Middle Airport Corporation, and Southern Airport Corporation. Its organizational chart and number of staff are in Figure 9. It has over 8,000 employees and consists of nine subsidiary companies operating in a wide range of fields. The organizational chart and the number of employees of T2, NIA are shown in Figure 10, and the roles of operation and maintenance are indicated for respective facility, including the department in charge and the name of the subsidiary. The Noi Bai Terminal Operation Center (NTOC) has jurisdiction together with T1. Aviation Technical Services Company (ATSC) oversees the utility services, such as the sewerage treatment plant (STP), electricity, and water. The NAFSC, a joint stock company which ACV capitalizes with over 50%, is responsible for the O&M of FHS. In order to enhance the quality of O&M management, the Japan side proposed the forming of the T2 Start Up and Commissioning Preparatory Committee. Its details are in the Colum.



**Figure 9 The Organization Chart of the ACV**



Source of Figure 9 and Figure 10: ACV

Note: Number inside the brackets is the number of staff as of 2019.

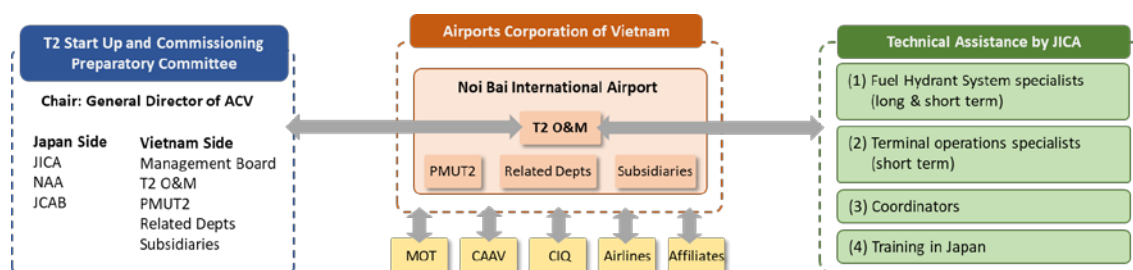
**Figure 10 The Organization Chart of the Noi Bai Airport**



**Colum** Institutional Building through the T2 Start Up and Commissioning Preparatory Committee

For ACV to carry out appropriate operations, an intensive institutional building was required such as organization structure arrangement, human resource development, and coordination with related organizations within a limited period. During the Preparation Study for the “Project for Support on Establishment of the Programs for O&M in NIA Technical Cooperation Project” in 2011, experts from the Narita International Airport Corporation (NAA) conducted studies of the existing terminal and drafted the implementation plans encompassing detailed actions—a so-called “To-Do List” that covers about 300 items—and submitted them to ACV. The items include the decision of management concept, mid-term business plan, ~~contract agreement with the airline companies and tenants~~, operation plans and training on the use of equipment, determining airport users fee. Enhancing the effectiveness of these as well as monitoring the progress management in a centralized manner, the T2 Start Up and Commissioning Preparatory Committee, which consists of the stakeholders of both countries, was established based on a mutual agreement.

The committee had seven meetings between April 2012 and June 2013. Under this committee, Japanese and Vietnamese experts formulated and approved action plans to carry out preparations to ensure a smooth commissioning of T2, as shown in Figure 11, referring to the case studies from NAA. The proposed agenda for the training were the extensive experiences and expertise in the technical aspects of the terminal operation and the soft components. The technical aspect of terminal operation includes the IT & communication equipment, special equipment, electrical equipment, mechanical equipment, and the soft components are the expansion of the non-aviation business, CS, security measures, tenant management, etc. (Table 9). These ensured the sustainable operation.



Source: MLIT, Note: CIQ: Customs, Immigration, Quarantine

**Figure 11 Noi Bai T2 Project Operation Preparation Framework**

**Table 9 The Major Technical Trainings Provided by the JICA**

Period/ Provider	Contents
2011–2014	On-site training in Japan Training on technical and policy issues by the NAA and Kansai International Airport (KIA)
2012–2013 NAA	Dispatch of Experts for New Terminal Management Support (Short-Term) · Airport management and O&M management for terminal facilities and equipment

	<ul style="list-style-type: none"> <li>• Institutional building for the new terminal facilities</li> <li>• Planning for the sound financial management, proper pricing policies, etc.</li> </ul>
2012–2015	Dispatch of an Expert for Aviation Policy and Fuel System (Long-Term by MLIT)
2013–2014 NAA	Project for Support on Establishment of the Programs for O&M in NIA Technical Cooperation Project (Terminal Management) <ul style="list-style-type: none"> <li>• Customer Satisfaction Improvement, Terminal Facility Management</li> <li>• Security Management, Terminal Operation Center</li> <li>• IT/Communication Equipment, Special Equipment/ Electricity, Manufacturing Facility</li> </ul>
2014–2015 KIA	Project for Support on Establishment of the Programs for O&M in NIA Technical Cooperation Project (Fuel Hydrant System) <ul style="list-style-type: none"> <li>• Aircraft refuelling facility operation technology, Operational Inspection / Security, Monitoring Control System</li> <li>• Laboratory Quality Management and Electricity / Machinery O&amp;M</li> </ul>
Source: Documents provided by the JICA Experts	

### 3.4.2 Technical Aspects of Operation and Maintenance

Simultaneously with the new T2 construction, an O&M team was established which received comprehensive technical assistance from JICA, and subsequently contributed to the human resource development of ACV. The core staff went to Japan for field training, attended in-country series of training by the dispatched Japanese experts, learned and understood various technical aspects and the O&M procedures, and prepared for the first day of operations of the terminal. When FHS first operated in Vietnam, ACV received support for the after-sales service of the supplier manufacturer. There was no major accident recorded since operations began so far, demonstrating that NIA acquired sufficient technical capabilities.

### 3.4.3 Financial Aspects of Operation and Maintenance

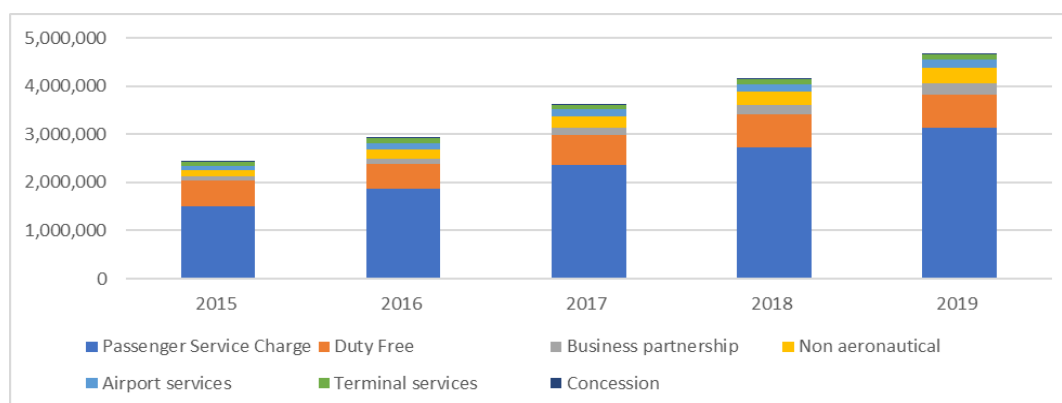
Regarding securing the budget for the future operation and maintenance of ACV, net income has increased in the past four years after T2 became operational, as shown in Table 10. T2 maintenance costs, in particular, were approximately 760 million yen from 2015 to 2019. The overhauling plan is in 10 years. Although, the operation revenue of NIA decreased drastically with the limited operations due to COVID-19. ACV, in fact, plans to start the expansion of T2 as planned. The NAA experts assigned under the Project recommended having a sound financial basis by diversifying and increasing the non-aeronautical revenue sources, such as applying tenant management techniques for higher earnings. The focus was on the extensive increase in revenue from Duty-Free and non-aeronautical sources, more than the rate of increase of passengers, and that materialized as shown in Figure 12.

**Table 10 Cashflow of the ACV**

Unit: VND million

	2016	2017	2018	2019
<b>Total Revenue</b>	10,690,586	13,830,215	16,123,161	18,328,552
Total Cost of Revenue,	6,590,039	8,182,345	8,295,605	8,994,924
Gross Profit	4,100,547	5,647,870	7,827,556	9,333,628
<b>Total Operating Expenses</b>	6,952,154	8,511,870	8,603,411	8,180,037
<b>Operating Income</b>	3,738,432	5,318,345	7,519,749	10,148,515
<b>Other income/expense</b>	-37,991	25,129	98,426	7,272
<b>Net Income Before Taxes</b>	3,700,441	5,343,474	7,618,176	10,155,787
Provision for Income Taxes	814,724	1,221,754	1,432,822	1,941,631
<b>Net Income After Taxes</b>	2,885,717	4,121,720	6,185,354	8,214,157

Source: ACV Financial Summary Report



Source: ACV

**Figure 12 The Revenue Sources of the Noi Bai International Airport T2**

#### 3.4.4 Status of Operation and Maintenance

The installed equipment and facilities are being well-maintained, contacting the suppliers when necessary, and are in good condition; thus, no particular difficulties were observed in the O&M of T2.

