Kingdom of Cambodia

FY2018 Ex-Post Evaluation of Japanese ODA Loan Project

"Greater Mekong Telecommunication Backbone Network Project"

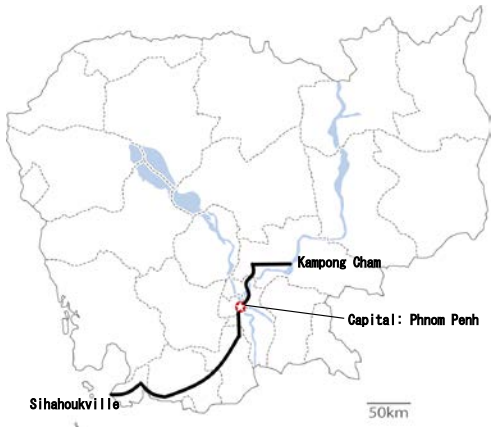
External Evaluator: Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project laid down optical cable and installed related facilities and equipment in the Growth Corridor in Cambodia, with the aims of improving telecommunication capacity and to responding to increasing telecommunication demand. This project, which develops infrastructure and expands service areas in telecommunications sector is consistent with Cambodia's development policy and development needs both at the time of project appraisal and the ex-post evaluation as well as with Japan's assistance policy at the time of project appraisal. However, the executing agency was deprived of its customer base by competitors triggered by significant delay in the project. In addition, the executing agency is also struggling to retain existing customers due to problems regarding its quality of services and inadequate customer response when problems occur. In this regard, there were problems in the appropriateness of the project plan and approach, such as inability to properly implement the inputs necessary to achieve the project purpose. Therefore, the relevance of the project is fair. In terms of project implementation, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair. Regarding the project effects, operation and effect indicators set at the time of project appraisal resulted in much lower achievement than the target figures for many items. In addition, from the interviews with beneficiaries, etc. it can be inferred that the project's contribution to the improvement of telecommunication capacity, responding to increasing telecommunication demand, and activation of economic activities, including industrial development etc. is limited. Therefore, effectiveness and impacts of the project are low. From the policy perspective of promoting reform of the telecommunications sector in Cambodia, it is considered that the project has contributed to a certain extent to securing competition and improving efficiency in the telecommunications sector. However, since various external factors are involved in policy and institutional reform, it is difficult to examine the indirect effects of the project. No negative impact on natural environment and resettlement has been reported. As for operation and maintenance, major problems have been observed in terms of the institutional/organizational, technical, and financial aspects, as well as current status. Therefore, sustainability of the project effects is low.

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

1. Project Description



Project Location (Optical cable laying route)

Office Building (Takeo Node)

1.1. Background

The central region of Cambodia, which extends from Kampong Cham, the distribution hub of farming products, to the capital Phnom Penh, and further to Sihanoukville Port, the country's only sea port, was the center of Cambodian economic activity and home to 45% of the total population.[1] The area from Kampong Cham to Phnom Penh and Sihanoukville was dubbed the "Growth Corridor," and back in 2005, the Sihanoukville port facilities were expanding (for which ODA loans were provided), and plans for an industrial park construction was underway. Population was growing in the region and with the economy registering about 15% annual growth between 1998 and 2000,[2] mainly on the strength of the manufacturing sector, demand for telecommunications in this region was expected to increase rapidly. In addition, communication among cities in the Growth Corridor relied on wireless networks installed by mobile-phone providers, and this made it difficult to exchange a large volume of information in a stable manner. Thus, the underdeveloped telecommunication network was emerging as a bottleneck for the region to invite and foster industries, including foreign companies. Therefore, development of a basic telecommunication network was urgently called for to meet the rapidly growing communication demands and business needs in the Growth Corridor.

1.2 Project Outline

The project aims to improve telecommunication capacity and to respond to increasing telecommunication demand in the "Growth Corridor," which encompasses Sihanoukville, Phnom Penh and Kampong Cham, by laying down optical cable and installing related facilities

[1] Information from the materials provided by JICA.
[2] Ibid.

and equipment in the region, thereby contributing to the economic development of the region through improvement of investment environment.

Loan Approved Amount/ Disbursed Amount	3,029 million yen / 2,973 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	March 2005 / March 2005	
Terms and Conditions	Interest Rate Repayment Period (Grace Period Conditions for Procurement	0.9% 30 years 10 years) General Untied
Borrower / Executing Agency	The Royal Government of Cambodia / Telecom Cambodia (TC)	
Project Completion	April, 2016	
Target Area	"The Growth Corridor," which encompasses Sihanoukville, Phnom Penh and Kampong Cham	
Main Contractors (Over 1 billion yen)	Alcatel Lucent Shanghai Bell Co., Ltd. (China) / Marubeni Corporation (Japan) (JV)	
Main Consultants (Over 100 million yen)	KDDI Foundation (Japan) / IS International Inc. (Japan) (JV)	
Related Studies (Feasibility Studies, etc.)	・Feasibility Study by the Ministry of Internal Affairs and Communications of Japan (February, 2001) ・JICA The Preparatory Study on the Project for the Development of the Telecommunications Network in the Central region (August, 2003) ・JICA SAPROF (September, 2004)	
Related Projects	[Technical Cooperation] ・ICT Engineer Development Project (Instructor Training Course) (October, 2007 – October, 2010) [Grant Aid Projects] ・The Project for the Development of the Telecommunications Network in Phnom Penh City I, II (February, 1996 – April, 1998) [Asian Development Bank] ・Regional Technical Assistance (RETA) 6004 (November, 2001 – October, 2003)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

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

Duration of the Study: August 2018 – September 2019

Duration of the Field Study: December 2 – December 18, 2018, April 21 – May 1, 2019

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

3.1 Relevance (Rating: ②[4])

3.1.1 Consistency with the Development Plan of Cambodia

At the time of project appraisal, Cambodian government's *the Socio-Economic Development Plan II (2001-2005)* emphasized the expansion of telecommunications service areas in Phnom Penh, Sihanoukville etc. as well as expansion of telecommunications services using optical cables to local cities. *The Rectangular Strategy Phase I* announced in July, 2004 also pointed out the importance of development of efficient telecommunication system of international standard. In addition, *the Long-Term Development Plan of Telecom Sector (2001-2005)* stipulated plans for backbone network projects etc. connecting all provincial capitals by optical cables or wireless by 2005. Furthermore, *the Postal Telecommunications Service Development Plan (2004-2008)* emphasized strengthening open policies through promotion of private sector participation in telecommunications sector. Therefore, it can be said that the project was consistent with the development policy of Cambodia.

At the time of ex-post evaluation, Cambodian government's *the Rectangular Strategy Phase III (2013-2018),* and *the National Strategic Development Plan (2014-2018)* that embodies *the Strategy* set out "Infrastructure Development: ICT Development" as one of priority issues, and put forward continuation of development of modern, cutting-edge, high-quality telecommunications sector and provision of competitive services in compliance with the international standards. In addition, *the Rectangular Strategy Phase IV (2019-2023)* announced in September, 2018 also points out the importance of ICT development. Furthermore, Cambodian government has set the direction of the telecommunications sector by 2020 in *the Cambodia ICT Master Plan 2020 (August, 2014)* and the government has also

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

[4] ③: High, ②: Fair, ①: Low

indicated in *the Telecommunications and ICT Development Policy 2020 (April, 2016)* promotion of infrastructure development and human resource development in telecommunications sector and strengthening business and investment environment in telecommunications and ICT sector by 2020. The implementation of the project is also consistent with the development policy of Cambodia at the time of ex-post evaluation.

