

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country: Republic of India

Project: Delhi Eastern Peripheral Expressway Intelligent Transport Systems Installation Project

Loan Agreement: March 31, 2017

Loan Amount: 6,870 million yen

Borrower: The President of India

2. Background and Necessity of the Project

(1) Current State and Issues of the Road Sector in India

In India, roads and railways are the main modes of transport that back the domestic transport sector with roads accounting for 85.2% of the country's passenger transport and 62.9% of its cargo transport (2011). However, in the major urban centers of India, where rapid urbanization has been taking place in recent years, traffic congestion poses a serious problem due to underdeveloped roads and other transport infrastructure, causing economic losses, which form a major challenge to further development. Given this challenge, comprehensive infrastructure development, including road development, is regarded as a vital element of the country's economic growth, and special emphasis is being placed on development work in the road sector.

In the Delhi metropolitan area, economic losses derived from road traffic congestion cause a major problem due to lack of insufficient ring road around the city itself despite huge demand for cargo transport that is not bound for the city but just passes through it. Heavy duty trucks are a major part of the problem. Although a traffic regulation is imposed to stop cargo through traffic from flowing into the city during daytime hours (from 8:00 a.m. to 9:00 p.m.), when the city has its busiest economic activities, hordes of heavy duty trucks run into the city to pass through it outside the regulated hours and cause environmental issues, such as noise and air pollution, as well as accidents and other problems, in addition to the economic losses stemming from the road traffic congestion.

In response to this, the Indian Government has commenced construction of a Ring Road around Delhi with a total length of 270 km as a detour route to reduce the influx of traffic into the city. The Western Peripheral Expressway (WPE), the western half of the Ring Road (approx. 135 km), is being constructed by the State of Haryana, and the Eastern Peripheral Expressway (EPE), the eastern half (135 km in total), is being constructed by the National Highways Authority of India (NHAI), and are both scheduled for completion in 2018. The aim is to streamline traffic flows in and around the Delhi metropolitan area by building the western and eastern halves of the Ring Road around the city of Delhi to control the cargo through traffic that goes into the city.

(2) Development Policies for the Road Sector in India and Role of the Project

The Indian Government promotes the National Highway Development Plan (NHDP) to help deal with challenges faced by the country's transport sector. According to the plan, comprehensive development of roads and other infrastructure is vital for economic growth, and proactive improvements, including expanding the width of existing roads, should be made. Actually, the NHAI puts in a lot of work to build new roads and widen existing ones to promote this NHDP and help resolve the challenges faced by the transport sector of India. In big cities like the Delhi metropolitan area, however, there is a limit to improvement of roads, due to the high population density and constraints on land acquisition, and thus it is necessary to make the most of the roads they have now. This is the reason that the NHAI's policy for these big cities is to take advantage of Intelligent Transport Systems (ITS) to streamline traffic through maximization of the traffic capacity of individual roads, for example by reducing toll gate waiting times using a toll collection system, and preventing traffic congestion and reducing accident response time using a traffic control system. The purpose of the Project is to introduce ITS¹ that combine (1) a Toll Management System and (2) an Advanced Traffic Management System to the EPE, which is being constructed by the NHAI and will have to face enormous traffic demand, presumably leading to challenges such as increased traffic accidents. The Project is also consistent with the development policy of the Indian Government, which places great importance on the role of comprehensive development of roads and other infrastructure in the country's economic growth, in the sense that it contributes to streamlining traffic and facilitating regional economic growth.

(3) Japan and JICA's Assistance Policies and Operations in the Road Sector

Japan's Country Assistance Policy for India (March 2016) states that it is necessary to develop important infrastructure required to ensure continued investments and a high economic growth while India needs to achieve comprehensive and stable high economic growth. In addition, the policy sets "enhancement of regional connectivity" as one of its priority areas and states that with a view to removing the bottlenecks in the infrastructure constraining investment and growth, it is necessary to support the development of transport infrastructure that will act as transport hubs and networks, to strengthen connectivity among major industrial cities and economic zones, as well as regional connectivity, in the country. Furthermore, JICA's Country Analysis Paper for India (March 2012) also regards the development of industrial and urban infrastructure as one of its priority areas and indicates the necessity of providing assistance for the development and improvement of infrastructure contributing to the acceleration of regional economic development and streamlining of logistics, including roads, mainly in the six major urban centers of the country (including Delhi) that are

¹ It is planned that simple ITSs will be introduced to the WPE using Radio Frequency Identification (RFID) technology.

expected to produce particularly marked positive effects on resolving bottlenecks in economic growth. As of February 2017, JICA received authorization to provide ODA loans to India in the amount of 175.8 billion yen for 10 projects in the road/bridge sector (which accounts for 14% of the transportation sector in India). Also, in the area of Technical Cooperation, JICA has implemented the Institutional Development Project on the Supervision for Highway and Expressway Operation, Management and Maintenance to help develop management and maintenance manuals and prepare technical specifications. Besides these, the Japan Chamber of Commerce and Industry in India has submitted several written proposals to the Indian Government to request early completion of the EPE in the past.

(4) Other Donors' Activities

The assistance provided by the World Bank includes expanding and improving the road network in the state of Mizoram to improve transport connectivity between the rural and urban parts of the state, repairing state roads in the state of Gujarat, supporting capacity building for the Government of Gujarat Roads and Buildings Department and providing technical assistance to the NHAI.

The Asian Development Bank is providing support for capacity building for the Jharkhand Roads Construction Department and is planning to provide assistance to the sustainable urban transport system of the city of Aizawl in the state of Mizoram through the introduction of environmentally friendly electric bicycles, etc., in addition to the development and improvement of pedestrian and bicycle roads.

