



Technical Assistance Report

Project Number: 40054
November 2006

Preparing the South Asia Subregional Economic Cooperation Information Highway Project (Financed by the Government of the Republic of Korea)

Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
CeC	–	community e-center
FIRR	–	financial internal rate of return
IA	–	implementing agency
ICT	–	information and communications technology
ISP	–	Internet service provider
NGO	–	nongovernment organization
SASEC	–	South Asia Subregional Economic Cooperation
Sea-Me-We	–	South-East Asia-Middle East-Western Europe
TA	–	technical assistance

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Transport and communications
Subsector	–	Telecommunications and communications
Themes	–	Sustainable economic growth, inclusive social development, regional cooperation, capacity development

NOTE

In this report, "\$" refers to US dollars.

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I. INTRODUCTION

1. The Asian Development Bank (ADB) has been supporting regional cooperation among Bangladesh, Bhutan, India, and Nepal through the South Asia Subregional Economic Cooperation (SASEC) Program since 2001.¹ In 2003, an information and communications technology (ICT) working group was formed as one of the six priority sector working groups. At the first ICT working group meeting in March 2004, the SASEC countries agreed to conduct a study for the SASEC ICT development master plan to prepare the basic framework for working group activities and identify priority cooperation projects. Subsequently, in February 2005, ADB approved a technical assistance (TA) grant² to support the undertaking. During the second SASEC ICT working group meeting in Bhutan in January 2006, the member countries accepted the SASEC ICT development master plan together with the identified priority ICT projects. The working group agreed that the SASEC Information Highway Project identified by the master plan should be prepared as a first priority project for immediate implementation.

2. During the third ICT working group meeting in Dhaka on 20 September 2006, member countries and ADB reached an understanding on the objectives, scope, cost estimates, financing plan, and implementation arrangements for the TA. This TA was prepared on the basis of the outcomes reached at the meeting, and its review of data, studies, and reports.³ ADB Management approved the TA concept paper on 11 August 2006. The design and monitoring framework is in Appendix 1.

II. ISSUES

3. Despite the proximity of all four member countries, the quality, capacity, and costs of telecommunications vary. Major quality issues are evident in the voice networks calling across SASEC borders from within India to Bangladesh, Bhutan, and Nepal. Congestion is common from fixed and mobile operator networks. Successful connections are often affected by severe echo or low volume. These problems are symptomatic of the data links. Microwave links from Nepal and Bangladesh need to be upgraded as does the Bangladesh-India microwave-fiber link. Communications within the region often go via third party countries, while most data traffic within the region goes via North America. Regional cross-border peering⁴ does not exist. Bhutan and Nepal are geographically landlocked with the Himalayan terrain and the borders of the People's Republic of China along their northern aspects, with Indian borders surrounding the rest of the respective countries' territory. Both aspire to competitive access with redundancy to international networks, particularly to submarine cables. Nepal has been addressing the option of a link through the People's Republic of China to Hong Kong, China. To date, this landlocked situation has dictated the primary use of satellite communications for access and delivery of international voice traffic and more recently Internet data traffic.

¹ The program has been supported through TA 5936 (ADB. 2000. *Technical Assistance for Identification and Prioritization of Subregional Projects in South Asia*. Manila), TA 6010 (ADB. 2003. *Technical Assistance for the South Asia Subregional Economic Cooperation II*. Manila), and TA 6297 (ADB. 2005. *Technical Assistance for the South Asia Subregional Economic Cooperation III*. Manila).

² ADB. 2005. *Technical Assistance for the South Asia Subregion Economic Cooperation Information and Communication Technology Development Master Plan*. Manila (\$450,000).

³ The TA first appeared in *ADB Business Opportunities* on 6 October 2006.

⁴ Peering is the arrangement of traffic exchange between Internet service providers (ISPs). Larger ISPs with their own backbone networks agree to allow traffic from other large ISPs in exchange for traffic on their backbones. They also exchange traffic with smaller ISPs so that they can reach regional end points.

4. Bangladesh and India have access to international fiber optic via submarine cable landings including the link to Sea-Me-We 4.⁵ India has landings from several submarine cables. Unlike Bhutan and Nepal, this provides Bangladesh and India with high-capacity international bandwidth as well as alternative gateways and redundancy. Despite significant latent and actual demand, no land-based operational fiber link is available between Bangladesh and India. The first such link is in fact the higher cost Sea-Me-We 4 submarine cable, while a relatively low-cost landline option, possibly offering the most attractive cost and capacity outcome has not been activated. The cross-border infrastructure among SASEC countries needs to be strengthened to provide low-cost, cross-border connectivity and easier access to international bandwidth for the two landlocked countries.