3.1.2 Consistency with the Development Needs of Cambodia

At the time of appraisal, communication among cities in the Growth Corridor in Cambodia relied on wireless networks installed by mobile-phone providers, which made it difficult to exchange a large volume of information in a stable manner. Thus, the development of a basic telecommunication network was urgently called for to meet the rapidly growing communication demands and business needs in the area.

At the time of ex-post evaluation, the penetration rates of mobile phones and fixed phones in Cambodia are 118% (2018) and 0.84% (2017), respectively.[5] Mobile phones are rapidly spreading, and it is calculated that one or more mobile phones are used per person. However, the penetration rate of fixed phones is extremely low.[6] The internet penetration rate is 75% (as of June 2018),[7] and it is pointed out that there are disparities in convenience and services between urban and rural areas. In addition, there are still strong needs for ICT infrastructure development for strengthening and expanding large-capacity and stable information transmission infrastructure.

From the above, the project is in line with the development needs of Cambodia at the time of planning and ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

At the time of appraisal, Japanese government's *the Country Assistance Policy for Cambodia (February, 2004)* stipulated "IT support" as one of priority areas and indicated "comprehensive cooperation to be considered such as preparation of long-term development strategies and human resource development etc., focusing on the development of information and communication infrastructure." In addition, *the Overseas Economic Cooperation Operations (April, 2002)* placed priority on "providing support for IT development in developing countries" and indicated that research and planning to be advanced for strengthening organizational capacity of the executing agencies in addition to the support for

[5] Source: Information from the materials provided by the Ministry of Posts and Telecommunications (MPTC).
[6] Mobile phones can be used easily because there is no need for construction work such as pulling in telephone lines or fixed facilities like fixed phones. Given this background, in Cambodia, where the telecommunication infrastructure has not been fully developed, mobile phones have spread before fixed phones.
[7] Source: Information from the materials provided by the Ministry of Posts and Telecommunications (MPTC).

the development of telecommunication infrastructure. Furthermore, *the Country Assistance Strategy for Cambodia (November, 2011)* indicated "emphasis will be placed on supporting development of communication facilities that are essential for promoting private economic activities, including foreign companies," It also stipulated "implementation of measures to enhance policy and institutions to be carried out simultaneously with infrastructure development." Thus, the project is in line with the above policy.

3.1.4 Appropriateness of the Project Plan and Approach

As mentioned later in "3.3 Effectiveness and Impacts," operation and effect indicators set at the time of appraisal resulted in much lower achievement than the target figures for many items. In addition, the project's contribution to the improvement of telecommunication capacity, responding to increasing telecommunication demand, and activation of economic activities, including industrial development etc. is limited – thus, the project purpose has not been achieved. The reasons behind this can be regarded as follows: triggered by significant delay in the project, the executing agency, Telecom Cambodia (hereinafter referred to as "TC")[8] was deprived of its customer base by competitors who entered the market a little earlier; there are problems with the quality of services of TC (internet failure problems); and there are also insufficient customer responses by TC when problems occur. TC has prepared a marketing strategy for customer acquisition since 2016 during the project and has been working on the preparation and sales activities of packages related to price, service and promotion,[9] but soon after the service was launched in August 2017, TC has encountered problems described below. At the time of ex-post evaluation, TC has not been able to recover the (potential) customers who have been deprived of by competitors and has been struggling to retain existing customers as well.

There are several causes for the significant delay of this project. Among them, one of the main factors is the delay in the establishment of the Telecommunication Regulator of Cambodia (hereinafter referred to as "TRC"), which is one of the action plans on telecommunications sector reform agreed upon by JICA and the Cambodian side at the time of appraisal. (For details, refer to "Project Period" under "3.2 Efficiency" below.) In fact, at the time of appraisal, it was not stated in the JICA provided documents whether competitors were expected to enter the market, and during the field survey, the external evaluator asked

[8] TC is a Cambodian government 100% owned state-owned enterprise, established in December 2005, after the telecommunications business unit of the Ministry of Post and Telecommunications (MPTC) of Cambodia was separated and transferred.

[9] According to TC, it has developed advertising campaign for acquiring customers such as free lease/free installation of internet connection equipment (ONU, router etc.), at the start of the service. TC has also carried out PR and solicitation through leaflets, banners, Facebook, TV commercials and individual visits. In addition, as described in footnote 20 below, TC has also developed unique services that are not disclosed in its website.

the TC officials, the Secretary of State of the Ministry of Posts and Telecommunications (hereinafter referred to as "MPTC") and the Secretary of TRC, respectively, how they think about the situation at that time. As a result, consistent views were indicated from them that it seems that competitors were not expected to enter the market at the time of appraisal. (For details, refer to "3.3 Effectiveness and Impacts" below.) The main cause of service quality problems of TC can be regarded as the failure of communication network function due to disconnection of the optical fiber cable with a background of construction rush in the project area (the root cause is that there is no backup system at the time of failure) as well as the connection failure due to problems with internet connection equipment. (For details, refer to "Status of Operation and Maintenance" under "3.4 Sustainability" below.) Regarding TC's insufficient customer response when problems occur, problems such as insufficient number of maintenance staff in the field and inefficient operation of the state-owned enterprise TC (slow decision making, complicated and time-consuming administrative procedures) are pointed out. As a result, existing customers have raised voices that "the tariff is high for this service" and "TC should lower the tariff because problems have occurred." (For details, refer to "Qualitative Effects" under "3.3 Effectiveness and Impacts" and "Institutional/ Organizational Aspect of Operation and Maintenance" under "3.4 Sustainability" below.)

Therefore, inputs were not appropriately carried out so as to lead to the achievement of project purpose and it cannot be said that the project has generated its effects in this project.

This project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. However, TC was deprived of its customer base by competitors triggered by a significant delay in the project. In addition, TC is also struggling to retain existing customers due to problems regarding quality of services and inadequate customer response when problems occur. In this regard, there were problems in the appropriateness of the project plan and approach, such as inability to properly implement the inputs necessary to achieve the project purpose. Therefore, the relevance of the project is fair.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

This project laid down optical cable and installed related facilities and equipment in the Growth Corridor, with the aims of improving telecommunication capacity and to responding to increasing telecommunication demand. Table 1 compares the planned and actual major outputs.

Table 1: Comparison of Planned and Actual Outputs

Plan	Actual	Comparison (Major Difference)
Civil Works, Procurement of Equipment etc.		
・Laying down an optical cable (Kampong Cham - Phnom Penh - Sihanoukville, total length of about 400km. Partially overhead line)	・Laying down an optical cable (Kampong Cham - Phnom Penh - Sihanoukville, total length of about 434km. All buried underground)	・Modification of optical cable route (Partial overhead lines were all buried underground)
・Metro ring (32km)	・Metro ring (34km)	・Expansion of metro ring route
・Installation of communication facilities such as switchboards and access cables	・Installation of communication facilities such as switchboards and access cables	・Modification of Local Access Cable (from copper cable to optical cable)
・Construction of office buildings (8 sites) Note 1)	・Construction of office buildings (10 sites) Note 2)	・Changes of office buildings (cancelled 1 site and added 3 sites. All new buildings) Note 3)
・Installation of electric facilities (introduction of IP telephone system)	・Installation of electric facilities (introduction of latest IP Multimedia Subsystem, IP telephone system)	・Modification of Access Gateway (from VoIP, DSLAM (for ADSL) to GE-PON)
・Capacity of backbone transmission system (STM-16 (2.5Gbps))	・Capacity of backbone transmission system (STM-16 (10Gbps))	・Increased capacity of backbone transmission system (from 2.5Gbps to 10Gbps)
・Fiber optic cable (single mode compatible)	・Fiber optic cable (DWDM compatible cable)	・Change of fiber optic cable (from single mode compatible to DWDM compatible cable)
Consulting Services		
Plan		Actual
・Detailed design, construction supervision		・As planned
・Follow-up on the progress of telecommunications sector reform etc.		・As planned

Source: Results from questionnaire survey of TC

Note 1) 8 sites as follows: 1. Takhmau, 2. Takeo, 3. Tram Kak (Ang Tasoam), 4. Chhuk, 5. Kampot, 6. Prey Nob (Veal Renh), 7. Sihanoukville. 8. Prey Toteoung.

