

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

South Asia Division, South Asia Department 4

Japan International Cooperation Agency

**1. Name of the Project**

Country : The People's Republic of Bangladesh (Bangladesh)

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

Loan Agreement : June 28, 2022

**2. Background and Necessity of the Project****(1) Current State and Issues of the Urban Development Sector and the Priority of the Project in Bangladesh**

The population of Dhaka increased from 6.62 million to 19.8 million (estimated value) between 1990 and 2018 (United Nations Population Division, 2018). This population increase and economic growth have 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 was 6.4 km/h, which is less than half that of central Tokyo (14.7 km/h) (Ministry of Land, Infrastructure, Transport and Tourism, 2015). Economic loss due to traffic congestion are estimated to be billions of dollars per year (World Bank 2018). 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>. WHO points out that emissions from vehicles are responsible for roughly 40% of air pollution in Dhaka, and is concerned that emissions from such traffic congestion could harm the health of residents in the Dhaka metropolitan area. These factors have worsened the country's economic activities and urban environment, creating a major bottleneck for economic and social development.

The Eighth Five Year Plan (FY2021-FY2025) sets a major goal of comprehensive economic growth, which benefits all people including the poor. In addition, it aims at reducing the traffic congestion and improving the environment, improving transport and traffic infrastructure so as to meet existing and potential demands, and developing an integrated and balanced system in which all modes can perform efficiently and each mode can fulfil its appropriate role in the system, in the "Transportation and Communication" sector.

The Government of Bangladesh has established the Revised Strategic Transport Plan (RSTP) with the assistance of JICA in August 2016, which aims to develop five mass rapid transit (MRT) routes and two bus rapid transit (BRT) routes.

MRT Line 5 (Northern Route), which will be constructed under 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 RSTP mentioned above.

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

The Country Development Cooperation Policy for the People's Republic of Bangladesh (February 2018) has set forth the priority area of "accelerating economic growth for the benefit of all citizens toward a middle-income country," trying to contribute to the improvement of regional connectivity by promoting the efficient move of people and goods through the development of high quality transportation and traffic infrastructure in accordance with international standards, while paying attention to the diversification of transportation systems. In addition, the JICA Country Analysis Paper for the People's Republic of Bangladesh (March 2019) identifies urban development including urban transport as a prioritized issue. 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 Goal 9 (Industry, Innovation and Infrastructure), 11 (Sustainable Cities and Communities), and 13 (Climate Action).

In addition to the JICA's recent major assistance activities in the urban development sector specified in 3. (7) 1), JICA implemented the technical cooperation, "Project on the Revision and Updating of the Strategic Transport Plan for Dhaka (FY 2014-2016), to establish RSTP.

#### (3) Other Donors' Activity

The World Bank (WB) assisted the preparation of the Strategic Transport Plan. WB also implemented the Clean Air and Sustainable Environment Project, which supports detailed design of the BRT Route 3 south section (between Airport Station and Jhilmil), from 2009 to 2016. The Asian Development Bank (ADB) has been implementing the Greater Dhaka Sustainable Urban Transport Corridor Project to develop the BRT Route 3 north section (between Gazipur and Airport Station) since 2010. ADB also provides assistance for the MRT Line 5 Southern Route (between Gabtoli and Aftabnagar station), 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

The objective of the Project is to alleviate the traffic congestion and mitigate the air pollution 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) Construction of a depot (land development, construction of depot buildings, railway sidings, etc.)
- 2) Construction of railway structures (total length of approx. 20km, construction of 14 stations, tracks, etc.)
- 3) Installation of electrical and mechanical system
- 4) Procurement of rolling stocks (144 cars: 8 cars × 18 sets)
- 5) Consulting services (feasibility study review, basic and detailed design, tender assistance, construction supervision, environmental and social consideration, training for operation and maintenance, institutional development assistance, assistance in preparing for non-rail business, etc.)

(4) Estimated Project Cost

605,250 million Yen (Loan Amount : 133,399 million Yen)

(5) Schedule

June 2018 (Loan Agreement of Engineering Service (E/S) loan) - October 2031 (161 months in total) The Project will be completed upon the opening of all sections (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: MRT Line 1 and 6, to be constructed with JICA's loan assistance under "Dhaka Mass Rapid Transit Development Project (Line 1)" and "Dhaka Mass Rapid Transit Development Project" respectively, will be connected with MRT Line 5 Northern Route being constructed under the Project. In addition, based on the outcomes of the technical cooperation, "Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area (Phase 1)," the technical cooperation, "Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area (Phase 2)" aims to establish a framework for making smart cards more widespread as well as to fully introduce and institutionalize the smart card payment system. Furthermore, the technical cooperation, "Technical Assistance for Mass Rapid Transit Safety Management System of Line 6", supports for capacity development to establish and implement DMTCL's operational safety management system. Additionally, the technical cooperation, "Project for Development of Policy and Guidelines for Transit Oriented Development along Mass Transit Corridors", supports for planning of strategic urban

development around MRT stations for officials of Rajdhani Unnayan Kartipakkha (RAJUK: public agency responsible for urban planning in Dhaka).