5. The provision of a cross-border convergent⁶ infrastructure with peering and a competitive access regime provides much of the essential foundation for SASEC ICT development. The SASEC ICT Development Master Plan accordingly proposes to establish the SASEC regional exchange as its first priority cooperative activity. The SASEC regional exchange with its central exchange hub and country exchange gateways would function to reduce user costs across borders, increase quality of service and redundancy, and provide peering as well as pool data traffic to increase cache opportunities.

6. While ICT is seen as one of the keys to bringing commerce and social services to rural areas, village ICT connectivity is widely regarded as the most difficult poverty reduction strategy. The problems include sustainability, power, awareness, and language. Until recently the sustainability challenge has proved that this connectivity has had mixed success at best. To overcome the obstacles, the SASEC ICT Development Master Plan proposes to strengthen ICT rural interest by mobilizing the concept of social capital within rural communities. The concept of social capital recognizes that local networking and local information sourcing from within rural communities are powerful drivers for ICT utilization in the rural context. The villages themselves will be the principal sources of information, news, opinion, and discussion within the network. The SASEC regional exchange will facilitate the sharing of social capital on a regional basis. Since the potential impact of expanding ICT accessibility to remote rural areas is to bring ICT-based services and information to the poorest 500 million people in the region, determining if the village network concept is workable in the context of regional cooperation among SASEC countries is important, and if so, what is a feasible model for involving the private sector for rolling out such facilities on a large scale.

7. An important emphasis of the SASEC ICT Development Master Plan is human resource development. The proposed SASEC regional exchange is designed to facilitate human resource development and other common national development policies required for industry development and employment. The challenges for human resource development are at three levels. The most basic is the need to raise ICT awareness and community e-literacy. This requirement is most commonly identified with disadvantaged sectors such as the rural poor. The second is ICT vocational (nonformal) training aimed at the nonprofessional members of the workforce. Numerous colleges and businesses in every country offer basic training such as web publishing and local area network management. Finally, a professional stream for ICT education and training is required for ICT industries, tertiary education, research, and development. The availability of adequate bandwidth and data peering within the region will create new

⁵ The South-East Asia–Middle East–Western Europe (Sea-We-Me) 4 is a submarine telecommunications cable linking South East Asia to Europe via the Indian subcontinent and Middle East.

⁶ The term convergence is commonly used in reference to the synergistic combination of voice (and telephony features), data (and productivity applications), and video onto a single network. These previously separate technologies are now able to share resources and interact with each other creating new efficiencies.

opportunities for virtual programs based in regional universities, and targeting regional and global markets for higher education. The proposed SASEC regional exchange would be appropriate for this purpose, foster the use of local content, and strengthen and demonstrate the value of SASEC collaboration in teaching and research.

8. The SASEC ICT development master plan proposes establishment of a regional research and training center that will look after regional human resource development initiatives covering all three levels of challenges. The research and training center will take charge of various human resource development initiatives such as university networking, vocational training, school education, village development, and ICT industry development, all through the SASEC regional exchange.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

9. The objective of the TA is to help SASEC countries prepare an investment project that will (i) establish robust data interchange capacity for the four SASEC members with reduced cost and an increase in reliability and competition, replacing some microwave facilities and providing efficient access, with redundancy, to submarine cables for Bhutan and Nepal; and reduce the dependency on satellite, enhance local peering, and reduce latency; (ii) expand ICT-accessibility in remote rural areas in the region by establishing village networks for SASEC regional village communities; and (iii) establish a regional ICT training and research center to provide a focal point for teaching, research, professional development, and industry and government advice.

10. The TA outputs will include (i) an investment plan for the SASEC regional exchange including in-country gateways and cross-border access links together with applicable peering arrangements and organizational model for operating the regional exchange; (ii) an investment plan for expanding ICT accessibility in remote rural areas in the region, a feasibility assessment of scaling up of village networks based on the social capital concept, and a feasible model for involving private sector investors to build small access network facilities through a subsidy mechanism; (iii) an investment plan for establishing a regional research and training center including its mandate and organizational setup, and a business model to operate it in a financially self-sustainable manner; and (iv) a feasibility assessment of the integrated investment project package.