Note 2) 10 sites as follows: 1. Takhmau, 2. Takeo, 3. Tram Kak (Ang Tasoam), 4. Banteay Meas, 5. Kampong Trach, 6. Kep, 7. Kampot, 8. Prey Nob (Veal Renh), 9. Sihanoukville , 10. Prey Toteoung.

Note 3) Cancelled 1 site (Chhuk) and added 3 sites (Banteay Meas, Kampong Trach and Kep).

According to TC and the project consultants, due to significant project delay (see “Project Period” below), detailed design was reviewed twice, and the outputs of civil works, procurement of equipment etc. were modified. As regards modification of optical cable route, the distance was extended because all the optical cables (backbone system) were buried in

the ground in order to avoid wetlands during the rainy season. With respect to the expansion of the metro ring route and changes of office buildings, modification took place keeping in mind the distribution in communication demand and population (potential customers). All these modifications were changes to realize efficient laying of optical cable and are considered as appropriate changes. In addition, modification of local access cable, access gateway, increase of capacity of backbone transmission system and change of fiber optic cable (all are changes in specifications and capacity) were to fill the gap in technological progress as a result of project delay and to enhance project effects in consideration of future increase in demand, and thus review of technology and installed capacity was carried out. Given the technological progress in telecommunications and the emergence of new technologies, modifications are considered as appropriate.

According to TC and project consultants, contents of consulting services (detailed design, construction supervision, follow-up on the progress of telecommunications sector reform etc.) were carried out as planned.

Optical Cable (underground)

Optical Cable (underground)

Marking post (The optical cable is buried under this)

Communication Equipment in the Office (Kampong Cham Node)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 3,746 million yen (out of which 3,029 million yen was to be covered by Japanese ODA loan). In actuality, the total project cost was 3,610 million yen (out of which 2,973 million yen was covered by Japanese ODA loan), which is lower than planned (96% of the planned amount).

The reason why the total project cost was lower than planned was due to the effect of depreciation of local currency, Cambodia Riel against yen during the project period.[10]

3.2.2.2 Project Period

The overall project period was planned as 55 months, from March, 2005 (signing of Loan Agreement) to September, 2009 (final disbursement date) as opposed to 134 months in actuality, from March, 2005 (signing of Loan Agreement) to April, 2016 (final disbursement date), which is significantly longer than planned (244% of the initial plan). Loan period was extended due to project delay. It was extended in March, 2012 and the final disbursement was on April, 2016.

Table 2 summarizes the comparison of planned and actual project period.

[10] At the time of appraisal, it was estimated as 1 Riel = 0.027 JPY. However, the actual rate was a weak Riel trend as 1 Riel = 0.024 JPY (average rate by IMF between 2008 and 2016).

Table 2: Comparison of Planned and Actual Project Period

Item	Plan	Actual
Selection of consultants	Apr. 2005 – Sep. 2005 (6 months)	Dec. 2006 – Dec. 2007 (13 months)
Detailed design	Oct. 2005 – Mar. 2006 (6 months)	Dec. 2007 – Dec. 2008 (13 months)
Consulting services	Oct. 2005 – Sep. 2008 (36 months)	Dec. 2007 – Sep. 2018 (130 months)
Selection of contractors	Jul. 2006 – Apr. 2007 (10 months)	Nov. 2008 – Mar. 2014 (65 months) * Suspended: Jan. 2009 – Mar. 2012 (39 months)
Construction works	Apr. 2007 – Sep. 2008 (18 months)	Mar. 2014 – Jun. 2017 (40 months)
Warranty period	Oct. 2008 – Sep. 2009 (12 months)	Jul. 2017 – Jun. 2018 (12 months)
Final Disbursement date Note 1)	Sep. 2009	Apr. 2016

Source: Information provided by JICA, and results from questionnaire survey of TC

Note 1) Definition of project completion is the final disbursement date. However, consulting services and construction work/ warranty period continued even after the final disbursement date.

Main reasons for project delay were as follows: (1) delayed establishment (appointment of the Chairperson and staff members) of the TRC (fulfillment of the action plan on telecommunications sector reform agreed upon by JICA and the Cambodian side at the time of appraisal was delayed), (2) delay in selection of consultants, (3) delay in detailed design (delay due to review of detailed design (changes in introduced technology, equipment capacity etc.), (4) delay in selection of contractors, (5) delayed issuance of construction permits etc. (such as coordination with the Ministry of Public Works and Transport, provincial governments, city halls, the Ministry of the Environment, and other related ministries and agencies was delayed), (6) delayed selection of de-mining company, and (7) delayed construction work by the contractors/sub-contractors (delay due to problems with contractor/subcontractor performance[11] and their problems with teamwork with consultants). As a result, consulting service period has been significantly extended.

As mentioned above (“Appropriateness of the Project Plan and Approach” under “3.1 Relevance”), at the time of appraisal, JICA confirmed the progress of telecommunications sector reform with the Cambodian side such as organizational reform of MPTC, establishment of TRC etc. In order to facilitate implementation, the action plans listed in Table 3 have been agreed[12] and it was decided that confirmation of the progress of each

[11] In the process of construction supervision, TC and the project consultants proposed to rebuild contractors’ system and changed the sub-contractor. TC has collected delay damages delinquent charge (USD 1.1 million) from the contractors.

[12] In order to ensure consistency with the sector reform proposed by the Asian Development Bank, etc. and promoted

item at each stage of project implementation to be carried out. Of these, delay in 6. Establishment of the TRC became one of the factors behind the significant delay in this project. This was because coordination has been difficult within the Cambodian government and fulfillment of the plan has been significantly delayed. Specifically, the establishment of the TRC (appointment of the Chairperson and staff members) was set as a condition of JICA's concurrence to the tender documents for the selection of contractors. In the project implementation process, since strict application concerning its fulfillment was required, tender did not start until the conditions were met, and the project was suspended for 39 months (January, 2009-March, 2012). The establishment of the TRC requires an enactment of Cambodian Royal Decree, and this was a big hurdle, as it required the decision-making process in the legislative body in addition to the administrative body.

