Ex-Post Project Evaluation 2019:

Package IV – 1 (Bangladesh)

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JAPAN INTERNATIONAL COOPERATION AGENCY

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Japan Economic Research Institute Inc.

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People’s Republic of Bangladesh

FY 2019 Ex-Post-Evaluation of Japanese ODA Loan

"Telecommunications Network Development Project"

External Evaluator: Katsuya Tokuda, Ernst & Young ShinNihon LLC

0. Summary

The purpose of this Project is to improve the quantity and quality of telecommunication services in and around major cities of Bangladesh by installing interconnection facilities for mobile and fixed telephone networks, international exchange systems, and backbone transmission facilities, thereby contributing to the economic growth of Bangladesh through the development of the private sector. Its objective is consistent with Bangladesh’s development plan and Japan's ODA policy. Moreover, the scope of the Project has been flexibly adjusted, as required, to consistently cope with the changes of Bangladesh’s development needs in the telecommunication sector by adapting to the technological innovations in that sector. Based on the above, the relevance of the Project is high. Although the project cost was within the planned cost, the project period exceeded the plan because of changes in the project scope occasioned by corporatization, policy changes, and a court judgment. Therefore, efficiency of the Project is fair. Thanks to the implementation of the Project, the internet capacity and number of lines used have increased, and a stable supply of high-quality telecommunication infrastructure and the smooth flow of information have been achieved to a certain extent. In addition to promoting the telecommunication industry itself, these changes have had an impact in promoting the smooth operation of businesses other than the telecommunication industry, as well. On the other hand, the number of actual connections to the capacity of the broadband services expanded by the Project is limited, leaving some room for improvement in the effectiveness of the Project. Therefore, effectiveness and impacts of the Project are fair. While the facilities installed by the Project are generally well-maintained, minor problems were identified in terms of financial, and the executing agency’s institutional and technical aspects for the operation and maintenance. Hence, sustainability of the Project is fair.

In light of the above, this project is evaluated to be partially satisfactory.

1. Project Description

Project Location

Interface equipment installed in the Project

1.1 Background

The Bangladesh Telegraph and Telephone Board (BTTB) was the main provider of fixed-line telephone services in Bangladesh at the time of the project appraisal and possessed equipment such as backbone transmission facilities and local and international exchange systems. However, due to delays in the infrastructure development, the existing facilities did not possess sufficient capacity to meet the demand. As a consequence, BTTB faced a huge backlog[1] of telephone line applications, and the rate of fixed-line telephone penetration in the country remained low compared to neighboring low-income countries. Furthermore, there were also significant problems in the quality of telecommunications services, such as the low call completion rate, due to the increasing deterioration of facilities. International lines also lacked capacity, which resulted in extremely poor international communications, both in quality and quantity. While the penetration rate of fixed-line telephones remained low, the spread of cell phones by private companies, including those in rural areas, was progressing rapidly. The number of cell phones that could be connected to the fixed-line network was limited, however, as the interconnection facilities between the cell phone network and fixed-line network were lacking so that the further growth of cell phone popularity was constrained. In addition, the cell phones that could not connect to BTTB's fixed-line network could not communicate with the fixed-line or international calls of government agencies and companies, which caused great inconvenience and hindered the smooth exchange of information. These delays in the development of the backbone communications infrastructure and the lack of convenience for users hindered progress in

[1] Number of lines waiting to be activated after applying for a new telephone subscription.

addressing three major obstacles to the further acceleration of the country's economic growth: the development of the private sector, the attraction of foreign investment, and the elimination of disparities between urban and rural areas. In response to this situation, the Bangladesh government set the goal of universal access to telecommunication services and identified the development of the telecommunication sector as a key government policy for economic growth. The World Bank provided consulting services to support telecom sector reform, including the corporatization of BTTB, but further support was needed for organizational strengthening and staff capacity building, especially after the corporatization of BTTB.

1.2 Project Outline

The objective of this project is to improve the quantity and quality of telecommunication services by developing interconnection facilities for mobile and fixed telephone networks, international exchange equipment, and backbone transmission facilities in major cities of Bangladesh and their surrounding areas, thereby contributing to the economic growth of Bangladesh through private sector development.

Loan Approved Amount/ Disbursed Amount	8,040 million yen / 5,761 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	June 2006/ June 2006	
Terms and Conditions	Interest Rate Repayment Period (Grace Period) Conditions for Procurement	0.01% 40 years (10 years) general untied
Borrower / Executing Agency	Government of the People's Republic of Bangladesh (GOB)/ The Bangladesh Telegraph and Telephone Board (BTTB)	
Project Completion	End of June 2016	
Project Area	Telecommunication lines in major cities of Bangladesh and their surrounding areas like Dhaka, Chittagong and Khulna	
Main Contractor(s) (Over 1 billion yen)	Marubeni (Japan) / KT Corporation (Korea) (JV)	
Main Consultant(s) (Over 100 million yen)	Development Design Consultants Limited (Bangladesh)/Engineering Consultants and Associates Limited (Bangladesh)/IS International Ltd. Consulting Services (Japan) / Japan	

	Telecommunications Engineering and Consulting Service (Japan) (JV)
Related Studies (Feasibility Studies, etc.)	- Feasibility Study (F/S) (Japan Telecommunications Engineering and Consulting Service (Japan), 2001) - Project Formation Study (JICA, 2004)
Related Projects	[ODA Loan] -Telecommunications network expansion project (1985) -Telephone Network Development Project in Greater Dhaka Area (1986) -Telephone Network Development Project in Greater Dhaka Area (II) (1992)

2 Outline of the Evaluation Study

2.1 External evaluator

Katsuya Tokuda (Ernst & Young ShinNihon LLC)

2.2 Duration of the Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October 2019 - January 2021

Duration of the Field Study: January 6 - 16, 2020

2.3 Constraints during the Evaluation Study

Because of travel restrictions due to COVID-19, two activities scheduled to take place locally in a second field survey, namely, the explanation of the evaluation results and the collection of additional information, were carried out remotely with the assistance of the local assistant. At the time, a preliminary meeting was held between the external evaluator and local assistant so that the local assistant could provide supplementary explanations on the evaluation results based on their accurate understanding of the necessary information to evaluate and analyze by using DAC five criteria. The evaluation results, therefore, were communicated to the Executing agency to ensure the quality of opinion collection on the evaluation results.

3 Results of the Evaluation (Overall Rating: C[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Consistency with the Development Plan of Bangladesh

At the time of the project appraisal, a national development policy, *The Poverty Reduction Strategy Document (2005)*, stated that ICT was a necessary tool for poverty reduction and proposed measures to expand telecommunication facilities, including interconnection facilities. A sectoral plan, *The National Telecommunications Policy (1998)*, also targeted universal access to telecommunications services. In the policy, it is considered necessary to create a competitive business environment and *The National ICT Policy (2002)* emphasized the importance of promoting the ICT sector for economic growth[4].

As of this ex-post evaluation, however, the national development policy, *The Seventh Five-Year Plan* (2016-2020), states that BTCL provides basic services related to telecommunication throughout the country for the realization of Digital Bangladesh. Specifically, those services include the installation/development of telephone networks, the production of telephone-related equipment, the expansion of BTCL's mobile network, value-added services (VAS), and high-frequency data and voice communications[5]. In addition, a sectoral plan, *the National Broadband Policy 2009*, aims to ensure the development of telecommunications infrastructure to achieve the objectives set out in the MDGs and *the Poverty Reduction Strategy* (PRS) by market-based competition. Furthermore, the *Telecommunication Policy 2018* also aims to develop the telecommunications sector, achieve universal access, and improve communication quality[6].

Both at the time of the project appraisal and the ex-post evaluation, the expansion and modernization of the telecommunication network were and are considered to play a role in the country's economic growth and poverty reduction in the National Development Plan, as mentioned earlier. In the sectoral plan, meanwhile, the Project has aimed to achieve the goal of universal access to communications and improvement of the quality of communications. The Project is highly consistent with the development plan, since the Project procured/installed telecom network related equipment for the provision of internet services and the expansion of the network in urban areas.

3.1.2 Consistency with the Development Needs of Bangladesh

At the time of the project appraisal, there was a huge backlog of applications for fixed-line telephones stemming from a lack of capacity and delays in infrastructure development.

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[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[3] ③: High, ②:Fair, ①: Low
[4] Source: Document provided by JICA
[5] Source: *The Seventh Five-Year Plan* (2016-2020), pp. 369-370
[6] Source: *Telecommunication Policy 2018, National Broadband Policy 2009*, documents provided by JICA

As a result, the penetration rate of fixed-line telephones remained low compared to neighboring low-income countries. Further, the call completion rate[7] was as low as 26.5% due to the aging of the facilities. International lines also lacked capacity, which resulted in extremely poor international communications, both quality-wise and quantity-wise. Meanwhile, the number of cell phones that could be connected to fixed-line telephones was limited by a lack of interconnection facilities between the cell phone and fixed-line phone networks, even though the cell phone penetration rate, including those in rural areas, was 4.59% and was growing rapidly through the activities of private operators. Cell phones that could not connect to the fixed-line phone network could not connect to fixed-line telephones of government agencies or companies and to international calls, which also constrained the spread of cell phones. This has resulted in low convenience and has hindered the smooth flow of information[8].

The demand for fixed-line telephones has been significantly reduced, however, as of the ex-post evaluation, thanks to the widespread use of cell phones since the project appraisal of the Project. The number of fixed-line telephone users is also on a significant downward trend (the fixed-line telephone penetration rate decreased from 0.66% in 2005 to 0.49% in 2015). Cell phone penetration, meanwhile, has increased (from around 4.59% in 2005 to 100.5% in 2019). The cell phone business got separated from Bangladesh Telecommunications Company, Ltd. (BTCL) at the time of corporatization, and thereupon fell outside of the scope of the Project[9]. Furthermore, the demand for high-speed Internet services has increased with the ongoing spread of the Internet. In order to improve the quality of communications, telecommunication carriers have been required to establish Network Operation Centers (NOCs) as facilities to manage network operations, and also to provide VAS using intelligent network (IN) equipment under the *ILDTS Policy 2007*.

As mentioned above, the communication technology innovations that have occurred since the time of the project appraisal have led to a significant decrease in the need for fixed-line telephones, while the need for cell phones, Internet, and quality communication has increased. As these changes in needs have been addressed by flexible adjustments in the scope of the Project, such as a new focus on the introduction of Internet-related equipment. The project is, therefore, evaluated as being highly consistent with development needs.

3.1.3 Consistency with Japan's ODA Policy

At the time of the ex-ante evaluation, the *Country Assistance Program for Bangladesh (2005)* laid out plans to support the reform of the telecom sector with a focus on the

[7] The ratio of successfully completed calls to the total number of calls attempted
[8] Source: Documents provided by JICA
[9] Source: Documents provided by JICA, Questionnaire, Interview with the person in charge

development of the core facilities of BTTB, the corporatization of BTTB, the development of hardware and software infrastructure, and human resource development to contribute to the promotion of information and communication technology-related industries. The plan also emphasized support to build the capacity of relevant government agencies, as well as sectoral reforms to synergize solutions. At the Kyushu-Okinawa Summit (2000), the Japanese government proposed comprehensive cooperation measures to tackle the international information gap. Japan's *Overseas Economic Cooperation Implementation Policy (2007)* also described supports for the development of IT infrastructure in developing countries as one of its policies[10]. The Project, therefore, supported the installation of various facilities for the improvement of the quantitative and qualitative aspects of telecommunication services in the country, which makes it consistent with Japan's aid policies and highly consistent with Japan's ODA policy for Bangladesh.