B. Methodology and Key Activities

11. The TA will survey and scope potential environments for the location and operation of a SASEC central exchange in Siliguri,⁷ India, and in-country gateways in each country; and identify suitable competitive options for operation including a scope of works to bring it up to a suitable standard. Locations will be selected that offer the best fit for access by Internet service providers, telecommunications service providers, other carriers, and major users including universities. Location will also allow for efficient connection to the regional hub facilities. The

⁷ Siliguri is the second largest city in the state of West Bengal connecting India to its north-eastern states and equidistant from the Bangladesh, Bhutan, and Nepal borders. This area reflects the diversity of people in this subregion. Given these strategic advantages, the SASEC countries agreed to establish the regional exchange facilities in Siliguri at the second ICT working group meeting. Nonetheless, the TA will examine other possible locations to strengthen the rationale for Siliguri.

existing shared facilities offered by alternative telecommunications networks such as power transmission networks will be assessed and explored as one of potential locations. Commercial availability options including long-term leasing will be considered. A site survey for microwave line as primary or redundancy links to each SASEC country will be conducted. The TA will also survey the existing access links between the SASEC countries and identify the optimal backhaul enhancements for linking the regional exchange and other infrastructure with the in-country gateways. Various options for fiber optic backhaul, including optical fiber ground wire that runs overhead on power transmission lines, will be examined. The existing cross-border fiber will be investigated. Indian backhaul capacity and access through the regional exchange from major cities, universities, and submarine landing stations will be identified. With the advent of Sea-Me-We 4 connection in Bangladesh, the TA will identify backhaul capabilities through Bangladesh to carry Sea-Me-We 4 capacity through the regional exchange.

12. The TA will develop legal instruments concerning ownership and operator structure of the regional exchange hub facilities to ensure commercially competitive, nondiscriminatory, and transparently cost-based or retail-minus charges for access for Internet service providers, telecommunications service providers, and other carriers. Country regulators will be included in the development of legal instruments to govern operation and encourage oversight of price competition. The applicable peering arrangements including a draft peering agreement will be developed.

13. The TA will examine the feasibility of adopting the village network concept to expand ICT accessibility into remote rural areas, particularly relying on various innovative technologies including wireless technology as a means to provide a last mile connection. Wireless pilots have been tried in Bhutan, and India is exploring options for village access to their connecting state-wide area networks. Wireless is now considered to have progressed to a point that allows for a more aggressive rollout. On the basis of the examination, the TA will design the basic features of the telecenter model covering (i) equipment for computing, power link, Internet, and other facilities to be installed; (ii) a package of e-services and e-applications to be carried out at telecenters; and (iii) a management and operation structure using the social enterprise model including a subsidy mechanism.

14. The TA will formulate an investment project suitable for ADB financing and carry out the preparatory studies required to examine the feasibility of each project component and to comply with ADB's safeguard and other policies and requirements for possible loan financing. These include economic and financial analysis, poverty and social impact assessment, performance measurement, monitoring and evaluation system development, and environmental impact assessment.

C. Cost and Financing

15. The estimated total cost of the TA is \$500,000 equivalent, which will be financed on a grant basis by the Government of the Republic of Korea. Detailed cost estimates and the financing plan are in Appendix 3. The governments of the SASEC countries were advised that approval of the TA does not commit ADB to finance any ensuing project. ADB will not finance any undertaking or activity in the territory of any member country unless and until it has received from the government of such member country a letter of no-objection or concurrence with respect to such activity or undertaking.

D. Implementation Arrangements

16. ADB will be the Executing Agency for the TA. The concerned ministry in each TA country will be an implementing agency (IA) and coordinate day-to-day implementation of the TA. Each IA will appoint a project manager who will act as a focal point for TA implementation. The TA will be guided by a steering committee to be formed before the start of the work. The steering committee will comprise the standing member of the SASEC ICT working group in each country, representatives from the government agency of each country that is responsible for building telecommunications infrastructure, representatives from the United Nations Economic and Social Commission for Asia and the Pacific, the Asia-Pacific Telecommunity, and the ADB project officer. The steering committee meeting will be cochaired by the standing member of the SASEC ICT working group of the host country and ADB project officer. The steering committee will review consultants' reports, reconcile different views among countries and ADB, provide feedback to the consultants, and guide implementation. The consultants will attend the steering committee meetings with broad responsibility for liaison and coordination of committee members. The steering committee will meet at least twice: at inception and when the consultants submit the draft master plan.

17. The TA will require international consulting services of 12 person-months and national consulting services of 43 person-months engaged from an international firm in association with national firms in each SASEC country using the biodata technical proposal procedures based on the quality- and cost-based selection method in accordance with ADB's *Guidelines on the Use of Consultants*. The international consultants will be (i) an ICT sector policy specialist (5 person-months), (ii) an ICT network specialist (5 person-months), and (iii) a rural telecommunications specialist (2 person-months). The national consultants will be (i) four ICT technical specialists (5 person-months in India and 4 person-months in other countries), (ii) four rural telecommunications specialists (2 person-months in each country), (iii) a project economist (3 person-months in India), (iv) a financial specialist (3 person-months in India), (v) four social development specialists (2 person-months in each country), and (vi) four environmental specialists (1 person-month in each country).