No major problems have been observed in the institutional / organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

This project is intended to respond appropriately to the sharp rise in air passenger demand and enhance convenience and safety by building a second passenger terminal for the use of

international passengers at Noi Bai International Airport in Vietnam's capital, Hanoi, thereby contributing to the promotion of Vietnam's economic growth and its international competitiveness. At the time of appraisal, the Five-Year Socio-Economic Development Plan (2001–2005) states the need for investment in modern aviation transport. Constructing a second passenger terminal in the Noi Bai International Airport has been one of the most essential policies to sustain Vietnam's economic growth. This project complies with the policies and the development needs as the plan to further expand the terminal building at Noi Bai International Airport has been under consideration during ex-post evaluation. It corresponds with the Country Assistance policy of Japan for Vietnam, which states "the promotion of economic growth and strengthening international competitiveness." Hence, the relevance of the project is high. The main output complies with the planned level and the project cost was within the plan. Due to the extended preparation period, the overall project period was slightly longer than planned, though the construction period has shortened considerably. The efficiency of the project is fair. The project has contributed to the significant increase in international passengers. Additionally, the Fuel Hydrant System (FHS), which first became operational in Vietnam, contributes to the competitiveness as well as safety of the Noi Bai International Airport. The intended impacts, such as economic growth, increase in Hanoi City tourists, etc., were fully demonstrated. The effectiveness and impacts of the project are high, even its sustainability when there are no significant problems in terms of institutional/organizational, technical, financial aspects, and status. In light of such findings, this project is evaluated to be highly satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

#### Improvement of the Transportation Service at the Terminal

Congestion in front of the terminal could not be observed at the time of the ex-post evaluation because of many flight cancellations due to COVID-19. However, the need to reduce congestion was specified in the Questionnaire Survey for the Tourism Industry. The concerns over increased ride-hailing service cars as well as inconvenience of bus passengers were expressed by the tourism-related companies. Police regulations should be strengthened, although they have yet to be introduced. In response to the demand for bus routes, measures such as allocating a space for boarding / alighting points in front of the terminal could possibly be adjusted. It is recommended for ACV to accommodate these improvement measures.

### 4.2.2 Recommendations to JICA

None

## 4.3 Lessons Learned

Successful opening of the terminal underpinned by elaborate preparations based on the Commissioning Preparatory Committee.

At the project commencement, Japanese stakeholders advised a strategy to apply CS training and increase non-aeronautical revenues along with the proper operation of equipment and facilities. These boosted competitiveness in terms of finance and convenience and raised the ranking in the World Airport Awards. The multiple outcomes were based on the careful planning of the T2 Start Up and Commissioning Preparatory Committee. It demonstrates the importance of strategic preparation through technical assistance relevant to this project for the sake of further enhancing the outcome of infrastructure development.

In addition, NAA, which played a core role in technical assistance during the project, has been in regular discussions with ACV even after the operation. Subsequently, these companies exchanged memorandums on an inter-airport agreement in 2017. The memorandums focused on strengthening the strategic network, stimulating air-transport demand by promoting tourism, and the technical cooperation in airport operation. Consistent involvement of the Japanese experts led to medium- to long-term business development, which ultimately contributes to the sustainable development of this project.

#### Impact on simultaneous operation of the three projects

The project was formally inaugurated in January 2015 together with “Nhat Tan Bridge (Vietnam-Japan Friendship Bridge)” and “the NIA to Nhat Tan Bridge Connecting Road,” which significantly improved accessibility. Accessing Hoan Kiem Lake in the city area from NIA used to take 60 to 90 minutes, according to the 2011 data, since traffic congestion used to be persistent when accessing from the Thang Long Bridge to NIA. Using the Nhat Tan Bridge and the Connecting Road significantly reduces travel time to 16–22 minutes. With the rapid increase in aviation demand, the number of vehicles accessing NIA has also rapidly increased. Without the Nhat Tan Bridge and Connecting Road, congestion in Hanoi would have been even obviously worse. It was significant that the three projects were operational concurrently.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
Terminal facilities	55.4 ha	58.22 ha
Construction Area (ha)	139,200 m <sup>2</sup> , 4 floors above ground, 1st basement floor	Same as planned
Civil Works	Viaducts, roads, parking lots, etc.	Partially revised (adjustment for the height of the road to the Connecting Road, and for the number of parking lots in response to the reviewed demand.
Airport Special Facilities	Baggage handling systems, passenger boarding bridge, and security systems	Same as planned except omission of two CT scanners and Revenue Management Systems as per the original scope of project
Sewage Treatment Plant	Capacity 2,600 m <sup>3</sup> /day	Same as planned
Fuel Hydrant Systems	4,000 kl × 4 Tanks Hydrant pits 22 for aircraft stands	Same as planned
Consulting Services	International Experts: 437.9 MM National Experts: 587 MM Supporting Staff: 49 8MM	International Experts: 471.53 MM National Experts: 636.13 MM Supporting Staff: 505.97 MM
2. Project Period	March 2010–December 2016 (81 months)	March 2010–December 2016 (82 months)
3. Project Cost		
Amount Paid in Foreign Currency	JPY 59,252 million	JPY 33,543 million
Amount Paid in Local Currency	JPY 16,880 million (VND 3,513,738 million)	JPY 35,128 million (VND 7,189,319 million)
Total	JPY 76,133 million	JPY 67,671 million
ODA Loan Portion	JPY 59,252 million	JPY 55,246 million
Exchange Rate	VND 1 = JPY 0.004804 (as of March 2010)	VND 1 = JPY 0.004566 (average between March 2010 and December 2016)
4. Final Disbursement	June 2020	

India

FY2019 Ex-Post Evaluation of Japanese ODA Loan

“Andhra Pradesh and Telangana Irrigation and Livelihood Improvement Project

External Evaluator: Nobuko Shimomura, Almec Corporation

## **0. Summary**

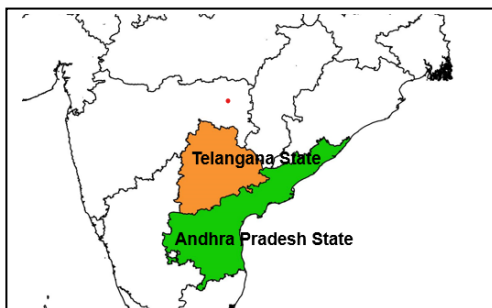
The objective of this project is to raise agricultural productivity and water management capacities through the construction of minor irrigation facilities, rehabilitation of medium irrigation facilities<sup>1</sup>, capacity building of operation and maintenance setup, and spread of farming technologies, in the states of Andhra Pradesh (AP) and Telangana (TS) in southern India, thereby contributing to the increase of farm income and the alleviation of poverty. Due to the improved water efficiency by transforming the rain-fed area to irrigated and renovating the existing facilities resources, the project relevance is high as project implementation was well in line with India's development policy and development needs, as well as with the ODA policy of Japan. The project cost was within the plan, but the project period was significantly longer than planned. Setting up the implementing framework after the bifurcation of AP state in 2014 took a while and longer in the land acquisition. The efficiency of the project is fair as the project period was significantly longer than planned. The targets in regard to irrigated area as well as crop yields had been achieved. On the other hand, the confirmed increase of household income was due to the fishery and livestock activities in the target areas, besides agriculture. The livelihood of target area of minor irrigation in TS where tribal communities and other disadvantaged communities reside were originally depend on rain-fed agriculture, in particular has considerably improved. Therefore, the effectiveness and impacts of the project are high since the planned effectiveness was achieved through project implementation. Regarding project sustainability, the technical aspect, and current status have no significant issues. However, there are issues with institutional / organizational aspect as well as finance since the need to support for beneficiary farmers as well as to secure and promptly disburse sustainable maintenance costs are confirmed. The sustainability of the project effects is, therefore, fair.

All things considered; the evaluation of this project is satisfactory.

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<sup>1</sup> Minor irrigation is defined as up to 2,000 ha, while medium irrigation is from 2,000 ha to 10,000 ha

## 1. Project Description



Project locations



Renovated medium irrigation facility

### 1.1 Background

In India, the agricultural sector accounts for 13.9% of GDP (as of 2013 - 2014), and roughly 46% of the land area is dedicated to farmland use. Regarding population, nearly 70% live in rural areas with about half the working population engaged in agriculture<sup>2</sup>. These figures demonstrate the importance of agriculture and rural development in achieving socio-economic balance and reducing poverty in India.

Nevertheless, seasonal fluctuations that affect the rivers or occurrence rainfall strongly influence the production of crops. The country has also become susceptible to climate change in recent years, from uneven distribution of rainfall or oscillate between flood and drought due to weather instability. In light of this, from the viewpoint of food security, stabilizing and boosting the production of crops is essential by utilizing efficient use of the available water resources. To achieve this goal, the Government of India has focused on large-scale irrigation development over the years, achieving a 49% irrigation rate for all arable land.<sup>3</sup> In the 10th 5-Year Plan (April 2002 – March 2007), the Government of India advocates four priority issues: (1) increase public funding for irrigation facilities and water resource management; (2) rural infrastructure development (local roads, etc.); (3) development and extension of agricultural technologies; and (4) crop diversification. Furthermore, in the Common Minimum Program (May 2004), irrigation is one of the designated top priority areas.

Andhra Pradesh (hereafter AP) and Telangana (hereafter TS) bifurcated in 2014, both are located in southern India with more than 50% of crop land are rain-fed. In such condition, there have been frequent flood and drought<sup>4</sup>. The net sown areas of AP and TS are 8.05 million ha, and 4.66 million ha, respectively. The employment rate of AP and TS in the agriculture sector of the total population, meanwhile, are 62% and 55%, respectively, while the farm land has been small

<sup>2</sup> Ministry of Agriculture, Department of Agriculture & Cooperation, and Directorate of Economics & Statistics, 2014.

<sup>3</sup> Same as above.