Table 3: State of Implementation/Achievement of Action Plans

Major Sector Reform Items	Initial Implementation Deadline	Status of Implementation and Achievement
1. Approval of the Sub Decree on establishment of TC by the Council of Ministers	August, 2005	Achieved (Date of achievement unknown)
2. Approval of the draft of the Telecommunication Law by the Council of Ministers	August, 2005	Achieved (Telecommunication Law enacted in December, 2005)
3. Establishment of the TC (appointment of the governing board for TC)	August, 2005	Achieved (December, 2005)
4. Transfer of responsibility from MPTC to the Ministry of Economy and Finance for management of Government's interests in operators	August, 2005	Achieved (Date of achievement unknown)
5. Establishment of the Universal Services Obligations policy and the Interim Fund of the Development Fund	December, 2005	Achieved (Establishment of the Universal Services Obligations Fund in July, 2017)

by the Cambodian government, and to further promote reform, JICA secured a monitoring system to be carried out by the consultants in this project and confirmed the progress of action plans with the Cambodian government.

6. Establishment of the TRC (appointment of the Chairperson and staff members)	December, 2005	Achieved (Appointment: March, 2012) (Establishment: September, 2012)
7. Review of existing licenses, establishment of fair and transparent licensing procedures and convert existing licenses to new standard ones.	December, 2005	Achieved (2009 -)

Source: Information provided by JICA, and results from questionnaire survey of MPTC and TC

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

Financial internal rate of return (FIRR) could not be calculated. The project has always been in red for the project life period and thus could not derive FIRR figures. Recalculation of the economic internal rate of return (EIRR) was not carried out since it was not calculated at the time of appraisal.

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[13] (Rating: ①)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects

Table 4 summarizes the operation and effect indicators set at the time of appraisal of the project and their actual figures on 2017 and 2018.[14] Since the final disbursement date, which is the definition of project completion, was in April, 2016, the target year is 2018 – 2 years after completion.

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

[14] The actual figures are figures for TC only. Although the targets indicated in the JICA provided documents assumes "target for the project area," no specific coverage is mentioned. In addition, it is not specified whether the targets are intended for the executing agency alone or the targets are intended assuming that not only the executing agency but also competitors to enter the market. In this regard, during the field survey, the external evaluator asked TC officials, the Secretary of State of the MPTC and the Secretary of TRC, respectively, how they think about the situation at that time. As a result, consistent views were indicated from them that it seems that competitors were not expected to enter the market at the time of appraisal. As such, the targets are regarded as targets of TC alone related to this project, and the comparative analysis with the actual figures of TC only was carried out.

Table 4: Operation and Effect Indicators

Indicators	Baseline	Target	Actual	
	2003	2011 2 Years After Completion	2017 1 Year After Completion	2018 2 Years After Completion
Operation Indicators				
Telephone Main Lines Operation Note 1)	51%	61%	0%	1.1%
Local Telephone Traffic Note 2)	101.4 (mil. Call * Minutes)	133.3 (mil. Call * Minutes)	0.5 (mil. Call * Minutes)	3.2 (mil. Call * Minutes)
International Telephone Traffic Note 2)	45.6 (mil. Call * Minutes)	59.9 (mil. Call * Minutes)	0.007 (mil. Call * Minutes)	0.03 (mil. Call * Minutes)
Call Completion Rate Note 3)	47%	60%	N.A.	65%
Fault Ratio Note 4)	9.4%	5.0%	N.A.	4.0%
Effect Indicators				
Telephone Density Note 5)	3.4%	10.6%	N.A.	1.1%
Number of Internet Users	7,799	24,000	28	399
Number of Internet Service Providers	4	8	1	1

Source: Information provided by JICA, and results from questionnaire survey of TC

Note 1) Telephone main lines operation: The ratio of the exchange capacity and the number of actual landline services started. (This indicates whether the switch is used without waste.)

Note 2) Telephone Traffic: Indicates how much fiber optic cables and interconnection equipment are used.

Note 3) Call completion rate: Outgoing landline calls, completion rates on landline calls, completion rates on international calls and other carrier interconnections.

Note 4) Fault Ratio: Incidence rate of failure for equipment installed by this project. Number of failures per 100 telephone users.

Note 5) Telephone Density: Fixed telephone penetration rate per 100 users.

The actual figures of operation and effect indicators resulted in much lower achievement than the target except for call completion rate and fault ratio (the achievement status of each indicator in 2018 is: telephone main lines operation: 1.8%, local telephone traffic: 2.4%, international telephone traffic: 0.05%, call completion rate:

108%, fault ratio: 80%, telephone density: 10.4%, number of internet users: 1.7%, and number of internet service providers: 12.5%). The background that the actual figures being significantly below the target can be regarded as follows as stated before ("Appropriateness of the Project Plan and Approach" under "3.1 Relevance"): triggered by significant delay in the project, TC was deprived of its customer base by competitors[15] who entered the market a little earlier. In addition, problems with the quality of services of TC (internet failure problems) and insufficient customer response by TC when problems occur are pointed out. As a result, TC has not been able to recover (potential) customers who have been deprived of by competitors, but also further withdrawal of a small number of original customers is happening. (As regards problems of TC, refer to "Qualitative Effects" in the next section as well as "Status of Operation and Maintenance" under "3.4 Sustainability".) While telephone traffic has been set as an operation indicator, traffic volume of data communication should have been originally added as the indicator based on the recent situation of the backbone network. In fact, the backbone network developed by this project is also used as a backbone network for mobile communications. However, because it was difficult to increase the indicators, the quantitative effects for effectiveness became a limited evaluation.

3.3.1.2 Qualitative Effects (Other Effects)

As qualitative effects of the project, it was expected that improving telecommunication capacity and responding to increasing telecommunication demand in the central region would be realized. In order to verify this assumption, interview survey was conducted to beneficiaries[16] in the vicinity of the project sites where site survey was conducted (residents who have signed internet contracts with TC) and to the Internet Service Provider (hereinafter referred to as "ISP"), a company[17] who has signed optical cable contracts with TC.

As a result, according to the interviews with the local residents, for the southern route (Phnom Penh-Sihanoukville), it has been pointed out that the speed of the internet is slower, communication signal is weaker, and cannot be connected as it goes to the south.

[15] According to the MPTC, this project was the first to be granted a license for optical cable laying in Cambodia, however, in 2007, a Chinese affiliated CFOCN (Cambodia Fiber Optic Cable Network) was granted a license for optical cable installation (infrastructure development), and in 2008 a Vietnamese affiliated Viettel was granted a service/operator license for an optical cable from the MPTC. While the project has been delayed, CFOCN and Viettel have each expanded their customer share by laying/operating optical cables on almost the same route as the optical cable laying route of this project.

[16] Breakdown of interviewees is as follows: 15 men (4 in 30s, 6 in 40s, 3 in 50s, 1 in 60s, and 1 in 70s) and 7 women (1 in 20s, 2 in 30s, 2 in 40s, and 2 in 50s , with a total of 22 people. Interviews were conducted with the residents around the office buildings in Kampong Cham, Kampot, Kep, Prey Nob, and Sihanoukville. Their occupations are: guest house owners, restaurant owners/staff, shop owners (bookstore/souvenir shop), paint shop, laundry shop, public agency staff (government agency, blood transfusion center), staff of water supply office and retired person.

[17] An internet service provider of Cambodian capital.