18. The international consultants will be based in India and make periodic trips to each of the other countries as work demands. The IA for India will provide counterpart staff, secretarial service, furnished office space suitable for two international consultants and two national consultants, office supplies, local communications including Internet access, and information and data on the ICT sector as required by the consultants. In the other countries, the IAs will provide temporary office accommodation. Each IA will assign a team of counterpart staff to work with the consultants in the day-to-day conduct of the study when working in that country. The TA will begin on 1 February 2007 and be completed on 30 June 2007. The consultants will submit the inception report by 28 February 2007, the interim report by 30 April 2007, and the draft final report by 15 June 2007. The consultant will submit the final report within 1 month after each country and ADB send their comments on the draft final report.

IV. THE PRESIDENT'S DECISION

19. The President, acting under the authority delegated by the Board, has approved ADB administering technical assistance not exceeding the equivalent of \$500,000 to be financed on a grant basis by the Government of the Republic of Korea for preparing the South Asia Subregional Economic Cooperation Information Highway Project, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
<p>Impact Economic growth and poverty reduction through improved ICT connectivity between all four SASEC members</p>	<p>Reduction in the cost of data transmission between SASEC countries by 10% per annum for 5 years after project completion</p> <p>Improvement of the speed for data transmission between SASEC countries by 30% at project completion</p> <p>Exchange of social capital between SASEC country villages through the regional exchange within 3 years after project completion</p> <p>Establishment of the SASEC education and research collaborative network linking universities and vocational training institutes in SASEC countries within 3 years after project completion</p>	<p>Compilation of government statistics</p> <p>ADB's TA review missions</p>	<p>Assumptions Peering arrangements will be agreed to by SASEC countries</p> <p>Regional exchange and in-country gateways will be operated to ensure commercially competitive, nondiscriminatory, and transparently cost-based or retail-minus charges for access for Internet service providers and other carriers</p>
<p>Outcome Agreed design for the loan project</p>	<p>Identification of project components, including their estimated costs, and preliminary assessment of safeguard compliance issues within 3 months after the TA starts</p> <p>Finalization of all project features, including the scope, cost estimates, financing plan, implementation arrangements, implementation schedule, detailed analysis of safeguard compliance issues, and economic/financial viability, within 4.5 months after the TA starts</p>	<p>Consultant's interim and draft final report</p> <p>ADB TA review missions</p>	<p>Assumptions Cost sharing of the project cost among SASEC countries will be agreed upon</p> <p>The terms of ADB financing will be accepted by SASEC countries</p>
<p>Outputs 1. Investment plan to ensure robust data interchange capacity between all four SASEC members 2. Applicable peering arrangements and organizational model for operating the</p>	<p>Investment plan for regional exchange and in-country gateways including cross-border access link to be developed within 3 months after the TA starts</p> <p>Investment plan for village networks and the regional research and training center to be developed within 3 months after the TA starts</p> <p>Peering arrangements for regional exchange and in-country gateways to be developed within 4 months after the TA starts</p>	<p>Consultants' interim and draft final reports</p> <p>ADB missions to assess TA implementation</p>	<p>Assumptions Governments fully support consultants' works as committed</p> <p>The steering committee delivers its mandate</p>

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
regional exchange and in-country gateways 3. Operational design of telecenters 4. Mandates and organizational setup of the regional research and training center, and a business model to operate it in a financially self-sustainable manner 5. Feasibility assessment for investment components	Ownership and operation model for regional exchange and in-country gateways and business model for their operation to be developed within 4 months after the TA starts Operational design of telecenters to be developed within 4 months after the TA starts Ownership and operation model for the regional research and training center and business model for its operation to be developed within 4 months after the TA starts Organizational structure of the operational entity for the regional research and training center to be developed within 4 months after the TA starts Feasibility study for investment components available at TA completion		
Activities with Milestones			Inputs
<ol style="list-style-type: none"> 1. Identify investment requirements for (i) regional exchange and in-country gateways including cross-border access links, and (ii) village networks and the regional research and training center to be developed within 3 months after the TA starts 2. Develop peering arrangements for regional exchange and in-country gateways in consultation with the concerned authorities and Internet service providers and other carriers within 4 months after the TA starts 3. Develop ownership and operation model for regional exchange and in-country gateways, and business model for their operation within 4 months after the TA starts 4. Develop operational design of telecenters within 4 months after the TA starts 5. Develop ownership and operation model for the regional research and training center, and business model for its operation within 4 months after the TA starts 6. Develop organizational structure of the operational entity for the regional research and training center within 4 months after the TA starts 7. Formulate an investment project suitable for ADB financing, and carry out the preparatory studies required to examine the feasibility of each project component and to comply with ADB's safeguard and other policies, including economic and financial analyses, poverty and social impact assessment, environmental impact assessment, and indigenous people's development plan if required, at TA completion 			TA financing of \$500,000 on a grant basis by the e-Asia and Knowledge Partnership Fund funded by the Government of the Republic of Korea Governments' in-kind contribution to TA 12 person-months of international and 43 person-months of national consulting services

ADB = Asian Development Bank, ICT = information and communications technology, SASEC = South Asia Subregional Economic Cooperation, TA = technical assistance.

