

## Ex-Ante Evaluation (for Japanese ODA Loan)

## 1. Name of the Project

Country : The People's Republic of Bangladesh

Project : Dhaka Mass Rapid Transit Development Project (Line 5 Northern Route) (I)

Loan Agreement : 12 August, 2020

## 2. Background and Necessity of the Project

## (1) Current State and Issues of the Urban Development Sector in Bangladesh

The population of Dhaka increased from 6.62 million to 17.6 million between 1990 and 2015 (United Nations Population Division, 2018). This population increase has caused a rapid increase in transportation demand, which in turn has led to chronic traffic congestion and air pollution. As a result, the average vehicle travel speed in Dhaka is 6.4 km/hour, less than half that in central Tokyo (14.7 km/hour; Ministry of Land, Infrastructure, Transport and Tourism, 2015). The economic loss due to traffic congestion is 3.868 billion US dollars per year (Bangladesh Water Development Board, etc., 2013), which is degrading the investment environment greatly and hindering the economic and social development of Bangladesh. In terms of air pollution, the annual average PM<sub>10</sub> concentration is reported to be 146 µg/m<sup>3</sup> (World Health Organization [WHO], 2018), which exceeds the WHO environmental standard of 20 to 70 µg/m<sup>3</sup>. Furthermore, there is also concern about the health hazards to the residents of the Dhaka metropolitan area due to the exhaust fumes emitted for long periods of time caused by severe traffic congestion.

To solve this problem, the Government of Bangladesh identified the promotion of economic growth and poverty reduction as a major goal in the 7th Five-Year Plan (FY2016/17–FY2020/21) and highlighted in its Transport and Communication Development Strategy the importance of reducing road traffic congestion in the metropolitan area with appropriate investment. Based on this plan, the government revised the Strategic Transportation Plan (STP), the master plan for Dhaka urban transportation, with aid from JICA in August 2016. In the revised STP, five Mass Rapid Transit (MRT) routes and two Bus Rapid Transit (BRT) routes were proposed to form a public transport network.

The Dhaka Mass Rapid Transit Development Project (Line 5, Northern Route) (hereinafter referred to as “the Project”) is a route that runs east-west through the center of the capital city of Dhaka, and connects with MRT Lines 1 and 6, both of which are currently supported by Japanese ODA Loans. The creation of this public transport network will facilitate traffic. The Project is positioned as a high priority project in the revised STP mentioned above.

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

The JICA Country Analysis Paper for Bangladesh (March 2019) identifies urban

development including urban transport as a priority issue, while Japan's Country Assistance Policy for Bangladesh (February 2018) has also set forth the priority area of "accelerating inclusive economic growth," with initiatives for developing transport infrastructure with diversified modes of transport and promoting the efficient movement of people and goods. The Project is thus consistent with this analysis and policy. Additionally, since it will help alleviate traffic congestion in the Dhaka metropolitan area, and reduce the negative environmental impact of air pollution, the Project will also contribute to the achievement of SDGs 9 (Industry, Innovation, and Infrastructure), 11 (Sustainable Cities and Communities), and 13 (Climate Action).

JICA's recent major assistance activities in the urban development sector include the Dhaka Mass Rapid Transit Development Project (Phase 1 Loan Agreement signed in 2012, Phase 2 Loan Agreement signed in 2016, Phase 3 Loan Agreement signed in 2018) (Note: MRT Line 6), the Project on the Revision and Updating of the Strategic Transport Plan for Dhaka (Technical Cooperation, FY 2016-2018), the Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area (Phase 1) (Technical Cooperation, FY 2014-2018), the Dhaka Mass Rapid Transit Development Project (Line 1) (Japanese ODA loan project, E/S. approved in 2017, Phase 1 approved in 2019), the Dhaka Mass Rapid Transit Development Project (Line 5) (Japanese ODA loan project, E/S, approved in 2018), and the Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area (Phase 2) (Technical Cooperation, FY 2019-2022).

### (3) Other Donors' Activity

In addition to supporting the development of the STP, the World Bank implemented the Clean Air and Sustainable Environment Project from 2009 to 2016, which included the detailed design of BRT Line 3 (between Dhaka Airport and Jhilmil). The Asian Development Bank (ADB) has been providing assistance for the Greater Dhaka Sustainable Urban Transport Corridor Project since 2010, which is developing BRT Line 3 (between Gazipur and Dhaka Airport). It is also providing assistance for the MRT Line 5 Southern Route (between Gabtoli and Aftabnagar stations), which is planned to be built parallel to the southern part of the Project. This, together with the Project, have been positioned as Strategic Partnership for Sustainable and Inclusive Development through Promotion of Quality Infrastructure Investment in Asia and the Pacific.

## 3. Project Description

### (1) Project Objective(s)

The objective of the Project is to reduce the traffic congestion in Dhaka City and adjoining areas by constructing the mass rapid transit system, thereby contributing to the economic development and improving urban environment.