<sup>4</sup> Heatwave causes death, especially among the poor, during the dry season. In May 2015, for example, the most severe heatwave hit in two decades resulted in approximately 1,800 and 600 victims in AP and TS respectively.



as to approximately less than one ha<sup>5</sup>. Livelihood support for the Scheduled Tribe<sup>6</sup> (ST) population in the TS, which accounts for 9.34%<sup>7</sup> of the total population, has been one of the most-prioritized policies of the TS Government after the bifurcation. Modernizing agriculture from rain-fed to irrigated farmland was highly needed.

Furthermore, the existing irrigation facilities are declining and water cannot reach the end of the facilities, making stable agricultural production difficult. AP, at the time of the project appraisal, was a state advanced in irrigation sector reform that focuses on improving management capacities for irrigation facilities. By promoting this reform through strengthening the capacities of Water Users' Associations (WUA), it may be anticipated that this project would become a model for other states.

## 1.2 Project Outline

The objective of this project is to raise agricultural productivity and water management capacities through the construction of minor irrigation facilities, rehabilitation of medium irrigation facilities, capacity building of operation and maintenance setup, and spread of farming technologies, in the states of Andhra Pradesh(AP) and Telangana (TS) in southern India, thereby contributing to the increase of farm income and the alleviation of poverty.

Loan Approved Amount/ Disbursed Amount	23,974 million yen / 15,129 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2007 / March 2007
Terms and Conditions	Interest Rate 1.3% Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement General Untied
Borrower / Executing Agencies	President of India / Water Resources Department, Government of Andhra Pradesh (WRD-AP), Irrigation and Command Area Development, Government of Telangana (I&CAD-TG).

<sup>5</sup> *Initiative in Irrigation Sector*, Water Resource Department, Government of Andhra Pradesh, *Telangana Socio Economic Outlook 2020*

<sup>6</sup> Scheduled Tribes, who reside in the mountainous region, were officially designated groups of people in the Constitution of India in 1935. They receive preferential treatment since their livelihoods are under-developed. The castes considered untouchable, also called Scheduled Caste (SC), are beneficiaries of the project.

<sup>7</sup> Telangana Tribal Welfare Department mentioned that the share of ST was approximately 7% in the former AP state prior to bifurcation based on the Census 2011, thus, the share of ST in TS is higher. (<https://tstribalwelfare.cgg.gov.in/mainPage.do>, confirmed in December 2020)

Project Completion	July 2017
Target Area	Andhra Pradesh and Telangana States
Main Contractor(s) (Over 1 billion yen)	M/S Sri Satya Sai Infrastructures Pvt. LTD. (India) M/S Sai Datta Constructions (India) M/S TBPR Infra Projects Pvt. LTD. (India)
Main Consultant(s) (Over 100 million yen)	Nippon Koei (Japan)
Related Studies (Feasibility Studies, etc.)	Special Assistance for Project Formation (SAPROF) for Andhra Pradesh Irrigation and Livelihood Improvement Project (October 2006, JICA)
Related Projects	<p><b>【ODA Loan】</b></p> <ul style="list-style-type: none"> <li>• Kurnool-Cuddapah Canal Modernization Project (I) (II)(January 1996 - May 2007)</li> <li>• Andhra Pradesh Irrigation and Livelihood Improvement Project (II) (December 2017- December 2024)</li> </ul> <p><b>【Other Organisation】</b></p> <p>World Bank: Water Sector Improvement Project (2010~2018)</p>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Nobuko Shimomura, Almec Corporation

### 2.2 Duration of Evaluation Study

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

Duration of the Study: December 2019 – January 2021

Duration of the Study by the National Consultant: April 2020 – January 2021

### 2.3 Constraints during the Evaluation Study

When the COVID-19 pandemic spread worldwide, the Evaluator was not able to do the Field Study. The National Consultants conducted the interview survey to the implementing agencies and site survey to confirm the effectiveness and impact of the output. Movements across states have been restricted since April 2020 and, even with relaxed restrictions, the site external evaluator adopted precautionary measures to change the target of the field survey. Since the state headquarters of the respective implementing agencies and offices of the target districts have been working remotely, setting up interviews with others was difficult. The interview with the central

government for the implementation budget was even abandoned. Furthermore, the capacity building activities of the project were almost complete before the bifurcation in 2014. The staff assigned from the implementing agency has since been replaced, so only a limited number of cases at that time could be confirmed.

### **3. Results of the Evaluation (Overall Rating: B<sup>8</sup>)**

#### 3.1 Relevance (Rating: ③<sup>9</sup>)

##### 3.1.1 Consistency with the Development Plan of India

Since 1951, India has been formulating five-year plans aiming to achieve food self-sufficiency, improve the lives of its citizens, and provide stability. At the time of appraisal, its 10th 5-Year Plan (April 2002 – March 2007) of India advocated; (1) increasing public funding on irrigation facilities and water resource management, (2) development of rural infrastructure (local roads, etc.), (3) development and extension of agricultural technologies, and (4) crop diversification.

The 12th Five-Year Plan for 2012-onwards sets an average real GDP growth rate target of 4% for the agricultural sector. Important challenges pointed out in realizing this are the effective utilization of water resources, popularizing sustainable technology, responding to climate change, and improving productivity. The priority is improving the productivity of irrigation agriculture as a basis to utilize water resources efficiently. During the ex-post evaluation of this project, NITI Aayog<sup>10</sup> prepared “Doubling Farmers’ Income (2017) “ that focused on having a strong programme for agricultural transformation. In the state level, Vision 2029 by AP, Mission Kakatiya by TS elaborated the vision to develop new tanks, renovate irrigation facilities, and identify and improve malfunctioning minor irrigation facilities.

Hence, the Project was consistent with the development policies of both states from the appraisal in 2006 to completion in 2017.

##### 3.1.2 Consistency with the Development Needs of India

As shown in Table 1, the growth rates of GRDP of both states exceeded over 7% comparing between the 2011–2012 and 2016–2017 fiscal years. The significance of agriculture, forestry and fishing especially high for AP, which represents 25% of the GRDP, and its annual growth rate was as high as over 8%. On the other hand, the growth rate of agriculture, forestry and fishing in TS was relatively small as 1.5%, as the capital of TS, Hyderabad is one of the hubs of IT export. However, the employment of agriculture sector was as high as 55% in TS<sup>11</sup> at the time of ex-post evaluation. The rural population share of AP was 67% (2011)<sup>12</sup> prior to the bifurcation.

<sup>8</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>9</sup> ③: High, ②: Fair, ①: Low

<sup>10</sup> National Institution for Transforming India. Aayog is Policy Commission in Hindi.

<sup>11</sup> *Telangana Socio Economic Outlook 2020*

<sup>12</sup> *The Handbook of Statistics on Indian States 2018 – 2019*

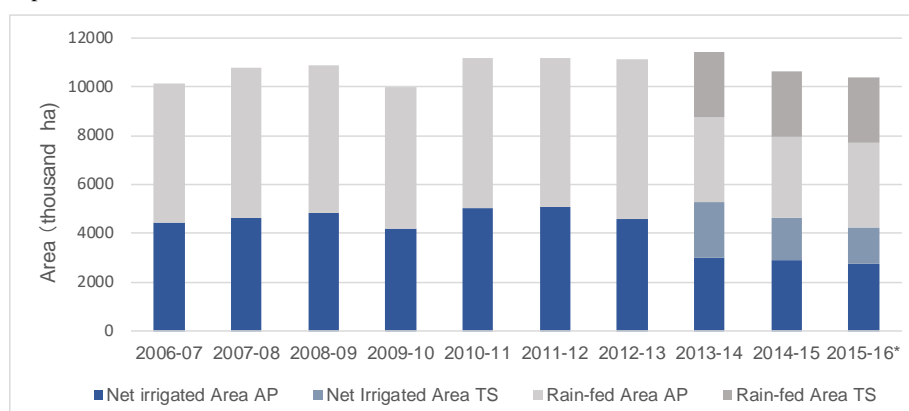
**Table 1 Gross State Domestic Product by economic activity at constant (2011 – 2012) prices, its share of agriculture, forestry and fishing, population, of AP and TS**

Item	State	2011–2012	2016–2017	CAGR
Gross State Domestic Product (Million Rs)	AP	3,794,015.8	5,470,214.5	7.6%
	TS	3,594,326.5	5,112,863.3	7.3%
Agriculture, forestry and fishing (Million Rs)	AP	940,080.5	1,388,332.9	8.1%
	TS	546,148.8	587,191.8	1.5%
Share of Agriculture Sector of GDP	AP	24.78%	25.38%	
	TS	15.19%	11.48%	
Population (Thousand)	AP	49,275	50,743	0.59%
	TS	35,682	37,505	1.00%

Source: The Handbook of Statistics on Indian States 2018 – 2019, 2019, Reserve Bank of India 2019

Note: Compound annual growth rate (CAGR) was estimated by the Evaluator.

Rs: Indian Rupee



Source: The Handbook of Statistics on Indian States 2018 – 2019, 2019, Reserve Bank of India 2019 originally from Ministry of Agriculture and Farmers Welfare, Government of India.

**Figure 1 Shift in net irrigated area of AP and TS (After bifurcation in 2014)**

The irrigated area in the total sown area from 2006 to 2015 has barely increased in both states, as shown in Figure 1. When irrigation facilities become too old to secure water, the payment of water user fees becomes increasingly difficult, and maintenance of irrigated land is impractical. There is a need for new irrigation facilities and rehabilitation for poorly maintained facilities as irrigated areas are not sufficient. Subsequently, the farmers, NGOs, and the relevant agricultural, livestock, and fisheries departments need to collaborate to secure water for agriculture and to improve livelihoods, which is in line with the development needs of both states at the time of appraisal and project completion.