INITIAL POVERTY AND SOCIAL ANALYSIS

A. Linkages to the Country Poverty Analysis

Is the sector identified as a national priority in country poverty analysis?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the sector identified as a national priority in country poverty partnership agreement?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<p>Contribution of the sector or subsector to reduce poverty SASEC countries:</p> <p>Information and communications technology (ICT) has become the heart of social and economic transformation to a knowledge society. Particularly in the era of globalization, the role of ICT becomes increasingly important as it enables transmission of information and connection of one economy with other economies at a much lower cost and more efficiently. Because of this, ICT has proved an effective means of empowering poor rural people in remote areas. Recognizing a large potential for economic growth inclusive of remote marginalized rural areas, all South Asia Subregional and Economic (SASEC) countries identified connecting remote rural areas to an ICT network as a national economic goal; thereby empowering rural residents to actively participate in economic development activities, and effectively achieving poverty reduction goals. That effort will continue in SASEC countries in the form of expanding community e-centers initiated by the public sector, private entrepreneurs, or nongovernment organizations (NGOs).</p>			

B. Poverty Analysis

Targeting Classification: General intervention

What type of poverty analysis is needed?

The poverty and social analysis will be conducted as follows:

- (i) Analyze how the project relates to national priorities as identified in the country poverty reduction strategy.
- (ii) Identify project beneficiaries and the likely barriers to their participating in and benefiting from the project.
- (iii) Assess affordability of accessing ICT-based service for low-income people.
- (iv) Identify and recommend how ICT can provide various channels to help reduce poverty and how the poor can take advantage of these interventions.

C. Participation Process

Is there a stakeholder analysis?

Yes No

The technical assistance (TA) will follow a participatory approach—to build consensus on development of investment components and feasibility study—through a series of town-hall meetings, workshops, seminars, training, and consultation for all stakeholders including other development partners involved in ICT development, Internet service providers, telecommunications operators, telecommunications regulators, NGOs involved in developing community e-centers, village residents, universities, and vocational training institutes.

Is there a participation strategy?

Yes No

A participatory strategy will be developed to promote awareness, local participation, and ownership by (i) working with telecommunications regulators, Internet service providers, telecommunications operators, and other development partners to establish the regional exchange that allows access of service providers by commercially competitive, nondiscriminatory, and transparent cost-based or retail-minus charges; (ii) working with other development partners, NGOs, and national agencies involved in community e-centers, and village residents to develop financially sustainable models for village networks; and (iii) working with universities and vocational training institutes to maximize the synergy of the university network and other e-education networks to be facilitated by the regional exchange.

D. Gender Development

Strategy to maximize impacts on women:

The potential of the project for gender development is large as various rural ICT development projects have proved. The TA will seek to maximize the impact on gender development by involving both men and women at the project design stage, particularly for the village network and the regional research and training center components. All the surveys to be conducted for preliminary design of the regional exchange, village networks, and research and training center will focus on the opinions of both men and women, and particularly reflect the voice of women in the project design.

Has an output been prepared? Yes No

E. Social Safeguards and Other Social Risks

Item	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
Resettlement	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	No land acquisition or resettlement is anticipated as a result of the project. All components will be constructed on available government land.	<input type="checkbox"/> Full <input type="checkbox"/> Short <input checked="" type="checkbox"/> None
Affordability	<input checked="" type="checkbox"/> Significant <input type="checkbox"/> Not significant <input type="checkbox"/> None	If cost recovery is introduced for village e-centers, plans for social protection and pro-poor mechanisms will be established.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Labor	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	No labor retrenchments are envisaged as a result of the project.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Indigenous Peoples	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	No positive or negative impacts are envisaged as a result of the project.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Other Risks and/or Vulnerabilities	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	No other social risks are anticipated as a result of the project.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

ICT = information and communications technology, SASEC = South Asia Subregional Economic Development, TA = technical assistance.