Especially in the southern end of Sihanoukville, construction boom by Chinese is continuing, and there are frequent cases that optical cables and local access cables have been cut off in the process of construction work, thus the network is disconnected. In addition, local residents pointed out that follow-up by TC when problems occur was not sufficient, and that TC did not come in a timely manner when necessary. According to Sihanoukville office of TC, the initial number of contracts was 40, but it has dropped to 14 at the time of ex-post evaluation. Local residents pointed out that the tariff is high for this service, and tariff should be lowered because there are problems. As regards the northern route (Kampong Cham-Phnom Penh), no particular problem was pointed out by the residents regarding internet connection. According to the interview with the ISP, information was obtained that although the state of internet disconnections and unstable connections has been improved, since the company cannot fully function as an ISP with TC services alone, the company has business alliance with another ISP as a backup. The services of that ISP seem to be much better than that of TC, and that ISP would respond promptly when problems occur. In addition, the ISP pointed out that since TC is a state-owned enterprise, decision making is slow and administrative procedures are complicated and time consuming (inefficient).

From the above, judging comprehensively based on the fact that many items under operation and effect indicators resulted in much lower achievement than the target and the results of interviews with the beneficiaries around the project sites and the ISP, the generated effects of the project is considered to be limited.

3.3.2 Impacts

3.3.2.1 Intended Impacts

In this project, vitalization of economic activities, including industrial development etc. though development of communication network infrastructures, and enhancement of living standards by improving telephone network were expected as impacts. Regarding this, interviews were conducted with the beneficiaries in the vicinity of the project site where the site survey was conducted and the ISP that has signed optical cable contracts with TC.[18]

As a result, local residents pointed out that online shops have increased. In addition, owners and staffs of restaurants and coffee shops indicated that free Wi-Fi has become integral part of their services and it would be fatal to their business if internet were not available. No voice was heard as regards relationship between the project and

[18] The interviewees are the same as the residents around each office and the ISP listed in footnotes 16 and 17.

enhancement of living standard. As regards interview with the ISP, after signing optical cable contracts with TC in 2017, there has been no particular change in the company's business (prior to 2017, the company had signed ADSL contracts with TC). On the other hand, the ISP indicated following points regarding the whole telecommunications sector: (1) TC has been contributing to securing competition and lowering tariff in the sector, and has worked as a brake against oligopoly by competitors,[19] and (2) from the viewpoint of national information security, there is a significance of the existence of TC, a 100% Cambodian state-owned enterprise. As for (1), the ISP has indicated that without the existence of TC, competitors would further expand their market to become oligopolies and tariff would be raised for land optical cable network. In that sense, TC has been contributing to securing competition and lowering tariffs, that is, TC plays an important role in securing the power balance of the telecommunications market and maintaining fair competition. (Refer to Table 5 for the land fiber optic cable network in Cambodia nationwide.) Regarding (2), competitors are foreign capital companies, and it was pointed out that the existence of TC, a state-owned company, is important from the viewpoint of information security.

Table 5: Land Fiber Optic Cable Network in Cambodia Nationwide

Project Implementer	Distance
Viettel (Vietnamese capital)	26,000km
CFOCN (Chinese capital)	19,000km Note 1)
TC (Cambodian state-owned enterprise)	1,600km Note 2)
Total	46,600km

Source: Prepared based on information provided by MPTC

Note 1) Of which Seatel, Chinese affiliated mobile telecommunication operator, has purchased infrastructure facilities such as land optical cable network (12,000 km) from CFOCN and has been developing its business. (See footnote 26 as well)

Note 2) Including this project.

[19] A remark taking into consideration about a Chinese affiliated CFOCN and a Vietnamese affiliated Viettel listed in footnote 15.

In fact, in Cambodia, data communication market has been liberalized, and private capital including foreign capital has newly entered as ISPs. At the time of ex-post evaluation, in Cambodia, the number of ISPs is 36, fixed-line carriers is 8, and mobile carriers is 6, and market competition is intensifying. (Table 6)

Table 6: State of Telecommunication Infrastructure in Cambodia

Item	Situation at the time of ex-post evaluation
Number of ISPs	36
Number of landline carriers	8
Number of mobile carriers	6

Source: Prepared based on information provided by MPTC

For example, for ISPs, tariff plans of TC, Metfone operated by Viettel (Vietnamese capital) and CooTel operated by XinWei (Chinese capital) are as shown in Tables 7 and 8, respectively.[20] While specific conditions such as maximum speed and installation costs differ, each company has various promotions and substantial discount battles are in progress.

Table 7: TC's Internet Tariff (as of February, 2019)

FTTH Maximum Speed	FTTH Monthly Fee	Data Usage/Equipment etc.	Others
Internet for Residence			
2Mbps	14USD	ONU[21]	Initial installation cost is free, ONU/WAP is lent free of charge. A deposit equivalent to the monthly fee is required.
2Mbps	18USD	WAP[22]	
3Mbps	21USD	ONU	
3Mbps	27USD	WAP	
4Mbps	28USD	ONU	
4Mbps	36USD	WAP	
Internet for Business 1			
11Mbps	66USD	ONU	Initial installation cost is free, ONU is lent free of charge. A deposit equivalent to the monthly fee is required.
12Mbps	72USD	ONU	
13Mbps	78USD	ONU	
14Mbps	84USD	ONU	
15Mbps	90USD	ONU	
Internet for Business 2			
16Mbps	80USD	ONU	Initial installation cost is free, ONU is lent free of charge. A deposit equivalent to the monthly fee is required.
17Mbps	85USD	ONU	
18Mbps	90USD	ONU	
19Mbps	95USD	ONU	
20Mbps	100USD	ONU	

Source: Prepared based on TC's website

[20] However, according to TC, tariff plans listed in each company's website can actually be negotiated individually, and each company has various services that have not been announced in their HP. For example, in the case of TC, in the internet for residence, when customers are using Facebook, Google and YouTube, the upper limit of data traffic can be doubled for free. The reason for not publishing these company-specific services in HP is because of the marketing strategies of each company.

[21] Optical Network Unit (hereinafter referred to as "ONU").

[22] Wireless Application Protocol (hereinafter referred to as "WAP").

Table 8: Internet Tariff of Metfone and CooTel (as of February, 2019)

Company (Brand)	FTTH Maximum Speed (in Phnom Penh)	FTTH Monthly Fee (in Phnom Penh)	Others
Viettel (Metfone)	8Mbps	30USD	Initial installation cost is 20USD.
	10Mbps	35USD	
	20Mbps	90USD	
	30Mbps	180USD	
	50Mbps	350USD	
XinWei (CooTel)	7Mbps	17USD	Initial installation cost is 50USD for 3months prepayment, free for 6 months and 1-year prepayment.
	9Mbps	21USD	
	12Mbps	33USD	
	15Mbps	40USD	

Source: Prepared based on home page of each company

From the above, based on the results of interviews with beneficiaries and ISP, it is conceivable that the effect of the project is limited with regards to vitalization of economic activities such as industrial development and improvement of telephone network access through telecommunication network infrastructure development. On the other hand, from the policy point of view of promoting reform of telecommunications sector in Cambodia, the establishment of the TRC has promoted liberalization of telecommunications business, and as mentioned above, substantial discounting battles are taking place due to intensifying competition, and benefits to consumers, including low-cost mobile phone communications tariff, have been realized. In other words, the project is considered to have contributed to securing competition and improving efficiency in telecommunications sector to a certain extent. However, although it is thought that the project has become a leverage of reform, it is difficult to verify the attribution of this project because various external factors are involved in policy and institution reform.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

This project does not fall under a large-scale sectors, characteristics and regions that are environmentally sensitive in th*e JBIC Guidelines for Confirmation of Environmental and Social Considerations* (promulgated in April 2002), and undesirable effects on environment were judged not to be serious. Although the project did not require preparation of the Environmental Impact Assessment (EIA) because its impacts on the natural environment are minor, the Initial Environmental Examination (IEE) has been

approved by the Ministry of Environment of Cambodia in February 2005.

