

## Ex-ante Evaluation

<b>1. Name of the Project</b>
Country: India Project: Delhi Mass Rapid Transport System Project (Phase 2) (I) (Loan Agreement: 03/31/2006; Loan Amount: 14,900 million yen; Borrower: The President of India)
<b>2. Necessity and Relevance of JBIC's Assistance</b>
<p>In large cities such as Delhi and Bangalore, traffic congestion accompanying increased road traffic demand has become a serious problem. Because this causes serious economic loss and damage to health by vehicle emissions such as air and noise pollution, it is necessary to introduce a mass transportation system to relieve traffic congestion and to cope with vehicle emissions.</p> <p>In response to these issues, the Government of India has announced in its 10<sup>th</sup> 5-Year Plan (2002-2007) that it will introduce a public transportation system, from the standpoints of safety, energy efficiency, and social environment conservation and in response to the transportation demand accompanying economic growth in recent years. Moreover, in the current administration's Common Minimum Programme as well as in the Indian Finance Minister's 2005 budget speech, the importance of installing urban transportation infrastructure is mentioned.</p> <p>In JBIC's current Medium-Term Strategy for Overseas Economic Cooperation Operations, priority areas in assistance to India are "Economic Infrastructure Development" and "Environmental Improvement." The assistance provided by this project is consistent with the strategy.</p> <p>Delhi's population increased from 6.20 million in 1981 to reach 13.70 million in 2001 (representing a population density of 9,340 people/km<sup>2</sup>). Because the number of buses and private vehicles have also increased, the average vehicle speed on city streets is 13 km/h. Economic loss due to traffic congestion as well as health damage due to vehicle emissions such as air and noise pollution are becoming increasingly critical. Because it is difficult to significantly expand the road network and the transport capacity of the existing public transportation (buses and railroads), a major component of the Delhi government's urban transportation policy and measures for urban environmental problems is extensions of the rapid transport system being constructed in Phase 1 (JBIC's previous loan, "Delhi Mass Rapid Transport System Project). Thus, because it is necessary to introduce a mass rapid transport system to relieve traffic congestion and vehicle emissions, JBIC's assistance is highly necessary and highly relevant.</p>
<b>3. Project Objectives</b>
The objective of this project is to cope with the increase of traffic demand in Delhi, the capital city of India, by extending the mass rapid transportation system with a total length of approximately 53 km, thereby promoting regional economic development and improving urban environment, through mitigation of traffic jam and decrease of pollution caused by increasing motor vehicles.
<b>4. Project Description</b>

(1) Target Area

National Capital Territory of Delhi

(2) Project Outline

This is a project to install the 6 segments of 5 lines mentioned below, as Phase 2 of the urban rapid transport system plan in Delhi (total length approximately 245 km).

(a) Civil engineering works

Line #1: Shahdra - Dilshad Garden (3.09 km)

Line #2: Central Secretariat - Qutab Minar (10.87 km, of which 7.98 km is underground)

Vishwa Vidyalaya - Jahangir Puri (6.36 km, of which 0.94 km is underground)

Line #3: Indraprastha - New Ashok Nagar (8.07 km)

Line #4: Yamujna Bank - Anand Vihar ISBT (6.16 km)

Line #5: Kirti Nagar - Mundka, Indralok - Shiva Ji Park (total 18.47 km)

Civil engineering works for an at-grade station (1 station), elevated stations (36 stations), and underground stations (8 stations).

(b) Electrical, signaling, and telecommunication-related matters

(c) Procurement of rolling stocks

(d) Construction of depots

(e) Consulting services

The yen loan portion applies to civil engineering works for the underground portions (southern extension of Line #2; but regarding rail tracks, the yen loan applies to all lines including those at ground level and those that are elevated); electrical, signaling, and telecommunication-related matters for all lines; rolling stock procurement; and consulting services

(3) Total Project Cost/Loan Amount

188,377 million yen (Yen Loan Amount: 90,673 million yen)

(4) Schedule

January 2006 – June 2011 (66 months)

(5) Implementation Structure

(a) Borrower: The President of India

(b) Executing Agency: Delhi Metro Rail Corporation Limited

(c) Operation and Maintenance System: Same as (b)

(6) Environmental and Social Consideration

(a) Environmental Effects/Land Acquisition and Resident Relocation

(i) Category A

(ii) Reason for Categorization

This project is classified as Category A because it is in the railway sector under the “Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations” (established April 2002), and has characteristics that may exert impact.

(iii) Environmental Permit

The EIA report is not required for the project in India's legal system, but an EIA report was completed in August 2005.

(iv) Anti-Pollution Measures

Measures to reduce noise are planned by installing soundproof walls and soundproofing pads.

(v) Natural Environment

The project site is in an urban area where no natural forests, etc., exist, and so no significant impact on the natural environment is foreseen.