COST ESTIMATES AND FINANCING PLAN
(\$)

Item	Total Cost
Government of the Republic of Korea Financing^a	
1. Consultants	
a. Remuneration	
i. International Consultants	192,000
ii. Domestic Consultants	150,500
b. Per Diem for International Consultants	36,000
c. Travel	14,000
2. Vehicle Rental (1 vehicle including operating cost)	10,000
3. Steering Committee Meeting	30,000
4. Surveys	15,000
5. Reports and Documents ^b	3,500
6. Miscellaneous Administration and Support	5,000
7. Contingencies	44,000
Total	500,000

^a Administered by Asian Development Bank.

^b Including books and periodicals.

^c Including fixed line phones and facsimile machine.

Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE

1. The objective of the technical assistance (TA) is to help South Asia Subregional Economic Cooperation (SASEC) countries prepare an investment project that will (i) establish robust data interchange capacity between all four SASEC members with reduced cost and an increase in reliability and competition, replace some microwave facilities, provide efficient access with redundancy to submarine cables for Nepal and Bhutan, reduce the dependency on satellites, enhance local peering, and reduce latency; (ii) establish village networks for SASEC regional village communities to enable rural information and communications technology (ICT) development consistent with the Millennium Development Goals; and (iii) establish a regional ICT training and research center to provide a focal point for teaching, research, professional development, and advice to industry and government.

2. The TA outputs will include (i) an investment plan for the SASEC regional exchange including in-country gateways and cross-border access links and applicable peering arrangements and organizational model for operating the regional exchange, (ii) an investment plan for establishing village networks for the SASEC countries including its operational design; (iii) an investment plan for establishing a regional research and training center, including its mandate and organizational setup and a business model for financially self-sustainable operation; and (iv) a feasibility assessment of the integrated investment project package.

A. Scope of Work

3. **Development of Regional Exchange Facility.** To prepare an investment plan for the regional exchange including in-country gateways and cross-border access links, the consultants will carry out the following tasks.

- (i) Review the SASEC ICT Development Master Plan (the master plan), assess overall feasibility of the project concept for establishing the regional exchange, and identify policy issues to be discussed and resolved with SASEC countries prior to further processing of project formulation.
- (ii) Identify possible locations for the regional exchange; examine their benefits and costs in comparison with Siliguri, India; and establish the rationale for building the regional exchange in Siliguri.
- (iii) Identify possible locations for in-country gateways in each country and select one in consultation with the authority of each country that offers the best fit for access by Internet service providers (ISPs), carriers, telecommunications service providers, and other potential users including universities; and allow for efficient backhaul to the Siliguri facilities.
- (iv) Determine the site of the regional exchange in Siliguri and the in-country gateways in the determined locations in consultation with the authority in each country, carriers, and operators including alternative network providers, ISPs, and telecommunications service providers in consideration of (a) potential existing shared facilities offered by alternative telecommunications networks such as power transmission networks; (b) convenience for fiber optic or microwave access to ISPs and telecommunications companies networks; (c) structural ability to support a microwave tower; (d) favorable building environment for housing a fiber distribution frame and digital distribution frame for cross connection; (e) ability for a potential microwave line as primary or redundancy links to each SASEC country; (f) availability of lockable rack system facilities, layer two Ethernet switch, potential domain name server, and uninterrupted

- power supplies; (g) appropriate building security and access; and (h) susceptibility for natural disasters.
- (v) Determine the specifications of the facilities to be built and installed in the regional exchange and in the in-country gateways in line with the guidelines provided in the master plan and in conformity with regional policies and regulations established to underpin the SASEC ICT infrastructure.
- (vi) Examine whether other options are available such as a long-term lease rather than acquiring the site and facilities for the regional exchange and in-country gateways.
- (vii) Examine the cross-border access links proposed by the master plan and modify them, if necessary, in consultation with the authority in each country to improve the reliability and quality of broadband services in the region consistent with the ICT development policies of all members, and determine the specifications of each cross-border access link.
- (viii) Develop a site layout for the regional exchange and in-country gateways.
- (ix) Develop a cost estimate for the entire investment plan including recurrent operation and maintenance costs in accordance with ADB's *Guidelines for the Financial Governance and Management of Investment Projects*¹ and a cost-sharing framework in consultation with SASEC countries, and allocate the entire cost to each country in accordance with the cost-sharing framework agreed upon.
- (x) Develop bid documents to tender construction of the regional exchange and in-country gateway facilities and cross-border access links.
- (xi) Develop a recommendable model for the ownership and operation of the regional exchange and in-country gateways that ensures commercially competitive, nondiscriminatory, and transparently cost-based and retail-minus charges for access for ISPs and other carriers; and develop a recommendable business model for the operation of the facilities to be financially self-sustainable.
- (xii) Develop an organization structure for the operational entity for the regional exchange and in-country gateways that ensures financial and managerial autonomy.
- (xiii) Develop a draft peering agreement and draft service agreements together with the reference interconnect offer in consultation with regulatory authorities, service providers, carriers, and ISPs in each country.

