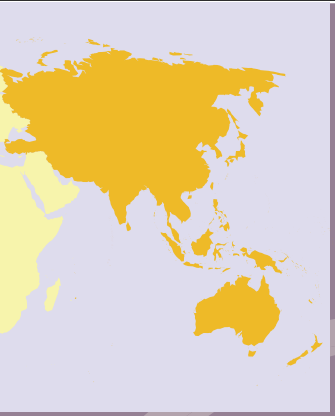

COLLECTION OF CASES OF FINANCING *ict* FOR DEVELOPMENT IN ASIA AND THE PACIFIC

United Nations
ESCAP

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

ESCAP is the regional development arm of the United Nations and serves as the main economic and social development centre for the United Nations in Asia and the Pacific. Its mandate is to foster cooperation between its 53 members and 9 associate members. ESCAP provides the strategic link between global and country-level programmes and issues. It supports Governments of the region in consolidating regional positions and advocates regional approaches to meeting the region's unique socio-economic challenges in a globalizing world. The ESCAP office is located in Bangkok, Thailand. Please visit our website at <www.unescap.org> for further information.

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United Nations

New York, 2005

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

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PREFACE

Information and communication technology (ICT) has become a powerful tool for poverty reduction and sustainable development by empowering rural and poor people. It has been seen as an effective means of transforming rural economies and service development, overcoming what up to now have been seen seemingly intractable problems with sparse population and distance, and providing necessary ways of delivery of information and services.

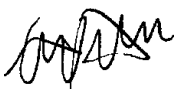
As the Secretary-General of the United Nations stated at the first phase of the World Summit on the Information Society, held in Geneva in December 2003, "From trade to telemedicine, from education to environmental protection, we have in our hands, on our desktops and in skies above, the ability to improve standards of living for millions of people on this planet." Indeed, ICT has the potential to provide new and exciting opportunities to those who have access to it. However, ICT also has the potential to further reduce existing economic imbalances and social inequalities.

Asia-Pacific is home to more than 60 per cent of the world's population and about 75 per cent of the world's poor. Around 60 per cent of the region's population live in rural areas where poverty is greatest. The region also presents the greatest contrast between large, continent-sized nations, mountainous and landlocked countries, city States and island State with tiny atolls separated by vast stretches of ocean as well as between some of the

world's richest and poorest nations. While some of the countries of the region have remarkable development and applications of ICT for poverty reduction and sustainable development, the situation in many other countries, especially, the least developed, island developing and landlocked developing countries is quite different.

The digital divide between urban and rural people and the rich and poor in those countries is still quite remarkable. Infrastructure for ICT development and applications is largely concentrated around the capitals and is very poor in rural areas. In fact, many countries do not have sufficient funds or appropriate technology for the purpose. There is a fear that the rural people will be left behind the opportunities provided by the rapid development of ICT since providing the necessary infrastructure will not be cost-effective and ICT application will not be sustainable in many rural areas. Innovative approaches involving the partnership of all stakeholders are required to transform the digital divide into digital opportunities with a focus on rural and poor people.

This publication presents examples of success stories/good practices in ICT for development, including descriptions of appropriate technology, financial mechanisms, respective roles of stakeholders and related ICT policies. The publication considers cases from China, India, Malaysia, Nepal and Thailand which have some uniqueness. It is hoped that the publication will be useful to all, and especially government ICT policymakers and implementers as well as NGOs, the private sector and civil society in taking appropriate measures in their efforts to provide access to ICT for all rural and poor people, including those living in the least developed, island developing and landlocked developing countries of Asia and the Pacific.



Kim Hak-Su
Executive Secretary

May 2005

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ESCAP expresses its appreciations to all the persons involved including those mentioned above for their contributions to this publication. ESCAP would also like to thank the participants and resource persons of the first regional and four sub-regional Conferences on follow up to the Geneva phase and preparation for the Tunis phase of the World Summit on the Information Society held at Bangkok in October 2004, Bishkek in November 2004, Suva in December 2004, Bali in February 2005 and Kathmandu in March 2005 for the discussions and contributions to case studies.

