

Installation of Digital Telephone Exchanges Project

Loan Contract Number: BGD-004-2000

Loan Approval Date: January 9th, 2003

Country: Bangladesh

The Export-Import Bank of Korea
(Government Agency for the EDCF)

By the Independent Evaluation Group of the
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EXECUTIVE SUMMARY

Inadequate telecommunications infrastructure and telecommunications backlogs have long hindered socio-economic development of Bangladesh. The government of Bangladesh accordingly set the policy direction to expand and modernize its telecommunications infrastructure since 1998. The telephone penetration rate in the country at the time of project request to the EDCF was 0.39% (as of 1997), the lowest in South Asia, and 40% of the telephone exchanges in the country were analog.

Three major cities of Chittagong, Khulna and Sylhet in Bangladesh were selected for the project, which installed digital telephone exchanges and other auxiliary equipment. The amount of the EDCF project loan was USD 30 million (equivalent to KRW 35 billion) and the BTCL (Bangladesh Telecommunications Company Limited) was responsible for the management of the project.

The project completed its intended outputs to expand and upgrade the wire communication network and relieved the telecommunications overload. Furthermore, it has contributed to laying the foundation for industrial and economic activities in the country through a modernized telecommunications infrastructure and to promotion of socio-economic development of the country.

Evaluation Results and Findings

The project is deemed to be a success according to five evaluation criteria of relevance, efficiency, effectiveness, impact and sustainability.

It was found to be ‘highly relevant’ to Bangladesh’s national development strategies, ICT sector development strategy and EDCF’s assistance strategy. Despite delays, the project was generally well-implemented as initially planned in terms of cost and project management and thus it is assigned a rating of “relatively efficient”. The project effectively produced outputs as planned, and the level of satisfaction with the provided equipment was also high.

The project’s impact in economic, socio-cultural, and technological terms was rated as substantial while the impact of technology transfer was limited due to the lack of training.

The project was rated “likely” on sustainability, measured in terms of financial and human resources, and organizational capacity; ownership; and current needs and priorities of Bangladesh.

Lessons Learned and Recommendations

The project made significant contributions to meeting the high level of demand for wired telecommunications service and modernizing telecommunications networks in the country, which is assessed having sufficiently achieved the objective of the project. It was particularly important that the project expanded telecommunications facilities as a basic social infrastructure and improved the environment for business, public services as well as education. As a result, the project contributed to building a foundation for economic and industrial activities, bridging the intra-regional digital divide and improving standards of living.

To improve the effectiveness of the project, however, more rigorous appraisal and feasibility studies are needed. It was found that the projection of demand and the planning of project scope were not meticulous enough, which resulted in the change of project design in the middle of project implementation. Also, providing policy consulting for the ICT sector by linking with KSP could also be considered. If policy consulting is offered and strengthens the capacity of local governments and institutions in the project appraisal stage, it could help maximize the effectiveness and impact of the project.

With respect to sustainability, the lack of training limited the effect of technology transfer despite the stand-alone training program provided by KT. This issue, coupled with the inadequate level of human resources at PMU, is the main hurdle to sustainability of the project. In addition, the high ratio of procurement of Korean equipment makes the post-completion maintenance challenging as manufacturers of the Korean equipment do not have a local presence in Bangladesh. The ratio of local procurement needs to be increased to minimize the burden of the partner country for maintenance.

It may be useful to learn from practices of other donors to provide a program-based comprehensive package which includes not only the provision of hardware but also

technology transfer and technical assistance for operation & management, along with marketing to enhance effectiveness and sustainability.

Also linking EDCF's infrastructure-building projects with "ICT for Development" which many donors and UN agencies are involved in would help increase synergy and maximize its impact. EDCF could consider partnering with other agencies such as KOICA or UNDP to carry out its infrastructure projects in conjunction with such projects as ICT training for civil servants, software development for government organizations, e-learning system operation, or vocational training.

Given that Bangladesh developed its own Development Results Framework by sector within the LCG (Local Consultative Group) and has conducted monitoring of projects in the LCG working group, EDCF may also make use of the LCG network to draw up appropriate performance indicators to be used as the basis of project monitoring. This can be accomplished by developing EDCF's own monitoring system and performance indicators, but also by dispatching experts and technicians to conduct monitoring of the project during the implementation cycle. Furthermore, the ratio of local procurement to expand untied aid is also recommended.