3.1.4 Appropriateness of the Project Plan and Approach

The corporatization of BTTB was a condition for effectuation of the Loan Agreement (L/A) in this Project. Several background factors prompted the decision to set this condition. At the time of the project appraisal, the implementation of JICA-supported projects, in which BTTB was the executing agency, had been delayed in the past. Japan, meanwhile, supported the telecommunications sector reforms with the World Bank to develop a legal framework for the corporatization of BTTB, and led policy discussions with the Government of Bangladesh. In order to facilitate the development of the telecommunication sector, promote efficiency, and speed up procurement, JICA took a collaborative stance with the World Bank on the BTTB corporatization project. Under this collaborative effort, JICA set cabinet approval of the legal documents necessary for the corporatization of BTTB as a precondition for effectuation of the L/A in the Project. The commencement of the Project was delayed, however, by delays in the corporatization of the BTTB, and the explosive spread of cell phones brought by technological innovation in the meantime reduced the development needs for the spread of fixed-line telephones. The corporatization also necessitated changes in the scope of operations under the jurisdiction of the executing agency, and the cell phone business ownership was transferred to another legal entity, TeleTalk Bangladesh Ltd.

In addition to the above background factors, the corporatization was delayed as BTTB staff opposed corporatization, fearing that they would lose their positions as civil servant in the process. Accordingly, the effectuation of the L/A was delayed, and the scope planned at the time of the project appraisal was changed with the signing of the MOU in 2009. This change of scope can be evaluated as an appropriate measure, as it responded to the changing

[10] Source: Documents provided by JICA, Country Assistance Program for Bangladesh

needs in Bangladesh. Innovations in telecommunications technology taking place over the period of delays after the project appraisal significantly changed those needs as a matter of course. Specifically, the amount of equipment installed was revised in order to better promote the Internet business (e.g., installation of GPON[11] services), and equipment necessary to comply with the ILDTS Policy 2007 was added.

The actual scope since then has diverged again significantly from the revised plan developed at the time of the MOU, due to changes or cancellations of the installed equipment. Specifically, a wireless telecommunications provider was legally required to obtain a CDMA-WLL (Code-Division Multiple Access Wireless Local Loop) license to operate, and only one company was permitted to obtain the license in the country. The corporatization and policy changes thus required BTCL to engage in a competitive bidding process, but BTCL was unable to win the bid and was therefore unable to install the relevant equipment. In addition, the procurement of the backbone transmission equipment was delayed by a supreme court judgement on the procurement process. Procurement within the timeframe was blocked by the judgment and was finally cancelled[12]. With regard to the latter cancellation, it was impossible to introduce other equipment to meet development needs after the decision of the cancellation, as the deadline had expired. After the decision to cancel upon the introduction of the CDMA-WLL, budget was reallocated from the CDMA-WLL to GPON-related equipment, which was increasingly needed at the time.

The scope of the plan at the time of the project appraisal and the revised plan had been flexibly modified to address changes in development needs occasioned by technological innovations and policy changes that occurred between the time of the project appraisal and the time of the MOU, as well as by impediments to project implementation (e.g., failure to obtain a license) that arose between the time of the MOU and the time of the Project's completion. Since the equipment was introduced in accordance with the development needs at that time, the project plan and approach were evaluated as appropriate.

Based on the above, this project has been highly relevant to the Bangladesh's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

[11] Gigabit Passive Optical Network: A technology for transmitting and receiving data by various communication methods on a single line shared by multiple subscribers in a public network using optical fiber. In the output of this Project, it refers to a system consisting of (4) part of the interface equipment (IP router) and (5) part of the broadband access line (optical fiber cable)

[12] Source: Documents provided by JICA and questionnaire

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

It is judged that the main outputs of the Project have been largely achieved for the project objectives established at the time of the project appraisal, except for those parts that required changes in the scope. At the time of the project appraisal, six equipment and facilities were to be procured and two soft components[13] were to be in place. This included, specifically: (1) an interconnection facility to connect fixed and cell phones; (2) a backbone transmission facility to connect regional and local networks; (3) an international exchange to enable communication between the country and the rest of the world; (4) interface equipment to enable the transmission of data; (5) broadband access lines; (6) an accounting system to enable billing rate calculations; (7) engineering consulting services for detailed design, bidding assistance, and construction supervision; and (8) management consulting services to check financial statements and provide advice on rate setting and organizational restructuring. Subsequently, as noted in 3.1.4, (9) the NOC, a system for managing the network to ensure the quality of communications, and (10) the IN, a system for providing value-added services such as call forwarding, speed dialing, and Pre-Paid Service, etc., were added to comply with the policy that were not included in the plan at the time of the project appraisal, to reflect the changes of scope upon the signing of the MOU in 2009. Table 1 shows the details of the plan at the time of the project appraisal, the revised plan at the time of the MOU and the actual output.

[13] The installation of equipment (1), (2), (4), and (5) was planned throughout Bangladesh, including Dhaka, while the other equipment was installed at BTCL base stations in Dhaka.

Table 1 Planned and Actual Output

#	Item	Unit	Plan	Revised plan	Actual
(1)	Interconnection equipment procurement (cell phone and fixed-line phone connection equipment)	Set [14]	1	1	0
(2)	Backbone transmission system expansion (inter-city connection system)				
	Optical fiber cable	km	644	1,431	0
	Microwave circuit	hops.[15]	7	11	0
(3)	International exchange (domestic and international communication equipment)	Set	1	1	1
(4)	Interface device installation (network)				
	IMS system (Centralized management system)	Set	Details undecided [16]	Details undecided	1
	Co-AGW (Interface in base stations)	Place	Details undecided	Details undecided	13
	Remote AGW (interface outside the base stations)	Place	Details undecided	Details undecided	88
	IP router	Place	Details undecided	Details undecided	26
	Diesel generator (Emergency power supply)	basis	Details undecided	Details undecided	6
(5)	Broadband access line installation (Data transmission)				
	Optical fiber cable	Km.	180	180	374
	Wireless LAN (CDMA-WLL)	port	2,600	2,600	0
	ADSL port	port	12,000	12,000	11,700
(6)	Procurement, installation and training of accounting systems	Set	1	1	0
(7)	Engineering consulting services	Set	1	1	1
(8)	Management consulting services	Set	1	1	0
(9)	Network Operation Center (NOC)	Set	0	1	1
(10)	Intelligent Network (IN)	Set	0	1	1

Source: Documents provided by JICA and questionnaire

[14] The plan at the time of the project appraisal was to procure interconnection equipment for eight major cities including Dhaka, Chittagong and Khulna. Because of delays in the commencement of the Project and changing development needs, however, the interconnection equipment procurement was cancelled in this Project, and installed with BTCL's own funds.

[15] An indicator for telecommunications that shows the distance to the other party and the length of the route (the number of forwarding and relaying facilities used to reach the other party in the communication network).

[16] The detailed design had not been carried out at the time of the project appraisal. The contractors and consultants were to formulate details, such as the numbers of equipment units and the areas where they were to be introduced, in the detailed design phase. During the implementation of the Project, a combination of the necessary items was installed according to the role of each base stations.

Among the above items planned at the time of the project appraisal, (1), (2), (5), (6), and (8) were cancelled in whole or in part after the MOU was signed in 2009 because of delays in the commencement of the Project, a Supreme Court judgment, policy changes, failure to obtain a license, and other reasons. Accordingly, there are discrepancies between the plan revised at the time of MOU and the actual outputs. The reasons for these changes, the measures taken, and the impact and relevance of the changes are detailed below[17].

3.2.1.1 Change in (1) (Cancellation of Interconnection Equipment Procurement)

Due to the delay in the commencement of the Project, BTCL judged that it would be inappropriate to also delay the procurement of the interconnection facilities, given the needs at the time, and therefore procured the facilities with its own funds. The exclusion of the procurement of this item from the project scope to avoid equipment duplication is evaluated as appropriate.

3.2.1.2 Change in (2) (Cancellation of the expansion of the backbone transmission facilities)

During the procurement process, BTCL determined that one of the bidders was ineligible due to inadequate bidding procedures and a court case with that bidder arose. The procurement was therefore delayed, and ultimately could not be carried out within the loan period because of a Supreme Court judgement on the re-tendering. The decision of cancellation is appropriate, as the suspension was due to unavoidable circumstances.

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3.2.1.3 Change in (5) (Partial cancellation of broadband access line development)

After the signing of the MOU in 2009, the total length of optical fiber cable was extended to meet an increased demand for Internet facilities in place of fixed-line telephones, with ongoing technological advancements. The authorities withheld approval for the installation of some of the ADSL ports (300 ports), so those ports were not installed. The ADSL ports not installed accounted for only 2.5% of the total number of ports, so the final effect on the Project was not judged to be significant. The increase or decrease in the number of broadband access lines versus the original plan was the result from flexible response to the development needs, and thus was deemed to be reasonable in light of the achievement of the project objectives. On the other hand, the installation of wireless LAN equipment was cancelled because BTCL was unable to win the competitive bidding for the license on the CDMA wireless local loop, which only one company in Bangladesh could hold. As a result, the installation of equipment using wireless technology was cancelled. This cancellation was

[17] Source: Documents provided by JICA, questionnaire, Interview with BTCL Maintenance Department staff

based on factors beyond BTCL's control.

3.2.1.4 Change in (6) (Cancellation of accounting system procurement, installation and training)

Taking into account the delay of the commencement of the Project and the high demand for early installation of the accounting system, BTCL installed the system with its own funds without waiting for the project to start. To avoid duplication of equipment already procured with its own funds, the cancellation of procurement under this Project is judged to be appropriate. No negative impacts from this change on the project cost or project period have been identified.

3.2.1.5 Change in (8) (Cancellation of management consulting services)

This item was cancelled due to an insufficiency of funds stemming from the priority investment in the additional components (9) and (10) in accordance with the policy changes. This change was necessary for business continuity, and thus is evaluated to be appropriate as a countermeasure in keeping with the policy change.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total cost of the Project was 7,134 million yen, lower than planned at the time of the project appraisal (11,411 million yen). Taking into account that the project cost was unchanged at the time of the MOU for the scope change, the total project cost was within the plan (62.52%) when compared to the planned cost at the time of the project appraisal (Table 2). The main reason for the lower cost was the cancellation of outputs, in particular, the cancellation of (2) Expansion of the backbone transmission facilities[18].

[18] The output of this Project was procured in two parts, Lot A (other than (2)) and Lot B ((2)). Even if the cancelled Lot B is excluded from the planned amount, the project cost is still within the planned cost. Some of the Lot A items were cancelled and added, but the amounts for each item in Lot A could not be obtained. It was confirmed with the executing agency, however, that the changes were premised by the condition that all of the changes to the outputs were to be within the planned project cost. Hence, the project cost was judged to be within the planned cost.

Table 2 Initial Plan and Actual Project Costs

(Unit: millions of yen)

Item	Plan			Actual			Percentage to Plan
	Foreign currency	Local Currency	Total	Foreign currency	Local Currency	Total	
Total project cost	7,510	3,901	11,411	5,462	1,672	7,134	62.52%
(loan amount)	8,040			5,462			67.94%

Source: Documents provided by JICA and questionnaire

3.2.2.2 Project Period

The project period was planned to be 44 months (February 2006 (signing of the L/A) to September 2009), but actually it took 84 months (July 2009 to the end of June 2016)[19], which significantly exceeded the plan (191% of the plan). As shown in Table 3, the delays in the Project were mainly attributable to the following: delays in the commencement of the Project due to delays in the corporatization of BTTB as a precondition for the effectuation of the L/A, delays in the approval of the implementation plan within the Bangladesh government, delays in the procurement preparations for retendering required by the Supreme Court's judgement, and delays in manufacturing/installation under the Project. The project period can therefore be judged to have been significantly longer than planned[20].

[19] The reference for the ex-post evaluation states that unless specified in the project appraisal or the like, the project start month is the signing of L/A in principle. In this project, however, it took more than two years for the effectuation of signed L/A due to the delay in corporatization. Therefore, in the evaluation of this project, in order to judge the efficiency of the project based on the period actually required to implement the project, the month of the project start is exceptionally defined as the time of signing of the MOU on the scope change (July 2009), not the time of the signing of the L/A. The definition of the project start could not be confirmed in the documents provided by JICA.