CONTENTS

INTRODUCTION

Financing, the mighty tool to support ICTs for development, can be utilized through various financial instruments to increase, and enhance the rollout of information and communications infrastructure, and applications across the Asia-Pacific region. Both the private sector and the respective governments have crucial roles to play in ensuring access to ICT tools. The region is a rich storehouse of experiences and lessons in this respect.

The Asia-Pacific region covers 25 per cent of the world's land area, and is largest in terms of population size. Approximately, 60 per cent of the region's population live in rural areas. Many countries have mountainous areas that cover more than 90 per cent of the total land area, and more than 70 per cent of the population resides in the mountainous part. Within the region, there are 21 island developing countries of which six are categorized as least developed countries (LDC's), and 12 land-locked countries of which four are categorized as LDC's.

Although Asia evokes impressive images of a fast-growing region, it is also home to 75 per cent of the world's poor. For example, the Asia-Pacific region, excluding Japan, will become the fast growing economic block between 2003 through 2007, but countries such as Bangladesh, Bhutan, Cambodia, and Nepal are near the bottom of the United Nations Human Development Index[1].

[1] *Economic Intelligence Unit, The Economist, http://www.eiu.com*

Additionally, there are also constraints to the social and economic development of the Pacific island countries due to their small land area, isolation, and vulnerability to environmental hazards.

The digital divide is also as diverse as the cultures, economies, and infrastructure of the region. For example, in the Republic of Korea, the number of households connected to broadband internet is over ten million, the number of internet users is at least 30 million, and the number of personal computers (PCs) per 100 people is over 25[2]. Whereas in Bhutan, there are only 5,000 PCs, out of which only 1,100 PCs are connected to the Internet and the number of PCs per 100 people, is less than one[3].

As follow up to the Geneva phase and preparation for the Tunis phase of World Summit on the Information Society (WSIS), ESCAP organized first regional and four sub-regional conferences to discuss the financial mechanisms for ICT for development. During the meetings, there was a recommendation that ESCAP collect and prepare the case studies on good practices in ICT for development which have certain uniqueness and could be useful for bridging the digital divide among the rural and urban and rich and poor people living in the developing countries of the region including land-locked, island developing and least-developed countries.

The purpose of the case studies collection on financing ICT for development is to provide information on the types of ICT projects conducted in rural areas of Asia and the Pacific. It is also to inquire, and initiate discussions on further improving the financial initiatives utilized or further seeking innovative financial

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[2] *"ICT Profile – South Korea", UNDP Asia-Pacific Development Information Programme (UNDP-APDIP), http://www.apdip.net/projects/dig-rev/info/kr*

[3] *"ICT Profile – Bhutan", UNDP Asia-Pacific Development Information Programme (UNDP-APDIP), http://www.apdip.net/projects/dig-rev/info/bt*

methods to fund these projects. Moving forward, ESCAP will continue to collect and publish such case studies should the international community find it useful.

Case studies included represent ICT infrastructure development in a remote part of Malaysia, as well as the creation of a Universal Service Provision Fund, similar to a Universal Access Fund, for development of telecommunication services in under-served rural areas. There is a case study on the implementation of a programme to increase PC ownership in Thailand primarily for first-time PC users, school students, and government employees, and an initiative to develop resource centres in all villages across India using space technology. Finally, there are case studies on the development of telecentres, or community e-centres in remote, mountainous parts of Nepal, and the Yunnan Province of China.

CHINA

Multi-Stakeholder Approach for Connectivity in a Remote Province

The Yunnan province is located in south-western China along the borders of Myanmar, Lao PDR, and Viet Nam. It is a highland province with a terrace topographical feature stretching from the northwest to the southeast, resulting in a diversity of elevation and climates. Yunnan is rich in mineral resources, namely non-ferrous metals, but not rich in farmland resources. Despite its ample water resources, the distribution is unbalanced between different regions, and different seasons.