I. Introduction

1. Basic Data

Loan Information

Loan Agreement No.	Loan Type	Approved amount	Approval Date
BGD-004-2000	Development Project Loan	USD 30 million KRW 35,259 million	2003.1.9

Project Cost

(Unit: Thousand dollars)

Component	Planned	Actual	Difference
Total Cost	USD 43,500	USD 47,340	USD
EDCF Loan	USD 30,000 (KRW 35,259 million)	USD 29,848 (KRW 35,082 million)	USD (KRW million)

Note: Exchange rate: 1,174.88 KRW/USD (as of 2004.9.2 on procurement contract)

Key Dates

Major Activities	Planned	Actual
Loan request	-	1999.6.14
Feasibility study (F/S)	1999.11	1999.11.2-11
Loan Agreement (L/A) (A)	2003.1	2003.1.9
L/A Effective Date	2003.3	2003.3.6
Consultant Contract	-	2003.9.18
Procurement Contract	-	2004.9.2
Completion (B)	2005.9	2007.12.26
Final disbursement	2007.3	2007.12.28
Project Duration (A-B)	30 months	57 months

□ Borrower: Ministry of Finance of Bangladesh

□ Executing Agency: BTTB (Bangladesh Telegraph and Telephone Board)

* The name of the organization was changed to BTCL (Bangladesh Telecommunications Company Limited) in 2008.

□ **Mission Data**

Type of Mission	Time of Trip	Remarks
Appraisal	2002.4.7-14	Submitted appraisal report to MOF (2002.7)
Midterm evaluation	2004.5.18-25	
Completion evaluation	2010.7	

2. Map of the Project Site



3. Evaluation in Brief and Process

Major Activities	Date	Remarks
Preliminary Literature Review	2012.5-6	Related literature research & analysis
Post Evaluation Execution Notice	2012.5	PMU and MOF
Distribution of Evaluation Compilation Document	2012.6	Project site assessment, interviews w/ related agencies
1 st Site Visit	2012.6.26-7.5	Consultative meetings and interviews with stakeholders
Expert Consultative Meetings	2012.5.22 2012.6.8 2012.6.19	Expert meetings with NGOs, ICT specialists and KT personnel
Evaluation workshop and 2 nd site visit	2012.9.15-19	Joint workshop with MOF
Final Evaluation Report Completion	2012.10	

*Preliminary literature reviews included, Feasibility Study (F/S), Project Completion Report (PCR), Loan Agreement (L/A) and etc.

4. Expected Results

The goal of the project is to expand and modernize the communication infrastructure in Bangladesh by installing digital telephone exchanges and other relevant equipment. The country had the lowest level of telephone penetration rate in the region, causing serious communication backlogs and the project intends to contribute to setting a foundation for economic activities of the country with enhanced communication infrastructure.

The project covered three cities of Chittagong, Sylhet, and Khulna and provided digital telephone exchanges, optical fiber cable installation, technology transfer as well as trainings for the operation and maintenance of the project.

II. Project Design and Implementation

1. Project Formulation

The goal of the project is to provide enhanced telecommunication infrastructure by installing digital telephone exchanges and equipment, and thus contribute to the economic and social development in the country.

The project area covered three main cities of Chittagong, Sylhet, and Khulna.

The project scope is as below:

- To install tandem exchange and local exchange of 130,004 lines
- To install optical transmission equipment, optical fiber cables and outside plants
- To procure or install other auxiliary system and equipment for the project

Table 1. Project Organization

Agency Types	Name of Agencies	Task Descriptions
Borrower	Ministry of Finance of Bangladesh	Project loan acquiring agency
Project Management Unit	BTTB: Bangladesh Telegraph and Telephone Board	Project implementing vendor selection, purchase order contract, construction management and inspection
Contractor	KT	Civil engineering, construction material provision, technical training, technology transfer
Consultant	Korea Telecom International: KTI	Design, supervision, documentation for bidding and reporting

2. Rationale

Inadequate telecommunications infrastructure and telecommunications backlogs in Bangladesh remain a substantial impediment to socio-economic development of Bangladesh.

The government of Bangladesh accordingly has set the policy direction to expand and modernize its telecommunication infrastructure since 1998.