According to TC, no negative impact on the natural environment during and after the project has been confirmed. In the detailed design, cable routes were set to avoid and minimize impacts on natural environment, and since most of the optical cables were installed at places facing public roads owned by the government, they did not pass environmentally sensitive areas such as mangrove forests. In addition, during construction work, construction methods with less effect on environment were adopted, and noise, vibration, etc. were also monitored. According to TC, it was confirmed that the results of monitoring have shown that the standard was not exceeded, and the effect was extremely minor. In the interviews with local residents, no negative impact on the environment was pointed out, except for one person who indicated that his car became dirty with dust and mud and that there were noise and vibration during the project.

Judging comprehensively from the results of interviews with local residents as well as from the results of site survey at the time of ex-post evaluation, no major problem with respect to natural environment has been identified.

(2) Resettlement and Land Acquisition

Resettlement did not take place in the implementation of this project. Land acquisition occurred at two sites, Takhmau (Kandal province, 397m^2) and Banteay Meas (Kampot province, 1,581m^2), for the construction of new office buildings.[23] TC purchased land that was vacant at a market price from each individual owner. According to TC, land acquisition process went smoothly, compensation was based on the Cambodian law, and there was no particular complaint from the land owners, including the purchase price. No particular factors that would cause problems were found from the site surveys at the time of ex-post evaluation.

From the above, it is considered that there was no particular problem with land acquisition.

(3) Other Impacts

One of the action plans (Table 3) that were to confirm the progress during project implementation was “5. Establishment of the Universal Services Obligations policy and the Interim Fund of the Development Fund.” The Universal Services Obligation Fund and Research and Development Fund were established in 2017, and the MPTC requires all Cambodian telecommunications carriers, including TC, to contribute to the funds.[24] The

[23] For the other 8 offices, TC received permission from the MPTC, and the post office’s empty spaces were transferred free of charge, and new offices were built.

[24] All telecommunication carriers are to contribute 2% and 1% of their annual gross revenue to the Universal

Universal Services Obligation Fund is used to develop telecommunication facilities in rural areas, and the MPTC is proceeding construction of 41 new base stations and the repair of 90 existing base stations. According to the MPTC, construction and repair work of base stations are underway at the time of ex-post evaluation, and the effects are gradually appearing as in some areas (flood areas in Kampong Cham province etc.) telecommunication coverage has increased from the initial 200 people to 2,000 people, and it became possible to use 4G (4th generation wireless) service from 2G (2nd generation wireless) services.

This project has achieved its objectives at a limited level. Therefore, effectiveness and impacts of the project are low.

3.4 Sustainability (Rating: ①)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

Operation and maintenance work of the project has been transferred from the MPTC to TC. TC, like other telecommunications carriers, operates as a carrier in the telecommunications sector under the same competitive environment. However, executive personnel, business plans, budget, etc. require the approval of the MPTC and the Ministry of Economy and Finance, and the government has a strong influence on important decision making. TC has been changing and innovating its institution for efficient operation and management since April 2018, and reforms are continuing at the time of ex-post evaluation. Its main purpose is to get out of inefficient operation management of state-owned enterprise, and renovation has been carried out, which goes even further into organizational culture and staff mindset. Specifically, in terms of personnel affairs, personnel changes through the introduction of early retirement system at senior level and the hiring of talented young people from outside have been taking place. In fact, in January 2019, almost all middle management staff[25] were replaced, and many of the new staff members were hired from outside. Also, in terms of business operations, TC signed a memorandum of agreement with Chinese affiliated mobile operator Seatel (Southeast Asia Telecommunications) on February 21, 2019 and has agreed on mutual use of optical cable backbone systems.[26]

Services Obligation Fund and Research and Development Fund, accordingly. The Cambodian government's telecommunications sector regional expansion policy does not impose public service obligation on the state-owned enterprise TC, but rather it imposes burden on all telecommunication carriers through the funds.

[25] Specifically, staff members with positions of Deputy Director General and Director General level. They transferred to advisors of TC.

[26] According to the MPTC and TC, Seatel has purchased infrastructure facilities such as land optical cable network of 12,000 km and access network from CFOCN and developing their business. By forming a business partnership with Seatel, TC will be able to use Seatel's infrastructure facilities in the event of failure or other problems in its own land optical cable network, thus it is expected to secure a backup system.

As mentioned above, TC is promoting organizational and institutional reform, and it is said that the operation and maintenance system of the project may be changed in the future. Looking at the organization at the time of ex-post evaluation, total number of staff in TC is 559, of which 32[27] work as maintenance staff for the project at the field office. The field staff members are mainly engaged in operation and maintenance work related to local access (including setting and restoration etc. when opening and connecting to the internet for customers). It was pointed out that most of the offices visited during the field survey are facing insufficient number of staff. In addition, it was also pointed out that number of maintenance staff in the field is insufficient in the interviews with the Commercial Department at the head office which supervises each office. The optical cable backbone system is managed remotely at the Phnom Penh head office (Angkor Center), and when problems occur, engineers are dispatched from the head office to the field. There are 18 technical staff at Angkor Center.

According to TC, the project's maintenance plan has not been prepared, and there is no prospect of formulating the plan because the organization is under modification. TC explained that as a provisional measure, maintenance and management plan[28] of TC's optical cable installation project implemented with a support from China has been utilized for this project. The TRC, whose establishment was set as one of the action plans of this project, was established in September 2012 as an independent regulatory body in the telecommunications sector in Cambodia, in a form of separation from the MPTC. The TRC is responsible for promoting efficient and fair competition in Cambodia's telecommunications market, granting various licenses to carriers, regulating interconnections, managing frequency bands, and resolving disputes among carriers etc. As mentioned above, TC, like other telecommunications carriers, operates as a carrier in the telecommunications sector under the same competitive environment and it is not treated specially by the TRC just because it is the only state-owned company in this sector.

Therefore, at the time of ex-post evaluation, TC is promoting major institutional changes and innovations. Some major problems have been observed regarding institutional/ organizational aspect of operation and maintenance of the project at the time of ex-post evaluation, considering the fact that there is a shortage of maintenance staff in the field and that maintenance plan has not been prepared etc.

3.4.2 Technical Aspects of Operation and Maintenance

There is no particular problem as to technical skills of the staff in charge of operation and

[27] The number of operation and maintenance staff in a total of 14 offices including 2 offices (Banteay Srey and Neak Poan) where equipment was updated in metro ring.
[28] Greater Mekong Sub-Region Information Superhighway Project (GMS-IS)

maintenance in the field regarding the skills related to local access (including setting and restoration etc. when opening and connecting to the internet for customers). However, their knowledge and understanding of optical cable backbone system is not sufficient. It was also pointed out that technical level of maintenance staff regarding backbone system is not sufficient in the interviews with the Commercial Department at the head office which supervises each office (as mentioned above, when problems occur with backbone systems, engineers are dispatched from the head office to the field).

According to the interviews with the maintenance staff, the following points were pointed out: training on operation and maintenance carried out by the contractors and consultants of the project was useful regarding local access, but the contents of backbone system were difficult and did not meet the ability level of trainees; training was basically in English and training materials were also in English thus trainees did not understand enough since many of them do not understand English.