[20] Source: Documents provided by JICA, Questionnaire

Table 3 Project Implementation Period (Plan and Actual)

	Planning at the time of appraisal		Actual		To plan ratio. Delay period
	Starting time	Period	Starting time	Period	
Loan Agreement (L/A signed)	February 2006	-	June 2006	-	5 months
Commencement of project (L/A in effect)	February 2006	-	June 2008 [21]	-	42 months
Detailed design	March 2007	3 months	January 2010	6 months	35 months
Procurement preparation	July 2007	3 months	January 2010	11 months	31 months
Manufacturing/Installation	May 2008	8 months	September 2013	20 months	65 months
Project completion [22]	September 2009	-	June 2016	-	82 months

Source: Documents provided by JICA and questionnaire

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

The recalculation of the internal rate of return in this Project is of low significance, since the output was substantially changed. But as a result of the recalculation, the financial internal rate of return was substantially lower than that at the time of the project appraisal, as shown in Table 4. The large difference between the value calculated at the time of the project appraisal and the recalculation result can be attributed to the change of the development needs and the change of the scope, as well as the assumption that the commencement and end points of the project life remain unchanged, and the fact that the project commencement was delayed approximately three years, resulting in a short period during which revenue can be generated. Specifically, the benefit from the proliferation of fixed-line telephones and cell phones was expected at the time of the project appraisal, but the main revenue had shifted to the Internet at the time of the ex-post evaluation as the demand for fixed-line telephones had declined and the cell phone business was no longer within the scope of BTCL's operations. As described in 3.3 Effectiveness/Impact below, however, the implementation of the Project has increased the number of broadband (GPON/ADSL) lines, while the number of connections to line capacity is still less than 3% of the total, which limits revenue growth. The economic internal rate of return (EIRR) was

[21] Although the L/A came into effect with the completion of the privatization in June 2008, the MOU on the change of scope, a component necessary for the commencement of the Project, was not signed until July 2009. The actual project commencement schedule was May 2010, when the implementation plan based on the MOU was approved by the government of Bangladesh, and the project director was thereupon assigned.

[22] Project completion is defined as the month in which the procured equipment is placed in service with the agreement of the executing agency, since the definition was not established at the time of the project appraisal,.

not calculated at the time of the project appraisal, and accordingly no recalculation of the EIRR has been performed.

Table 4 FIRR Recalculation Results and Basis for Calculation

	At the time of project appraisal	At the time of ex-post evaluation
FIRR	13.42%.	-0.83%.

Source: Recalculation by the evaluator based on documents provided by JICA and questionnaire

Table 5 Basis for Calculation of the Results

Item	Plan	Actual
Prerequisites		
Project life	20 years (2006-2025)	20 years (2006-2025)
Cost		
Project cost	Planned value required for equipment procurement and installation	Actual value of equipment procurement and installation
Operation and maintenance costs	70% of profits	Actual values for operation and maintenance
Revenue		
Usage fees to be collected from the subscriber	Fixed-line phone Cell phone International phone call Broadband	Fixed-line phone - International phone call Broadband

Source: Documents provided by JICA and questionnaire

Based on the above, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts[23] (Rating:②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

As shown in Table 6, all of the targets set at the time of the project appraisal, excepting the fixed line telephone penetration rate, were achieved in 2011, two years after the commencement of the Project, even before the equipment was actually installed. With the significant changes in the environment of the telecommunication sector, the original operation and effect indicators set at the time of the project appraisal were outdated through technological innovation. In addition, at the time of the scope change (2009), there was no discussion regarding the necessity to revise the target values, and it was confirmed with the

[23] Sub-rating for Effectiveness is to be put with consideration of Impacts.

executing agency that no new target values had been set. The executing agency therefore agreed that the quantitative effects of the Project were to be measured with the newly set operation and effect indicators (number of fixed-line and ADSL/GPON subscribers/line capacity and volume of international calls received and transmitted), as shown in the Table 7

Table 6 Original Operation and Effect Indicators

Quantitative effect (Operation and effect indicators)	Baseline	Target	Actual
	2005	2010	2011
		1 year after the planned project completion year	2 years after the planned completion year (Before equipment installation)
Call completion rate (%)	26.48	40.00	96.00
Failure rate (%)	1.50	1.00	0.50
Accumulation applicants	140,586	10,000	8,100
Fixed line phone penetration rate (%)	0.66	1.48	0.49
Cell phone penetration rate (%)	4.8	8.2	72.71
Number of interconnected lines to the fixed telephone network (persons)	1,570,000	12,000,000	119,080,000
Number of Internet users (persons)	0.4million	1 million	66.86 million

Source : Documents provided by JICA and questionnaire

Table 7 New Operation and Effect Indicators

		2013	2017	2019
		Before Installation (Baseline)	1 year after completion	3 years after completion
Fixed line phone	Capacity (millions)	1.47	1.46	1.63
	Actual subscribers (millions)	0.90	0.66	0.55
ADSL (Low speed Internet)	Capacity (number of lines)	47,000	89,000	89,000
	Actual subscribers	13,000	20,000	15,000
GPON (High speed Internet)	Capacity (number of lines)	N/A	110,000	110,000
	Actual subscribers	N/A	212	2,791
International phone call	Incoming calls (10 million minutes)	207.56	494.4	279.41
	Outgoing calls (10 million minutes)	3.64	2.32	1.23

Source : Documents provided by JICA and questionnaire
Note: Data as of June 30 of each year

As shown in Table 7, the number of actual fixed line phone subscribers has been decreasing in line with the decline in demand due to the spread of cell phones and IP phones. The number of Internet-related lines (ADSL/GPON), other than those related to fixed line and international calls, has increased substantially as a result of the introduction of optical fiber cables and ADSL-related equipment in the Project. On the other hand, the number of actual subscribers of internet-related lines has only reached about 3% of the Internet capacity, which leaves significant room for improvement to maximize the effects of the Project.

3.3.1.2 Qualitative Effects (Other Effects)

The following two qualitative effects of the Project were expected: (1) facilitated information flow through the installation of interconnection equipment and international exchanges, and (2) narrowing of the information gap between regions within the country.

(1) Facilitated information flow through the installation of interconnection equipment and international exchanges

The implementation of the Project has improved the number of beneficiaries and the quality of broadband access, in addition to the quality of domestic/international calls. As such, the Project has contributed to the smooth flow of information. Specifically, the interviews[24] with the beneficiaries of the Project have confirmed that the number of domestic/international call interruptions has been reduced and that the quality of the connections has been improved. It was also confirmed that the installation of high-speed Internet-related equipment has improved the Internet speed and quality, which enables the beneficiaries to download and upload data-heavy files and content, such as videos. It can therefore be said that the installation of high-quality telecommunication infrastructure has facilitated information flow, as planned at the time of the project appraisal.

(2) Narrowing of the information gap between regions within the country

The expansion of the backbone transmission facilities was re-tendered by the Supreme Court's judgement, and furthermore, procurement was cancelled due to the expiry of the Project period. Therefore, this qualitative effect has not emerged by the implementation of this Project. With the rapid development of the telecommunication sector through technological innovation, however, the cell phone penetration rate has improved from 4.8% in 2005 to 97.3% as of 2018[25]. Improvement of the regional information gap in the country

[24] Four persons (business personnel in an industrial park and end users in households) were selected from BTCL's subscribers by BTCL's maintenance staff and interviewed. It was attempted to confirm the quality of the telephone and data communications through the simple hearings.
[25] ITU World Telecommunication/ICT Indicators Database

can thus be confirmed.

3.3.2 Impacts

3.3.2.1 Intended Impacts

At the time of the project appraisal, the impact of the Project was expected to contribute to the country's economic growth through the development of the private sector. In fact, the GDP growth indicators and FDI value were on the increasing trend at 8.15% and 3,888 million USD respectively, as of the ex-post evaluation (2019), compared to 7.11% and 2,003 million USD upon the completion of the Project (2016) [26]. Thus, it can be concluded that the development of telecommunication infrastructure through the Project has indirectly contributed to the improvement of the investment environment and to the country's economic growth through the development of the private sector. The interviews with the beneficiaries, moreover, confirmed that the Project has helped to improve the investment environment in Bangladesh by providing inexpensive, stable, and high-speed telecommunication infrastructure, which in turn has facilitated the smooth operation of the businesses.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the natural environment

According to the *JBIC Guidelines for Confirmation of Environmental and Social Considerations (April 2002)*, the Project was judged to be a Category B, which means that it had no significant negative impact on the environment. The implementation of a telecommunication project is usually not considered to have significant negative impacts on the natural environment, and no actual negative environmental impacts (e.g., negative impacts on air quality due to dust, waste, noise, soil pollution, etc.) as a result of the implementation of the Project have been confirmed. It was confirmed, however, that noise/exhaust were improperly controlled in some of the six diesel engine generators installed in the Project, which had a minor negative impact on neighboring residents. With the improved power supply in Bangladesh over time, however, the generators, which were originally installed as a backup power source in the case of blackout, were operated far less often than had initially been expected during the planning (confirmed by interviews with BTCL staff). The negative environmental impact of the Project is very limited.

(2) Resettlement and land acquisition

At the time of the project appraisal, no resettlement or land acquisition was planned for the implementation of this Project, and the executing agency confirmed at the ex-post

[26] Source: Questionnaire

evaluation that there had been no resettlement or land acquisitions for the Project.

(3) Unintended positive/negative impacts

As with the time of the project appraisal, the executing agency confirmed that no other positive or negative impacts had occurred as of the ex-post evaluation.

Thanks to the implementation of the Project, positive effects/impacts, such as the increased number of broadband subscribers and improving quality of domestic/international calls, have been confirmed. On the other hand, further effects can still be realized, and the negative impacts (e.g., noise and air emission) were confirmed, though limited, due to the installation of diesel engine generators. In light of the above, this project has achieved its objectives to some extent. Therefore, effectiveness and impacts of the project are fair.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

In total, 19,000 persons were employed by BTTB, the executing agency, at the time of the project appraisal, many of whom were assigned to the maintenance department. Concerned that the organizational restructuring with the corporatization of BTTB would affect the institutional system, this Project planned to assist in the establishment of an appropriate operation and maintenance management system as part of its consulting services. While BTTB had been converted into BTCL and employed a total workforce of 8,374 at the time of the ex-post evaluation, the organizational and institutional design for the corporatization ended up being inadequate[27]. This problem was attributed to the delay in the commencement of the Project, which limited the opportunity to provide consulting services to support the establishment of the maintenance and management system in line with the structural changes taking place with the corporatization. Another cause was a 10-year suspension in the hiring process for new employees after the corporatization due to a backlash from BTTB staff against the hiring of new employees. Specifically, some of the equipment outside the base stations was inadequately maintained for many years due to a shortage of skilled operation and maintenance personnel. This shortage of operation and maintenance personnel was identified as an issue. Considering that some facilities and equipment were not being operated at the time of the ex-post evaluation, there are still some concerns about the maintenance and management system. The new operation system, however, has already started under the new organizational structure adopted in July 2018, and recruiting activities have also resumed. Additionally, by the time of ex-post evaluation, initiatives have been

[27] Source: Questionnaire, Interviews with BTCL staff

taken for resolving the above-mentioned issues by expanding maintenance staff.

3.4.2 Technical Aspect of Operation and Maintenance

At the time of the project appraisal, BTTB's maintenance department had experience in maintaining telephone exchanges and existing backbone transmission facilities and had sufficiently utilized systems for newly hired staff training, regular repair training, national and international training programs, and the like. Thus no particular technical concerns were observed. While BTTB's maintenance staff had extensive experience in maintenance management as of the ex-post evaluation, as noted earlier, a 10-year suspension of recruitment resulted in a shortage of operations and maintenance personnel.

