

Ex-Ante Evaluation (for Japanese ODA Loan)

South Asia Division 1, South Asia Department, JICA

1. Basic Information

Country: India

Project Name: Delhi Mass Rapid Transport System Project Phase 3 (III)

Loan Agreement : October 29, 2018

2. Background and Necessity of the Project

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

While rapid urbanization has progressed in recent years in India, and while the number of registered automobiles and motorcycles has been rapidly increasing, public transportation infrastructure has not improved. In major cities such as Delhi and Mumbai, traffic congestion accompanying expansion of demand for road traffic is a serious problem, and economic losses and automobile pollution such as air pollution and noise are getting worse. (e.g. PM 10 concentration in the National Capital Territory of Delhi is 261 $\mu\text{g}/\text{m}^3$ while the criteria in India is 60 $\mu\text{g}/\text{m}^3$ [Source: Central Pollution Control Board]) For this reason, the development of public transportation systems is essential to mitigate traffic jams and to improve the urban environment.

In order to deal with the above problems, the Government of India emphasizes the development of public transportation systems from the viewpoint of safety/energy efficiency/social environment conservation, in addition to dealing with the demand for transportation due to the recent economic growth. The Government of National Capital Territory (NCT) of Delhi plans to improve urban traffic with the introduction of a large-volume high-speed transportation system aiming to mitigate congestion of the conventional public transportation system, to improve traffic conditions, and to alleviate air pollution in the National Capital Territory of Delhi.

The first and second plans of the Delhi Mass Rapid Transport System have completed, and service has started for all the lines. The first plan aims at alleviating congestion in the commercial area and the governmental office area in the city center. Lines 1-3, which run from the city center to radiating lines, cover approximately 65 km. The second plan aims at preventing overconcentration in the city center. Lines 1-3, which run toward the outer perimeter of the NCT Delhi, were extended and lines 4-6 were built; and the plan covers approximately 125 km. In order to strengthen the functions of commuter railways in the future, the Government of NCT Delhi puts weight on constructing new lines and extending the existing lines in taking urban transportation policy measures and measures against urban environmental issues.

(2) Japan and JICA's Policy and Operations in the Urban Transport Sector

Japan's Country Assistance Policy for India (March 2016) sets strengthening industrial competitiveness as a priority area, and analyzes that it is necessary to improve important infrastructure, which would contribute to raise competitiveness of the manufacturing industry and other industries in India. JICA Country Analysis Paper for India (March 2018) also analyzes that it is necessary to improve public transportation services in urban areas. This project is positioned as assistance for responding to rapidly advancing urbanization, which is listed as the task that JICA should address in the above-mentioned priority field.

The Project is consistent with these policies and analysis.

(3) Other Donors' Activity

The World Bank supports the Mumbai Urban Transportation Project (road and suburban railway improvement) and the Eastern Dedicated Freight Corridor project. The Asian Development Bank (ADB) is providing institutional and other assistance to India's railway sector, especially for organizational reforms of Indian Railways.

3. Project Description

(1) Project Objective

The objective of the Project is to cope with the increase of traffic demand in Delhi by expanding the mass rapid transportation system, thereby promoting regional economic development and improving urban environment, through mitigation of traffic jams and decrease of pollution caused by increasing motor vehicles.

(2) Project Site/Target Area: The National Capital Territory of Delhi

(3) Project Components

As the third phase of the mass rapid transportation system construction project in the National Capital Territory of Delhi, an underground railway (about 56 km) and a surface railway (about 60 km) will be constructed and vehicles will be procured. ODA loan part is as shown in the below.

- 1) Civil works (Extension of Line 3, underground section of Line 8, and underground stations (However, orbital laying is applicable to all lines including ground and elevated parts))
- 2) Traction & power supply, signaling & telecommunication system and automatic fare collection system, Ventilation, air conditioning equipment, etc.
- 3) Rolling stocks (total: 785)
- 4) Consulting service (bidding assistance, construction supervision, etc.)