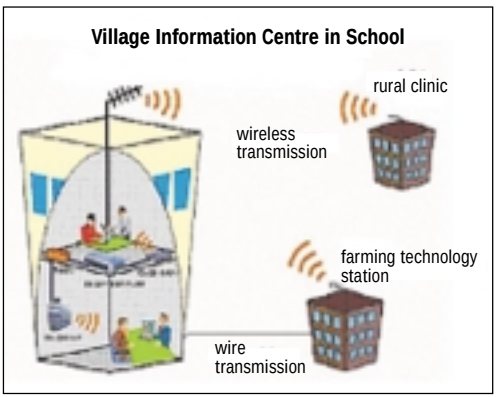
Yunnan is also one of the largest, and one of the poorest provinces in China[4]. Cultivated land, consisting of only eight per cent of the area, constitutes a small part, owing to steep mountains. There are over 127 counties, of which all counties have mountainous areas that covers at least 90 per cent of the total area in 111 counties of Yunnan Province. Total population was approximately 44 million people, by 2000 registration records, out of which the rural population was over 30 million. Most of Yunnan's population lives in the eastern river basin, and the western mountainous and semi-mountainous areas are sparsely populated.

Various counties are characterized by high mountains, steep slopes, and harsh natural conditions not favourable to agricultural production. To create opportunities in the mountainous rural areas, the provincial government of Yunnan recognized the importance of utilizing ICT applications for agricultural

[4] *Xiao, Li, Qiu Dunlian, and Song Xia, "Case Analysis and Development Direction of Agricultural Informatization in Southwest China's National Minority Regions", Information Research Institute, Sichuan Academy of Agricultural Sciences, Chengdu*

information services, distance education, and health-related communicable disease monitoring, and prevention. In 2003, the satellite-based rural community e-centre (CeC) pilot project was established with the objective to explore and demonstrate the most cost-effective approaches for the establishment, development and applications of an integrated provincial rural information service network. As of September 2004, numerous areas within Yunnan Province have been covered with phone capabilities due to the adoption of a satellite-telecom approach.

The pilot CeCs are linked to a communications satellite for information sending and receiving. Communication satellites typically provide connectivity to telephones, and television. Information is received simultaneously through satellite Internet content broadcasting, and is stored in the server connected via local area network with other PCs. The pilot model is jointly organized by the Provincial Office on Information Technology, the Provincial Department of Education, and a commercial satellite Internet Service Provider (ISP).



Rural information services applications are organized and provided by public organizations as websites of agricultural authorities, provincial computer-aided agricultural expert service system, national and provincial education television programmes, and provincial agricultural information service systems.

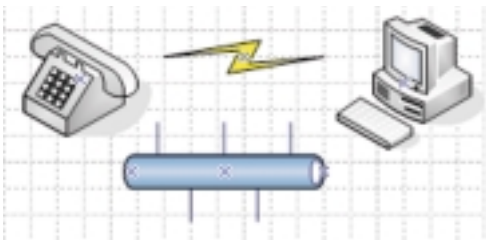
The CeCs are established within schools. For example, at a secondary school, students utilize the computer laboratory to learn how to design their own web pages.

When the computer laboratory is not in use by the students, the laboratory is open to anyone in the community who wishes to send or receive emails, browse the Internet, receive training in computer and Internet technologies, or training in agricultural knowledge and skills.

As of the latest information received, 9,000 CeCs have already been established. A typical CeC contains one server, 20 PCs, one projector or television, one satellite terminal, and dialup modem. Usually four managers and technicians support the CeCs operations, and maintenance. The local community pays for the use of these services, and the money is used to sustain the laboratory, and pay for staff and instructors. However, application information resources are provided by national and provincial government agencies in education, science, technology, agriculture, and commerce at no cost to users.