4. **Expansion of ICT-Accessibility in Remote Rural Areas.** To prepare an investment plan for the improvements of last mile accessibility in rural and remote areas of SASEC countries, the consultants will carry out the following tasks in coordination and cooperation with the Empowering the Rural Areas through Community e-Centers Project.²

- (i) Review the rural telecommunications policies, regulations, and strategies in each SASEC country; and identify policy and regulation measures to improve the accessibility of rural and remote areas through more private sector participation, including market-oriented reform, universal access fund management, licensing policy, subsidy scheme, and spectrum policy.
- (ii) Review the concept of the village network provided in the master plan, and refine it, if necessary, to make it more adaptable and more applicable in terms of sharing village social capital through the regional exchange facilities.

¹ ADB. 2002. *Guidelines for the Financial Governance and Management of Investment Projects*. Manila.

² ADB. 2005. *Empowering the Rural Areas through Community e-Centers Project*. Manila.

- (iii) Review the expansion of community e-centers (CeCs) pursued by the government, NGOs, private sector, and other development partners in each country; and identify mechanisms for the private sector/NGOs to increase their participation in the sustainable delivery of ICT services included in the national CeC program.
- (iv) Assess various innovative technologies including wireless technology as a means to provide a last mile connection for remote villages in consideration of mountainous terrain, low population density, base station and coverage from base station, line of site or nonline of site, power consumption, potential of solar power, technology life cycles, technological evolution, and technology interoperability.
- (v) Design the basic features of the CeC to be established including (a) the equipment for computing, power link, Internet, and other facilities to be installed; (b) a package of e-services and e-applications to be carried out at the CeCs; and (c) management and operation structure using the social enterprise model.
- (vi) Develop national and regional frameworks and strategies for a sustainable CeC program to ensure social, economic, and financial sustainability.
- (vii) Develop potential e-applications that ensure regional traffic among CeCs in SASEC countries including e-commerce and e-education.
- (viii) Select candidate villages in each country using the following criteria: (a) the villages are included in the national priorities for the country's CeC program, (b) benefits from regional traffic can be maximized, (c) social development impact of providing ICT connectivity to remote rural areas is fully considered, and (d) additional infrastructure investment requirements are minimized.
- (ix) Determine the sites for CeCs to be established in the selected villages in consultation with the authority in each country.
- (x) Develop an investment plan to provide the village networks for the selected villages to be connected through the regional exchange, and to establish CeCs at the selected villages as designed.
- (xi) Develop a cost estimate for the entire investment plan including recurrent operation and maintenance costs in accordance with ADB's *Guidelines for the Financial Governance and Management of Investment Projects* (footnote 1) and a cost-sharing framework in consultation with SASEC countries, and allocate the entire cost into each country in accordance with the cost-sharing framework agreed upon.
- (xii) Develop bid documents to tender (a) building of fiber optic, microwave, and wireless connections as designed; and (b) construction of CeCs.

5. **Development of Regional Research and Training Center.** To prepare an investment plan for the regional research and training center, the consultants will complete the following:

- (i) Review the master plan and develop the mandates of the proposed regional research and training center on the basis of the recommendations of the master plan and in consultation with the authorities of SASEC countries.
- (ii) Develop a recommendable model for the ownership and operation of the regional research and training center together with a recommendable business model for the operation to be financially self-sustainable in consultation with concerned authorities, and specify revenue-generating mechanisms.
- (iii) Develop an organization structure for the operational entity for the regional research and training center that ensures financial and managerial autonomy.

- (iv) Develop a draft agreement by which SASEC countries will agree with the ownership and operation of the regional research and training center; and the business model for the operation of the entity, which will spell out the organization structure of the operational entity together with the revenue-generating mechanisms.
- (v) Develop a preliminary design for the physical structure of the center building, and the equipment and facilities to be installed.
- (vi) Determine the site for the center building in Thimpu, Bhutan in consultation with the authority in Bhutan and considering the preliminary design of the structure.
- (vii) Develop a cost estimate for the entire investment plan including recurrent operation and maintenance costs in accordance with ADB's *Guidelines for the Financial Governance and Management of Investment Projects* (footnote 1).
- (viii) Develop bid documents to tender the purchase and installation of the equipment and other facilities to be installed in the center building.

6. **Economic and Financial Assessment.** To ensure the economic and financial viability of the investment components, the consultants will carry out the following tasks.