This project was proposed by the government of Bangladesh in June 1999 to meet the growing demands for telecommunications infrastructure and to accomplish its long-term policy goal in the ICT sector.

3. Cost, Financing and Executing Process

The appraised total cost of the project was USD 43.5 million. EDCF pledged to finance USD 30 million out of the total budget and the remaining USD 13.5 million was borne by the Bangladeshi government. The project was completed within the said budget.

Table 2. Initial Project Financing according to Project Appraisal

(unit: thousand USD)

	Foreign Currency	Local Currency	Sub Total
EDCF	30,000	-	30,000 (69%)
Bangladesh Gov't	-	13,500	13,500 (31%)
Total	30,000	13,500	43,500 (100%)

Source: Korea EXIM Bank Appraisal Report

EDCF funds were used for procurement of construction materials, construction, technology transfer, and staff training. The funds from the Bangladeshi government were used for purchasing land and building, taxes, and procurement of local telecommunications equipment.

4. Consultants

KTI (Korea Telecom International) was selected as a consultant in September 13, 2003 through the Limited Competitive Bidding process according to the EDCF consultant procurement guidelines. The consultants team was comprised of experts in exchange, transmission, optical-fiber cable network and electrical equipment; and was responsible for field studies, demand forecast, documentation for bidding, procurement contracts as well as negotiation support.

5. Procurement, Construction

The tendering process was open to Korean companies through the Limited Competitive Bidding (LIB) according to the procurement guidelines of the EDCF. The successful bidder was Korea Telecom (KT) and the contract was signed in September 2004 for USD 28 million.

The eligible sourcing countries of goods and services were limited to Korea and Bangladesh. More than 95 percent of the project supplies including exchange, transfer system and cables were procured in Korea and coaxial cables and other locally available products were sourced in Bangladesh.

6. Output

A total of 106,304 lines of digital exchange, optical fiber cables (90km) and transmission equipment were installed in 18 locations in three cities of Chittagong, Khulna, and Sylhet.

Table 3. Output of the project

(unit: lines)

Region	Items	Planned	Actual
Chittagong	Tandem switch	6,500	23,700
	Local/toll switch and subscriber line installation	57,000	88,304
Sylhet	Local switch and subscriber line installation	10,000	10,000
Khulna	Local switch and subscriber line installation	7,000	8,000
Total		80,500	130,004

7. Loan Agreement

This part of the report is an evaluation of the recipient's commitment to the loan conditions. The conditions include: purchasing and consultant contracts, fulfillment of the execution (implementation) plans, loan repayment fulfillment, timely submission of project appraisals and project completion reports and etc.

The loan contract was made between the Ministry of Finance of Bangladesh (borrower) and Korea Eximbank on January 9, 2003 and became effective as of March 6, 2003. The annual

interest rate is 1.0% with a 30-year repayment period (10-year grace period included) according to the EDCF operation guidelines. The Concessionality Level (C.L.) is 79.64% which meets the OECD minimum standard of C.L. for tied aid to LDCs (50%).

III. Assessment for Each Evaluation Criterion

1. Overall Assessment

The project was assessed as successful according to the five evaluation criteria of relevance, efficiency, effectiveness, impact and sustainability. It was 'highly relevant' to Bangladesh's ICT sector development strategy and EDCF's assistance strategy. Although delays in project completion caused a drop in the efficiency level to 'relatively efficient,' the project was generally implemented as planned, earning a rating of "generally effective". Its impact in terms of economic, socio-cultural, technological and environmental aspect was rated substantial and the sustainability is assessed as 'less likely.'

2. Relevance

The project was consistent with the priorities set out in Bangladesh's national development, ICT strategies, MDGs as well as the EDCF's priority countries. The programs prove the high relevance of the project to the needs of the borrower and the operational direction of the EDCF.

The government of Bangladesh enacted the National Telecommunication Policy in 1998, recognizing the importance of ICT sector as a driver of economic development. This policy set a specific target for increasing the telephone penetration rate and digitizing telephone exchanges and transmission equipment. The National Information and Communication Technology Policy released in 2002 represented a plan to upgrade analog exchange to digital ones to raise the quality of the telecommunications service. In this regard, this project was highly relevant to the needs of Bangladesh.