School development funding is provided by the Yunnan Provincial Government, other government agencies, and other local schools. Cash budget of CNY 2.5 million (US$302,000) has been allocated. The Provincial Government is providing CNY 1 million (US$121,000), and a combination of local government agencies, and schools providing CNY 1.5 million (US$181,000). An increase in government funding for education would benefit the community e-centres.

There has been an increased awareness in the problems of organizing, and coordinating information, but the issues on lack of funding has not been addressed. For example, Yinmore Communications, the company allocated to provide satellite receivers, does not have funding available to provide additional services to rural areas. Support and assistance has been requested from international organizations, such as ESCAP, UNDP, ADB, and World Bank to provide assistance in funding, training, and expertise.



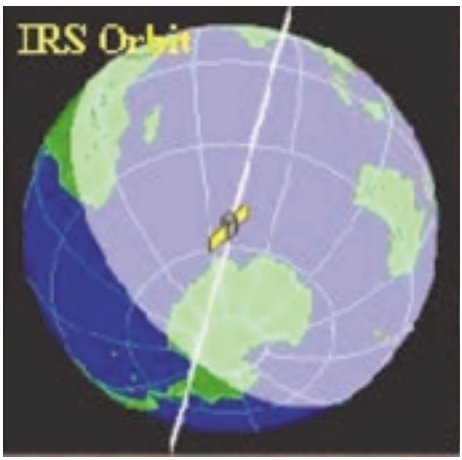
The goal is to connect 90 per cent of primary and secondary schools to the Internet by 2010[5]. Based on the successful implementation of the CeC pilot project, a discussion on developing the framework for a rural information service system is ongoing at the Yunnan Provincial level. If a favourable decision is made, the rural information service system will be established on available hybrid broadband resources of optical fibre, television cable and satellite systems. The existing 2000 rural primary and secondary schools in the province would enhance their education and community information service functions. By end of 2008, the intent is to develop more than 20,000 sites covering all administrative villages of the Yunnan Province.

[5] *Chen, Li, "CHINA: ICT Use in Education", UNESCO Meta Survey on the Use of Technologies in Education*

INDIA

Area-Specific Online Services through Space Technology

During the past four decades, a wide-ranging array of research and development has been conducted by the space industry resulting in technological advances which have affected the growth of existing and new industries and permeated many aspects of our daily lives. Space activities incorporate some of the most important areas of high technology such as computer software and hardware development, sophisticated electronics, satellite manufacturing, life sciences, new materials and launch technology. Products and services derived directly from space technology as well as indirectly from a large number of its spin-offs contribute, in many ways, to improving the quality of life and society.



Satellite communications constitute the most mature segment of the space market. According to some studies, there will be between 260 to 320 communications satellites in the geostationary orbit by 2006. New applications such as digital television, rural telephony, digital audio broadcasting, mobile services and high-bit-rate data delivery services provide the growing demand for these satellites.

As of November 2004, several prominent private information technology (IT) enterprises, such as Hewlett Packard, Microsoft, and Cisco in partnership with MS Swaminathan Research Foundation (MSSRF), Amrita Vishwa Vidyapeetham (Amrita), and the Indian Space Research Organization (ISRO) agreed on moving forward with the establishment of satellite-based Village Resource Centres (VRCs) across the country[6]. ISRO is committed to the practical applications of space technology to promote national development, and Amrita is an educational institution that hosts both the satellite e-learning, and telemedicine network. The goal of the telemedicine programme is to provide health care professionals the capability to examine, monitor, investigate, and treat patients in remote areas through satellite technology using video conferencing equipment or robotic technology. Amrita's telemedicine programme is made possible through its link with an ISRO satellite. MSSRF, a registered non-profit Trust, in partnership with ISRO implemented the pilot VRCs in October 2004.