### 3.1.3 Consistency with Japan’s ODA Policy

At the time of the project appraisal, “Rural Development Benefiting the Poor” was the priority sector in Japan’s Country Assistance Policy for India. The Country Assistance Program

(2006) set irrigation and flood-control as priorities. The objective of the project is consistent with both policies.

To conclude, this project is highly relevant to the development plan and development needs of the country, as well as Japan’s ODA policy. Therefore, its relevance is high.

### 3.2 Efficiency (Rating:②)

#### 3.2.1 Project Outputs

The plan versus actual of the outputs of this project are shown in Table 2.

**Table 2 The outputs of this project (Plan and Actual)**

Plan	Actual
(1) New construction of 59 minor irrigation facilities and rehabilitation of 11 medium irrigation facilities (irrigation tanks and canals)	(1) New construction 48 minor irrigation facilities and rehabilitation of 20 medium irrigation facilities (irrigation tanks and canals)
(2) Formation and capacity building of Water Users’ Associations (including farming assistance and assistance for the poor)	(2) Same as Planned
(3) Assistance with sector reform (capacity building of Water Users’ Associations at the state level and strengthening of departments and organizations related to irrigation)	(3) Same as Planned.
(4) Consulting Services Scope of Services: detailed design, bidding assistance, construction management, etc.	(4) Consulting Services International Consultant Service was terminated after the bifurcation in 2014.

Source: Documents provided by JICA and Implementing Agencies

Regarding the new construction and rehabilitation of irrigation facilities (tanks and canals), the minor irrigation facilities faced difficulties due to land acquisition. On the other hand, other medium irrigation facilities needed rehabilitation in addition to the originally planned. Eleven subprojects for new minor irrigation facilities were cancelled out of the 59 originally planned, and the number of subprojects for the rehabilitation of medium irrigation facilities increased from 11 to 20 after the start of the project. Without the revisions, the project would have required more time for land acquisition, extending the project period and making it difficult to expand the beneficiary area. In light of the project objectives, the above adjustments are reasonable and have had a positive effect on the realization of the project impact.

The activities to form and strengthen WUA included the following three aspects related to the maintenance of irrigation facilities and agricultural technology. A total of 950 farmers from AP and 974 farmers from TS participated in the project<sup>13</sup>. Although it was not possible to

<sup>13</sup> Responses from the Implementing Agencies.

directly confirm the impact of the training during the site survey, there were some examples of diversification of agriculture and use of agricultural methods to increase yield.

- 1) Awareness raising regarding the role of WUA (water management, finance, monitoring) and participation in the exposure visit financed by the project (JICA).
- 2) Preparation for the Participatory Action Plan Preparation (PAP), water management by crops, financial plan, collaboration with the implementing agencies, WUA office establishment, and mitigation measures for the conflict on right water use.
- 3) Implementing the Farmer Field School, improving livelihoods through soil improvement and cultivation of vegetables and other crops in backyards.

As part of the actual support in the farming and poverty alleviation, there were also activities to form and strengthen water users' associations. Farmers prepared land and built facilities, such as warehouses, offices, dry land, and aquaculture ponds, to support livelihood improvement activities. Such activities stagnated in TS due to the condition that beneficiaries shoulder the 20% costs and insufficient budget allocation for WUA activities due to the budget shortage for irrigation works resulting from inflation. At the same time, AP facilities were also found incomplete despite approval in the five medium irrigation subprojects. On the other hand, the offices and logistics facilities serving the WUA, logistics facilities, post-harvest facilities, and aquaculture ponds conducive to associations were confirmed to be in service and utilized in the beneficiary areas after construction under the project at the time of ex-post evaluation (Table 3).

**Table 3 Samples of the facilities built for capacity building of the WUA livelihood improvement programme conducted under the project**

Name of subprojects	District (AP State)	Godowns / Office buildings		Drying yards / Fish ponds	
		Approved	Completed	Approved	Completed
Gajuladinne (Medium)	Kumool	12	10	12	11
Swarnamukhi (Medium)	Chitoor	6	1	6	3
Gandipalem (Medium)	Nellore	17	0	17	0
Lower Sagileru (Medium)	Kadapa	6	0	6	0
G.Mekapadu (Minor)	Prakasam	1	0	1	0

Source: Implementing Agencies

There were various forms of training on sector reform, such as strengthening the WUA, related organisation of irrigation as elaborated in “3.4 Sustainability”.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost ③

In contrast with the total project cost of 28,672 million yen (of which the ODA loans

covered 23,974 million yen) planned at the time of the appraisal, the actual project cost was 18,422 million yen (of which the ODA loans covered 15,129 million yen), which was below the plan (at 64 %). The reasons for the actual project cost being lower than planned include the depreciation of the Indian rupee against the Japanese yen and that the contract for international consultants was not extended after the bifurcation in 2014.

**Table 4 Project cost**

Unit	Plan			Actual			
	Project Cost	JICA	Government of India		Project Cost	JICA	Government of India
Million Rs	11,377	9,513	1,864	AP	2,913	2,578	336
				TS	8,128	6,490	1,638
				Total	11,041	9,068	1,974
Million Yen	28,672	23,974	4,698	Total	18,422	15,129	3,293

Source: Documents provided by JICA and Implementing Agencies

Exchange Rate; Rs. 1.0 = Yen 2.52 (appraisal period in 2006), Rs. 1.0 = Yen 1.67 (ex-post evaluation in 2020).

### 3.2.2.2 Project Period ①

The planned project period during the appraisal was 73 months (from March 2007 to March 2013), while the actual project period was 125 months (from March 2007 to completion in July 2017). The actual project period was at 171%, far exceeding the planned period. The main reason for the extended period is the delay in land acquisition for the new minor irrigation, as previously mentioned. In addition, when the bifurcation of AP state in 2014 delayed the implementation work, an increase in compensation became mandatory per new land acquisition act in 2014, namely the Right to Fair Compensation and Transparency in Land Acquisition, amended in the same year to compensate the landowners generously and to facilitate land acquisition.

### 3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

The Financial Internal Rate of Return (FIRR) was not calculated for this project at the time of appraisal, but the Economic Internal Rate of Return (EIRR) was at approximately 16.9%, based on the project cost, excluding taxes, operation and maintenance costs, and the increase in agricultural production as benefits, assuming a 10-year construction period and 30-year project life. The EIRR was not recalculated during the ex-post evaluation, given that the basis for comparison was different because of the changed cropping pattern during the project implementation period. Also, the data needed for recalculation was unavailable. However, it was expected higher than the target value of the EIRR estimated at the time of the appraisal,

because the project cost was lower than planned, the significant increase in the beneficiary area, and the increase in yield were confirmed.

Although the project cost was within the plan, the project period exceeded the plan; therefore, efficiency of the project is fair.

### 3.3 Effectiveness and Impacts<sup>14</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Among the operational and effectiveness indicators set for the appraisal, those directly related to the improvement of agricultural productivity and water management capacity in the Project area are (i) area benefited by the project, (ii) cultivated area by crop, (iii) water use charge collection rate, (iv) production output by major crops, (v) unit yield by major crops, and (vi) gross farm income per unit (Rs/year/unit). Since the Department of Agriculture oversees agriculture production and productivity of major crops, sufficient data for evaluation were not collected. Therefore, the data collected from 20 sites by site survey of the Evaluator were used<sup>15</sup>(Table 5). The item (6) which is related to impact has been discussed in section 3.3.2.

In addition to the questionnaire-based interviews with the implementing agencies in the command areas of the target subprojects, focus group discussions were also conducted with representatives of water users' groups and other users<sup>16</sup> (including women's groups). The number of participants was 315 in AP and 526 in TS. The following topics were reviewed: farm management support to strengthen the capacity of water users, other activities implemented under the poverty alleviation program, collection of water user fees, crop diversification, introduction of new crops and technologies, and changes in yield and income.

The command area of the minor irrigation and medium irrigation subprojects varies in size. The average size of the command area is 300 ha and 6,700 ha respectively for minor and medium irrigation systems. More than half of the farmers own less than 0.8 ha of farmland, and many are small-scale farmers. The proportions of tenant farmers to the total command farmers was 12% of in the minor irrigation and 23% in the medium irrigation.

#### (1) Area benefited by the project

The planned benefiting project area was 105,522 ha through the formation of new minor irrigation and rehabilitation of medium irrigation systems. The total area benefited was 134,248 ha (with 16,073 ha from 48 new minor irrigation projects and 118,175 ha from 20 rehabilitated

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<sup>14</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

<sup>15</sup> A total of 20 subprojects, 7 from AP (1 minor irrigation and 6 medium-scale irrigation) and 13 from TS (9 minor irrigation and 4 medium-scale irrigation), were surveyed between June and September 2020. A balance was taken into consideration to avoid concentrating on subprojects in the same districts, but where the location was difficult to reach due to the COVID-19 pandemic, it was abandoned.

<sup>16</sup> Some of the WUAs were already inactive, in which case the people involved were interviewed.



medium irrigation projects), which is about 127% of the planned area.

**Table 5 Project indicators : area benefited by the project**

	Area benefited by New Minor Irrigation and Renovated Medium Irrigation (ha)	Number of Subprojects	
		New Minor Irrigation	Renovated Medium Irrigation
Baseline (2005)	66,740		
Target (2 years after completion)	105,522	59	11
Actual (2020)	134,248	48	20
AP	49,412	1	9
TS	84,836	47	11

Source: Documents provided by JICA and the implementing agencies

(2) Cultivated Area by Crops

Since data from TS are limited, and crops in the benefiting areas changed after the irrigation in both states, it was impossible to compare them with the target values.