(4) Estimated Project Cost

695,565 million yen (of which, the ODA Loan amount is 330,479 million yen, and a subsequent ODA Loan of 53,675 million yen)

(5) Schedule

April 2012-December 2022 (129 months in total) The commencement date of service (February 2021) shall be the time of the Project's completion.

(6) Project Implementation Structure

- 1) Borrower: President of India
- 2) Executing Agency: Delhi Metro Rail Corporation Limited: DMRC
- 3) Operation and Maintenance agency: Same as 2)

(7) Collaboration and Division of Roles with Other Projects and Donors

- 1) Japan's assistance activities: The consultant employed by the Delhi Mass Rapid Transport System Project (1997-2005) and the Delhi Mass Rapid Transport System Project (Phase 2)(2006-2010) is providing training programs inside and outside of Japan on the operation and maintenance of urban transportation to DMRC. Experts were also dispatched to DMRC for the purpose of developing capacity in the fields of vehicle maintenance and safety management (2007-2008).
- 2) Other development partners' assistance activities: None in particular

(8) Environmental and Social Consideration/Poverty Reduction/Social Development

- 1) Environmental and social considerations: As shown in the Appendix.
- 2) Cross-cutting Issues:
(Climate change) As the introduction of the regenerative braking system

which is Japan's energy-saving technology and the progress of modal shift by this project is contributing to the reduction of greenhouse gas emissions, this project can contribute to mitigating climate change. Climate change mitigation effect (estimated GHG emission reduction) is about 28.71 million tons (CO₂ equivalent: total reductions by Phase 1-3 projects from 2002 to 2032 including this project). In addition, the Project is registered with the United Nations as a Clean Development Mechanism (CDM) project.

(Consideration for persons with disabilities) In accordance with the domestic laws of India, station buildings and passenger cars (elevators, toilets, announcements, braille blocks, wheelchair space, etc.) that also take into consideration for usability for the elderly and persons with disabilities are adopted. At the same time, station staff, crew members, and all other frontline staff have been provided with customer care training.

- 3) Gender Category: GI(S)--Gender Informed (Significant) (Gender Activity Integration Project)

<Description of activities and reason for classification> The Project incorporates introduction of female-only vehicles, setting of priority seats for passengers who need support including women, installation of CCTV cameras in the station buildings and inside the vehicles, use of low hanging straps, etc. in order to make women feel safe and comfortable when they use the subway. Based on the reasons mentioned in the above, the Project is classified into a Gender Activity Integration Project.

- (9) Other Important Issues: None in particular

4. Targeted Outcomes

- (1) Quantitative Effects

Performance Indicators (Operation and Effect Indicator)

Indicator	Baseline (Actual value in 2011)	Target (2022) [Expected value 2 years after project completion]
Operating rate (%/year)	-	92
Running distance (1,000 km/day)		264.51
Number of Running Train (number/day)		915
Volume of Transportation (million passengers-km/day)	-	40.99
Income from Passenger (million rupees/day)	-	97.60

- (2) Qualitative effects: Improvement in traffic situations in the National Capital Territory of Delhi, alleviation of traffic pollution, alleviating climate change, improvement in convenience through ensuring the scheduled movement, and economic development of the National Capital Territory of Delhi.

- (3) Internal Rate of Return

Under the conditions indicated below, the economic internal rate of return (EIRR) and the financial internal rate of return (FIRR) will be 24.04% and 6.93%, respectively.

[EIRR]

Cost: Project cost, operation and maintenance expenses (both excluding tax)

Benefits: Effect of reducing cost for operating and maintenance of transportation systems and roads, effect of shortening traveling time for users, effect of reducing traffic accidents, and pollution mitigation effect

Project Life: 30 years

[FIRR]

Cost: Project cost, operation and maintenance expenses

Benefits: Fare income, advertisement revenue, and real estate development revenue

Project Life: 30 years

5. Prerequisites / External Factors

- (1) Prerequisite: Expansion of the bus network operated by the executing agency.
- (2) External Factors: Deterioration in political and economic conditions and natural disasters in India and the areas surrounding the project site

6. Lessons Learned from Past Projects

From the results of the ex-post evaluation of the India "Delhi Mass Rapid Transport System Project (I)-(VI)," a divergence between the target value and the actual value of the number of passengers is cited as an important issue. It is pointed out that it is desirable to set more realistic target values by improving the method of predicting the number of passengers as the basis.

