

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 1) (I)

Loan Agreement: May 29, 2019

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 the Dhaka Metropolitan Area increased from 6.62 million to 17.60 million between 1990 and 2015 (United Nations Population Division, 2018). The population increase has caused a rapid increase in transport demand, which in turn has led to chronic traffic congestion. As a result, the average travel speed for vehicles during rush hours in the Dhaka Metropolitan Area is 6.4 km/hour, less than half of that in commercial areas in Tokyo (14.7 km/hour) (Ministry of Land, Infrastructure, Transport and Tourism, 2015). As for air pollution, the annual average PM10 concentration is reported to be 158 $\mu\text{g}/\text{m}^3$. This exceeds the World Health Organization environmental standard of between 20 $\mu\text{g}/\text{m}^3$ and 70 $\mu\text{g}/\text{m}^3$. The estimated economic loss due to the traffic congestion is 3.868 billion US dollars per year (Bangladesh Water Development Board, etc., 2013), which is hindering the economic and social development of Bangladesh.

In its Urban Transport, Investment Priorities, The Strategy for Transport in the Seventh Five-Year Plan (FY2016/17–FY2020/21), the Government of Bangladesh indicates that it is important to alleviate road congestion in the Dhaka Metropolitan Area with appropriate investment. Based on the policy, the Dhaka Strategic Urban Transport Plan (hereinafter referred to as the "STP"), a master plan in the urban transport sector formulated in 2005, was revised with the support of the Japan International Cooperation Agency (JICA) (approved by the Cabinet in August 2016; hereinafter referred to as the "RSTP"). In the RSTP, developments of five lines of the mass rapid transit system (hereinafter referred to as the "MRT") and two routes of the bus rapid transit system (hereinafter referred to as the "BRT") were planned as public transport networks. The Dhaka Mass Rapid Transit Development Project (Line 1) (hereinafter referred to as the "Project") develops the MRT Line 1, which connects Kamalapur Station in the

central area of Dhaka City with Dhaka International Airport and Purbachal District, a new residential area in the east Dhaka Metropolitan Area. From the perspective of transport demand, the MRT Line 1 is considered as a prioritized development initiative in the RSTP along with the MRT Line 5, which connects east and west Dhaka, and the MRT Line 6, which connects north and south Dhaka.

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

The JICA Country Analysis Paper for Bangladesh (May 2014) cites urban development as one of the priority issues and the development of transportation networks in the Dhaka Metropolitan Area as a priority support issue. Moreover, Japan's Country Assistance Program for Bangladesh (February 2018) identifies one of Bangladesh's priority areas as being to accelerate economic growth so that everyone can benefit. It mentions that the Government of Japan will contribute to better connections throughout the region by developing high-quality transportation networks and promoting the efficient movement of people and goods, while considering diversifying transportation. The Project is consistent with the policy and analysis. Since the Project promotes smoother transportation in the Dhaka Metropolitan Area, it is considered to contribute to Goal 11, "Make cities and human settlements inclusive, safe, resilient, and sustainable," of the Sustainable Development Goals (hereinafter referred to as the "SDGs").

In the past, JICA implemented the Institutional Building Assistance for Dhaka Urban Transport Network Development (FY2010–FY2011) and the Preparation of Rules and Regulations under the Urban Mass Rapid Transit Act (Dhaka, Bangladesh): Technical Assistance Related to ODA Loan (FY2013–2015) with the goal of supporting the development of the legal system, including urban railway law and urban railway technical standards. JICA also provided support for the establishment of the Revised STP through the technical assistance related to ODA loan called the Project for the Revision of Dhaka Strategic Urban Transport Plan (FY2014–FY2016).

(3) Other Donors' Activities

In addition to assisting the establishment of the above-mentioned STP, the World Bank 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 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 with the targeted opening by the end of 2019.

3. Project Description

(1) Project Objective(s)

The objective of the Project is to alleviate traffic congestion and mitigate air pollution in Dhaka city and adjacent areas by constructing a mass rapid transit system, thereby contributing to economic development and improving the urban environment.

(2) Project Site / Target Area

Dhaka and Narayanganj Districts

(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. 31km, construction of 19 stations, etc.)
- 3) Installation of railway system (track works, electric system, telecommunication system, signal systems, etc.)
- 4) Procurement of rolling stocks (200 cars)
- 5) Detailed design and Basic design Consulting services (F/S review, basic design, detailed design, tender assistance, etc.)
- 6) Supervision Consulting services (Construction supervision, etc.)

(4) Estimated Project Cost (Loan Amount)

735,067 million Yen (Loan Amount: 52,570 million Yen)

(5) Schedule

June 2017 (Loan Agreement of E/S loan) - March 2029 (142 months in total).