On the other hand, the project contractors provided training for the operation and maintenance of the equipment introduced in the Project, in order to equip the personnel with the necessary knowledge for operation and maintenance. Specifically, overseas training (for a total of 69 persons) and domestic training (for a total of 132 persons) were provided to the BTCL staff. In addition, the manuals on knowledge required for operation and maintenance were prepared, and the operation and maintenance have been conducted based on those manuals and on-the-job trainings. However, when troubles requiring advanced technical skills arise, the situation where the project contractor (or equipment provider) deal with the troubles has been continued even though the warranty period has already expired. There is room for improvement in a maintenance management system and education/training system, and enhancement of BTCL’s maintenance management capacity will be needed in the future to ensure the sustainability of the generated effects from the installed equipment. As for the staff newly hired, it was confirmed that BTCL was actively hiring people who had systematically learned the knowledge required for the operation and maintenance of telecommunication equipment before they were hired, and that BTCL provided on-the-job training after they were hired[28].

3.4.3 Financial Aspect of Operation and Maintenance

No problems with the financial aspect of the operation and maintenance were found at the time of the project appraisal as the fee revenue was 15.3 billion Taka and the expenditure was 6.3 billion Taka (FY 2003-2004). It was planned that the executing agency’s account would continue to be independent from the government accounting after the corporatization, and the financial simulations conducted by the World Bank indicated the sufficient revenue would be secured.

However, BTCL's revenue and expenditure at the time of ex-post evaluation in 2019 after

[28] Source: Questionnaire, interviews with BTCL maintenance personnel

corporatization were tallied at 8.8 billion Taka and 13.7 billion Taka, respectively. BTCL's revenue, therefore, has not exceeded its expenditure due to insufficient marketing to acquire potential customers, and its retained earnings carried forward also remain in deficit. Furthermore, the auditor has indicated that there is ongoing concern about BTCL's ability to continue the operations, and the amount of retained earnings carried forward has tripled from the 2014 level, indicating that the company has been operating at a deficit ever since corporatization. On the other hand, its cash flow has been positive, indicating that a large proportion of capital investment is burdened by depreciation costs. Various plans and measures are being taken to decrease deficit, including a plan to improve the profit structure by expanding and modernizing the network and entering into lease contracts to lease optical fiber cable to other telecom companies.

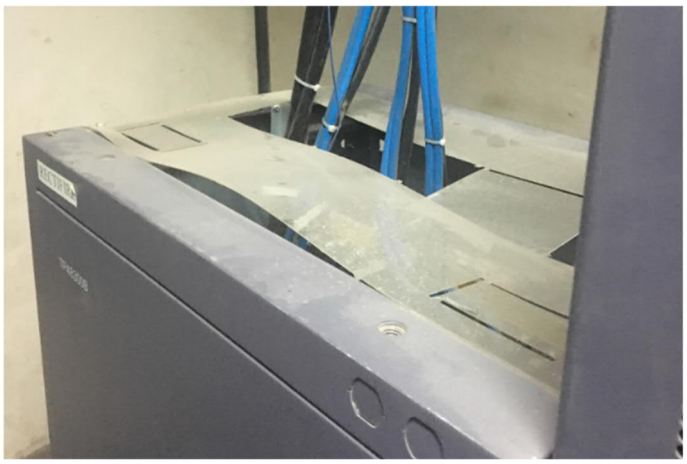
While many new projects are being implemented, the maintenance costs for facilities and equipment are decreasing year by year. It is therefore confirmed that the minimum amount of budget is allocated to operate the current equipment but falls short of the amount needed to cover equipment replacements. Thus, in the interviews with maintenance personnel of the executing agency, it was confirmed that BTCL purchased and upgraded equipment by using the budget and revenue of other projects in addition to its own capital[29] when equipment was damaged, replaced or purchased for operation and maintenance.

3.4.4 Status of Operation and Maintenance

In the questionnaire and site inspection, the operation and maintenance status of the facility was found to be generally good. During the site inspection, on the other hand, some of the Remote-AGW (RAGW), an interface device installed outside the BTCL base stations, was found to be inadequately managed. The problem was attributed to insufficient knowledge of the maintenance and management personnel and insufficient monitoring measures. More specifically, the maintenance and management rules on precision equipment (e.g., room temperature control, regular cleaning, prohibition of eating and drinking inside the room, prohibition of shoes on the ground) were loosely enforced. In addition, it was found that some of the diesel engine generators procured and installed for emergency power supply have never been operated, as the country's improved power situation had offset any need. At the base stations, moreover, a large number of GPON service-related units (MDUs and ONUs) were found to be kept in storage unused, due to insufficiencies in the number of customers and in the marketing by BTCL. The NOC and IN introduced in response to the policy requirement was also left unused, mainly due to the lack of management personnel needed to operate them and insufficient demand from VAS subscribers.

[29] Source: BTCL Annual Report 2019, interviews with maintenance personnel

While some of the equipment was found to be improperly operated and maintained at the time of the ex-post evaluation, the situation did not directly affect the sustainability of the effects. There was room for improvement, however, in the operations and maintenance necessary to ensure that BTCL will be able to provide even higher quality telecommunications services to its customers. It is confirmed that BTCL is aware of this challenge and willing to work towards improving its operations and maintenance management system.

	
RAGW Not cleaned in spite of precision equipment	NOC Not used after installation

In light of the above, some minor problems have been observed in terms of the institutional/ organizational aspect, technical aspect, financial aspect and current status. Therefore, sustainability of the project effects is fair.

4 Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The purpose of this Project is to improve the quantity and quality of telecommunication services in and around major cities of Bangladesh by installing interconnection facilities for mobile and fixed telephone networks, international exchange systems, and backbone transmission facilities, thereby contributing to the economic growth of Bangladesh through the development of the private sector. Its objective is consistent with Bangladesh's development plan and Japan's ODA policy. Moreover, the scope of the Project has been flexibly adjusted, as required, to consistently cope with the changes of Bangladesh's development needs in the telecommunication sector by adapting to the technological innovations in that sector. Based on the above, the relevance of the Project is high. Although the project cost was within the planned cost, the project period exceeded the plan because of changes in the project scope occasioned by corporatization, policy changes, and a court judgment. Therefore, efficiency of the Project is fair. Thanks to the implementation of the

Project, the internet capacity and number of lines used have increased, and a stable supply of high-quality telecommunication infrastructure and the smooth flow of information have been achieved to a certain extent. In addition to promoting the telecommunication industry itself, these changes have had an impact in promoting the smooth operation of businesses other than the telecommunication industry, as well. On the other hand, the number of actual connections to the capacity of the broadband services expanded by the Project is limited, leaving some room for improvement in the effectiveness of the Project. Therefore, effectiveness and impacts of the Project are fair. While the facilities installed by the Project are generally well-maintained, minor problems were identified in terms of financial, and the executing agency's institutional and technical aspects for the operation and maintenance. Hence, sustainability of the Project is fair.

In light of the above, this project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

- Development of training mechanisms and systems to resolve the shortage of management-level workforce

  Technical staff to carry out maintenance and management activities have been deployed, but too few management-level personnel are posted to oversee their activities. Accordingly, there have been several cases where the equipment has not been properly operated or maintained due to a shortage of managers in the maintenance department. One of the reasons for the shortage of managers is the 10-year suspension of hiring after the corporatization. Hence, it is desired to consider having discussions on the development of the training mechanisms and systems to resolve the shortage of management-level workforce, and to formulate a mid to long-term (about five years) human resource development strategy and a training program to develop the staff capacity to fill the necessary management positions. In addition, regular reporting of these capacity building activities to JICA would help in ensuring its effectiveness.

- Strengthen the marketing department and plan strategies to resolve the shortage of GPON service subscribers

  In a number of cases, the benefits of the equipment introduced have not been maximized. Furthermore, with the impact of COVID-19, the demand for telecommunication infrastructure is expected to increase more and more in the country. The recommended step for BTCL, therefore, is to develop a marketing strategy to increase the number of subscribers by increasing its marketing budget and strengthening/improving its marketing department before the surplus GPON service

equipment becomes obsolete. There are further options to consider to this end, including outsourcing to an outside agency, if staffing shortages become a problem. In order to ensure the effectiveness of the capacity building efforts, periodical reporting to JICA on the progress of the capacity building would be desirable.

- Clarification of maintenance standards and rules for sustainable operation of installed equipment

  It was confirmed that some of the equipment, such as the RAGW installed outside the main BTCL base stations, was improperly maintained. The weaknesses found in maintenance management partly stemmed from a lack of established maintenance standards and rules. Hence, it is necessary to first clarify the maintenance standards for installed equipment and then to facilitate discussions on how to establish a system to ensure compliance with those standards and introduce this system in a feasible manner. Specifically, basic rules should be established for the operation of precision equipment, such as rules on the frequency and methods of equipment cleaning and the use of air-conditioning facilities, after the maintenance status of the external base stations is inspected.

4.2.2 Recommendations to JICA

- None

4.3 Lesson learned

Points to keep in mind when corporatization is a precondition for effectuation of the L/A.

The Project was carried out on the pre-condition that the L/A effectuation was to be based on the corporatization. In this Project, there was approximately three years delay in the commencement of the project due to the delay of the corporatization. BTCL hired no new staff after the corporatization, which resulted in a shortage of personnel for the maintenance. The corporatization also required renewals/repeal of various permits and licenses from the authorities, which unavoidably resulted in a change in the scope of the Project. On the other hand, it also had the significance of promoting reform of the telecommunications sector by preconditioning the effectuation of L/A. It is, therefore, even more important to consider the impact of such precondition on the project in advance, including the risks involved. A project involving corporatization thus necessitates the engagement of consultants with knowledge and experience in corporatization, as well as arrangements with the government regarding project assumptions, such as the granting of permits and licenses, the business structure, etc. Specifically, arrangements with the executing agency should be made in advance on how to deal with delays in the commencement of a project, concerning the content and duration of

a project, and how to respond to changes in project's scope. In the case of this Project, it was necessary to consider all the possible impacts and risks caused by the corporatization, such as the change in the reward system for employees to reflect their transfers from the public to private sector.

Points to keep in mind when the commencement of a project in the telecommunications sector is delayed

Technological innovations take place faster in the telecommunications sector than in other sectors, and existing telecommunications technologies often become obsolete. One of the objectives of this Project, as of the project appraisal, was to increase the penetration rate of fixed line telephones. Yet by the time the project scope was changed, three years later, the rapid spread of cell phones in the market had considerably reduced the significance of the dissemination of fixed line telephones. The implementation of a project over a long period of time is likely to require scope changes during implementation, which is likely to adversely affect the effectiveness and efficiency of the Project. When implementing a project in the telecommunication sector, in particular, the project must be streamlined and shortened through rapid planning and implementation. When a project is to be set for a long period of time, both parties should agree, in the project appraisal, to review the plan (including the operation and effect indicators) in advance based on the speed of technological innovation and the status observed in the interim monitoring. Thorough management of possible future risks and countermeasures to arising risks should also be considered at the time of the project appraisal.

Discussion and documentation during scope changes

An important feature of this Project was the significant change in the scope of the Project from the one initially planned. Background information on the scope change and the process by which it took place, however, was not well documented. In addition, the evaluation indicators, a crucial component for evaluations on effectiveness, were not changed in line with the revised scope. When implementing and managing a project with a scope change, it is required to revise the indicators for the evaluation and confirm the relevance between the revised scope and the project objectives, then for all the revisions and reasoning to be documented.