The year 2004 provided three successful events for the Indian space programme. First was the launch of EDUSAT, a satellite dedicated primarily to the educational sector to link large number of under-equipped rural educational institutions[7]. Secondly, the successful inauguration of small number of VRCs, and finally, a further expansion of the telemedicine network using space technology.

The VRC concept is integrated with satellite communications to disseminate a variety of services emanating from the space systems and other information technology tools to address the changing and critical needs of the rural communities. (VRCs) combine space-enabled information with ground derived information to provide locale-specific community advisory services. For example, natural resources information up to cadastral level, prospective zones of portable/drinking water as well as recharge, occurrence of wastelands for reclamation through rural employment creation, watershed attributes, environment, infrastructure related information alternate cropping pattern, water harvesting, etc., could be provided. Using ISRO satellite imagery, groundwater experts have raised the success rate for well-drilling significantly. Also, satellite weather forecasting helps the farmers take maximum advantage of rainfall and

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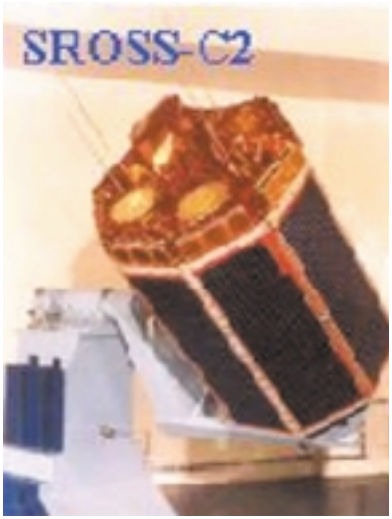
[6] *"MOU Signed for Setting up of Satellite-based Village Resource Centres", 5/11/2004, http://www.isro.org/pressrelease/Nov05_2004.htm*

[7] *Madhavan, N., "Take-off to Learning?", 26/9/2004, The Financial Express, http://www.financialexpress.com/*

be better prepared for drought. Additional variety of services to rural communities include capabilities to disseminate tele-education, in which the VRC acts as virtual community centric learning centre, telemedicine, e-government services, and interactive advisory services.

The first three clusters of Space Technology enabled VRCs implemented by ISRO and MSSRF together were inaugurated in October 2004. Efforts are on to set up VRCs in association with various agencies like Amrita. ISRO provided technical backup, and the centres were managed by the NGOs. The longer term goal is to establish over 1,000 VRCs across India.



The VRC utilizes an interactive VSAT (Very Small Aperture Terminal) based network offering value-added satellite-based services. VSAT is considered as a pivotal technology for developing countries because they can use it to deliver on their promise of universal access. VSAT networks provide an efficient, cost-effective method for reliable distribution of data through multiple site organizations, regardless of location.

The technology backbone of VSAT is provided by the Indian National Satellite (INSAT) and Indian Remote Sensing (IRS) satellites. INSAT includes more than 150 transponders, and serves numerous sectors of the economy in India, including exclusive channels for the telemedicine network, as well as for training and educational purposes. On the other hand, IRS satellites provide data to be effectively utilized in application areas such as drought assessment, natural resources management, and agriculture[8]. Users are typically connected to the VSAT network through nodes. Each node communicates with another node through video and audio links, and each of the nodes can then be further extended using technologies such as wireless and optical fibres.

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[8] *Hegde, V.S. and K. Ganesha Raj, "Reaching the Un-reached: Space Technology Enabled Village Resource Centres (VRCs) in India, Indian Space Research Organization (ISRO) HQ, presented during the Southeast and East Asia Conference on Follow-up to the First Phase and Preparation for the Second Phase of WSIS, Bali, Indonesia (1st – 3rd February 2005)*

VRC is an example of a public – civil-private partnership. Funding for VRCs is provided by ISRO, a public research agency, a combination of various NGOs, state-level government divisions, and private enterprises such as Hewlett Packard, Intel Corporation, and Tata Consultancy Services. ISRO provides funding in the amount of US$25,000 to US$30,000 for hardware equipment for VSAT communication link, telemedicine, educational purposes, advisories database, and training. Private enterprises provide hardware support in a large scale to ensure VRC rollout is successful in the villages. Remaining agencies provide US$4,000 to US$5,000 towards building materials, furniture, software costs, etc. Current VRC operational cost ranges between US$300 to US$500 per month. Efforts are continuing to reduce the cost of communication, telemedicine, and tele-education equipment to make VRCs cost effective.