The Project will be completed upon the opening of all sections (December 2026).

(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; Operation and maintenance group of MRT Line 1 in DMTCL

(7) Cooperation and Sharing of Roles with Other Donors

- 1) Japan's Activity

The Japanese ODA Loan Project called the Dhaka Mass Rapid Transit Development Project (approved in FY2012 for the first phase, FY 2016 for the second phase, and FY 2018 for the third phase) has supported the development of MRT Line 6 as a preceding line for the Project, and also supported the establishment of DMTCL, the executing agency of the Project. In addition, the yen-loan project, the Dhaka Mass Rapid Transit Development Project (Line 5) (E/S) (approved in FY2018), will support the detailed design of MRT Line 5 north section, which is planned to cross the Project.

The Project also plans to introduce an IC card settlement system built in the technical assistance related to ODA loan called the Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City (FY2014–FY2018).

2) Other Donors' Activity

The Asian Development Bank is considering support for MRT Line 5 south section (between Gabtoli Station and Aftabnagar Station,) and has been conducting a pre-F/S since 2018.

(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 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 Anti-Pollution Measures: Measures for air quality, noise, and vibration during construction, such as regular water sprinkling and installation of a temporary fence, will be taken for minimizing their impacts. The noise level after opening exceeds the noise standards in the country, but it is expected to satisfy the noise standards of conventional railways in Japan by the installation of long rails, sound insulation walls, etc. Deterioration of water quality is expected to be avoided by the introduction of wastewater treatment facilities from stations and rolling stock yards. The Project will generate construction surplus soil (approximately 2.4 million m³) by the underground tunnel excavation, but most of the surplus soil will be reused for reclamation and banking

by DMTCL and private companies, and the rest will be disposed of appropriately at the soil disposal site secured by DMTCL.

- ④ Natural Environment: The project target area does not fall under national parks and other vulnerable areas or their vicinities, and adverse effects on the natural environment are assumed to be minimal.
- ⑤ Social Environment: The Project is expected to involve land acquisition of approximately 39 ha and resettlement of 2,770 residents from 698 households. The land acquisition and resettlement of residents will proceed in accordance with Bangladesh's domestic laws and the Resettlement Action Plan, which was formulated based on the JICA Guidelines for Environmental and Social Considerations. At the residents' consultation, there was a demand for sufficient compensation and prior information disclosure, so compensation and resettlement procedures reflecting the requests of affected residents will be carried out. At present, no particular objection to the Project has been made by affected residents.
- ⑥ Other / Monitoring: In the Project, the contractor will monitor air quality, noise, vibration, water quality, and waste during construction, under the supervision of the executing agency, and the executing agency will monitor noise, vibration, and water quality after opening. NGOs entrusted by DMTCL will monitor the progress of land acquisition and resettlement procedures and livelihood recovery support.

2) Cross-Cutting Issues

- ① Projects related to climate change mitigation: The Project is expected to have an effect of mitigating climate change (GHG emissions reduction) of approximately 63,421 tons/year (CO₂ equivalent).
- ② Poverty reduction and consideration: N/A
- ③ Measures against AIDS, HIV, and other infectious diseases: N/A
- ④ Participatory development/consideration for persons with disabilities: Regarding the station buildings and facilities subject to the Project, barrier-free-based urban railway technical standards, which have been developed in the technical assistance related to ODA loan called the Preparation of Rules and Regulations under Urban Mass Rapid Transit Act (Dhaka, Bangladesh), will be adopted, and slopes and tiles for guiding the visually impaired will be installed to give consideration

to persons with disabilities.

- 3) Gender category: [Gender issues] GI (S) (Integrated gender activity project)

Activities / reason for Categorization: The safety of female passengers, such as measures for preventing sexual harassment, etc., is not sufficiently ensured in public transportation in Bangladesh. This makes female passengers feel reluctant to use public transportation. In this context, a gender action plan will be introduced in the Project, including operation of women-only cars in rush hours and installation of security cameras in the trains and stations, to ensure the safety of women in the trains and stations and to enhance understanding of gender issues.