### (2) Project Site/Target Area

## Dhaka District

### (3) Project Component(s)

- 1) Depot land development and construction (land development, construction of depot buildings, railway sidings, etc.)
- 2) Construction of railway structures (total length of approx. 20km (elevated approx. 6.5km, underground approx. 13.5km), construction of 14 stations, including elevated and underground railway facilities, etc.)
- 3) Installation of electrical and mechanical system (track works, electric system, telecommunication system, signal systems, etc.)
- 4) Procurement of rolling stocks (180 cars [30 six-car trains])
- 5) Consulting services (F/S review, detailed design, tender assistance, construction supervision, environmental and social consideration, institutional development assistance, assistance in preparing for non-rail business, security assessment, and risk mitigation, etc.)

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

556,237 million Yen (Loan Amount : 55,696 million Yen)

### (5) Schedule

June 2018 (Loan Agreement of E/S loan) - October 2031 (161 months in total) The Project will be completed when the facilities are put in place (November 2029).

### (6) Project Implementation Structure

- 1) Borrower: The Government of the People's Republic of Bangladesh
- 2) Guarantor: N/A
- 3) Executing Agency: Dhaka Mass Transit Company Limited (DMTCL)
- 4) Operation and Maintenance System: DMTCL

### (7) Cooperation and Sharing of Roles with Other Donors

1) Japan's Activity: In the Dhaka Mass Rapid Transit Development Project and the Dhaka Mass Rapid Transit Development Project (Line 1), both ODA Loan projects, urban railways that connect to the Project will be constructed. Additionally, based on the outcome of the previously-implemented Technical Cooperation Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area (Phase 1), phase 2 of this project will aim to develop an implementation system for the dissemination of IC cards and for the full-scale implementation and dissemination of the IC card payment system. Furthermore, through the project for Training and Education on Mass Transit System Operation and Maintenance Management, a Technical Cooperation project approved in FY 2018, an operation safety management system for MRT workers will be created to strengthen their capacity for implementation, and human resources with the skills necessary to operate a safe urban railway will be developed.

- 2) Other Donors' Activity: N/A

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

1) Environmental and Social Consideration

- ① Category : A
- ② Reason for Categorization: The project falls into the railways sector under the JICA Guidelines for Environmental and Social Considerations (published in April 2010).
- ③ Environmental Permit: An Environmental Impact Assessment (EIA) Report on the Project was approved by the Department of Environment, Ministry of Environment and Forests of Bangladesh, in November 2017. In Bangladesh, environmental permits must be renewed every year, and the renewal procedure for up to the end of December 2020 has been completed.
- ④ Anti-Pollution Measures: Air pollution, noise, and vibrations caused by the construction work will be minimized by implementing various measures, such as regularly sprinkling water, installing temporary enclosures, installing sound absorbers for the construction equipment, and installing noise barriers. Through the installation of long rails and sound insulation barriers, the level of noise emitted when the trains are in service is expected to meet the Japanese noise standard for conventional railways. Any deterioration in water quality will be prevented by installing wastewater treatment facilities at train stations and depots. Additionally, tunnel excavation for the Project will generate approximately 1.5 million m<sup>3</sup> of surplus soil, but this will be reused by RAJUK (Capital Development Authority) and private companies for land reclamation and earth filling. Specific uses, storage methods and treatment methods will be adjusted and decided by the Government of Bangladesh during the detailed design phase.
- ⑤ Natural Environment: As the Project site is not located in or around national parks or other vulnerable areas, any undesirable impact on the natural environment is likely to be minimal.
- ⑥ Social Environment: The construction of the railway structures and depot, most of which will make use of the space above and below existing roads, will involve the acquisition of about 23.6 ha of land (about 22 ha for the depot and about 1.6 ha for the ground and elevated sections). Out of 4,660 affected people from 1,107 households affected by the Project (Including the results of supplementary survey), 135 residents from 29 households will need to be resettled. The land acquisition and resettlement will be implemented in accordance with the domestic procedures of Bangladesh and a resettlement plan formulated under the JICA Guidelines. No particular objections to the Project were raised during meetings with local residents.
- ⑦ Other / Monitoring: During the construction phase, the contractor and the executing agency are in charge of monitoring air pollution, noise, vibration,

water quality, waste, etc. After the start of operations, the executing agency will monitor noise, vibration and water quality, etc. The executing agency will also monitor progress in terms of land acquisition, resettlement and livelihood recovery support.

## 2) Cross-Cutting Issues

The Project will contribute to the reduction of greenhouse gas (GHG) emissions through the promotion of public transportation. The climate change mitigation effect of the Project (approximate GHG emission reduction) is equivalent to about 39,491 tons/year of CO<sub>2</sub> (estimate for 2025). In addition, in accordance with the Bangladesh National Building Code (BNBC) and Japanese guidelines for the development of barrier-free passenger facilities and vehicles, universal design features will be incorporated, including guidance blocks for the visually impaired and ramps for wheelchair users.