(vi) Social Environment

The project requires land acquisition of 99.05 ha. The project is expected to necessitate the relocation of 968 houses and structures. The resident relocation process will be conducted based on India's land acquisition act and the Delhi government's relocation and rehabilitation policy. The executing agency is holding discussions with the residents to be relocated, and no significant opposition has been expressed toward the project. It is planned to offer slum residents land usage rights for consideration at the relocation site on the city outskirts, and the executing agency plans to monitor the living conditions after the relocation by hiring an NGO at its own expense.

(vii) Other/ Monitoring

The executing agency will monitor noise, air quality, water quality, groundwater level, land acquisition, and resident relocation, etc., related to this project.

(b) Promotion of Poverty Reduction

None

(c) Promotion of Social Development (e.g. Gender Perspective)

Many of the migrant workers employed by this project live alone, and their risk of HIV infection is considered high. For this reason, referring to the measures taken in Phase 1, the executing agency will hire an NGO to implement HIV prevention programs for the workers, in an effort to contribute to society.

(7) Other Important Issues

None

**5. Outcome Targets**

(1) Evaluation Indicators (Operation and Effect Indicator)

Indicator	Target (2011, project completion)	Target (2013, 2 years after completion)	Target (2018, 7 years after completion)
Operating rate (%/year)	92	92	92
Running distance (thousand km/day)	90.24	90.24	90.24
Line #1 Shahdra - Dilshad Garden	5.64	5.64	5.64
Line #2 Central Secretariat - Qutab Minar	20.52	20.52	20.52

Line #2 Vishwa Vidyalaya - Jahangir Puri	11.60	11.60	11.60
Line #3 Indraprastha - New Ashok Nagar	13.56	13.56	13.56
Line #4 Yamujna Bank – Anand Vihar ISBT	7.90	7.90	7.90
Line #5 Kirti Nagar - Mundka, Indralok - Shiva Ji Park	31.03	31.03	31.03
Number of running train (number of running train/day in one direction)	1272	1272	1272
Line #1 Shahdra - Dilshad Garden	228(X=6)	228(X=6)	228(X=6)
Line #2 Central Secretariat - Qutab Minar	236(X=3)	236(X=3)	236(X=3)
Line #2 Vishwa Vidyalaya - Jahangir Puri	228(X=6)	228(X=6)	228(X=6)
Line #3 Indraprastha - New Ashok Nagar	210(X=4)	210(X=4)	210(X=4)
Line #4 Yamujna Bank – Anand Vihar ISBT	160(X=12)	160(X=12)	160(X=12)
Line #5 Kirti Nagar - Mundka, Indralok - Shiva Ji Park	210(X=4)	210(X=4)	210(X=4)
Volume of transportation (million persons/km/day)	35.44	39.4	51.35
Passenger income (million rupees/day)	35.44	39.4	51.35

(X = the interval in minutes between trains at peak time)

(2) Internal Rate of Return

Financial Internal Rate of Return (FIRR): 7.2%

- (a) Cost: Project cost, operation and maintenance expense
- (b) Benefit: Fare income, advertising income, real estate development income
- (c) Project Life: 25 years

Economic Internal Rate of Return (EIRR): 22.7%

- (a) Cost: Project cost (excluding tax), operation and maintenance expense
- (b) Benefit: Cost savings on conventional transportation means and roads, reduction in travel time for users of these train lines and for users of other means of transportation, savings on the operation expenses of transportation systems such as buses due to reduced road

<p>congestion, and effect of fewer accidents and less pollution</p> <p>(c) Project Life: 25 years</p>
<p><b>6. External Risk Factors</b></p>
<p>Economic stagnation/deterioration in India and the surrounding area of the project as well as natural disasters</p>
<p><b>7. Lessons Learned from Findings of Similar Projects Undertaken in the Past</b></p>
<p>In the ex-post evaluations of previous railway and underground rail projects, it has been learned that establishment of a financially independent project implementation structure is important from the standpoint of ensuring proper operation and maintenance. In this project, it is desirable to adjust this project's routes so as not to compete with bus routes in order to boost the usage rate. The Delhi government is already conducting this adjustment, and Delhi Transport Corporation has agreed that bus lines will play the role of feeder lines for this project. Moreover, to further improve the project's financial status, the executing agency is studying related businesses such as advertising and real estate development, etc.</p>
<p><b>8. Plans for Future Evaluation</b></p>
<p>(1) Indicators for Future Evaluation</p> <ul style="list-style-type: none"> <li>(a) Operating rate (operating train cars/procured train cars) (%/year)</li> <li>(b) Running Distance (thousand km/day)</li> <li>(c) Number of running train (trains/day in one direction)</li> <li>(d) Volume of transportation (million persons/km/day)</li> <li>(e) Passenger income (million rupees/day)</li> <li>(f) Internal rate of return: FIRR (%), EIRR (%)</li> </ul> <p>(2) Timing of Next Evaluation</p> <p>After project completion</p>