(3) Collection Rate of Water Charge

Water tax collection, at present, in the two states is widely varied. TS has changed its policy and discontinued water fee collection from the farmers finally in 2018. On the other hand, AP has continued with water tax collection<sup>17</sup>. According to the site survey, farmers were reluctant to pay water charges due to inadequate water supply. The implementing agency in AP reported that the average water user fee collection rate in the project area was about 20%, but in some areas were approximately 80% tax collection. Although the target water user fee collection rate was 70%, it was incomparable because TS does not currently collect the fee, and AP did not achieve the target.

(4) Production volume of major crops

As for the output of agricultural products, directly comparing it with the original targets due to the change in the scope of this project is impossible. There was, however, a remarkable increase in rice and cotton and confirmed crop diversification in the site survey. Accordingly, it was confirmed that once water for agriculture was secured through irrigation facilities, there was a shift to crops with higher commercial value. The main crops grown before the project were rice, cotton, soybeans, peanuts, sorghum, sesame, and bean. After the project, the crops may have been diversified since the number of farmers who cultivated vegetables, turmeric, fruits (mangoes), onions, and other commodity crops in addition to rice and cotton have increased.

<sup>17</sup> Water tax was levied as Rs 200 per acre for medium irrigation, and Rs 100 per acre for minor irrigation by the AP Water Tax Act.

**Table 6 Collection rate of water charge , cultivated area by crops, production volume of major crops, yield of major crops, gross annual average farm income in the project area**

Indicators	Baseline(2005)		Target (Year 2015, 2 years after completion)		AP Actual Data		TS Actual Data	
	Minor irrigation	Medium Irrigation	Minor irrigation	Medium Irrigation	Minor irrigation	Medium Irrigation	Minor irrigation	Medium Irrigation
<b>Collection Rate of Water Charge (%)</b>		5	70	70	20% to 80% depending on the subproject sites		No fees are collected	
<b>Cultivated Area by Crops (ha) (Data on TS are partial)</b>								
Paddy	3,563	38,552	7,126	52,894	45	35,849	660	14,698
Cotton	4,455	392	8,910	756	No cultivation in project area	812	4,858	5,427
Groundnuts	1,781	392	3,561	1,134		3,282	876	0
Jowar	3,252	3,136	6,504	756		735	0	0
Maize	1,781	784	3,561	1,889		2,062	0	368
Chili	1,781	587	3,561	1,323		1,090	53	0
Other	2,985	5,472	5,970	12,272		65	848	2,301
<b>Production volume of major crops (ton/year) (Data on TS are partial) *</b>								
Paddy	5,345	57,828	22,091	163,972	260.1	207,058	3,812	84,893
Cotton	1,114	98	3,564	302	No cultivation in project area	1,796	10,745	12,004
Groundnuts	890	196	3,170	1,010		6,560	1,751	0
Jowar	1,626	1,568	6,700	779		832	0	0
Maize	1,781	784	11,186	5,932		14,599	0	2,605
Chili	1,781	587	11,395	4,234		2,238	109	0
Other (Ginger, Tomato, etc.) (Data on AP only)	315	3,920	3,774	56,670		270.4	3,528	9,573
<b>Yield of major crops per unit area (ton/ha)(Actual values of TS are calculated from site survey outputs)*</b>								
Paddy	1.50	1.50	3.10	3.10	5.78	5.78	6.04	5.9
Cotton	0.25	0.25	0.40	0.40	No cultivation in project area	2.19	3.19	4.54
Groundnuts	0.50	1.50	0.89	0.89		2.00	1.91	2.45
Jowar	0.50	0.50	1.03	1.03		1.13	2.37	4.63
Maize	1.00	1.00	3.14	3.14		7.08	4.36	5.99
Chili	1.00	1.00	3.20	3.20		2.10	-	2.45
<b>Gross annual average farm income* (Rs/ year/ household)</b>	12,692	12,692	22,000	22,300		23,678	92,733	34,310

Source: Documents provided by JICA and the implementing agencies

Note: As for the area planted by crop and the output by major crop (tons/year), the figures for TS are calculated based on 26 subprojects, reflecting only a part of 58 subprojects, and are not sufficient even as actual figures, so they are presented as reference figures. The yield of major crops per unit area and gross agricultural revenue per farmer was based on the data from the implementing agency in AP and calculated from the results of site surveys in TS.

(5) Yield of major crops per unit area (ton/ha)

There has been an increase in crop yields for all the crops in the site survey, though directly comparing it with the original targets is not possible due to the change in the scope of this project (Table 6). The increase in yields is twice the target and four times the baseline for paddy; 5 to 10 times the target for cotton; 1.5 to 2 times the target for maize. In particular, the increase in yield after the rehabilitation of medium irrigation is more pronounced than that of new minor irrigation.

The factors that led to the improved in crop yields include water availability, choice of seed varieties and better agronomic practices. The capacity building activities carried out during the project period have also played critical part in the yield increase. The content of the training (which were provided by NGOs) for the water users' association included agricultural technologies, such as the use of earthworms to convert organic waste into fertilizer, pest and soil management, and seedling management. In addition, demonstration farms were established to provide agricultural technology to farmers who have poorer skills to improve their livelihoods<sup>18</sup>. Demonstrations on SRI (The System of Rice Intensification)<sup>19</sup>, which is a water-saving rice cultivation method, have been confirmed. Although they have not been deployed on a large scale, they have contributed to an increase in the yield.



Pakala Medium Irrigation Facility: Reservoir, Renovated Water Sluice, and Buffaloo tamed by the Beneficiary farmers.

### 3.3.1.2 Qualitative Effects (Other Effects)

#### (1) Livelihood Improvement Activities (During the Project Implementation)

While the rehabilitation of medium irrigation was mechanized in the project, the construction of new minor irrigation facility required a lot of manual labour.<sup>20</sup> In these areas, farmers learned how to maintain and operate the irrigation system by participating in the construction, which encouraged them to involve the O&M in the future<sup>21</sup>.

#### (2) Livelihood Improvement Activities after Completion of the Construction

Supported by the Department of Fisheries, Fisherman groups that have started inland water fisheries and aquaculture using reservoirs have been identified in 12 out of the 20 subprojects. Livestock farming has become visibly active with improved water and fodder availability around the reservoirs and irrigation canals<sup>22</sup>. It is estimated that the NGOs hired by the project or the Department of Agriculture have reduced the cost of farm management and contributed to improving the livelihood by implementing a variety of water-saving agricultural techniques,

<sup>18</sup>Interview from the Consultant in charge of demonstration farms.

<sup>19</sup>Confirmed at Wyra Medium Irrigation Subproject.

<sup>20</sup> For example, employment opportunities of approximately 70,000 person-day in Konadmpet (TS) and 180,000 person- day in Jaggaram (TS) were provided.

<sup>21</sup> G Mekapadu Minor Irrigation subproject (AP), Kondampet Minor Irrigation subproject (TS)

<sup>22</sup> Due to the increase in fodder plants and trees, Konadmpet minor irrigation subproject (TS) and Zandaguda minor irrigation subproject (TS) have also seen an increase in milk production, and in Asifnihar medium irrigation subproject(TS) , there was a case that a dairy farm has been started, and employs approximately 30 people.

organic fertilizer production, and reduction of chemical fertilizer and pesticide use in the field<sup>23</sup>.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

The impact expected from the project has been set as "improvement of livelihoods of beneficiary farmers" which contribute to increase in agricultural income and poverty alleviation. These aspects are confirmed quantitatively and qualitatively.

#### (1) Quantitative Impact

In the site survey referred to in Section 3.3.1.1, Quantitative Effectiveness (Operational and Effectiveness Indicators) is measured in terms of the gross average farm income (Rs/year/unit) which was estimated based on the crop yields and the number of farmers (Table 6). In comparing with the target for 2015, with achievement in 2020 (i.e., at the time of the ex-post evaluation), the inflation rate of 3 – 4.5% for the five-year period<sup>24</sup> was taken into account. The target was well achieved for minor irrigation subprojects, and significantly exceeded the target for medium irrigation subprojects.

**Table 7 Overview of new economic opportunities for women after minor irrigation completed**

Economic activities started after the project completion	Number of women participated	Number of days employed / year	Annual / increased (Rs)
Aquaculture, Fish Marketing	8	180	32,143
Vegetable vending	69	300	103,107
Milk Production	179	276	31,571
Wage employment	1,155	215	56,250
Retail shop	53	300	77,125

Source: Implementing Agency of TS

Note: Interviewing the implementing agencies and the women groups in the site survey confirmed the number of women participating in economic activities.

In AP, the implementing agency reported that the income of tenant farmers increased by 40% and that of farmers with their own land increased by 50% at the site survey. The increase in household income was also due to various factors other than the project (i.e., market conditions of agricultural products and changes in off-farm income). The project has sufficiently played an important role to the increased income, although this impact cannot be solely attributable to the project.

Interviews with women's groups confirmed that the completion of minor irrigation facilities in areas that were dependent on rain-fed agriculture had improved the livelihoods of women (Table 7).

<sup>23</sup> In Gajuladinne medium irrigation subproject (AP), NGOs trained the farmers on agricultural diversification and water management, and in Asifnagar medium irrigation subproject (TS), the respondents said that training by the Department of Agriculture has been conducted on a regular basis. In Bhairavanithipa medium irrigation subproject (AP), the Department of Agriculture and Department of Fisheries provide technical assistance as a livelihood improvement activity.