## 3) Gender Category: [Gender Project] GI (S) (Gender Activities Integration Project) Activity Component(s)/Reason for Categorization:

On public transportation in Bangladesh, the safety of women cannot be sufficiently ensured, thereby obstructing their use of public transportation. Therefore, since it is necessary to promote women's safety and an understanding of gender on trains and in stations, gender action plans have been agreed upon; these include the operation of women-only cars at peak times, the installation of surveillance cameras in stations and cars, as well as the promotion of hiring women for construction operations and at managing entities. Consequently, this is categorized as a Gender Integrated Project.

## (9) Other Important Issues: N/A

The introduction of advanced Japanese technologies (e.g. rolling stocks, electrical/signaling systems, civil engineering technology, etc.) to achieve high-quality infrastructure is possible.

## 4. Targeted Outcomes

### (1) Quantitative Effects

#### Performance Indicators (Operation and Effect Indicator)

Indicator	Baseline (Actual Value in 2019)	Target (2031) 【Expected value 2 years after project completion】
Volume of Transportation (Man * km)	n/a	10,023
Train Kilometer (km/day)	n/a	5,794
Running Time between Vatara to Hemayetpur (min)	122	32
Number of Running Train (Number of Running Train / Day)	n/a	261
Operating Rate (%)	n/a	93

\* formula: Train Kilometer=Running Distance / Total Trains

### (3) Qualitative Effects

Facilitation of transportation and physical distribution in the Dhaka metropolitan area, development of Bangladesh's economy through the reduction of economic losses by reducing traffic congestion, and mitigation of climate change through the reduction of GHG emissions by promoting a modal shift to public transportation.

### (3) Internal Rate of Return

According to the following preconditions, the Project's Economic Internal Rate of Return (EIRR) will be 12.4%. The Financial Internal Rate of Return (FIRR) will be 7.1%.

#### 【EIRR】

Cost: Project costs and operation/maintenance costs (excluding tax)

Benefit: Saving in Travel Time Cost, Saving in Vehicle Operating Cost, Reduction in CO2

Project Life: 37 years

#### 【FIRR】

Cost: Project costs and operation/maintenance costs

Benefit: MRT toll revenue

Project Life: 37 years

## 5. External Factors and Risk Control

(1) Preconditions: N/A

(2) External Conditions: N/A

## 6. Lessons Learned from Past Projects

The ex-post evaluation of the Calcutta Metro Railways Construction Project (ODA Loan for India, evaluated in 2001) revealed that, for projects involving land acquisition and facility relocation, it is important to take into account the opinions of local residents and parties involved in the planning and implementation phase. The ex-post evaluation also indicates that delays in relocating underground installations, such as waterworks and sewerage, can cause construction delays and cost overruns. In addition, the ex-post evaluation of the Delhi Mass Rapid Transport System Project (I)-(IV) in India (evaluated in 2010) showed that construction delays were prevented because the executing agency (Delhi Metro Rail Corporation), not the water authorities or other such parties, relocated the underground installations. Furthermore, the ex-post evaluation for the Mass Transit System Project in Bangkok (Purple Line) (I) and (II) (ODA Loan for Thailand, evaluated in 2018) reported that the progress of the MRT line as planned in the master plan and the development of branch lines connecting MRT stations to residential areas were necessary to ensure sufficient passenger numbers.

Based on the lessons above, the Project is intended to determine the scale of the land

acquisition and resettlement areas and start discussions with stakeholders at an early stage during the detailed design phase of the E/S Loan through consulting services for environmental and social considerations. A geological survey, underground utilities survey, underground obstacle survey, and cultural asset survey will be conducted during the detailed design phase. In order to prevent construction delays and cost overruns resulting from geological conditions, underground installations, underground obstacles, and cultural assets, while the executing agency DMTCL will relocate and remove underground installations and coordinate the relocation and removal work with relevant agencies. In addition, in order to provide convenient access to MRT Line 5, coordination with various stakeholders is planned from the detailed design stage to formulate a plan and design that ensures user-friendliness when connecting to other MRT lines, as well as to other modes of transport such as trains and buses.

## 7. Evaluation Results

The Project is consistent with the development issues and development policies of Bangladesh, as well as the assistance policies and analyses of the Government of Japan and JICA. Through the development of a mass rapid transit system, the Project will help alleviate traffic congestion in the Dhaka metropolitan area, which is becoming increasingly severe, and help reduce the negative environmental impact of air pollution, thereby contributing to the achievement of SDGs 9 (Industry, Innovation, and Infrastructure), 11 (Sustainable Cities and Communities), and 13 (Climate Action). Therefore, the necessity for JICA to support the Project is substantial.

## 8. Plan for Future Evaluation

### (1) Indicators to be Used

As described in (1)-(3) of Section 4.

### (2) Timing

Ex-post evaluation: Two years after the project completion