This project was also aligned with the EDCF's country assistance strategy (2008-2012) which suggested transportation and ICT as key areas of development in Bangladesh. Both

EDCF mid-term operation strategy and Country Cooperation Strategy and Program for Bangladesh 2008-2011 included ICT sector as a key assistance area.

BTCL as a project management unit under the Ministry of Posts and Telecommunications has an exclusive position as the specialized entity in the operation of the backbone network, telegraphs and international telecommunication. It has participated in various projects related to expansion and improvement of internet service and public data network building. Considering the expertise and experiences in the ICT sector, the selection of BTCL as PMU was appropriate.

The project areas were appropriately selected based on telecommunications demands and congestion in Chittagong, Khulna and Sylhet. Chittagong, the second largest and industrial city, was experiencing a high level of communication backlog. Sylhet and Khulna, as less benefited regions were experiencing the deficiency of telephone lines.

3. Efficiency

The project was rated fairly efficient based on implementation duration, costs, scope and management system of the project.

The project period was extended by 12 months due to delays during the preparation of loan agreements and procurement contracts. Despite the reduction of construction time by 7 months, the total project period was prolonged to 57 months, as opposed to the initial planned period of 30 months.

Part of the delay was ascribed to the additional installation of 5,000 lines in Chittagong region and to the delays related to consultant and procurement contract caused by the complicated local procedures in Bangladesh.

Table 4. Implementation Duration

Loan request - Government approval	Government approval-L/A effective	Project Duration (L/A effective-completion)	
		Planned	Actual
3 years 7 months	1 years 6 months	2 years 6 months	4 years 9 months

Source: Project Completion Report and Appraisal Report

In terms of project cost, the planned loan amount was USD 30 million and the project was completed within the budget. The cost-effectiveness of equipment provided was also high, as the quality of products justified the higher costs compared to other equivalent options.

The scope of the project was to build 106,304 lines of digital phone exchange and auxiliary equipment in 21 locations in Chittagong, Khulna and Sylhet. During the implementation phase, the number of installation spots was reduced as KEPZ (Korea Export Processing Zone) in Chittagong and CEPZ (Chittagong Export Processing Zone) were excluded due to their 'inadequacies' with respect to their installment. On the other hand, the number of lines installed was increased without significant increase of the project cost.

The PMU of this project is the BTCL, responsible for project implementation and post-completion operation and maintenance. BTCL managed the overall process of project implementation including selection of consultants/contractors, monitoring construction, management of financial resources, contracts, and communications with government counterparts. Ministry of Communication supervised the PMU by approving project documents and budget plans.

4. Effectiveness

Effectiveness was assessed as 'generally effective' when vis-à-vis the initial plan for the achievement of the project, outcome and the level of satisfaction with the provided equipment from the partner country.

The main aim of the project to expand and modernize Bangladesh's wire telecommunication network by providing digital exchange and auxiliary equipment was achieved in an efficient manner. In terms of direct output, digital exchange, transmission equipment, and optical fiber cables were installed in 18 locations across Chittagong, Khulna, and Sylhet. The share of digital exchange provided by KT is on average 35 percent in three project areas and the project is believed to have contributed to the expansion of wire telecommunication networks in the country.

In terms of rate of utilization of the exchange, the average rate is about 60 percent which is lower than the average of 80 percent for BTCL lines. While the current performance is not as high as expected, considering the constantly increasing penetration rate of wire

telephones in Bangladesh, the project is expected to take on an even greater role in meeting the larger demand for telecommunications infrastructure.

The level of satisfaction with the quality of equipment sourced and provided by Korean manufacturers was generally high except in the case of batteries. There also remains the problem of maintenance due to the absence of local distributors of the necessary parts of the said equipment in Bangladesh.

5. Impact

The level of impact of the project in terms of economic, socio-cultural, technology transfer and follow-up project prospect was rated relatively high.

The project contributed to laying a foundation, for strengthening business environment and economic activities through the upgraded telecommunication infrastructure by providing the optical backbone transmission network and digital exchange in the project area. The project contributed to increased telephone penetration rate, enhanced business environment and improved public and education service in the region. The connectivity in the country was expanded by enabling internet connection such as ADSL and VDSL through the subscriber cable network and overseas communication through the optical transmission network linked to satellite stations.

In addition, the project contributed toward setting up the infrastructure needed to achieve 'Digital Bangladesh' policy that has been under implementation since 2010. This policy initiated by Prime Minister Sheikh Hasina in 2009 aims to put the country in the middle-income category by 2021.