(5) Necessity of the Project

The Project is consistent not only with the development themes and policies of the Indian Government, but also with the assistance policies of Japan and JICA, as well as the results of their analyses. Moreover, given the potential contribution the Project can make to Sustainable Development Goal (SDG) 11, "make cities and human settlements inclusive, safe, resilient and sustainable," it can be deemed as highly necessary and relevant for JICA's assistance.

3. Project Description

(1) Project Objective

The objective of the Project is to introduce ITSs to the EPE, which the NHAI is constructing in the Delhi metropolitan area, to contribute to facilitating regional economic growth in the metropolitan area by enabling smooth traffic flow to meet the rapidly increasing amount of traffic.

(2) Project Site/Target Area

Delhi Metropolitan Area (States of Uttar Pradesh and Haryana)

(3) Project Components

1) ITS equipment

- Toll Management System (hereinafter referred to as "TMS") (all toll collection

center equipment, including RFID-based ETC systems and surveillance cameras)
· Advanced Traffic Management System (hereinafter referred to as “ATMS”) (all traffic control center equipment, including traffic monitoring cameras, anomaly monitoring cameras, traffic volume measuring instruments, weather observation devices, variable road signs, highway radio and optical fiber cables)

2) Consulting services (detailed design reviews, construction supervision and enhancement of organization)

(4) Project Cost

11,738 million yen (Loan amount: 6,870 million yen)

(5) Schedule

March 2017–December 2022 (70 months in total). Project completion is defined as the commencement of service (December 2018).

(6) Project Implementation Structure

1) Borrower: The President of India

2) Guarantor: none

3) Executing Agency: National Highways Authority of India (NHAI)

4) Operation and Maintenance System: Operations and maintenance work are to be outsourced to private-sector companies under the supervision and responsibility of the NHAI.

(7) Environmental and Social Considerations / Poverty Reduction / Social Development

1) Environmental and Social Considerations

① Category: C

② Reason for Categorization: The Project is classified as Category C because it is expected to only have minimum negative impact on the environment as the road construction work is conducted by the executing agency and the main purpose of the Project is to install ITSs on the expressway although it is classified into the road sector under the “Japan International Cooperation Agency Guidelines for Environmental and Social Considerations” (published in April 2010).

2) Poverty Reduction: N/A

3) Social Development: As the Project will involve a large number of local workers in the delivery and installation of equipment, it is planned that the instructions to bidders will contain a provision on HIV/AIDS prevention requiring contractors to cooperate in its preventive measures against HIV/AIDS as part of its efforts to minimize HIV infection risks during these operations.

(8) Collaboration with Other Donors: N/A

(9) Other Important Issues: N/A

4. Target Outcomes

(1) Quantitative Effects

1) Operation and Effect Indicators

Indicator	Baseline (Recorded in 2016*)	Target (2020) [2 years after project completion]
Traffic accident rate (1,000 vehicles/km**) (Only the EPE section covered by the Project)	NA	0.018%
Average emergency response time (Average time from detection/reporting to arrival on site)	NA	20 min
Toll gate waiting line length (average)	NA	0 m

*Not recorded because the EPE is still under construction.

**The rate of accidents among 1,000 vehicles/km is to be calculated based on the number of accidents (annual average) on the whole extension of the EPE.

(2) Qualitative Effects

The expected qualitative effects of the Project include increased comfort of road transport (in the EPE section), increased convenience resulting from more punctual trips in the Delhi metropolitan area, urban environmental improvements, such as mitigated congestion in the city of Delhi, and slowed climate change due to curbed greenhouse gas (GHG) emissions.

(3) Internal Rate of Return

Based on the conditions indicated below, the economic internal rate of return (EIRR) of the Project will be 9.0%, while the financial internal rate of return (FIRR) cannot be calculated as ITS devices cannot generate revenues in themselves.

【EIRR】

Cost: Initial cost, renewal cost, operation cost and maintenance cost (all excluding tax)

Benefit: Shortening of time and reduction of traffic accidents

Project Life: 25 years

5. External Factors and Risk Control

- The political and economic conditions in India, particularly in and around the target area, will not worsen. No large-scale natural disasters will hit the country/area.
- The policy of the Indian Government on ITS introduction and the organization and operations of the executing agency will not be changed.
- There will not be any drastic change in the use of land or facilities in the target area, such as cancellation of use of the expressway.

6. Lessons Learned from Past Projects

(1) Results of Evaluation of Similar Past Projects

The ex-post evaluation of the Project for the Improvement of Traffic Flow in Kampala City, a grant aid project for Uganda, revealed that signals were not maintained properly as the result of replacement of engineers to whom knowledge of the technology had been transferred during the project. A lesson from this is that a maintenance system needs to be established from a longer-term point of view.

(2) Lessons for the Project

In the Project, the plan is for the ITS contractor to continue operating and maintaining the ATMS after the ITS is introduced until December 2022 (not yet finalized), so that the technology, etc. required for the maintenance work can be transferred to NHAI staff members and the local operator that will take on the operation and maintenance of the ATMS later. This technological transfer is intended as an opportunity to establish a medium- to long-term operating and maintenance system.

7. Plans for Future Evaluation

(1) Indicators to be used

- 1) Traffic accident rate (1,000 vehicles/km)
- 2) Average emergency response time (min)
- 3) Toll gate waiting line length (average) (m)
- 4) Economic internal rate of return (EIRR) (%)

(2) Timing of the next evaluation

Two years after project completion

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