

**1. Name of the Project**

Country:	India
Project:	Delhi Mass Rapid Transport System Project Phase 3 (II)
Loan Agreement:	March 31 <sup>st</sup> , 2014
Loan Amount:	140,000 million yen
Borrower:	The President of India

**2. Background and Necessity of the Project****(1) Current State and Issues of the Urban Transportation Sector in India**

India is experiencing rapid urbanization. While the registered number of automobiles and motorcycles are surging, the development of public transportation infrastructure is much lagging. As a result, traffic congestion due to the increased number of automobiles and motorcycles is becoming a serious problem in urban areas. Particularly, in metropolitan cities such as Delhi, Mumbai and Chennai, traffic congestion accompanying the rise in road traffic demand is becoming a critical issue. Since this is causing economic loss and health hazards due to air, noise and other forms of vehicle-related pollution, there is an urgent need to introduce a public transportation system to alleviate traffic congestion and vehicle-related pollution.

**(2) India's Development Policies for the Urban Transportation Sector and the Role of the Current Project**

To address the above challenge, development of the public traffic system is focused in the Twelfth Five-Year Plan (April 2012 to March 2017) not only to satisfy the transport demand accompanying economic growth in recent years but also from the viewpoint of safety, energy efficiency, and social environment conservation, and investment of 1,300 billion rupees to railways is planned in five years.

**(3) Japan and JICA's Policy and Operations in the Urban Transportation Sector in India**

The "Promotion of Economic Growth" is one of the priority areas in the Japan's Country Assistance Programs for India by the Government of Japan. Accordingly, JICA has set the "Promotion of Sustainable Growth through the Development Assistance to the Infrastructure" as a priority area. The Project is categorized under the "Improvement of Transport Networks" program within the said priority area; therefore the assistance for the Project is consistent with Japan and JICA's policy. JICA has so far approved yen loans to the urban transportation sector in 23 cases. The total amount of the yen loans is 826.7 billion yen (71.8% of the approved amount of yen loans to the transportation sector).

**(4) Other Donors' Activities**

In the urban transportation sector, the World Bank is supporting Mumbai's urban transportation project (development of roads and suburban railways) and the development of the Eastern Corridor under the freight railway construction plan. The Asian Development Bank is supporting the railway sector, focusing on support of "soft (non-physical)" aspects, such as organizational reform of the Indian Railway.

**(5) Necessity of the Project**

The population of the Delhi metropolitan area increased from 9.42 million in 1991 to 16.75 million in 2011 and is estimated to rise to 24.32 million in 2021. With this increase in the population, the number of registered automobiles has increased sharply from 3.46 million in 2000 to 6.93 million in 2011, resulting in serious traffic congestion and automobile pollution. Since it is difficult to enhance the transportation capacity of existing public transportation (buses and railways) and the road networks, the extension of mass rapid transit system constructed in Phase 1 and 2 of Delhi Mass Rapid Transport System Project has become a major countermeasure in the urban transportation and Japanese ODA Loan environmental policy of the Government of Delhi. As the extension of existing lines and the development of beltways will continue to be the main pillars of the urban transport policy and urban environmental measures to ease traffic congestion in the metropolitan area;

JICA's assistance for the Project is highly necessary and relevant.

### 3. Project Description

#### (1) Project Objective

The objective of the Project is to cope with the growing traffic demand in the Delhi metropolitan area, the capital city of India, by extending the mass rapid transport system totaling approximately 115.78 km in length, thereby contributing regional economic development and improvement of the urban environment, through alleviation of traffic congestion and reduction of traffic pollution.

#### (2) Project Site / Target Area

The Delhi metropolitan area of India

#### (3) Project Components

Construction of four segments in four lines (with a total length of 103 km) and the procurement of rolling stock as the phase 3 of Delhi Mass Rapid Transport System Project (a total length of about 245 km in Phases 1 to 3); the portions of the Project covered by Japanese ODA Loans are as follows:

- 1) Civil works (Underground Portion of Line-8 (24.30 km) including 15 underground stations, Track Works for all the alignment)
- 2) Electrical and signaling & telecommunication system
- 3) Procurement of total 785 of rolling stocks (enhancement of the transportation capacity of the above-mentioned four sections and some existing lines)
- 4) Consulting services (design review, construction monitoring and supervision etc.)