In the Project, based on the lesson learned above, the more realistic target value of the number of passengers is set through taking the number of passengers on existing lines into consideration after investigating the traffic volume in the target area, the income level of the residents, transportation means, etc.

7. Evaluation Results

The Project, being consistent with the development issues and development policies of the country and cooperation policies and analysis results of the Government of Japan and JICA, will contribute to balanced economic development in the National Capital Territory of Delhi through mitigation of traffic congestion and reduction of traffic pollution in the area. Therefore, the Project is to contribute to Goal 9 of the SDGs, "Industry Innovation and infrastructure," and it is highly necessary to support the project implementation.

8. Plan for Future Evaluation

- (1) Indicators to be Used
Same as 4. (1) - (3)
- (2) Timing of the Next Evaluation
Ex-post evaluation: 2 years after project completion

END

Appendix

- (1) Category: A
- (2) Reason for Categorization: This project falls into the railway sector and has influential characteristics, both being shown in the JICA Guidelines for Environmental and Social Considerations (proclaimed in April 2010).
- (3) Environmental Permit: Preparation of a report of Environmental Impact Assessment (EIA) concerning this project is not obliged by the domestic laws of India. However, a report was formulated in August 2011, and revised in November 2013. EIA of Najafgarh - Dhansa bus stand section, on which an alignment change of the existing scope was made, was formulated in March 2018.
- (4) Anti-Pollution Measures: At the time of construction, countermeasures such as proper management of pollutants, construction vehicles, and heavy equipment are taken. Regarding impacts on the ground during the construction, no serious impacts of land sinking are anticipated, as adoption of shield tunneling method prevents loosening of the ground and inflow of underground water. After the project starts, soundproof wall against the noise, installation of elastic rubber layer under the orbit against vibration, installation of effluent treatment facility at the vehicle base, and other mitigation measures will be introduced as anti-pollution measures.
- (5) Natural-Environment: The target area of the project is located in the urban area without national parks or natural forests, and the scheduled line will run almost along the existing roads. Accordingly, no special impacts on the natural environment are expected. However, some part of the scheduled line will run near a bird sanctuary. In order to prevent strikes, mitigation measures such as horn blowing in the surrounding area are adopted.
- (6) Social Environment: Acquired land area for this project is 528,806 m² (including private land area of 14,230 m²), and 435 households and 1,101 residents were relocated. DMRC held discussion with targets of land acquisition and resettlement so that procedures were taken according to the resettlement plan formulated for the purpose of satisfying the conditions of the JICA Guidelines, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act, and the resettlement policy of the Government of NCT Delhi. All procedures for land acquisition, resettlement, and compensation, including those for the Najafgarh - Dhansa bus stand section (acquired land area: 9,243.9 m² with no private lands and requiring no resettlement) and excepting one section, were completed. Regarding Mayur - Bijar - Trilockpuri section, land acquisition (3,500 m² with no private lands), resettlement (108 households and 272 residents), and compensation for them have not been completed. However, consultation with the targets has also progressed, and the procedures are expected to complete by September 2018. Regarding informal residents, in addition to compensation for housing, the right to use the land located near Delhi and relocation expenses have been provided.
- (7) Other/Monitoring: A part of the lines in this project is planned to run near a cluster of historical spots in the downtown of Delhi, impacts of vibration on the historic buildings give cause for concern. DMRC has already received construction approval from the National Monument Authority of India, but voluntarily implements mitigation measures such as use of vibration reduction mats and introduction of springs. In this project, DMRC monitors land acquisition and resettlement during construction, and the construction contractor monitors noise,

vibration, soil, air quality, water quality, waste, etc. under the supervision of DMRC. When the line is placed in service, DMRC will monitor noise, vibration, air quality, water quality, etc. In addition, DMRC will employ a specialized external consultant with its own funds, in order to conduct monitoring of land acquisition, resettlement, and relocated persons' living conditions after relocation.

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