<sup>24</sup> IMF - World Economic Outlook Databases (October 2020)

## (2) Qualitative Impact

The demand for daily agricultural labour has increased after the project so as employment opportunities with fishery, livestock, and retails. For instance, the average wage employment availability period in minor irrigation subproject areas in TS were less than half a year prior to the project, but it increased with the range being 20 days to 120 days per year based on the site survey. The figures varied from one subproject to other. Further, there was also increase in daily wage rates. The increase in daily wages is on an average Rs 70 for women and about Rs 130 per for men. Thus, the project has also contributed towards livelihoods enhancement of the poor and landless by increasing employment opportunities (Table 8). There were also cases where families who used to go other states for work stayed in the village for better wages and duration of employment.<sup>25</sup> Furthermore, the site survey demonstrated that seasonal migrant workers from other places in the same districts began to move in some subproject areas after the completion of irrigation facilities<sup>26</sup>. In addition, there is a case of a flourishing dairy industry due to an increase in grass availability for livestock. Minor irrigation facilities created under the project have also contributed to groundwater recharge according to the site survey and implementing agencies. This has resulted in increase of ground water level in bore wells and reducing the problem of drinking water<sup>27</sup>. It was reported that increased incomes have led to increased nutrition and education levels for children.

The percentages of Scheduled Castes (SC) and Scheduled Tribes (ST) to the total population in combined AP were 16.4% and 7%, respectively (Census 2011)<sup>28</sup>. According to the site survey of 20 subprojects, the percentage of ST farmers in the project areas was more than half (51.7%), especially in the minor irrigation subprojects. In the medium irrigation subprojects, the share of other backward classes<sup>29</sup> was high as 50 percent<sup>30</sup>. It has been observed in the site survey that the STs are making efforts to acquire more agricultural technologies and improve their livelihoods with the support of the Integrated Tribal Development Agency (ITDA)<sup>31</sup>.

**Table 8 Changes in wage opportunities in the sample minor irrigation projects**

Subproject	Wage employment availability period in the farm (days / year)	Wage rates (Rs / day)	
		Men	Women

<sup>25</sup> Based on the focus group discussion in the Tatiguda minor irrigation subproject.

<sup>26</sup> It was reported that in the Sathanla medium irrigation subproject (TS), there was an influx of laborers from other areas and land prices and wages increased significantly. The Asifnihar medium irrigation subproject (TS) has a labour inflow of thousands at harvest time.

<sup>27</sup> Chowpanguda minor irrigation subproject (TS), Gajuladinne medium irrigation subproject (AP)

<sup>28</sup> Census of India 2011, Office of the Registrar General & Census Commissioner, India

<sup>29</sup> Other Backward Class (OBC) is a collective term used by the Government of India to classify castes which are educationally or socially disadvantaged. It is one of several official classifications of the population of India, along with General Class, Scheduled Castes and Scheduled Tribes.

<sup>30</sup> The beneficiaries of minor irrigation subprojects Thatiguda and Chowpanguda are 100% ST, 63% ST and 27% SC in Kalegaon, 24% and 45% respectively in Kondampet. ST such as the Kolams and Gonds Lambada reside in this area.

<sup>31</sup> Those receiving the support of ITDA were confirmed in Jaggaram, Chowpanguda, Kalegaon, Kondampet, Thatiguda of minor irrigation subprojects in TS.

	Pre-project	Post project	Pre-project	Post project	Pre-project	Post project
Dignoor	120	140	200	300	100	200
Jaggaram	180	300	300	500	250	350
Kalegaon	120	180	250	300	150	200
Kondampet	120	240	300	500	200	300
Sonakasa	180	250	250	350	150	200
Zandaguda	150	210	250	400	150	200
Tatiguda	100	180	200	300	150	200

Source: The Result of the Site Survey

		
Cotton Field of the Benefited Area of the Rallapadu medium irrigation subproject	Weir of the Kalegoan, minor irrigation subproject: operation and maintenance in good condition by removing weeds	Beneficiary of Women Groups (ST: Gonds) in the Kalegeon minor irrigation subproject:

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the Natural Environment

Based on the JBIC Environmental Guidelines for ODA Loans (April 2002), this project was not applicable to susceptible sectors / characteristics and susceptible regions, thus, categorized as B. The preparation of an Environmental Impact Assessment (EIA) report for this project was not required under the Indian domestic law. However, when the land acquisition for minor irrigation facilities included forest areas, the Forest Department did not approve the land use change due to its high environmental impact. Consequently, the relevant subprojects were excluded from the project.

A monitoring report on the impact on biodiversity<sup>32</sup> was compiled, in 2014, during the project period. However, the regular monitoring activities of the environment were not confirmed during the ex-post evaluation. As previously discussed, livestock farming has flourished in the project areas with enhanced water and fodder availability. While this is a positive impact from the project, environmental concerns were identified from over grazing of pastures near the reservoirs. The destruction of pastures near the reservoirs had caused soil erosion and silted up the irrigation systems that, in turn, affected the storage capacity of irrigation schemes. Provision of LPG by the government has generally reduced the consumption of fuelwood, but some farmers continued its usage. As a consequence, the

<sup>32</sup> Biodiversity Assessment for Environmental Monitoring of Medium/Minor Irrigation Schemes in Andhra Pradesh 2014 Irrigation and CAD Department Government of Andhra Pradesh.

deterioration of catchment areas of the important river basins and irrigation projects were reported. Hence, the suggestion is to minimize negative environmental impacts by continuing to raise awareness of the importance of environmental considerations to farmers. At the same time, the report points out that the construction and rehabilitation of reservoirs has enriched biodiversity; and these reservoirs acted as support system for flora and fauna by providing food and water even during the dry season.

The project had hired the services of NGOs for capacity building and guidance to WUAs and the farmers. Support for NGOs has had a positive influence on pest and soil fertility management. The results of the site survey showed that using chemical fertilizers and pesticides in the project area tended to be lower when compared with their average use in the target districts (Table 9). Therefore, there are both positive and negative impacts on the natural environment.

**Table 9 Average use of fertilizers and pesticides in the 20 subprojects and district average**

State	Use of fertilizers (average. kgs/acre)			Use of pesticides (average. lit/acre)		
	Site survey area average	District average	Variation (%)	Site survey area average	District average	Variation (%)
TS	334.62	375.00	-12	2.34	6.48	-177
AP	235.71	435.71	-85	2.29	6.46	-183
Total	300 (average)	396.25	-32	2.32	6.48	-179

Source: Data obtained from the implementing organization, etc. during the site survey

## (2) Resettlement and Land Acquisition

At the time of the appraisal, it was confirmed that the project would not result in resettlement, but would involve land acquisition of approximately 1,950 ha. The project had acquired 1,715 ha of land, between 2007 and 2014, for the formation of new minor irrigation systems. In some subprojects, the construction of canals could not be started due to land acquisition issues. As of 2014, only 13 subprojects for minor irrigation facilities could be fully completed. After the formation of the TS state in 2014, TS has issued the Government Order Ms. No. 123 for expeditious acquisition of lands from land owners for public purpose. The land acquisition has progressed to the point where 48 small-scale irrigation projects have been completed, except some partially unfinished works. Even at the time of ex-post evaluation, land acquisition issues were identified in two out of the ten minor irrigation subprojects surveyed. The implementing agencies were involved in resolving the situation in such subprojects<sup>33</sup>.

In addition to agriculture, inland water aquaculture and livestock farming were observed

<sup>33</sup> The site survey confirmed there was no compensation for the flooded trees in the Nagulapally subproject. The landowners did not agree on the price of compensation due to the difference between the time of project formation and the time of construction start, and land acquisition for canal construction was not proceeding in the Tatiguda subproject.

to have flourished in the beneficiary areas, increasing employment opportunities even for those who do not have agricultural land and increasing incomes in the target areas. In particular, newly formed minor irrigation facilities are areas that depend on rain-fed agriculture, where many of the SC of Telangana reside, and the impact of the project on improving their livelihoods has been significant. The project has mostly achieved its objectives. Therefore, the effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ②)

#### 3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

##### (1) Project Implementation Framework by Implementing Agency

In this project implementation units were formed under the implementing agencies and consultants were hired. NGOs services were taken for providing lateral support such as organizational formation and capacity building training for WUA. The committees were also established at the District and State levels to oversee the project implementation.

The division office is responsible for operation and implementation management, and the sub-division offices under that provide supervision and technical support for O&M activities. Monitoring of facilities such as sluices and canals is carried out by Work Inspector and Care Takers (Lascars) who are responsible for day-to-day maintenance and management and for responding to problems as they arise. In the event that a problem arises at a level that is difficult to deal with in the field, a system is in place to seek guidance from the sub-division office.

There is a large gap between the number of existing staff and sanctioned strength. This more so in the case of personnel below the technician level (Table 10). This situation, however, has continued for the past 20 years. The existing staff members, nonetheless, have been performing the necessary tasks for O&M, and personnel were taken, as needed, on contact basis. No major problems have occurred in the irrigation system to date.