Comparison of the Original and Actual Scope of the Project

Items	Plan	Actual
1. Project Output.		
・Interconnection Equipment Procurement	1 Set	Cancelled
・Backbone transmission facility expansion	1 Set	Cancelled
・International exchange installed	1 Set	1 Set
・Interface device installation		
IMS System	No details provided.	1 unit
Co-AGW.	No details provided.	13 locations
Remote AGW	No details provided.	88 locations
IP Router	No details provided.	26 locations
Diesel generator	No details provided.	6 places
・Broadband access line installation		
Optical fiber cable	180 km	374 km
Wireless LAN	2,600 ports	Cancel
ADSL Port	12,000 ports	11,700 ports
・Procurement, installation and training of accounting systems	1 Set	Cancelled
・Engineering and Consulting Services	1 Set	1 Set
・Management Consulting Services	1 Set	Cancelled
・Network Operation Center	-	1 Set
・Intelligent Network	-	1 Set
2. Project Period	February 2006 - September 2009 (44 months)	July 2009 - June 2016 (84 months)
3. Project costs		
Amount Paid foreign currency	7,510 million yen	5,462 million yen
Amount Paid local currency	3,901 million yen (BDT 6,581 million)	1,672 million yen (BDT 2,110 million)
Total	11,411 million yen	7,135 million yen
ODA Loan Portion	8,040 million yen	5,462 million yen
Exchange rate	1 BDT = 1.68 yen (As of February 2006)	1 BDT = 1.26 yen (2009-2015 average)
4. Final Disbursement	June 2015	

People’s Republic of Bangladesh

FY2019 Ex-Post Evaluation of Japanese ODA Loan

“Dhaka-Chittagong Railway Development Project”

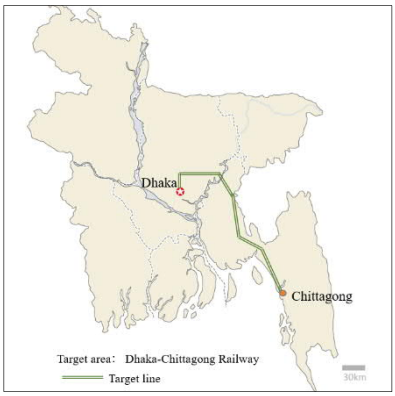
External Evaluator: Hisae Takahashi, Ernst & Young ShinNihon LLC

0. Summary

Under this project, part of the Dhaka-Chittagong Railway line was doubled, the Chittagong station yard was rehabilitated, and locomotives were procured with the aim of enhancing the transportation capacity and improving the quality of service of the Dhaka-Chittagong Railway. This project, under which the railway network and the transportation services of an important section in Bangladesh were improved, is consistent with Bangladesh’s development policy and development needs at the time of both project appraisal and the ex-post evaluation, and is also consistent with Japan’s assistance policy. Therefore, the relevance of the project is high. In terms of project implementation, the project period exceeded the plan due to unsuccessful bidding and changes in project scope. Also, the project cost largely exceeded the plan due to fluctuations in exchange rates and increases in prices in addition to scope changes and the prolonged project period. Thus, efficiency of the project is low. Regarding the project effects, a certain increase in container traffic handling has been observed though it did not reach the target figures since the project only covered part of the section and since track doubling for the entire section has not been completed. Furthermore, the degree to which operation and effect indicators set at the time of project appraisal were achieved was high, except for container traffic handling, and the convenience of railway services resulting from increasing the number of services and improving punctuality was also confirmed through interviews with railway users, thus indicating that the project has made a significant contribution to improving the quality of railway services. Therefore, effectiveness and impacts of the project are high. As for operation and maintenance, minor problems have been observed in terms of institutional/organizational, technical, and financial aspects, as well as the current status. Therefore, sustainability of the project effects is fair.

In light of the above, this project is evaluated to be partially satisfactory.

1. Project Description



Project Location

Tracks that were Doubled under the Project

1.1 Background

In Bangladesh at the time of the appraisal, projects in the railway sector required more time and funds to see results than road and other projects. For this and other reasons, the government of Bangladesh rarely made any new investments in railway development since independence in the 1970s. Consequently, the most of railway facilities and equipment in use were developed during the British colonial period, which lasted until 1947. Indeed, they became outdated and decrepit, and were unable to fully capitalize on the railway's inherent strengths, namely being massive, rapid, punctual, safe, and environmentally friendly, and thus resulting in reduced transportation volume, poor service and a smaller role for the railway in the overall transport sector.

Meanwhile, in parallel with robust GDP growth (5-6%), demand for freight transportation steadily increased by 5-6% annually in Bangladesh at the time of the appraisal. Particularly rapid growth was seen in demand for transportation along the Dhaka-Chittagong section that connects Dhaka, the capital city and political and economic hub of the country, and Chittagong, the second largest city and industrial hub, as well as in the Port of Chittagong's cargo handling volume, which had grown by more than 10% per year since 2001. In addition, further growth in demand for transportation on this section was expected if Chittagong port facilities were expanded and private companies were attracted to the export processing zones. Although there were high expectations for railways to play a leading role in meeting this increasing demand as an alternative mode of transportation to roads, it was difficult, both in terms of transportation volume and quality of service, for the existed railway facilities to meet such expectations, thus posing a bottleneck for economic growth in the years ahead. Additionally, in order to achieve sustainable development that takes the environment into consideration, a modal shift from road transportation to environmentally friendly railway transportation was indispensable and the development of a railway network to improve railway services in an important section was an urgent issue.

1.2 Project Outline

The objective of this project is to enhance the transportation capacity and improve the quality of services by doubling part of the Dhaka-Chittagong Railway line in Bangladesh, rehabilitating a workshop, procuring locomotives and so on, thereby contributing to social and economic development and improving the environment.

Loan Approved Amount/ Disbursed Amount	12,916 million yen/12,887 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	December 2007/December 2007	
Terms and Conditions	Interest Rate	0.01%
	Repayment Period (Grace Period	40 years 10 years)
	Conditions for Procurement	General Untied
Borrower/ Executing Agency	Government of the People's Republic of Bangladesh/ Bangladesh Railway (BR)	
Project Completion	December 2016	
Target Area	Along Dhaka-Chittagong Line and in Chittagong City	
Main Contractors (Over 1 billion yen)	・Max Automobile Products Ltd. (Bangladesh)/Chengdu Ranken Railway Construction Co., Ltd. (Republic of China) /China Railway Materials Import & Export Co., Ltd. (Republic of China) (JV) ・Max Automobile Products Ltd. (Bangladesh) ・Equipment: Marubeni Corporation (Japan)	
Main Consultants (Over 100 million yen)	・SMEC International Pty Ltd. (Australia)/Canarail Consultants Inc. (Canada)/DB International Gmbh. (Germany) (JV)	
Related Studies (Feasibility Studies, etc.)	Special Assistance for Project Formation for Dhaka-Chittagong Railway Development Project (2006)	
Related Projects	[ODA Loan Project] ・Jamuna Railway Bridge Construction Project (June 2018) [International Organization, Other Development Partners] ・ADB "Railway Sector Investment Program" (2006) ・WB "Bangladesh Railway Reform Programmatic Development Policy Credit" (2006)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisae Takahashi, Ernst & Young ShinNihon LLC

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October 2019 - January 2021

Duration of the Field Study: January 4 - January 21, 2020

2.3 Constraints during the Evaluation Study

While the main component of this project was double tracking the target section (Laksam-Chinkiastana), the outcome of the project was planned to be generated in the target section based on the assumption that the entire Dhaka-Chittagong section would be double-tracked. However, at the time of the ex-post evaluation, the double tracking of part of the Dhaka-Chittagong section, Akhaura-Laksam, had not been completed. Even in situations where the track doubling of Akhaura-Laksam was not completed, it was possible to confirm increase in the number of passengers of the target section, which was assumed as the effect for the project, since many passengers use the railroad to travel only on some sections of the entire Dhaka-Chittagong section. On the other hand, since major freight is mainly transported on the entire Dhaka-Chittagong section, it is considered to be too early to properly measure the effectiveness since double tracking has not been completed for the entire section. It was thus determined that it would be difficult to evaluate the effectiveness set at the time of appraisal and, instead, the effectiveness was analysed by focusing on the level of achievement of the other operation and effect indicators.

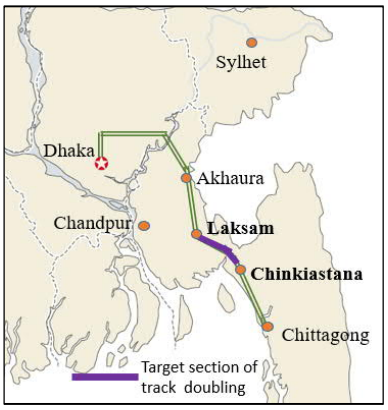


Figure Target Section of Track Doubling (Laksam-Chinkiastana)

In addition, due to the global outbreak of COVID-19, the second field survey for this evaluation study was cancelled. Therefore, collection of additional information, provision of feedback on the evaluation results to the related organizations, and solicitation of comments, which were scheduled to be carried out as part of the second field survey, were carried out remotely from Japan through local assistant. Since the evaluator was not able to conduct the field survey and considering the restrictions on the local assistant in Bangladesh with regards to in-country travel and conducting meetings and interviews, it was not possible to confirm some of the detailed information that had been planned, and in particular, verification of information related to sustainability was limited.

3. Results of the Evaluation (Overall Rating: C[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Consistency with the Development Plan of Bangladesh

At the time of the appraisal, the development plan of Bangladesh, the *First Poverty Reduction Strategy 2004/05-2006/07* (2005), identified the rail sector as a sector that would play an important role in poverty reduction by promoting economic growth and increasing international competitiveness by lowering transportation costs. The need to develop infrastructure, strengthen transport capacity and improve the quality of services in the railway sector was also outlined in the *National Land Transport Policy* (2004) and the *Integrated Multi-modal Transport Policy* (2008), and on the basis of these policies, the government planned to formulate a *National Rail Development Plan* for the next 20 years. In addition, in 2011, the *Bangladesh Railway (BR) Reform Program* was formulated to privatize BR. This program provided a long-term plan that set out the reforms to be implemented to transform the organization into a business unit, improve its financial and human resource systems, and improve its maintenance and management operations[3].

The *7th Five Year Plan 2016-2020* (2015), the development plan at the time of the ex-post evaluation, positioned the development of economic infrastructure as one of the top priorities and indicated the need for continued new investment as well as organizational and pricing reforms to modernize the railway sector. Specifically, 1,110 km of double tracking, bridge construction, locomotive procurement, and workshop and maintenance upgrades were identified as key plans[4]. The *Railway Master Plan 2010-2030* approved in 2013 and the *Updated Railway Master Plan 2016-2045* also aim to expand operating capacity, increase and capture freight market share, manage railway assets more efficiently, improve financial efficiency, and integrate the gauge system[5]. Although the exact progress of the *BR Reform Program* up to the time of the ex-post evaluation was not clearly indicated, it was confirmed that the three prerequisites, namely (1) the reorganization of the BR, (2) the formulation of the five-year business plan, and (3) the establishment of KPIs to achieve the goals of the plan, for track doubling and rehabilitating the Chittagong station yard were already implemented[6].

As noted above, the development policy and plans for the transport and railway sector in Bangladesh, from the time of the appraisal to the time of the ex-post evaluation, have placed importance on the railway sector as part of economic growth and economic infrastructure development, and this is consistent with the project, which aimed to improve rail services through the track doubling of part of the Dhaka-Chittagong section, the procurement of

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[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[2] ③: High, ②: Fair, ①: Low
[3] Document provided by JICA
[4] Source: *7th Five Year Plan 2016-2020*, BR, *Information Book 2018*
[5] Source: BR, *Information Book 2018*
[6] Source: Document provided by JICA

locomotives, and other related measures.

3.1.2 Consistency with the Development Needs of Bangladesh

At the time of the appraisal, Bangladesh maintained a high economic growth rate (5-6% GDP growth rate) with a proportionate annual growth rate in demand for freight traffic of 5-6%. The Dhaka-Chittagong section was the most important route for BR, carrying approximately 1,442 million people/km and 80,000 TEUs[7] of containers per year. In addition, with the expansion of Chittagong Port and the attraction of private companies to the export processing zones, demand for transportation on this section was expected to increase further[8]. On the other hand, most of the facilities and equipment had been developed during the British colonial period, which lasted until 1947, and there had been virtually no new investment in the railway sector since independence. Furthermore, the railway facilities and equipment were aging, making it difficult at the time to meet demand in terms of both quantity and quality, thus potentially becoming a bottleneck for economic development.