According to the maintenance staff of each office, maintenance manual for the project (English version) and drawings were provided by the manufacturer of the project, however, those who use the manual and those who do not exist and there were even cases that staff could not locate where the manual is. As such, their utilization situation varied, and it cannot be said that they are effectively utilized as a whole.

Therefore, some problems have been observed regarding the technical aspects of operation and maintenance at the time of ex-post evaluation.

3.4.3 Financial Aspects of Operation and Maintenance

The necessary operation and maintenance costs of the project are estimated by TC (head office), and after consultation with the Board of Directors it needs to be approved by the MPTC and the Ministry of Economy and Finance.

Table 9 shows comparison of budget, actual allocation and actual expenditure of operation and maintenance cost of the project.

Table 9: Operation and Maintenance Cost of the Project

(Unit: USD)

	2017	2018
Planned Budget (Requested Amount)	146,940	132,246
Actual Allocation	153,597	178,082
Actual Expenditure	153,597	178,082

Source: Results from questionnaire survey of TC

According to TC, the reason why actual allocations are more than the requested amounts is because additional budgets were approved after budget request. Specifically, underground burial costs of local access cable associated with the urban planning in Phnom Penh Capital City[29] was not included at the time of budget request, but since the specific burial site was identified after the request, additional budget was approved.[30]

Local Access Cable (overhead line)

Operation and maintenance costs of the project have been covered in excess of the requested amount, and no problem can be identified from the financial aspect at the time of ex-post evaluation.

Table 10 shows the revenue from the telecommunications business of this project. The figures increased drastically in 2018 because internet services and line leases to ISP have been in full operation since 2018. The number of internet users is shown in Table 4. From a simple comparison with the actual operation and maintenance expenditures in Table 9 above, it can be seen that the operation and maintenance expenditures for this project are not covered by the revenue from the telecommunications business of this project.

Table 10: Revenue from the Telecommunications Business of this Project

(Unit: USD)

	2017 (from August)	2018
Fee income from internet users	417	57,873
Fiber usage revenue from ISP (DPLC lease fee)	750	14,379
Fee income from fixed-line large scale users	1,614	9,266
Fee income from fixed-line individual users	21,648	65,616
Total	24,429	147,134

Source: Results from questionnaire survey of TC

Financial data of the entire TC is shown in Table 11.

[29] The English translation has been changed from Municipality of Phnom Penh to Phnom Penh Capital City based on Cambodian decree and it has become usual notation, thus, “Phnom Penh Capital City” is used.

[30] Based on the notice about city planning issued by Phnom Penh Capital City in 2016, instructions were given to bury overhead lines along major roads from the perspective of urban landscape and safety. Thus, TC is proceeding with the burial work with its own funds.

Table 11: Financial Data of TC

(Unit: USD)

	2015	2016	2017	2018
Operating Revenue	17,069,899	17,317,702	14,021,393	10,512,988
Non-Operating Revenue	2,484,868	1,300,348	1,643,789	850,094
Total Operating Income	19,554,768	18,618,051	15,665,182	11,363,082
Operating Expense	13,382,031	12,551,297	11,979,433	11,558,089
Depreciation	4,698,564	4,222,804	3,873,919	3,689,508
Other Expense	2,025,323	604,296	2,326,304	367,645
Total Operating Expense	20,105,918	17,378,397	18,179,656	15,615,241
Income before Tax	-551,150	1,239,654	-2,514,474	-4,252,159
Profit Tax (Prepayment on Profit Tax)	173,597	182,962	179,981	17,454
Net Income	-724,747	1,056,692	-2,694,455	-4,269,613

Source: Results from questionnaire survey of executing agency

Note 1) Partial inconsistency of figures exists due to rounding error

Note 2) Operating revenue includes revenue from local call, transit, interconnection and VoIP.

Note 3) Non-operating revenue includes interest, gain from exchange rate (JPY, RBM), etc.

Note 4) Operating expense includes cost of goods, salary, electricity, administration cost and others.

Note 5) Other expense includes loss from exchange rate (JPY, RMB), interest, tax penalty etc.

Note 6) Non-operating revenue in 2017 includes delay damages delinquent charge paid from contractors of the project.

According to the financial data of TC, except for 2016, net income has been in the red and operating revenue has not increased. (As a matter of fact, TC was aiming at new listing on the Cambodian stock exchange in the past, but it has been postponed due to its unclear and severe financial conditions.)

Therefore, although operation and maintenance costs of the project are covered at the time of ex-post evaluation, given the fact that it is not covered by the revenue from the telecommunications business of the project and that the financial situation of the entire TC is severe, it is judged that there are serious problems.

3.4.4 Status of Operation and Maintenance

As a result of interviews with the maintenance staff of each office, beneficiaries and the ISP during the field survey, it was found that problems have occurred in both optical cable backbone system and local access of the project. Consultation with relevant officers at TC

head office was conducted based on the actual situation in the field, and following reasons came up as the causes of failure: (1) telecommunication network function failure due to disconnection of optical cable and (2) connection failure due to problems with internet connection equipment. These issues are directly linked to the problems of TC's service quality.

As for (1), as mentioned above ("Qualitative Effects" under "3.3 Effectiveness and Impacts"), problems of disconnection of the optical fiber cable are taking place due to construction rush. In Sihanoukville, in particular, due to rapid investment inflows from China, construction boom is continuing, and optical cables and local access cables are cut off in the process of construction work, and thus there are frequent cases where the network is disconnected. The issue of system design is pointed out as the fundamental problem (backup system has not been incorporated). The optical cable system of the project (the northern route: Kampong Cham-Phnom Penh and the southern route: Phnom Penh-Sihanoukville) is one-way, single route and not in a ring. Thus, if optical cable is disconnected at a certain location, network is disconnected from that place.[31] To address this issue, as described above ("Institutional/Organizational Aspect of Operation and Maintenance"), TC signed a memorandum of agreement with Chinese affiliated mobile operator Seatel on mutual use of optical cable backbone systems to secure backup system (however, according to TC, it is currently making specific adjustments with Seatel, and backup has not been realized, and the outlook was unclear at the time of ex-post evaluation).

As for (2), problems have occurred with routers procured in this project. Failures have been reported from several offices, and according to TC head office, there seem to be some problems with the performance of routers. At present, spare parts are stocked at each office, and they are taking measures by replacing routers as needed.

ONU (center) and Router (right)

Maintenance mainly consists of daily maintenance activities, such as checking and replacing consumables, adjusting

[31] Competitors CFOCN and Viettel, on the other hand, have installed alternate backbone cables and have a backup system in place. According to TC and the project consultants, although possibility of developing a backup route (National Road No.4 route (about 250km) via Sihanoukville) was considered during the project, it was not realistic to undertake the work due to budget constraints etc. However, in Phnom Penh, the design of metro ring route was modified in the process of project implementation and the route was expanded, and thus the backup system has been strengthened within the budget.

equipment, regular monitoring, checking for optical cable loss, changing engine oil of diesel engine generator, refueling machinery, cleaning equipment and so on. As mentioned above, the utilization situation of the maintenance manual prepared by the contractors varied, and systematic measures have not been taking place.

Spare parts are stored in the warehouse of TC head office, and procurement (bidding procedure) and inventory management are undertaken at the head office. Most of the spare parts can be procured domestically and are available in a couple of months including bidding process.

TC is considering new marketing and sales strategies for retaining existing customers and acquiring new customers. Specifically, they are as follows: clarification of target customer segments, new hiring of sales personnel (staff) in rural areas, door-to-door sales to each home by sales staff, development of various promotions[32] and so on. However, prospects of budgetary measures are not clear, and thus outlook for realizing them were unclear at the time of ex-post evaluation.