**Table 10 Staffing for O&M of the six medium irrigation sub projects(Unit: person)**

Category	Position (Duty location)	AP		TS	
		Sanctioned	Existing	Sanctioned	Existing
Executing Agency	Chief Engineer: Responsible for the O&M of the project and budget arrangements with the State Government (Division Office)	3	3	3	3
	Superintendent Engineer: O&M of the project facilities (Division Office)	3	3	3	3
	Executive Engineer: (EE) Guides and manages the O&M of the project facilities (such as water supply), water management, the preparation of the O&M plan and cost estimates (Division Office)	3	3	3	3
	Deputy EE: Actual execution of the O&M of the project facilities (such as water supply, gate operation etc.) (Sub-Division Office)	3	3	3	3
	Assistant EE: (Sub-Division Office)	6	6	7	5



Category	Position (Duty location)	AP		TS	
		Sanctioned	Existing	Sanctioned	Existing
	Technician	8	0	4	0
	Skilled worker	8	0	2	0
	Gate operator	21	0	4	0
Facility	Work Inspector: Canal maintenance and Water regulation	7	0	7	2
	Care Taker (Lascar): Same as above, Including Drivers	33	1	40	16
Overall		86	10	70	30

Source: Survey responses from executing agency

## (2) O&M by Farmers' Organizations

At the time of appraisal of the project, the O&M of the minor and medium irrigation facilities were to be done by the WUA. The Andhra Pradesh Farmer Management of Irrigation Systems (APFMIS) Act, enacted in 1997, provides for the establishment of WUA in the irrigation sector. Last elections to WUAs were held in the year 2008, and the term of WUAs elected in 2008 had expired in 2013. The TS had not held election to WUAs since then, and setting up WUA is not mandatory. In AP, however, elections for WUAs were held in 2015, farmers engage in O&M. Since this term was also ended in June 2020, no election was planned so far, transitional arrangements were made to handing over functions of WUA to concerned irrigation officials. Had WUAs existed, they would have implemented water allocation and maintenance, jointly along with the department, to maximize agricultural production. In some cases, farmers, beneficiaries of the project have been implemented O&M<sup>34</sup>. The irrigation facilities constructed with the participation of the farmers were found to be in good condition even after the project period<sup>35</sup>. However, the areas with the newly introduced irrigation inhabited by SC are often remote, limiting the support from implementing agencies and the Department of Agriculture. Continuous support is considered important for further effective use and maintenance of water resources in the future.

Although WUA was confirmed to implement O&M and WUAs were not functioning well at the time of appraisal, the field offices of implementing agencies are supplementing the functions, roles, and responsibilities of WUAs for O&M. Farmers groups were observed collaborating with the department officials in some cases, while technical assistance for water management in the SC living areas is limited. Therefore, there are some minor issues in the institutional aspect of the O&M.

<sup>34</sup> The Site Survey confirmed such cases in Asfinaahar medium irrigation subproject (TS), Rallapadu medium irrigation subproject, Sagileru medium irrigation subproject (AP).

<sup>35</sup> The beneficiary farmers formed a committee without the support of the implementing agency to remove silt from the waterways from the intake at the Kondampet minor irrigation subproject (TS).

### 3.4.2 Technical Aspects of Operation and Maintenance

The implementing agencies have the necessary framework for capacity building. The Capacity Building Unit of I&CAD, overseen by a training coordinator, had carried out the capacity building of I&CAD staff at various levels and WUAs in technical and management areas. The Water and Land Management Training and Research Institute (WALAMTARI) has been providing training to the implementing agency staff of quality management, soil management, water management, watershed management, and irrigation project operation and maintenance. The training programmes continue as of now (Table 11). In addition, the implementing agencies have participated in training programs in other states and in Japan.

**Table 11 Trainings conducted for implementing agencies under the project**

Training course title /subject	Qualification of trainees	Total no. of trainees
Basic computer skills, scrutiny of Estimates, familiarity with new state scheduled rate tendering, etc.	Technical officers	645
Training on office correspondence Establishment matters, Budget matters, Scrutiny of bills MS Office, Right to Information Act.	Ministerial staff	2,310
Contract and Quality Management in irrigation projects, Disputes and claims, causes and remedies, Arbitration and quality control, quality assurance – third party quality control.	Executive Engineers	163
Hydrology and Irrigation – APFMIS Act, Assessment of Flood control and management options, Flood forecasting, Reservoir Operation and maintenance, dam safety, hydrologic review, structural stability, crop water requirement, evaporate transpiration, crop yields, Preparation of DPR for minor irrigation projects, Bench marking in irrigation & Drainage sector, Soils for embankment, Quality control in construction.	Deputy Executive Engineers	482
	Asst Executive engineers and Assistant Engineers	1,329

Source: Implementing Agencies.

In addition to the implementing agencies, WALAMTARI, NGOs<sup>36</sup>, the Department of Agriculture, and the Department of Fisheries have played a role in providing guidance and imparting skills in their respective areas—"management of irrigation facilities, capacity building of WUAs, agricultural technology, and inland fisheries." On the other hand, as mentioned earlier, farmers in the minor irrigation subprojects in remote areas have been requesting for continuous training, given the limited support from the implementing agencies.

Overall, it can be concluded that no problems have arisen that would compromise the sustainability and the operation and maintenance aspects, but there seems to be some issues in terms of the need for technical assistance to farmers in remote areas.

<sup>36</sup> The NGOs that participated in the project were Aranya (TS), Jana Chaitanya Rural Development, Society for Education and Economic Development, Pratibha Education Society, APARD: Awaking People's Action for Rural Development (AP).

### 3.4.3 Financial Aspects of Operation and Maintenance

Collection of water user fees, as mentioned earlier, was not implemented in TS and was not collected at a level sufficient to cover maintenance costs in AP. Some areas were exempted in times of drought. Respective irrigation facilities calculate their annual maintenance cost and request it to the state government, which is then incorporated into the budget. It is estimated that a medium irrigation subproject requires about 1 million Rs (about 1.4 million yen) per facility for maintenance every year, while a minor irrigation subproject requires about 150,000 to 500,000 Rs (about 200,000 to 700,000 yen)<sup>37</sup>. Under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS<sup>38</sup>), wages are paid for labour on the maintenance of irrigation facilities as well as construction of roads and public facilities. O&M also utilizes this scheme budget.<sup>39</sup>

**Table 12 Trends in O&M budgets and expenditures for entire states of respective implementing agencies**

Unit: Million Rs

Year	2015-16		2016-17		2017-18		2018-19		2019-20	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
AP	550.0	452.9	550.0	323.7	452.8	331.2	400.0	306.7	341.7	325.9
TS	1,085	587.7	949.9	317.3	3,551	216.5	2,668	319.5	2,624	125.2

Source: Survey responses from the executing agency

There is also an example in AP where a maintenance budget has been set aside for the period 2015–2018 under the mission of "Water Management and Sustainable Development (Neeru- Chettu) "<sup>40</sup>. Similarly, O&M was carried out in TS through the Mission Kakatiya funds under the Flood Damage Repairs, and lease amount from fishery activity. As shown in Table 12, both AP and TS have been able to secure maintenance budgets, but their expenditures are limited.

Although a certain number of O&M budgets were allocated in the two states, it can be observed that the substantial time is required from allocation to execution. Consequently, maintenance works were carried out by using other funds, such as MGNREGS. The collection of water user's fee, which was regarded as an important source, has been discontinued after year 2013 in TS, and the collection situation in AP has not improved in recent years. According to

<sup>37</sup> Based on interviews with implementing agencies having jurisdiction over the subprojects in the site survey. For example, a minor irrigation subproject in Jaggaram in Kothaguedm District (TS), with a beneficiary area of 211 ha, requires Rs 150,000 per year (approx. 210,000 yen).

<sup>38</sup> A program to guarantee employment in simple labour to the rural poor launched in February 2016. Wages will be provided for labour in the construction of rural roads, public facilities, and maintenance of minor irrigation projects. Wage labour are provided to agricultural workers who will have no income to absorb the rural surplus labor that occurs during the off-season.

<sup>39</sup> Interview with the implementing agency officer of Kondampet minor irrigation subproject (TS).

<sup>40</sup> Interview with the implementing agency officer of Bhairavanithippa medium scale irrigation (AP). No maintenance cost allocation for the last four years in the state budget and maintenance was done in the budget of Neeru-Cheetu

the implementing agencies, the current situation of subprojects does not necessitate considerable maintenance costs, hence, no major issues were identified at the time of the ex-post evaluation. But the future outlook is uncertain. Regarding the finances of O&M, it is necessary to consider securing sustainable maintenance costs and prompt disbursement, including reframing the system of water user fee collection.

#### 3.4.4 Status of Operation and Maintenance

Various inspections and repairs of irrigation facilities were carried out by the implementing agencies as shown in Table 13. At the same time, some of the minor irrigation facilities do not receive sufficient support from the implementing agencies. Therefore, the farmers themselves carry out simple maintenance work. Among the 20 subprojects covered by the site survey, no major problems (i.e., failure of irrigation facility, poor construction, or other problems) were observed. The condition of the facilities created under the project was found to be good at the time of ex-post evaluation. The defect liability period has completed, but no major complaints were reported. Some irrigation canals remain partially constructed, and minor failures of canals were observed in minor irrigation facilities<sup>41</sup>. In the medium irrigation subprojects, there were cases of minor deficiencies in the drainage ditches<sup>42</sup>, insufficient weed removal in the canals<sup>43</sup>, and illegal water intake by motor engines<sup>44</sup>; but no malfunctions were observed. With the renovation of new and existing channels, seepage losses were reduced, the time for water to reach the end of the canal was greatly reduced, and access to water quantity was achieved to 80 – 90% of the planned level. Regarding the status of O&M, some of the subprojects have reported issues pertaining to irrigation facilities, inspection and repairs, and operation; but in general, no significant problems were observed.