#### (4) Estimated Project Cost (Loan Amount)

607,252 million yen (Loan amount of this tranche: 140,000 million yen)

#### (5) Project Implementation Schedule

March 2012–October 2020 (104 months in total). Project completion is scheduled in October 2020 as all vehicles and rolling stocks are delivered

#### (6) Project Implementation Structure

- 1) Borrower: The President of India
- 2) Executing Agency: Delhi Metro Rail Corporation Limited (hereinafter referred to as "DMRC")
- 3) Operation and Maintenance System: DMRC

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

- 1) Environmental and Social Considerations: as described in the Appendix
- 2) Promotion of Poverty Reduction: None in particular.
- 3) Promotion of Social Development (e.g. Gender Perspective, Measures for Infectious Diseases Including HIV/AIDS, Participatory Development, Consideration for Persons with Disability, etc.):

Many of the migrant workers employed by the Project live alone, and the risk of HIV/AIDS infection is considered high. For this reason, DMRC in cooperation with local NGOs has been implementing HIV/AIDS prevention activities by its own funds as a form of social contribution. At the same time, as a working environment policy, HIV/AIDS prevention clauses have been inserted in tender documents, and each contractor is expected to cooperate with efforts to prevent HIV/AIDS infection. In addition, according to the laws of India, the stations and coaches are designed taking into consideration of needs of the elderly and the physically challenged (e.g., user-friendly design of elevators and restrooms, announcements at stations, signs in Braille, space for wheelchairs). Further, DMRC has plans to offer training in customer care for all frontline staffs including station clerks and crews.

(8) Collaboration with Other Schemes or Donors

None in particular

(9) Other Important Issues

Due to the introduction of regenerative braking systems for electricity powered vehicles, which is an energy-saving technology employed in Japan, and the development of a modal shift under this Project, it will contribute to the reduction of greenhouse gas emissions, thus this Project can be considered to contribute to the mitigation of climate change. As with Phase 2, this Project will be registered with the United Nations as a Clean Development Mechanism (CDM) project. The effect of mitigating climate change is estimated to be about 2.2 million tons (in terms of CO2 equivalent: total amount of the reduction between 2008 and 2032 achieved by Phases 1 to 3).

**4. Targeted Outcomes**

(1) Quantitative Effects

1) Performance Indicators

Indicators	Target (2022) [2 years after project completion]
Operating Rate (%/year)	92
Running Distance (thousand km/day)	244.16
Number of Running Trains (number of trains/day, one direction)	979
Volume of Transportation (million persons-km/day)	49.56
Passenger Revenue (million rupees/day)	92.64

2) Internal Rates of Return

Based on the assumptions below, the economic internal rate of return (EIRR) for the Project will be 19.1% and the financial internal rate of return (FIRR) will be 4.4%.

[EIRR]

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

Benefit: Savings of vehicle operating cost (fuel consumption) and maintenance cost, savings of the metro and road passenger travel time, savings on vehicle operating cost by alleviating congestion (time factor), savings from decrease of accidents, reduction of traffic pollution

Project life: 30 years

[FIRR]

Cost: Project cost (excluding tax); operation and maintenance cost

Benefit: Revenue from the metro passenger, advertisement and property development

Project life: 30 years

(2) Qualitative Effects

Improvement of the traffic conditions in the Delhi metropolitan region; mitigation of traffic pollution; mitigation of climate change; improvement of convenience by securing the timeliness of transportation; economic development in the Delhi urban area

**5. External Factors and Risk Control**

Worsening of the political and economic situations and occurrence of natural disasters in India and in the areas

around the target area

## **6. Results of Evaluations and Lessons Learned from Past Projects**

### (1) Evaluation Results of Similar Projects

In the ex-post evaluations of the 1<sup>st</sup> phase of Delhi Mass Rapid Transport System Project, it is pointed out that the gap between predicted number of passengers and the actual number is one of the important challenges. It is recommended to make a forecast more realistic by improving the method of demand analysis when we establish target performance indicators.