Even at the time of the ex-post evaluation, Bangladesh's GDP growth rate was above 7% per year on average[9], and the volume of BR's passenger and cargo traffic was on an upward trend, as shown in the table below. BR's freight volumes between the Inland Container Depot (ICD) in Dhaka, where transported containers are temporarily stored, and Chittagong Port, have also been increasing in recent years (see Table 1) and have increased significantly compared to the pre-project period (573,903 tons in 2006/7), thus confirming the importance of the section of the railway network covered by the project.

Table 1 Trends in Passenger and Freight Traffic According to BR

		2015/16	2016/17	2017/18
All of BR	Volume of Transportation (Million passenger/Km)	9,167	10,041	12,994
	Freight Tonnes Carried (Thousand Tonnes)	2,486	3,877	4,555
ICD (Dhaka)-Chittagong Port	Freight Tonnes Carried (Thousand Tonnes)	603	577	767

Source: BR, *Information Book 2018*, Chittagong Port Authority website (http://cpa.gov.bd/)

While passenger and freight traffic has been on the rise, the aging railway facilities and equipment in Bangladesh noted above remain as one of the challenges in the railway sector, both at the time of the appraisal and at the time of ex-post evaluation, thus there continues to be a strong need for the development of facilities and equipment in the railway sector.

[7] Abbreviation for Twenty Foot Equivalent Units, a unit of measurement for the number of containers in 20 feet.
[8] Source: Document provided by JICA
[9] Source: WB, *World Development Indicator*. GDP growth rate of Bangladesh was on average 7.1% in 2016, 7.3% in 2017, and 7.9% in 2018.

3.1.3 Consistency with Japan's ODA Policy

The *Country Assistance Policy for Bangladesh* (2006) at the time of the appraisal stated the importance of providing infrastructure related to transport to realize the sustainable economic growth needed to support poverty reduction. In the *Strategy for Overseas Economic Cooperation Operations* (FY2005-2007), support for the development of basic economic infrastructure to promote economic growth was designated as a priority area for assistance to Bangladesh. Furthermore, the *Country Assistance Strategy for Bangladesh* (2006) indicated that Japan would support the development of the railway network while encouraging reform of BR in cooperation with the Asian Development Bank (ADB) and the World Bank (WB). Hence, the objective of the project is in line with Japan's assistance policy.

3.1.4 Appropriateness of the Project Plan and Approach

The expansion and improvement of the Pahartali workshop was removed from the scope of the project during the implementation of the project[10]. This change was made in order to avoid unnecessarily extending the project period and in consideration of the cost of the project after several unsuccessful bids which took longer than expected. Furthermore, while this was the first JICA project for BR, the broad scope of the project was seen as an impediment to operate and manage the project, including the bidding process. The project scope was reviewed during implementation of the project and it was agreed among the parties concerned that the focus should be on track doubling, thus leading to the determination that it would be appropriate to change the scope of the project such that work related to the Pahartali workshop would be implemented as a separate project at the expense of the counterparty government.

In light of the above, this project has been highly relevant to Bangladesh's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

The planned major outputs of the project consisted of the track doubling of the Laksam-Chinkiastana section, expansion and improvement of the Pahartali workshop, remodelling of the Chittagong station yard, procurement of locomotives and provision of consulting services. The major planned and actual outputs are shown in Table 2.

[10] This scope was subsequently implemented with funding from the Government of Bangladesh and a grant for debt relief (DRGF) from Japan, and completed in 2019.

Table 2 Planned and Actual Output

	Unit	Plan	Actual
1. Track Doubling between Laksam and Chinkiastana			
1-1. Track Doubling of the Target Section	Km	61	As Planned
1-2. Remodelling of Track Layout and Provision of Station Facilities	No. of Station	11	As Planned
1-3. Construction of the Related Facilities Bridge Pipe Culvert Box Culvert	No. No. No.	5 11 19	8 As Planned 34
1-4. Expansion of Crossing	No.	13	As Planned
1-5. Installation and Expansion of Signalling and Telecommunication System	No.	11	As Planned
2. Expansion and Improvement of Pahartali Workshop	-	-	Out of Scope (Implemented as Separate Project)
3. Chittagong Station Yard Modelling			
3-1. Loop Track Platform	No. No.	3 1	As Planned
3-2. Installation of Water Supply and Drainage system	-	-	
3-3. Renovation and Construction of Offices	-	-	
3-4. Replacement of Tracks and Turnouts in the Station Yard	-	-	
3-5. Restoration of Track and Bridge on the Section between Chittagong Marshalling Yard and Pahartali Station	-	-	
4. Procurement of Locomotives	No.	11	As Planned[Note]
5. Consulting Service			
5-1. Follow Up on Detailed Design, Tendering, Construction Supervision, Disburse Management, Project Progress Supervision, etc.	-	-	Items written in left column were implemented as planned. Support for evaluation of the tendering was added.
5-2. Technical Assistance (Skill Development Program for Marketing Department and Maintenance Department)	-	-	

Source: Document provided by JICA, questionnaire answers from BR

Note: Though number of locomotives procured was as planned, the specification of the locomotive was changed. The detail is noted below.

As shown in Table 2, changes in the major outputs included removing expansion and improvement of the Pahartali workshop from the scope of the project, increasing the number of related facilities (bridges and culverts) to be constructed, changing the specifications of the procured locomotives, and adding support for evaluating bids as a consulting service. The details of the changes and the reasons therefor are as follows.

[Changes in the major outputs and the reasons therefor]

① Increase in the number of bridges and culverts constructed for the target section (track doubling between Laksam and Chinkiastana)

Reason: Since some of the bridges and culverts in the section were antiquated and had axle loads lower than those stipulated by regulations at the time, a decision was made to rebuild them in accordance with the design of the double track system. Increasing the number of bridges and culverts was necessary to ensure the safety of the railway service in the newly double tracked section, and is thus deemed to be an appropriate change.

② Cancelation of expansion and improvement of the Pahartali workshop

Reason: The reason for this was that although bidding was held twice, none of the bidders had sufficient technical skills and thus none of them were selected. As a result, due to the increased cost of other work under the scope of the project, this workshop-related work was implemented under a separate project[11] with Bangladesh's own budget and a grant for debt relief (DRGF) from Japan[12].

③ Changes in the specifications of the procured locomotives

Reason: Although there was no change in the number of locomotives procured, the maximum axle load was changed from 11.75 to 11.96 tons. At the time of the appraisal, it was decided that the locomotive specifications would be re-examined based on an analysis of future demand, thus this change is not deemed to be an issue.

④ Addition of support for evaluating bids as a consulting service

Reason: Support for evaluating bids was added to the planned provision of consulting services. Since this was the first JICA-supported project for BR and the project components were complicating, BR requested support for evaluating bids. This addition is deemed to be appropriate as both BR and JICA agreed that the addition was necessary.

Roadbed Developed through the Project

A Signal Installed through the Project

[11] According to BR, this project was completed in December 2019.
[12] Source: Document provided by JICA and interview with BR

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was 33,213 million yen, significantly higher than the originally planned cost of 20,811 million yen (160% of the original plan). As shown in Table 3, the portion covered by the Japanese side was within the plan, while that covered by the Bangladesh side increased substantially.

Table 3 Planned and Actual Project Cost

(Unit: Million Yen)

	Plan			Actual		
	Total	Japanese Portion	Bangladesh Portion	Total	Japanese Portion	Bangladesh Portion
Track Doubling between Laksam and Chinkiastana	6,601	3,497	3,104	15,347	6,538	8,809
Expansion and Improvement of Pahartali Workshop	1,839	1,839	0	0	0	0
Remodelling of Chittagong Station Yard	858	858	0	1,975	480	1,495
Rolling Stock Procurement	3,794	3,794	0	5,370	4,174	1,196
Consulting Service	1,738	1,738	0	1,687	1,687	0
Land Acquisition and Compensation	75	0	75	35	0	35
Administration Cost	129	0	129	178	0	178
Tax	4,428	0	4,428	4,142	0	4,142
Price Escalation	574	574	0	4,479	0	4,479
Contingency	774	616	158	0	0	0
Total	20,810	12,916	7,894	33,213	12,879	20,334

Source: Document provided by JICA, questionnaire answers from BR

Note: Exchange rate Plan: 1 Bangladesh Taka (1 BDT) = 1.66 yen, Actual: 1 BDT = 1.34 yen, Average rate by International Financial Statistics of IMF during the project implementing period.

The main reasons why the project cost was significantly higher than planned were changes in the scope of the project, increases in prices and exchange rate fluctuations[13]. As previously explained, the expansion and improvement of the Pahartali workshop was removed from the scope of the project due to repeated unsuccessful bids and the impact that this had on the project period and the difficulty in selecting appropriate contractors. On the other hand, with regards to the track doubling of the Laksam-Chinkiastana section, which was the main output of the project, adding the objective of strengthening the bridges and culverts required for safe operations and changing locomotive specifications resulted in an increase in project costs. In addition, while the Bangladesh side prepared its Development Project Proposal (DPP) in 2005, the actual changes in prices were larger than expected at the time and it was

[13] The exchange rate was 1 BDT = 1.66 yen when the Bangladesh side prepared the DPP. However, the yen continued to appreciate since then, reaching 0.97 yen to 1 BDT in 2012 during the implementation of the project, and 1 BDT to 1.39 yen in 2017 when the project was completed.

needed to examine the estimate cost and revise the DPP to reflect the actual situation, and in turn, affected by the increase in project costs[14].

3.2.2.2 Project Period

The project period[15] was planned to be 92 months as opposed to an actual 109 months, from December 2007 to December 2016, which was longer than planned (118% of the plan). The main reasons for the longer project period were the procedures required for the change of scope related to track doubling, longer time required for bidding preparations, and nationwide demonstrations led by the opposition party during the construction period which halted work for nearly two months. In addition, for the tendering process for locomotive procurement and the expansion and improvement of the Pahartali workshop, there were no bidders who met the technical requirements, thus the re-tendering process was repeatedly implemented, and it took time to prepare the documents each time, which also contributed to the delay. Further, this project was the first JICA-supported project for BR, and the project, which had many components, was complicating for BR and the bidders, which made it difficult to revise the scope of the project and implement the re-tendering process.

Table 4 Planned and Actual Project Period

	Plan (As of the appraisal)	Actual
L/A	November 2007	December 2007
Track Doubling between Laksam and Chinkiastana	January 2008-July 2013	July 2009-March 2015
Expansion and Improvement of Pahartali Workshop	April 2007-February 2010	-
Remodelling of Chittagong Station Yard	September 2008-May 2012	July 2009-May 2015
Rolling Stock Procurement	April 2007-February 2010	May 2011-December 2013
Consulting Services	April 2007-December 2012	May 2009-December 2014
Project Completion (Project Period)	December 2007-July 2015 (92 months)	December 2007-December 2016 (109 months)

Source: Document provided by JICA, questionnaire answers from BR

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

At the time of the appraisal of the project, the Financial Internal Rate of Return (FIRR) was calculated as 2%, with passenger and freight revenues set as the benefit, project cost and operation and maintenance costs set as the cost, and a project life of 25 years. The Economic Internal Rate of Return (EIRR) was calculated as 9%, with time savings, increase in GDP,

[14] For example, the lowest price in the bid for locomotive procurement was 49% above the estimated amount.
[15] The project period is defined as the period from the month in which the L/A is signed to the month in which the defect liability period ends. (The warranty period was two years after the procurement of equipment, one year after the completion of construction and two years after the procurement of signaling equipment.)

savings on vehicle purchasing costs, and savings on locomotive purchasing costs set as the benefit, project cost and operation and maintenance costs set as the cost, and a project life of 25 years as well. However, the disbursement of the project funds differed significantly from the original plan and assumptions due to the change in the scope of the project. Furthermore, due to the fact that data for each scope needed for quantitative analysis was not available, it was not possible to recalculate the internal rate of return.

As described above, the project cost significantly exceeded the plan and project period also exceeded the plan. Therefore, efficiency of the project is low.