2) Other Donors' Activity: N/A

(8) Environmental and Social Consideration/Cross-Sectoral Issues/Gender Category

1) Environmental and Social Consideration

- ① Category : A
- ② Reason for Categorization: The project falls into the railway sector, and is likely to have significant adverse impact due to its characteristic under the JICA guidelines for environmental and social considerations (April 2010).
- ③ Environmental Permit: The 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, the Environmental Clearance Certificate must be renewed annually, and the certificate for the Project was renewed in November 2021.
- 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 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 40.4 ha of land (about 29 ha for the depot and about 11.4 ha for the construction yard). 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 executing agency and 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 of land acquisition, resettlement and livelihood recovery support.

2) Cross-Cutting Issues

The Project is intended to reduce air pollution and mitigate climate change through the promotion of public transportation, thereby contributing to reduce Green House Gas (GHG) emissions. The Project’s mitigation effect on climate change (estimated reduction of GHG emissions) is expected to be approximately 39,491 tons of CO<sub>2</sub>/year (estimate for 2029). In addition, flood prevention measures in stations, transition sections and the Depot area will be considered in the detailed design and thereby the project may contribute to adaptation to climate change. Based on the Bangladesh National Building Code and Barrier-free Maintenance Guideline about facilities and vehicles of public transportation in Japan, barrier-free facilities such as guiding blocks for persons with disabilities and slopes for wheelchairs are provided. Measures against COVID-19 infection are implemented such as taking PCR test before entering the construction site, preparing isolation buildings, assigning doctors, and reserving hospital beds for contractors and consultants. Considering the impact of COVID-19, the cost, construction period, etc. have been revised with reference to Bangladesh national laws and guidance

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

Gender action plans including 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 sites and at managing entities will be implemented to promote gender understanding and woman safety.

(9) Other Important Issues: N/A

The introduction of advanced Japanese technologies such as 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 2017)	Target (2031) 【Expected value 2 years after project completion】
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Passenger Kilometer (1,000 people/km/day)	n/a	10,023
Train Kilometer (km/day) *	n/a	5,794
Average Travel Time (min)*	122	32
Number of Running Train (Number of Running Train/Day/one way)	n/a	261
Operating Rate of Train (%)	n/a	93

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

\*\*The time required is calculated for the Project area (between Hemayetpur station and Vatara station). The Baseline value is from the average speed of the bus in the relevant section.

## (2) Qualitative Effects

Facilitation of transportation and logistics in the Dhaka Metropolitan Area, development of Bangladesh's economy through the reduction of economic losses by reducing traffic congestion, mitigation of climate change through the reduction of GHG emissions by promoting a modal shift to public transportation and alleviation of air pollution, and promotion of women's empowerment.

## (3) Internal Rate of Return

According to the following preconditions, the Project's Economic Internal Rate of Return (EIRR) will be 14.0%. The Financial Internal Rate of Return (FIRR) will be 7.5%.

### 【EIRR】

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

Benefit: Reduction in vehicle operation costs, travel time, GHG emissions etc.

Project Life: 41 years

### 【FIRR】

Cost: Project costs and operation/maintenance costs

Benefit: Fare revenue

Project Life: 41 years

## 5. External Factors and Risk Control

(1) Preconditions: N/A

(2) External Conditions: N/A

## 6. Lessons Learned from Past Projects

The results of 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. It also indicates that delays in relocating underground installations, such as waterworks and sewerage, can cause construction delays and cost overruns. In addition, the

results of 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 results of the ex-post evaluation for the Mass Transit System Project in Bangkok (Purple Line) (I) and (II) (evaluated in 2018) reported that 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 are 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 implemented 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 MRT, the Project will help to alleviate traffic congestion in the Dhaka metropolitan area and help to reduce the air pollution, thereby contributing to the achievement of SDGs Goal 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 indicated in sections 4. (1) to (3).
- (2) Future Evaluation Schedule: Ex-post evaluation: Two years after the project completion

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