### (2) Lessons for the Project

Based on the foregoing lessons, a more realistic target of number-of-passengers has been set up in the Project, taking not only the traffic of the project area, residents' income level and a transportation mode but also actual passengers record of the existing lines into consideration.

## **7. Plan for Future Evaluation**

### (1) Indicators for Future Evaluation

- 1) Operating rate (%/year)
- 2) Running distance (100km/day)
- 3) Number of running trains (trains/day, one direction)
- 4) Volume of transportation (million persons-km/day)
- 5) Income from Passengers (million rupees/day)
- 6) Internal rate of return: FIRR (%), EIRR (%)

### (2) Timing

Two years after project completion

## Delhi Mass Rapid Transport System Project Phase 3 Results of the Environmental Review

1. **Category: A**
2. **Reason for the Categorization:** This Project is classified as Category A because it falls under the railway sector according to the “JICA Guidelines for Environmental and Social Considerations” (put into effect in April 2010) and has characteristics that are likely to have an adverse environmental impact.
3. **Environmental Permit:** Although no environmental impact assessment (EIA) report is required under India’s domestic laws, a report was already prepared in August 2011 and revised in November 2013.
4. **Stakeholders’ Main Opinions and the Executing Agency’s Response:** Consultation meetings with the residents concerning the EIA and the relocation of residents were held thirteen times between April 2011 and September 2013. Because a participant had a question about noise during construction and use, the executing agency explained the measures to be taken under this Project. When a participant requested consideration for the convenience of women, elderly persons and other socially vulnerable people during use, the executing agency explained that it will give consideration to this. Concerning the relocation of residents, because participants requested payment of fair compensation, the provision of support for the actual move and the provision of job opportunities for the affected residents, the executing agency explained the compensation scheme, including the provision of job opportunities, and the details of support for the actual relocation.
5. **Measures to control Pollution:** Measures are to be taken during the construction work, including the proper management of pollutants and construction vehicles and heavy machinery. With regard to the impact on the ground, due to the adoption of the shield methods that prevent ground subsidence and the inflow of groundwater, no serious impact is expected to arise from subsidence. After the beginning of use, soundproof walls will be installed as a measure against noise, layers of absorbent rubber will be placed under the tracks as a measure to control vibration, and measures for the mitigation of water pollution will be taken, such as the installation of drainage treatment facilities at vehicle depots.
6. **Natural Environment:** Because the project is located in an urban area, there are no natural forests or rare species. Moreover, because the planned routes generally run along existing roads, no special impact on the natural environment is foreseeable. However, because some routes run through the surroundings of bird sanctuaries, measures to avoiding bird strikes will be taken, such as the provision of alarm whistles in the surrounding areas.
7. **Social Environment:** This Project requires the acquisition of private sites totaling about 5.3 ha and the relocation of 543 households and 1,373 residents. The DMRC will proceed with the procedures according to the resident relocation plan (based on the Site Acquisition Law and resident relocation policies of the Government of the National Capital Territory of Delhi). Although the DMRC is planning to complete the acquisition of the sites, the relocation of the residents and the payment of compensation in July 2015, it will continue to confirm the consistency of the procedures with the JICA Guidelines.
8. **Other aspects/Monitoring:** During the construction, the DMRC will monitor the acquisition of sites and the relocation of residents. Moreover, under the supervision of the DMRC, the contractors will monitor noise, vibration, soil, air quality, water quality, waste, etc. When the system is operating, the DMRC will monitor noise, vibration, air quality, water quality, etc. In addition, outside consultants will monitor the acquisition of sites, the relocation of residents and the living conditions of the residents after their relocation.

9. **Conclusion:** As described above, it can be considered that checking whether the environmental and social considerations are consistent with the JICA Guidelines will reduce the possibility of the occurrence of any serious and undesirable impacts from this Project. However, after the signing of the loan contract, it will be necessary to regularly check the status of the implementation of this Project in terms of the following:
- (1) Status of the acquisition of sites and the involuntary relocation of the residents
  - (2) Environmental monitoring (during the construction work and when it is in operation)