3.3 Effectiveness and Impacts[16] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Table 5 summarizes the actual data since the year of project completion for each of the operation and effect indicators established at the time of the appraisal of the project. In addition to the operation and effect indicators, the “travel times on the target sections” and “number of accidents” are provided in Tables 6 and 7, respectively, as reference indicators to supplement improvements in train speed and safety.

[16] Sub-rating for Effectiveness is to be put with consideration of Impacts.

Table 5 Operation and Effect Indicators of the Project

	Baseline	Target	Actual		
	2005	2016	2016/17	2017/18	2018/19
		1 Year After Completion	Completion Year	1 Year After Completion	2 Years After Completion
Number of Passengers at Station on the Project Section (person/day)	5,440	15,600	12,345	13,700	13,655
Container Traffic Handling (1,000 TEU/year)	53,899[Note1]	229,028[Note1]	72,998	74,741	88,850
Number of Trains Running (Average per Day, Up & Down)	38	65	58	58	60
Operating Rate of Locomotives (%)	-	86	N.A.	N.A.	86
Pahartali Workshop Productivity[Note2]					.
Diesel (Unit/Month)	3.0	4.0	N.A.	N.A.	N.A.
Coaches (Unit/Day)	2.4	3.5	2.6	2.9	3.4
Wagons (Unit/Day)	5.0	7.5	3.7	2.9	2.2
Train Speed (Km/h)					
Passenger	55	80	72	80	80
Freight	31	60	45	45	45
Operation punctuality (%)					
Intercity train	72	95	94	94	92
Local train	59	85	94	94	93

Source: Document provided by JICA, questionnaire answers from BR

Note 1: Since the baseline data provided by BR at the time of the ex-post evaluation was different from that at the time of the appraisal, the data provided at the time of the ex-post evaluation was used as the revised baseline data to maintain consistency, and the target was also re-set to match the conditions at the time of the appraisal (the target was 4.25 times the baseline).

Note 2: As the improvement of the Pahartali workshop was carried out under a separate project, this data is for reference only.

The targets for the operation and effect indicators set at the time of the appraisal were expected to be achieved one year after the completion of the project. As the project was completed in 2016, the achievement status of the targets is analysed based on the data as of 2017/18. Actual results were around 80% or more of targets for the number of passengers at the stations on the section covered by the project, the number of trains running, train speed, and operation punctuality. Converting the single track to a double track in the target section made it possible to increase the number of trains running and the passengers. Train speed has also increased due to improvements in track layout and the installation of signalling and communication systems, and grasping the proper operations and reducing waiting times at train stations have greatly contributed to improving the operation

punctuality. In addition, though the container traffic handling did not reach the target, a certain level of effects, the increase compared to the time of the appraisal, was confirmed. This is due to the fact that some sections of the Dhaka-Chittagong line (namely, Akhaura-Laksam[17]) were not double-tracked. As stated in "2.3 Constraints during the Evaluation Study", it is pointed that container traffic handling will be fully effective after the entire section has been double-tracked. With regard to the target values, although the completion of the Tongi-Bailab Bazaar section was a precondition for the achievement of the project effects, the fact that the timing of implementation and completion of the Akhaura-Laksam section was not yet determined was not sufficiently taken into account when the target values were set, resulting in target values that may have been set too high. Furthermore, according to the Freight Forwarders Association, a lack of sufficient space near the Dhaka railway station has also affected the volume of railway container traffic on this section since containers transported to Dhaka are once stored in a depot before being transported to their various destinations.

Table 6 Travel Times on the Target Sections

Section	Name of Train	Before the Project	After the Project
Laksam-Chinkiastana	Subarno	1 Hour and 12 Minutes	50 Minutes
	Karnofully Exp.	1 Hour and 33 Minutes	1 Hour and 22 Minutes
Dhaka-Chittagong	Subarno	7 Hours and 5 Minutes	5 Hours and 10 Minutes
	Karnofully Exp.	11 Hours	9 Hours and 30 Minutes

Source: Document provided by BR

Table 7 Number of Annual Derailment Accidents involving Locomotives Running the Target Sections

Before the Project (2005)	After the Project (2016/17)	After the Project (2017/18)	After the Project (2018/19)
25 cases	3 cases	5 cases	6 cases

Source: Questionnaire answers from BR

The time required for the entire Dhaka-Chittagong section and the section covered by the project declined after completion of the project, as shown in Table 6. This was mainly due to improved speed resulting from track doubling and related facilities, the expansion of station platforms, and the efficient operation of trains through improvements to the loop track. In addition, the number of derailment accidents is also lower than before the project implementation through improvements to the track (see Table 7). The data in Table 7 shows the number of derailment accidents on the line involving the target section, Laksam-Chinkiastana[18]. Out of 25 cases before the project, the number of derailment accidents that occurred in the targeted section is unknown, thus an accurate comparison

[17] ADB is supporting track doubling of this section (scheduled for completion in 2022).
[18] The line of the target section (Laksam-Chinkiastana) connect Chittagong to Sylhet and Chandpur areas, which is not included in the targeted area, in addition to Dhaka.

cannot be made. According to the department in charge of the operation and management of the target section, however, no derailment accidents, which were frequently observed before the project, have occurred in the target section since the project was implemented. Under this project, along with track doubling, track improvements and the installation of signalling and communication systems have allowed for IT to be leveraged to automate those systems, and the enhanced accuracy with which operations can now be monitored has contributed to more stable operations and fewer accidents.

3.3.1.2 Qualitative Effects (Other Effects)

The qualitative effect of the project was expected as improvement in the convenience of railway services, such as safety and punctuality. This can be confirmed through the quantitative effects described above, such as an increase in the number of trains running, a reduction in travel times, punctuality, and the number of accidents. To procure information to supplement these quantitative effects, interviews with passengers using the railway were conducted at stations on the target section visited during the site inspection as part of this evaluation[19]. In interviews, passengers also commented on the increase in the number of trains running and the reduction in travel time and waiting time, confirming the quantitative effects of the study. In addition, improvement of comfort at the stations was identified as a result of rehabilitating the Chittagong station yard. For example, the construction of platforms with roofs has provided passengers with a shelter from rain when they wait for the train, and the installation of crosswalks across platforms has enabled passengers and people living in the area to safely cross the tracks. Responses to interviews also indicate that the installation of public toilets and the like has improved the station environment, and the installation of drainage systems has resulted in less flooding of stations and tracks when it rains, thus improving sanitation during rainfall.

Furthermore, according to interviews with the Freight Forwarders Association, track doubling and the development of related facilities and equipment in the target sections has resulted in punctuality and reduced damage to goods caused by shaking and a greater number of trains running. However, for companies involved in transporting freight, the section is still considered to be under construction as track doubling has not been completed for the entire Dhaka-Chittagong section, despite double tracking being completed for the section covered by the project. Since major cargo is transported from Chittagong to Dhaka, the entire section needs to be double-tracked to accurately understand the extent to which railway convenience has increased in terms of freight transport.

[19] Interviews with passengers waiting for trains at stations during the site inspection. A total of 18 people (14 males and four females) were interviewed, six at Chittagong station and three each at Laksam, Gunaboti, Fenin and Chinkiastana stations.

3.3.2 Impacts

3.3.2.1 Intended Impacts

(1) Contribution to strengthening the economic infrastructure

As explained in Effectiveness, the number of passengers increased alongside an increase in the number of trains running, and container traffic handling also increased after the project was implemented, although it did not reach the target (see Table 8). The project is considered to have indirectly contributed to strengthening the economic base of the country by improving railway services, as evidenced by recent year-on-year growth in the volume of containers handled at Chittagong Port, which is the origin and terminus of freight traffic between Dhaka and Chittagong.

Table 8 Volume of Container Handling at Chittagong Port

(Unit: TEU)

2014/15	2015/16	2016/17	2017/18	2018/19
1,867,062	2,189,439	2,419,481	2,705,090	2,808,499

Source: Chittagong Port Authority website (http://cpa.gov.bd/)

In interviews conducted during the site inspection, persons working at shops located near the stations covered by the project mentioned that sales have increased in line with the increase in the number of passengers at stations. It has been confirmed that the number of customers and sales of shops around the stations have increased and that the use of railways has increased compared to at the time of the appraisal, thus contributing, to a certain extent, to the strengthening of railway services as a foundation for the economy. Considering that track doubling of the entire Dhaka-Chittagong section has not been completed as noted in Effectiveness, the contribution of the project to strengthening the economic base of the target area is expected to be enhanced after the track doubling of the entire section is completed in the future.

(2) Improving the environment through the development of railway facilities

The document at the time of the appraisal indicated that there were expectations for a modal shift from road to rail transport and an associated reduction in CO2 emissions. However, improvement in the environment was not assumed by the executing agency to be an impact of the project at the time of the appraisal and during implementation, and if such an impact was to occur, it would be negligible. In addition, although the Freight Forwarders Associations and passengers were asked in interviews about the effect of the project on the environment, sufficient information could not be obtained to analyse this effect as it was not recognized by persons that were interviewed[20].

[20] Source: BR, interviews with Freight Forwarders Association and railway users

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

In accordance with *JBIC Guidelines for Confirmation of Environmental and Social Considerations* (April 2002), the project falls into Environmental Category B, indicating that the undesirable effects of the project on the environment are not significant. As such, although preparation of an environmental impact assessment was not mandatory, a simplified environmental impact assessment was conducted and approved in 2007. In addition, the contractor submitted an environmental management plan and implementation schedule, and monitored air, water quality, noise, and waste during construction. Monthly reports were also prepared and submitted, and no particular issues were reported[21].

(2) Resettlement and Land Acquisition

The land utilized for the project was owned by BR and no land acquisitions occurred. However, as a result of track doubling, 11 unauthorized households, 110 shops (including 106 unauthorized shops), one unauthorized office, four unauthorized mosques, and one unauthorized market were resettled. Upon resettlement, the amount of compensation was determined at the land level in each area and procedures were carried out according to the Resettlement Action Plan with the prior consent of the aforementioned resettled parties. In addition, a Complaint Redress Committee was formed as part of the resettlement, and no complaints were received[22].

(3) Other Impacts

As part of the consulting services, plans were made to conduct education and awareness activities on HIV/AIDS prevention for construction workers involved in the project. The HIV and AIDS prevention program was implemented by a major NGO in Bangladesh as planned, and the activities were monitored by a consultant. Specifically, HIV/AIDS sessions were conducted for workers, leaflets and condoms were distributed, and information sessions were held for local communities. The initiative was proposed by JICA and was the first case of its kind for BR. Since the implementation of the project, BR has carried out similar activities in all projects involving construction[23].

In light of the above, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

[21] Source: Documents provided by JICA and BR
[22] Source: Document provided by JICA, questionnaire answers from BR
[23] Source: Interview with BR

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

Operation and maintenance of the constructed and refurbished facilities are carried out by BR. BR is divided into two zones, the East Zone and the West Zone, and each of the departments responsible for maintenance related to the project are part of the East Zone, including departments providing maintenance for tracks, bridges, equipment and locomotives. At the time of the ex-post evaluation, the total number of staff at BR was 25,823 (in 2017/2018). However, BR staff mentioned that the planned number of required staff was 40,000[24]. Meanwhile, BR, with the support of ADB, has been undergoing organizational reform for improving the efficiency whereby it has been reducing the number of employees with the aim of greater organizational strength by reorganizing, scaling back unprofitable departments, and outsourcing some operations such as ticket booking to private companies[25]. Though there may be a difference in opinion between on-site employees and management about the number of personnel[26], understaffing is considered for some operations. For example, at the time of the appraisal, it was noted that additional maintenance personnel would be needed, particularly for the maintenance of the double-track project. However, at the time of ex-post evaluation, the staff responsible for the maintenance of the single track is also responsible for the one of the double track. In addition, three of the 11 train stations developed under the project have been closed due to insufficient manpower. This factor impedes proper operation and maintenance of the facilities that were developed and is identified as a challenge in terms of institutional and organizational aspects.

