

Ex-ante Evaluation

1. Name of the Project
Country: India Project: Bangalore Metro Rail Project (Loan Agreement: 03/31/2006; Loan Amount: 44,704 million yen; Borrower: The President of India)
2. Necessity and Relevance of JBIC's Assistance
<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 10th 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>Bangalore's population increased from 3.00 million in 1981 to reach 5.70 million in 2001 (representing a population density of 11,000 people/km²). Because the number of buses and private vehicles have also increased, the average vehicle speed on city streets is 10 - 12 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), it is necessary to introduce a mass rapid transport system to relieve traffic congestion and vehicle emissions, and so JBIC's assistance is highly necessary and highly relevant.</p>
3. Project Objectives
<p>The objective of this project is to cope with the increase of traffic demand in Bangalore, the capital city of the State of Karnataka in southern India, by constructing a new mass rapid transportation system with a total length of approximately 33 km, thereby promoting regional economic development and improving urban environment, through mitigation of traffic jam and decrease of pollution caused by increasing motor vehicles.</p>
4. Project Description

(1) Target Area

Bangalore city, State of Karnataka

(2) Project Outline

(a) Civil engineering works

East-West Line: Baiyapanahalli Terminal - Mysore Road Terminal (18.1 km, of which 3.4 km is underground)

North-South Line: Yeswantpur - R. V. Road Terminal (14.9 km, of which 3.3 km is underground)

Civil engineering works for ground-level stations (2 stations), elevated stations (23 stations), and underground stations (6 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; signaling and telecommunication-related matters for all lines; and consulting services

(3) Total Project Cost/Loan Amount

133,183 million yen (Yen Loan Amount: 44,704 million yen)

(4) Schedule

January 2006 – April 2013 (88 months)

(5) Implementation Structure

(a) Borrower: The President of India

(b) Executing Agency: Bangalore 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 March 2003.

(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 89.52 ha. The project is expected to necessitate the relocation of 313 houses and structures. The resident relocation process will be conducted in accordance with the Karnataka industrial area development board act and the national policy on resettlement and rehabilitation for project affected families. 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 houses for free at the relocation site nearby, 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 Delhi Mass Rapid Transport System Project, the executing agency will hire an NGO to implement HIV prevention programs for the workers, using project loan funds.

(7) Other Important Issues

None

5. Outcome Targets

(1) Evaluation Indicators (Operation and Effect Indicator)

Indicator	Target (2012, start of commercial operation)	Target (2014, 1 year after completion)	Target (2019, 6 years after completion)
Operating rate (%/year)	92	92	92
Running distance (thousand km/day)	32.9	58.3	58.3
East-West Line	15.8	28.0	28.0
North-South Line	17.1	30.3	30.3
Number of running train (number of running train/day in one direction)	332	380	380
East-West Line	166(X=6)	190(X=6)	190(X=6)
North-South Line	166(X=6)	190(X=6)	190(X=6)
Volume of transportation (million persons/km/day)	7.53	8.25	10.40

East-West Line	3.62	3.96	4.99
North South Line	3.92	4.29	5.41
Passenger income (million rupees/day)	8.1	9.6	14.8

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

(2) Internal Rate of Return

Financial Internal Rate of Return (FIRR):8.0%

- (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): 25.9%

- (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 congestion, and effect of fewer accidents and less pollution
- (c) Project Life: 25 years

6. External Risk Factors

Economic stagnation/deterioration in India and the surrounding area of the project as well as natural disasters

7. Lessons Learned from Findings of Similar Projects Undertaken in the Past

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 Karnataka State government is already conducting this adjustment, and Bangalore Metropolitan 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.

8. Plans for Future Evaluation

(1) Indicators for Future Evaluation

- (a) Operating rate (%/year)
- (b) Running distance (thousand km/day)
- (c) Number of running train (trains/day in one direction)
- (d) Volume of transportation (million persons/km/day)
- (e) Passenger income (million rupees/day)
- (f) Internal rate of return: FIRR (%), EIRR (%)

(2) Timing of Next Evaluation

After project completion