Therefore, some problems have been observed regarding the status of operation and maintenance at the time of ex-post evaluation.

Major problems have been observed in terms of the institutional/organizational, technical, and financial aspects, as well as current status. Therefore, sustainability of the project effects is low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project laid down optical cable and installed related facilities and equipment in the Growth Corridor in Cambodia, with the aims of improving telecommunication capacity and to responding to increasing telecommunication demand. This project, which develops infrastructure and expands service areas in telecommunications sector, is consistent with Cambodia's development policy and development needs both at the time of project appraisal and the ex-post evaluation as well as with Japan's assistance policy at the time of project appraisal. However, the executing agency was deprived of its customer base by competitors triggered by significant delay in the project. In addition, the executing agency is also struggling to retain existing customers due to problems regarding its quality of services and inadequate customer response when problems occur. In this regard, there were problems in the appropriateness of the project plan and approach, such as inability to properly implement the

[32] As mentioned above (footnote 20), TC has various services that have not been disclosed to website, and TC intends to strengthen its customer base by making substantial discounts by developing and providing specific services to customers.

inputs necessary to achieve the project purpose. Therefore, the relevance of the project is fair. In terms of project implementation, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair. Regarding the project effects, operation and effect indicators set at the time of project appraisal resulted in much lower achievement than the target figures for many items. In addition, from the interviews with beneficiaries, etc. it can be inferred that the project's contribution to the improvement of telecommunication capacity, responding to increasing telecommunication demand, and activation of economic activities, including industrial development etc. is limited. Therefore, effectiveness and impacts of the project are low. From the policy perspective of promoting reform of the telecommunications sector in Cambodia, it is considered that the project has contributed to a certain extent to securing competition and improving efficiency in the telecommunications sector. However, since various external factors are involved in policy and institutional reform, it is difficult to examine the indirect effects of the project. No negative impact on natural environment and resettlement has been reported. As for operation and maintenance, major problems have been observed in terms of the institutional/organizational, technical, and financial aspects, as well as current status. Therefore, sustainability of the project effects is low.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Importance of early formulation and implementation of new business operation and maintenance management strategies after organizational and institutional reform of TC

At the time of ex-post evaluation, TC has been promoting major institutional changes and innovations, however, a new marketing and sales strategy under the new system is under consideration and there is no concrete prospect for the future. It is important for TC to establish and implement strategies early, including budgetary measures, in order to retain existing customers and to attract new customers.

4.2.2 Recommendations to JICA

It is important that JICA to follow-up TC's organizational and institutional reform situation and to encourage TC to formulate and implement new marketing and sales strategy as well as operation and maintenance strategy early.

4.3 Lessons Learned

Importance of fully examine the appropriateness of the selection of conditions and to give flexibility to their enforcement when setting conditions for improving the recipient country's policy and institutions in the infrastructure development, and implementing the project while following its progress

This project was prepared and implemented in the context of growing momentum on the side of Japan to actively participate in Cambodia's policy and institutional reform when providing assistance. Thus, it can be regarded as a leading-edge project which incorporates elements of policy and institutional reform into infrastructure development project at that time. However, "the establishment of the TRC," one of the action plans, was a big hurdle, as it required the decision-making process in the legislative body in addition to the administrative body. In addition, strict application concerning its fulfillment was required in the project implementation process. As a result, the project has been delayed significantly and the project effects have also been negatively affected. Therefore, when setting conditions (reform items) for improving policy and institutions in the infrastructure development, and preparing and implementing the project in the future, based on the premise that conditions to be selected are truly important and necessary for the recipient country's reform, it is important to focus on conditions which can be dealt with/decided within the control of relevant administrative organizations related to the project in the recipient country. In addition, because policy and institutional reform involves various stakeholders and the situation becomes extremely fluid, it is also important for JICA to take measures such as relaxing the conditions according to the actual situation while continuing policy dialogue with the recipient country in the project implementation process. In other words, rather than strictly enforcing the conditions set at the time of project formulation, it is important to operate flexibly so as to lead to the steady achievement of project purpose, after sufficiently grasping and taking account of the changing circumstances.

In case of significant delay of a project, it is necessary to review the status of the project in light of changes in the surrounding environment and to substantially revise project scope in order to achieve project effects

One of the fundamental problems of communication network failure in this project is the problem of system design (backup system has not been incorporated). While the project has been significantly delayed, Cambodia's economy has developed with a sharp inflow of investment from China and construction boom is taking place. Physical disconnection of optic cables has taken place by such constructions, creating negative effects on project effectiveness. In this project, although possibility of developing a backup route (National Road No.4 route (about 250km) via Sihanoukville) was considered during the project, it was not realistic to

undertake the work due to budget constraints etc. It seems that it was difficult to specifically foresee such situation in Cambodia after 15 years at the time when SAPROF was carried out in 2004. From this, when a project is significantly delayed, it is necessary to review the status of the project in light of changes in the surrounding environment during project implementation, and to substantially revise the project scope taking into consideration of the appropriate timing so that project effectiveness will be generated.

Importance of developing a system in place to carry out local trainings by contractors and consultants in local language

In this project, training on operation and maintenance was conducted locally by contractors and consultants. According to those who received training, training was basically conducted in English and although the TC staff made interpretation, many people could not understand well since they could not understand English. In addition, the maintenance manual prepared by the contractors was only in English, and its utilization situation by the operation and maintenance staff of each office varied, without systematic measures. In this regard, if JICA is going to include local training programs targeting the staff of the executing agencies and operation and maintenance agencies or manual preparation in the terms and conditions of contractors or consultants, it is important that JICA specifies the usage of local language (as much as possible), and specifies to set up a system that can be implemented in local language, and to ensure its steady enforcement.

End

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil Works, Procurement of Equipment etc. ・Laying down an optical cable (Kampong Cham - Phnom Penh - Sihanoukville, total length of about 400km. Partially overhead line) ・Metro ring (32km) ・Installation of communication facilities such as switchboards and access cables ・Construction of office buildings (8 sites) ・Installation of electric facilities (introduction of IP telephone system) ・Capacity of backbone transmission system (STM-16 (2.5Gbps)) ・Fiber optic cable (single mode compatible) 2) Consulting Services ・Detailed design, construction supervision ・Follow-up on the progress of telecom sector reform etc.	1) Civil Works, Procurement of Equipment etc. ・Laying down an optical cable (Kampong Cham - Phnom Penh - Sihanoukville, total length of about 434km. All buried underground) ・Metro ring (34km) ・Installation of communication facilities such as switchboards and access cables ・Construction of office buildings (10 sites) ・Installation of electric facilities (introduction of latest IP Multimedia Subsystem, IP telephone system) ・Capacity of backbone transmission system (STM-16 (10Gbps)) ・Fiber optic cable (DWDM compatible cable) 2) Consulting Services ・As planned. ・As planned.
2. Project Period	March, 2005 – September, 2009 (55 months)	March, 2005 – April, 2016 (134 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	2,717 million yen 1,029 million yen (38,107 million Riel) 3,746 million yen 3,029 million yen 1Riel=0.027yen (As of October, 2004)	2,973 million yen 637 million yen (26,556 million Riel) 3,610 million yen 2,973 million yen 1Riel= 0.024yen (Average between 2008 and 2016)
4. Final Disbursement	April, 2016	

End