As for socio-cultural aspects, this project is assessed to be able to make the living standards of the project area population better for those who suffered from insufficient wire telephone lines. In addition, the project enabled better access to information and exchange of information by expanding wire telecommunication, which contributed to a reduced digital gap.

The project has limited impact on technology transfer in the ICT sector; the training programs were provided for the managers and engineers of the PMU with KT's resources. A

total of seven training courses were conducted both in Chittagong and Korea in the area of exchange, transmission, and IP equipment. However, there exist several factors that limited the impact such as unbalanced selection of trainees, frequent staff transfers after the training, and lack of retraining in the organization. Considering the current challenges that the PMU faces in terms of operation and maintenance, further consideration of sufficient technology transfer and education is necessary.

This project had no significant impact in inducing follow-up projects, partly due to the rapidly growing wireless market. Despite the increasing focus on the wireless market, the state of wire communication network shows much room for improvement and the government of Bangladesh has been implementing various wire network projects with loans from the Chinese government. The project has no significant impact on the environment.

6. Sustainability

Sustainability was measured against financial and human resources; and organizational capacity, ownership, and current needs and priorities of Bangladesh. The project is rated to be more or less sustainable.

BTCL is deemed to have sufficient financial resources to sustain the project as the only public enterprise that has been profitable in Bangladesh. However, the only concern is that BTCL's profit margin has been diminishing, and there is a need to diversify its sources of revenue and make greater efforts at marketing and sales to expand the subscriber base.

The lack of human resources for the operation and maintenance of network service may curtail the organizational capacity to undertake maintenance, especially after the phase-out of KT's post-completion support for the project. There are a total of 205 engineers, supervisors and technicians responsible for telephone networks at BTCL offices in Chittagong, Khulna and Sylhet. Despite an additional two years of maintenance service provided by KT engineers during 2006-2007 after the completion of the project, the PMU is still struggling due to the lack of in-house experts and parts for maintenance. BTCL runs only a corrective maintenance system rather than a preventive system, which jeopardizes the smooth operation of the system. The manpower shortage is partly due to the restructuring of BTCL from a public entity to a private enterprise in 2008; various human resources issues such as status, compensation of employees are not resolved yet. Upon recognizing the

seriousness of operation and maintenance issues, the PMU is considering signing a maintenance service contract. KT submitted a maintenance service proposal worth USD 1 million in May of 2012.

The project is implemented on a turn-key basis and will later be handed over to Bangladesh. Given the limited involvement of the Bangladeshi government in the planning and implementation stages, this type of project is deemed to have reduced the ownership of Bangladesh. Discrepancies were found in terms of sense of ownership between a project director at BTCL headquarters and other engineers at regional offices. While staff at the BTCL headquarters had a stronger sense of ownership, staff at regional offices showed a poor sense of ownership regarding the project.

In terms of current needs and priorities of Bangladesh, the ICT sector is still considered to be a main driver of economic growth at present. However, as the locus of the telecommunications market shifts to mobile services, the potential for future growth of wired telephone services appear to be limited, and it is not likely to be a top priority of the Bangladeshi government in the foreseeable future.

IV. Lessons Learned and Recommendations

The project is deemed to have achieved its objectives successfully: it has met the high demand for wired telephone services and modernized the telecommunications infrastructure of Bangladesh significantly. Given the low telephone penetration rate in provincial areas of Bangladesh, three major cities other than the capital; namely Chittagong, Khulna, and Sylhet; were selected for the project. The project is thought to have had positive socio-economic impact overall: the installed digital telephone exchanges helped improve the business environment, public services, and educational infrastructure, provide the base for industrial and economic activities, and increased connectivity and bridged the information gap in the selected areas. To further improve the effectiveness and impact of future projects, the following lessons and recommendations may be considered.

1. Lessons Learned

Improving ownership of the recipient country and harmonization with other donors

Considering that the need for training among technicians and engineers in Bangladesh for the maintenance of the project, future EDCF projects could take a program-based approach that can combine various ways such as post-completion training programs to ensure long-term sustainability. At the same time, EDCF can take an active role in LCG, particularly in the ICT sector where Korea has comparative advantage, to facilitate cooperation, knowledge sharing and division of labor with other key players in the country.