3.4.2 Technical Aspect of Operation and Maintenance

The executing agency, BR, had experience in implementing a number of donor-supported projects, and it was noted in the documentation at the time of the appraisal that there were no issues related to the agency's technical capacity in terms of basic operations and maintenance. In fact, interviews with BR staff revealed that they have the technical capacity to carry out single and double track operations and maintenance activities. During the implementation of the project, training on the operation and maintenance of newly installed equipment and locomotives was conducted, and participants of the trainings have shared the knowledge and experience gained within BR after the completion of the project. Therefore, BR has basic technical capacity and there are no facilities or equipment that are not operational due to a lack

[24] Source: BR, *Information Book 2018* and interview with BR

[25] The total number of BR staff, which was 34,168 in 2006, was reduced by more than 20% to 25,823 in 2018. ADB's program positions headcount reduction as an improvement in BR's productivity and efficiency.

[26] There were plans to confirm with management during the second field survey the inadequate number of personnel identified at the time of the ex-post evaluation and the status of personnel reductions due to organizational restructuring. However, it was not possible to confirm the information in detail since the evaluators could not conduct the second field survey due to the impact of COVID-19 and restrictions on meetings and interviews within Bangladesh.

of operational and maintenance capacity. Although ongoing operation and maintenance training is needed for staff in charge of the communications system installed under the project, there is no set training system within the organization, and there are limited opportunities for staff to improve their technical capabilities related to operation and maintenance. Accordingly, there was a minor concern about operations and maintenance techniques at the time of the ex-post evaluation. Although training was provided under the project to strengthen the capacity of the marketing department, the department was unable to coordinate the schedule with the relevant participants, and as such the effect and impact of the training on the sustainability of the project could not be determined.

3.4.3 Financial Aspect of Operation and Maintenance

Maintenance costs accounted for about 30% of BR's expenditures (see Table 9) and, according to BR staff, although the maintenance budget is not adequate, they have conducted maintenance to the extent possible within the budget. BR has been operating at a loss for many years, reporting a loss of 14,318 million BDT (approximately 17,942 million yen) in FY2017/18. In Bangladesh, railways are heavily used by low-income groups, and fares are kept low as a Public Service Obligation (PSO). Although BR has received compensation for the amount related to this PSO from the government in line with government policy, the amount has been fixed since 1997 (see Table 10) due to financial difficulties experienced by the government, which has also led to a growing deficit. In addition, fares have remained unchanged at BR since 1992. Although fares were raised in 2012 for the first time in a decade, indicating an improvement in the revenue to expense ratio, this has since been offset by staff wage increases. Some improvement was seen when fares were once again raised in 2016, and ADB, which has supported BR reform, noted the need to continue to set appropriate fares. Although there were discussions at BR in 2020 about raising fares, the prospects for this are not yet known, due in part to COVID-19.

Table 9 BR's Expenditures

(Unit: Million BDT)

	General Admin.	Repair & Maintenance	Staff Salaries	Others	Miscellaneous Expenses
2015/16	3,564	7,169	1,269	1,737	4,931
2016/17	4,074	8,552	1,383	2,189	8,157
2017/18	3,981	9,931	1,309	2,102	7,755

Source: BR, *Information Book 2018*

Table 10 Revenue to Expense Ratio

(Unit: Million BDT)

	PSO Compensation	Welfare Grant	Operating Revenue	Operating Expenses	Revenue to Expense Ratio (%)
2011/12	860	370	7,264	15,671	215.7
2012/13	860	390	9,293	15,624	168.1
2013/14	860	359	9,220	16,017	173.7
2014/15	860	394	10,608	18,083	170.5
2015/16	860	372	10,272	22,292	217.0
2016/17	860	553	14,451	28,355	196.2
2017/18	860	656	16,378	29,180	178.2

Source: BR, *Information Book 2018*

As noted above, while the financial deficit continues, in terms of its budget, BR's budgetary requests to the government have been fulfilled nearly in full during the last five years (see Table 11), and BR's budget plan is positively evaluated by the government to some extent.

Table 11 Budget Allocation from the Government to BR

	Requested Amount (Million BDT)	Allocated Amount (Million BDT)	Allocation Ratio (%)
2014/15	11,715	11,673	99%
2015/16	13,045	12,482	96%
2016/17	15,830	15,710	99%
2017/18	31,655	31,655	100%
2018/19	36,000	34,638	96%

Source: Documents provided by BR and JICA

3.4.4 Status of Operation and Maintenance

In terms of facilities and equipment maintained under the project, it was confirmed through interviews and inspections during the site visit that the double tracked layout, bridges and culverts, related facilities such as level crossings and signalling and communication systems, loop start-up at Chittagong station, platforms, drainage systems, offices, tracks and turnouts, and locomotive maintenance, are in good condition and operating without issue except for at three of the 11 stations developed that are now closed.

Maintenance of facilities is generally carried out in accordance with provisions set forth by BR. For roadbeds and tracks, BR adds ballast[27] generally every five years, and regularly conducts adjusting them, weeding, and checking of bolts and tracks. In addition, BR assigns an average of one person per kilometre of double tracked sections to carry out regular inspections. Cleaning and inspection of station buildings and related facilities are also

[27] Gravel for paving railway tracks, roads, etc.

conducted on a regular basis. Locomotives also undergo daily inspections (inspection and replacement of consumables, etc.) and periodic inspections (checking the inside of engines, checking the condition of engines, including cylinders and accessories, replacing spare parts as planned, etc.) according to a set schedule. As noted above, at the time of the ex-post evaluation, three stations are not utilized, accordingly the communication and signal systems in the vicinity of those stations were also found to be underutilized, mainly due to staff shortages.

In light of the above, some minor problems have been observed in terms of the institutional/organizational aspect, technical aspect, financial aspect, current status. Therefore, sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

Under this project, part of the Dhaka-Chittagong Railway line was doubled, the Chittagong station yard was rehabilitated, and locomotives were procured with the aim of enhancing the transportation capacity and improving the quality of service of the Dhaka-Chittagong Railway. This project, under which the railway network and the transportation services of an important section in Bangladesh were improved, is consistent with Bangladesh's development policy and development needs at the time of both project appraisal and the ex-post evaluation, and is also consistent with Japan's assistance policy. Therefore, the relevance of the project is high. In terms of project implementation, the project period exceeded the plan due to unsuccessful bidding and changes in project scope. Also, the project cost largely exceeded the plan due to fluctuations in exchange rates and increases in prices in addition to scope changes and the prolonged project period. Thus, efficiency of the project is low. Regarding the project effects, a certain increase in container traffic handling has been observed though it did not reach the target figures since the project only covered part of the section and since track doubling for the entire section has not been completed. Furthermore, the degree to which operation and effect indicators set at the time of project appraisal were achieved was high, except for container traffic handling, and the convenience of railway services resulting from increasing the number of services and improving punctuality was also confirmed through interviews with railway users, thus indicating that the project has made a significant contribution to improving the quality of railway services. Therefore, effectiveness and impacts of the project are high. As for operation and maintenance, minor problems have been observed in terms of institutional/organizational, technical, and financial aspects, as well as the current status. Therefore, sustainability of the project effects is fair.

In light of the above, this project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

・Consideration of assigning an appropriate number of staff (review of the possibility of staffing closed stations for their use)

At the time of the ex-post evaluation, three stations had been closed since construction mainly due to staff shortages. There continues to be a situation where persons in charge of single track operations and maintenance are also in charge of that for double tracked sections. Staff shortages are a common problem across the public sector in Bangladesh and are unlikely to be resolved any time soon. Further, considering that personnel reductions have been promoted as part of organizational reforms, it is recommended that the department in charge of operations and maintenance for each facility and set of equipment assess the exact number of personnel needed, share this information within the organization, and discuss how to secure personnel so that the facilities developed under the project can be properly utilized.

・Taking initiatives to set appropriate fares to improve the deficit

BR has been operating at a loss since the time of the appraisal. This is due in part to low fares and the fact that PSO compensation amounts are set on a fixed basis rather than taking into account factors such as inflation. Going forward, BR will need to discuss appropriate PSO compensation amounts and fare pricing, and consider realistic plans to improve the situation.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

・Project formation where the executing agency does not have sufficient experience

This was the first JICA project for BR, the executing agency of the project. On the other hand, the project was a complicating undertaking with a wide scope to be covered, including track improvements, construction of station facilities, construction of bridges and other related facilities, track doubling including installation of signalling and communication systems, expansion and rehabilitation of a workshop, rehabilitation of a station yard, and procurement of locomotives. This made it difficult for the project to proceed smoothly, as was seen by, for example, repeated unsuccessful bids. For projects such as this one where the executing agency has little or no experience with JICA projects, it is necessary to examine whether the project is too complicating and whether the capacity of the executing agency (staff and implementation capacity) is sufficient. In doing so, it is desirable to examine the project plan that takes into account the burden on the executing agency, such as dividing the project into multiple phases when multiple components are included, or providing the necessary support when the executing agency does not have sufficient capacity to operate and manage the project.

・Setting of indicators for the project that supports a part of the target area or scope

The container traffic handling, an operation and effect indicator of this project, did not reach the target, where the way of setting the target can be raised as the main reason. This project supported the track doubling of a part (Laksam-Chinkiastana) of the most important line (Dhakka-Chittagong section) in Bangladesh. On the other hand, it was considered that the target was set on the assumption that the entire Dhaka-Chittagong section would be double-tracked. However, at the time of ex-post evaluation, some sections other than the target section of the project in the Dhaka-Chittagong were not double-tracked. Accordingly, the container traffic handling, mainly intended to be transported on the Dhaka-Chittagong section, did not achieve the target though a certain effect was confirmed. In the case of the project that supports a part of the target area or scope of the project, the persons involved in the project planning need to set the target after clarifying the scope of effects that will be generated by the implementation of the project in order to accurately understand the project effects. If external factors beyond the scope of the project support are involved in generating effects, it is desirable to set targets that also take into account the effects of these factors, and to provide sufficient explanations of the conditions that were assumed, so that the project effects can be more accurately understood.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
① Outputs	1) Track Doubling between Laksam and Chinkiastana ・Track Doubling of the Target Section: 61 km ・Remodeling of Track Layout and Provision of Station Facilities: 11 Stations ・Construction of the Related Facilities Bridges: 5 Pipe Culverts: 11 Box Culverts: 19 ・Expansion of Crossing: 14 Places ・Installation and Expansion of Signaling and Telecommunication System: 11 Stations 2) Expansion and Improvement of Pahartali Workshop 3) Chittagong Station Yard Modelling ・Loop Tracks: 3 Places ・Plat Form: 1 Place ・Installation of Water Supply and Drainage System ・Renovation and Construction of Offices ・Replacement of Tracks and Turnouts in the Station Yard ・Restoration of Track and Bridge on the Section between Chittagong Marshalling Yard and Pahartali Station 4) Procurement of Locomotive: 11 locomotives 5) Consulting Service ・Follow Up on Detailed Design, Tendering, Construction Supervision, Disburse Management, Project Progress Supervision, etc. ・Technical Assistance -Skill Development Program for Marketing Department - Skill Development Program for Maintenance Department	1) Track Doubling between Laksam and Chinkiastana →As Planned →As Planned →8 Bridges Pipe Culverts: As planned, Box Culverts: 34 →As Planned →As Planned 2) Out of Scope 3) Chittagong Station Yard Modelling All Item: As planned 4) Procurement of Locomotive: As Planned 5) Consulting Service Support for Evaluation of the Tendering was Added. Other Than That, as Planned.
② Project Period	November 2007-July 2015 (93 Months)	December 2007-December 2016 (109 Months)
③ Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	 11,701 Million Yen 9,740 Million Yen (5,867 Million BDT) 23,032 Million Yen 12,887 Million Yen 1 BDT = 1.66 Yen (As of September 2006)	 9,661 Million Yen 23,551 Million Yen (17,611 Million BDT) 33,213 Million Yen 12,879 Million Yen 1 BDT = 1.34 Yen (Average between December 2007 and December 2016: Source: International Financial Statistics Data of IMF)
④ Final Disbursement	March 2017	