(9)Other Important Issues: N/A

4. Targeted Outcomes

(1) Quantitative Effects

Indicator	Baseline (Actual value in 2018)	Target (2028) [Expected value 2 years after project completion]
Passenger transportation volume (1,000 people/kg/day) ^{Note 1} (Between Kamalapur Station and Airport Station)	NA	5,916
Passenger transportation volume (1,000 people/kg/day) ^{Note 1} (Between Notun Bazar Station and Purbachal Terminal Station)	NA	4,058
Number of services (Number of trains/day) ^{Note 2} (Between Kamalapur Station and Airport Station)	NA	146
Number of services (Number of trains/day) (Between Purbachal Terminal Station and Notun Bazar Station)	NA	67
Number of services (Number of trains/day) (Between Purbachal Terminal Station and Kamalapur Station)	NA	54
Train operating distance (km/day) ^{Note 3} (Between Kamalapur Station and Airport Station)	NA	4,311
Train operating distance (km/day) (Between Purbachal Terminal Station and Notun Bazar Station)	NA	2,013
Train operating distance (km/day) (Between Purbachal Terminal Station and	NA	2,535

Kamalapur Station)		
Time required (minutes) ^{Note 4} (Between Kamalapur Station and Airport Station)	139	24.3
Time required (minutes) (Between Purbachal Terminal Station and Notun Bazar Station)	117	20.4
Time required (minutes) (Between Purbachal Terminal Station and Kamalapur Station)	207	36.2
Train operation rate (%)	NA	92.6

Note 1: Estimated demand in the preparatory survey in the event of completion of all projects (MRT Line 5, MRT Line 6, and BRT Route 3) that are expected to be completed by 2028 according to the RSTP. To avoid overlap, passengers between Notun Bazar Station and Kamalapur Station on the Purbachal Line are included in the Airport Line (among Airport Station, Notun Bazar Station, and Kamalapur Station).

Note 2: Set based on the results of demand forecasting. As there is little demand for the Purbachal Line, the line will not be operated directly to Kamalapur Station, but turn back at Notun Bazar Station right after opening.

Note 3: Train operating distance is calculated by multiplying the number of trains passing between the stations by the distance between the stations (platform center interval).

Note 4: The required time is calculated using the average speed of buses running in the section.

Note 5: At the time of opening, the number of train cars will be 25, of which 22 will provide commercial services, and the remaining three will be put on standby for inspection, etc.

(2) Qualitative Effects

Responding to transportation demand in the Dhaka Metropolitan Area, mitigating traffic congestion through the promotion of public transportation, and reduction of health hazards to residents by improving the urban environment

(3) Internal Rate of Return

According to the following preconditions, the Project's Economic Internal Rate of Return (EIRR) will be 15.1%. The Financial Internal Rate of Return (FIRR) will be 4.0%.

【EIRR】

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

Benefit: Reduction in vehicle operation costs, travel time, greenhouse gas, etc.

Project Life: 38 years

【FIRR】

Cost: Project costs and operation/maintenance costs

Benefit: Fare revenues

Project Life: 38years

5. Preconditions / External Conditions

(1) Preconditions: N/A

(2) External conditions: N/A

6. Lessons Learned from Past Projects

The results of the ex-post evaluation of India's Kolkata Subway Construction Project revealed that, with projects that involve land acquisition and relocation of facilities, it is important to actively incorporate ideas from residents and parties involved from the planning and implementation phase. The results also indicated that delay in the relocation of underground installations such as water and sewage can become a factor for construction delays and cost overrun. Based on these lessons, the Project specified the scale and location of land acquisition from the phase of the preparatory survey. In particular, discussions with stakeholders were held from an early stage at candidate sites for rolling stock bases, where large-scale land acquisition is expected, to form social agreement. Additionally, construction delays and cost overrun will be prevented by conducting a detailed geological survey, underground installation survey, underground obstacle survey, and cultural asset survey during the detailed design phase, and having DMTCL secure the construction yard and soil disposal site, perform the relocation and removal of underground installations, and coordinate organizations involved.

In the preceding the Dhaka Urban Transport Development Project, only one bidder was accepted for some of the procurement packages, and the bidding price exceeded the planned price and procurement was prolonged. Based on this lesson, the Project will obtain the agreement of the government of the recipient country on the fragmentation of the procurement package, and the detailed design consultant will finalize the fragmentation of the procurement package and the tender conditions, etc. in order to ensure competitiveness at the time of bidding, taking into account market trends before bidding.

7. Evaluation Results

The Project will respond to the transportation demand in the Dhaka Metropolitan Area, which faces chronic traffic congestion and environmental

deterioration due to rapid urbanization and increased traffic, by constructing MRT Line 1 connecting the center of Dhaka District and satellite cities, thereby contributing to economic development and improvement of the urban environment through mitigation of traffic congestion. The Project is consistent with Bangladesh's development policies and with the assistance policies and analyses of the Government of Japan and JICA. Thus, the necessity for JICA to support the Project is substantial. The Project is also expected to contribute to SDGs goal 11, "Make cities and human settlements inclusive, safe, resilient, and sustainable." Thus, 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) Timing

Ex-post evaluation: Two years after the project completion