**Table 13 O&M activities of the project irrigation system**

Frequency	Medium	Minor
Daily inspection	<ul style="list-style-type: none"> <li>• De-silting</li> <li>• Weed removal</li> <li>• Embankment repairs</li> <li>• Revetment</li> <li>• Repairs to shutters</li> <li>• Repairs to masonry and lining</li> <li>• Cleaning and oiling of screw gearing shutters</li> <li>• Painting of hoists and gates etc.</li> <li>• Emergent breach closing works</li> <li>• Maintenance of inspection paths</li> </ul>	<ul style="list-style-type: none"> <li>• De-silting</li> <li>• Weed removal</li> <li>• Revetment</li> <li>• Repairs to shutters</li> </ul>
Periodic inspection	<ul style="list-style-type: none"> <li>• Reconstruction of sluices</li> <li>• Reconstruction/repairs to drops and regulators</li> <li>• Reconstruction of measuring devices</li> <li>• Rehabilitation of the system</li> </ul>	<ul style="list-style-type: none"> <li>• Reconstruction of sluices</li> <li>• Reconstruction of measuring devices</li> <li>• Canals</li> </ul>

<sup>41</sup> Nagulapally minor subproject (Vikarabad District, TS)

<sup>42</sup> Gandipalem medium subproject (Nellore District, AP)

<sup>43</sup> Asifnagar medium subproject (Nalgonda District, TS)

<sup>44</sup> Pakhalmedium subproject (Warangal District, TS), Zandaguda minor subproject (Adilabad District, TS)

Frequency	Medium	Minor
Large scale works	<ul style="list-style-type: none"> <li>• Modernization of the system</li> <li>• Other construction work in the irrigation system</li> </ul>	<ul style="list-style-type: none"> <li>• Rehabilitation of the tank</li> <li>• Other construction works</li> </ul>
System diagnosis	<ul style="list-style-type: none"> <li>• Check condition of dam and reservoir</li> <li>• Mechanical / electrical system</li> <li>• Spillway, drains &amp; outlet works</li> <li>• Inspection of each and every hydraulic structure and recording of its status before dry and wet seasons and identification of all critical reaches</li> </ul>	Diagnosis for Sluice, Surplus weir, Bunds, and Canals

Source: Documents from the Implementing Agency

In summary, some minor problems have been reported in the institutional / organizational aspect as well as the financial aspect. However, no significant issues were confirmed in the technical aspect and in the current condition of subprojects. Sustainability of the project effects, thus, is fair.

#### **4. Conclusion, Lessons Learned and Recommendations**

##### 4.1 Conclusion

The objective of this project is to raise agricultural productivity and water management capacities through the construction of minor irrigation facilities, rehabilitation of medium irrigation facilities capacity building of operation and maintenance setup, and spread of farming technologies, in the states of AP and TS in southern India, thereby contributing to the increase of farm income and the alleviation of poverty. Due to the improved water efficiency by transforming the rain-fed area to irrigated and renovating the existing facilities resources, the project relevance is high as project implementation was well in line with India's development policy and development needs, as well as with the ODA policy of Japan. The project cost was within the plan, but the project period was significantly longer than planned. Setting up the implementing framework after the bifurcation of AP state in 2014 took a while and longer in the land acquisition. The efficiency of the project is fair as the project period was significantly longer than planned. The targets in regard to irrigated area as well as crop yields had been achieved. On the other hand, the confirmed increase of household income was due to the fishery and livestock activities in the target areas, besides agriculture. The livelihood of target area of minor irrigation in TS where tribal communities and other disadvantaged communities reside were originally depend on rain-fed agriculture, in particular has considerably improved. Therefore, the effectiveness and impacts of the project are high since the planned effectiveness was achieved through project implementation. Regarding project sustainability, the technical aspect, and current status have no significant issues. However, there are issues with institutional / organizational aspect as well as finance since the need to support for beneficiary farmers as well as to secure and promptly disburse sustainable maintenance costs are confirmed. The sustainability of the project effects is, therefore, fair. All things considered; the evaluation of this project is satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

#### (1) Enhancing the O&M Framework and Budget Optimisation

WUA has completely handed over the O&M system to the Implementing Agency in TS. The situation in AP, on the other hand, is the implementation of WUA elections after the bifurcation of the state and continuous effort to maintain WUA. The site survey also revealed the shortage of O&M personnel at the ground level in both states, noting the non-availability of an adequate number of support staff, such as lascars and work inspectors, has remained unaddressed for decades. Meanwhile, the sanctioned number of management level engineers were sufficiently filled. As of now, no major issues confirmed. With the WUAs barely functioning in TS, the future remains uncertain in case no system is in place for farmers, who are the beneficiaries, to do their own silt and weed removal. Implementing agencies in both states are recommended to deploy the required personnel and continue building cooperation with farmers on O&M management.

#### (2) Strengthening the Information Sharing System

The external evaluator faced difficulties obtaining information on the cultivated area, the yield of major crops, and the status of O&M of the respective subprojects. While there is a policy to establish the Management Information System, it has not reached the level of utilization to maximize the outputs of irrigation facilities. It is required to study and build methods to proactively collect, analyse, and share basic data for understanding the current status of water resources and their effective use of water resources and crops in collaboration with the Department of Agriculture, including the introduction of automatic management and control systems for agricultural water, and to conduct training to materialise these approaches.

### 4.2.2 Recommendations to JICA

None

## 4.3 Lessons Learned

### Importance of preparatory activities for land acquisition for new irrigation facilities

Regarding the minor irrigation subprojects, some farmers may not agree to release land for new facilities even after explaining the benefits of livelihood improvement by shifting from rain-fed to irrigated agriculture. Also, obtaining approval from the Forest Department is difficult in case the subproject acquired the forest area for the formation of new tank. Therefore, a sufficient preparation period for discussions with the local residents from the time of project formation may have prevented significant delays in the Project. This demonstrated the importance of preparatory activities prior to the start of the Project.

### Continuously required capacity building for beneficiary farmers

The beneficiary farmers requested continued support from the department to operate and maintain the irrigation facilities and the surrounding forest, including the environmental management and prevention of illegal water intakes, etc. On the other hand, farmers in some areas do not fully understand that they need to manage their irrigation facilities, such as the regular silt and weed removal in canals and maintenance of field channels. The site survey confirmed that the farmers involved in the construction of new irrigation facilities are also willing to involve themselves in maintenance activities. The series of training from the project or other government line departments had helped farmers in the efficient use of water and learn of agricultural technologies. Although the implementing agencies, cannot continue disseminating the agricultural technologies with it being outside the scope of work, strengthening the capacity of the beneficiary farmers was the prerequisite to maintain and efficiently use the irrigation facilities. Collaborating with the Department of Agriculture can address this. Additionally, the department shall continue focusing on the technical training and closely monitoring the activities.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	<p>1) Construction of 59 Minor Irrigation Facilities Rehabilitation of 11 Medium Irrigation Facilities</p> <p>2) Establishment and Strengthening of the WUA including agricultural extension service and support for the poorer.</p> <p>3) Support for the sector reform (Strengthening of WUA and the Irrigation Department)</p>	<p>1) Construction of 48 Minor Irrigation Facilities Rehabilitation of 20 Medium Irrigation Facilities</p> <p>2), 3) Same as planned</p>
Consulting service	<ul style="list-style-type: none"> <li>• International: 110M/M</li> <li>• National: 438M/M</li> </ul>	<ul style="list-style-type: none"> <li>• International: 81.5 M/M</li> <li>• National: 659 M/M</li> </ul>
2. Project Period	March 2007 – March 2013 (73 months)	March 2007– July 2017 (125 months)
3. Project Cost		
Amount Paid in Foreign Currency	1,737 million yen	1,312 million yen
Amount Paid in Local Currency	26,935 million yen	17,108 million yen
Total	28,672 million yen	18,422 million yen
ODA Loan Portion	23,974 million yen	15,129 million yen
Exchange Rate	1 Rs = 2.52yen (As of Month year)	1 Rs = 1.67 yen (2020)
4. Final Disbursement	July 2017	



**Appendix Table 1 Summary of the subprojects done by the site survey**

Particulars	Minor	Medium	Particulars	Minor	Medium
Subprojects covered*	10	10	Actual storage / Planned Storage (%)	97.8	78.5
	TS:9, AP:1	TS:4, AP:6			
The project number by size of command area (Minor)			Beneficiaries(Those who own farm land)	2,296	88,560
< 200 ha	5	-	<b>Social Profile</b>	(%)	(%)
201 – 500 ha	2	-	Scheduled Caste (SC)	9.5	12.8
501 – 1000 ha	3	-	Scheduled Tribe (ST)	51.7	7.2
The project number by size of command area (Medium)			Other Backward Caste (OBC)	16.4	49.1
< 5000 ha	-	2	Open Category	19.0	25.5
5001 – 10000 ha	-	8	Minority (Christian, Muslim)	3.5	5.4
<b>Average command area (ha)</b>	314	6,726	<b>% of women farmers to total farmers</b>	27.5	23.2
Minimum(ha)	73	4,128	<b>% of tenant farmers to total farmers</b>	12.1	23.1
Maximum(ha)	809	9,863	<b>Area of owned land</b>	(%)	(%)
Total command area(ha)	3,108	66,480	Less than 0.4 ha	22	37
<b>Average Project Cost (Million Rs)</b>	93	371	0.4 –0.8 ha	36	33
Minimum	23.3	144	0.8 – 2 ha	27	19
Maximum	275.8	701	Over 2 ha	14	10

Source: Evaluator

Note: Though the survey targets were selected so that at least one target subproject would be selected in an District where the subprojects are located, the subprojects in Vizayanagram district in AP and Karimnagar district in TS were not included in the site survey.

**Appendix Table 2 Participants profile of the site survey**

Target Group	TS			AP		
	No. of sites	Total no. of Participants	Ave. no. of participants per site	No. of sites	Total no. of Participants	Ave. no. of participants per site
Farmers with command area	21	208	10	19	157	8
Meeting with Fishermen	12	81	7	4	18	5
Interaction with WUAs	8	35	4	16	36	2
Interaction with women Groups	19	99	5	17	52	3
Interaction with wage earners.	20	103	5	17	52	3

Source: Evaluator

Note: Regarding the survey for the medium irrigation subprojects, one or two water users' associations near the water intake and downstream were surveyed.