People's Republic of Bangladesh

FY 2019 Ex-Post-Evaluation of Japanese ODA Loan

"Telecommunication Network Development Project"

External Evaluator: Katsuya Tokuda, Ernst & Young ShinNihon LLC

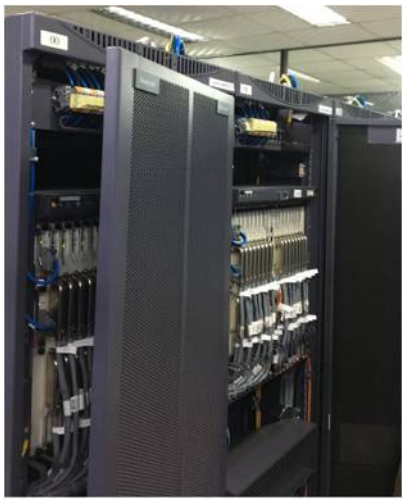
0. Summary

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 addressing three major obstacles to the further acceleration of the country's economic growth: the

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

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 Study (F/S) (Japan Telecommunications	

(Feasibility Studies, etc.)	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.

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ②:Fair, ①: Low

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. 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

[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
[7] The ratio of successfully completed calls to the total number of calls attempted

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 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

[8] Source: Documents provided by JICA
[9] Source: Documents provided by JICA, Questionnaire, Interview with the person in charge
[10] Source: Documents provided by JICA, Country Assistance Program for Bangladesh

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 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

[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)

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.

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

[12] Source: Documents provided by JICA and questionnaire

[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.

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.

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.

.

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 based on factors beyond BTCL's control.

---

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

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

[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,.

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 3 4Basis 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	Fixed-line phone
	Cell phone	-
	International phone call	International phone call
	Broadband	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 executing agency that no new target values had

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

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 65 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].

[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

Improvement of the regional information gap in the country 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 evaluation that

[26] Source: Questionnaire

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

[27] Source: Questionnaire, Interviews with BTCL 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 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

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

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.

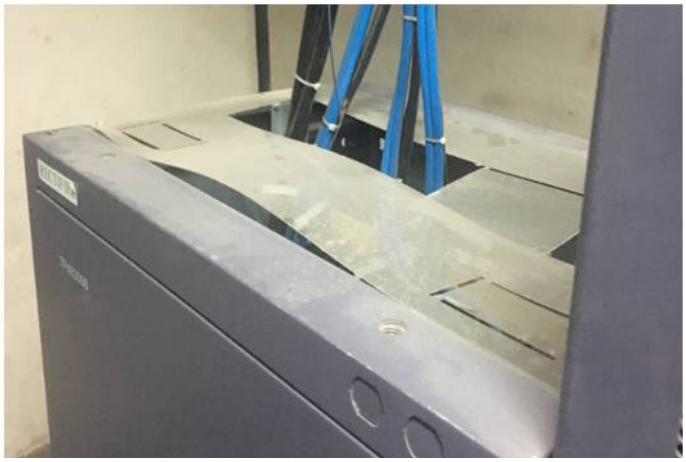
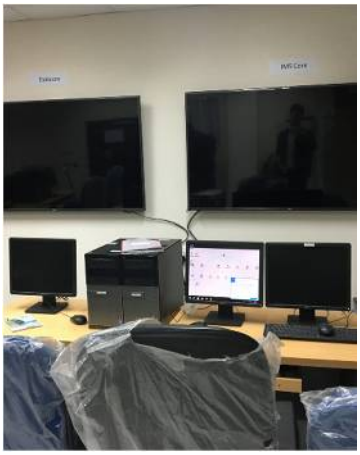
3.4.4 Status of Operation and Maintenance

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.

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.

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

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	