- (i) Develop economic and financial analysis models for (a) regional exchange and in-country gateway, (b) village networks, and (c) regional research and training center in line with ADB's *Guidelines for the Economic Analysis of Projects*,³ *Guidelines for the Economic Analysis of Telecommunications Projects*,⁴ and *Guidelines for the Financial Governance and Management of Investment Projects* (footnote 1).
- (ii) Estimate the traffic for the regional exchange and in-country gateways using a 20-year time frame.
- (iii) Assess the economic life of the components and identify the economic benefits of each investment component comparing the with-project and without-project situation.
- (iv) Establish tariffs adequate to ensure full cost-recovery for the investment components.
- (v) Calculate the economic internal rate of return for each investment component, and conduct sensitivity tests for the economic internal rate of return by varying benefits and investment costs.
- (vi) Calculate the financial internal rate of return (FIRR) for each investment component; establish the financial viability of each investment component by comparing the FIRR with the cost of capital; and conduct sensitivity tests for the FIRR by varying tariffs, financial revenues, and investment costs.

7. **Social and Resettlement Impact Assessment.** To assess the social and resettlement impact of the investment components, the consultants will carry out the following tasks.

- (i) Based on the review of data and reports, and field investigations, prepare a poverty and social analysis for investment components in accordance with ADB's *Guidelines for the Incorporation of Social Dimensions in ADB Operations*⁵ and *ADB's Handbook on Poverty and Social Analysis*.⁶

³ ADB. 2002. *Guidelines for the Economic Analysis of Projects*. Manila.

⁴ ADB. 1997. *Guidelines for the Economic Analysis of Telecommunications Projects*. Manila.

⁵ ADB. 1997. *Incorporation of Social Dimensions in Bank Operations*. Manila.

⁶ ADB. 2001. *Handbook on Poverty and Social Analysis: A Working Document*. Manila.

- (ii) Prepare a study of the socioeconomic and poverty status of the project areas of influence, including the nature, extent, and determinants of poverty in these areas; identify and estimate the likely socioeconomic and poverty reduction impacts of the project; and prepare proposals for monitoring and evaluating the benefits and impacts before and after the project.
- (iii) Determine the presence of indigenous peoples/ethnic minorities in the project areas.
- (iv) Based on the findings of (i) and (iii), prepare an indigenous peoples development plan or formulate specific actions for indigenous people, if required, in accordance with ADB's policy on indigenous peoples.⁷
- (v) Conduct gender analysis and identify project design elements that have the potential to address gender equity in ICT.
- (vi) Assess all investment components, and identify potential land acquisition and involuntary resettlement impacts as defined in ADB's involuntary resettlement policy.⁸
- (vii) Prepare a resettlement plan in accordance with ADB's involuntary resettlement policy and in reference to ADB's *Handbook on Resettlement*⁹ as a guide.

8. **Environmental Impact Assessment.** To assess the environmental impact of the investment components, the consultants will carry out the following tasks.

- (i) Assess direct and in-direct environmental impacts, as well as accumulated impacts associated with the proposed investment components.
- (ii) Prepare the initial environment examination or environmental impact assessment on the basis of the environment impact assessment in accordance with (a) ADB's *Environmental Assessment Guidelines*,¹⁰ (b) ADB's *Environment Policy*,¹¹ and (c) relevant government environment acts and regulations.
- (iii) Prepare a summary initial environment examination or environmental impact assessment in ADB format.
- (iv) Prepare the environmental management and monitoring plans, including the costs to implement the plans as well as institutional arrangements including potential involvement of NGOs.

B. Reports

9. The following reports, all in English, will be submitted by the consultants to each country and ADB. The final report will also be submitted in CD ROM.

- (i) **Inception report.** To be submitted within 1 month of the start of the services, this brief report should outline any changes in the approach, methodology, or work plan, as well as cost implications for the consultants' services (contained in the consultants' proposal) that are required to fulfill the terms of reference.
- (ii) **Interim report.** To be submitted at the end of 3 months from inception.
- (iv) **Draft final report.** To be submitted at the end of 4.5 months from inception.
- (v) **Final report.** To be submitted within 1 month of receipt of comments from each country and ADB.

⁷ ADB. 1998. *The Bank's Policy on Indigenous Peoples*. Manila.

⁸ ADB. 1995. *Involuntary Resettlement*. Manila.

⁹ ADB. 1998. *Handbook on Resettlement: A Guide to Good Practice*. Manila.

¹⁰ ADB. 2003. *ADB Environmental Assessment Guidelines*. Manila.

¹¹ ADB. 2002. *Environment Policy*. Manila.