Promoting measures to improve sustainability

Sustainability of the project was found to be the biggest challenge in this evaluation. There was no allocation of funding for education by EDCF, but the contractor (KT) provided the education instead. It is critical to secure a sufficient budget for training as a part of technology transfer which is crucial for long-term sustainability of the project and capacity building of partner country stakeholders who are responsible for the operation and maintenance.

In addition, the untied nature of loans made equipment maintenance difficult as most of the equipment provided by Korean companies does not have local distributors in Bangladesh. It may be desirable to consider whether parts and maintenance service can be locally obtained for future projects.

The organizational issue in the PMU was another hurdle for sustainability. As BTCL, once part of the government organization, was transformed into a public enterprise in 2008, there arose a human resource issue related to the status change of its employees, recruitment of new staff, and lack of in-house training.

Enhancing the analysis of domestic market of the recipient country at project appraisal and feasibility study stages

The evaluation team assessed that the inadequate appraisal and feasibility study of the project hindered the estimation of reliability and effectiveness. The project did not proceed in accordance with what was forecasted and planned at the feasibility stage, and there were some changes in demand and market environment, which requires more vigorous project preparation and design.

For example, the appraisal report emphasized the importance of a KEPZ (Korea Export Processing Zone) and allocated 80 percent of telephone lines in the Chittagong region by virtue of its status as a major project location with its high telecommunication

demand as a leading industrial city in Bangladesh. However, the actual project implementation excludes the KEPZ due to the lack of preparation in the project area, as the KEPZ was not properly operating at the time. Furthermore, the forecast of demand for landline communication did not accurately reflect the market environment which was progressing rapidly toward wireless communication.

2. Recommendations

Linking with ICT for development EDCF's assistance in the ICT sector has been focused on building the infrastructure. However, it is worth noting that whereas EDCF, Japan, China, and the World Bank carry out ICT projects to promote ICT as an industry, ICT projects of most of the donors have focused on "ICT for Development," using ICT as a tool for poverty eradication and economic development. While it is highly relevant that EDCF focuses on ICT infrastructure-building since it is an area where Korea is strong and there are high demands on the part of partner countries, it can have further synergy and maximize its impact if it could be combined with ICT for development initiatives.

In this regard, EDCF could link infrastructure projects with projects such as ICT training for civil servants, software development for government organizations, e-learning system operation, or vocational training. EDCF may also take the opportunity for joint project with other donors such as UNDP, which is actively involved in ICT for development programs. KOICA can also be an ideal partner for bringing in training program components into the EDCF infrastructure project.

Strengthening capacity-building and technical assistance For this project, capacity building is necessary as a long-term investment and assistance for the PMU, due to the PMU's insufficient experience and knowledge in maintenance and equipment operation. For future projects, capacity building through further technical cooperation and technology transfer is recommended for the independent operation of the facilities and the necessary budget should be in place. Besides technical know-how, setup and management of O&M system as well as marketing/sales capacity within the organization would be also useful.

Instituting Systematic Monitoring System It is important to set up performance assessment indicators based on appraisal and feasibility study for similar ICT projects in the future. Bangladesh government prepared Development Results Framework with other

donors and the working groups within LCG conducted monitoring based on the standard. EDCF should also refer to this existing framework of RBM and develop its own targets for projects consistent with the Bangladesh's targets.

Monitoring based on established performance indicators is a useful tool to identify and respond to risks and difficulties that may arise during the implementation of project. To further facilitate monitoring, having an EDCF representative in Bangladesh would be an advantage.

Improving Local Market Analysis and Supporting ICT Policy Formulation by Linking with KSP(Knowledge Sharing Program) As stated in the lessons learned, in order to address such issues as the exclusion of KEPZ (Korea Export Processing Zone), the unexpected mobile boom, lower-than-expected demand for wired telephone services, more thorough analysis of economic feasibility and the local market environment would be in order. Moreover, providing policy consulting for the ICT sector by establishing a connection with KSP could also be considered. If policy consulting is offered to strengthen the capacity of local government and institutions in the project appraisal stage, it could help maximize the effectiveness and impact of the project.

Expanding local procurement of equipment The ratio of local procurement needs to be increased to minimize the burden of the partner country on maintenance after the project is completed. Local procurement will help minimize the issues related to equipment and maintenance, and reduce secondary complications.