The main cost of the VSAT solution is the earth station, which represents 60 per cent of overall expenditure, while maintenance and space segment costs make up remaining 40 per cent[9]. Initially, there was no fee associated with the service usage of VRCs. Eventually, a nominal fee was charged for information dissemination. For example, a fee was charged to provide information on crucial subjects like weather[10]. Additional revenue generating fee to cover operational costs should also be implemented in the near future.

Strategic partnerships between public, private, and community are needed to ensure space applications can be utilized effectively. This is important to ensure sustainability of the project. As mentioned, currently, there is no fee charged for the use of VRC services. At least, revenue generating activities to cover operational costs has to be implemented.

VRCs should also link with other ISRO satellites to increase

[9] *DeZoysa, Sanjima, "VSATs – the rural choice?", Telecommunications International, April 2002, http://www.findarticles.com*

[10] *"ISRO to set up 100 village resource centres", 5/10/2004, http://www.siliconindia.com*

content. For example, VRCs can integrate with the GRAMSAT Project, which connects over 314 state-level government agencies through a wide area network using the INSAT satellite, and a dedicated VSAT network, specifically to implement e-government services[11]. This would provide connectivity to additional information for local community usage, such as e-governance services related to issuing land rights, birth and death certificate requests, agricultural pricing information, ICT training, etc.[12].

It is known that rural villages in India lack communications connectivity, and rural telecommunication providers do not consider rural connectivity as revenue generating business venture. But, satellite-based VRCs can be established in remote reaching rural areas, mountainous regions, and tribal dominated areas at much less cost to deploy, maintain, and operate. Furthermore, satellite-based VRCs can be easily replicated at any remote location. Each user is connected to the satellite through the same "virtual circuit" therefore a single broadcast message can go to an unlimited number of end-user locations. Inexpensive wireless technology can then be utilized to extend the link further to adjoining villages. Network expansion using VSAT is also simple and inexpensive compared to network expansion work on any other terrestrial environment such as frame relays, and DSL.

The arguments in support of VSAT-based platforms are clear, but in practice, implementation has been difficult. VSAT solutions face barriers to cost-effective solutions due to government policies, and market conditions. The VSAT market has been growing in India, but there are three areas of concern, namely,

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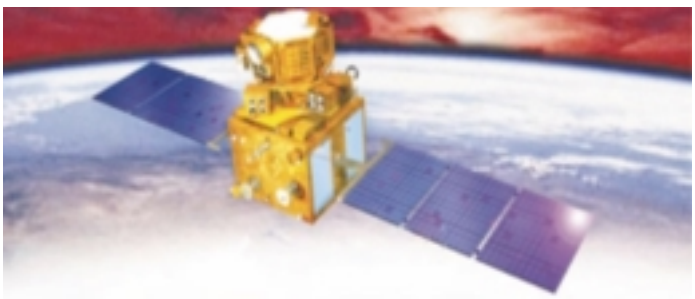
[11] *"8th National e-Governance Conference", 5/2/2005, http://203.129.205.9/egovernance/PressRelease.htm*

[12] *Hegde, V.S. and K. Ganesha Raj, "Reaching the Un-reached: Space Technology Enabled Village Resource Centres (VRCs) in India, Indian Space Research Organization (ISRO) HQ, presented during the Southeast and East Asia Conference on Follow-up to the First Phase and Preparation for the Second Phase of WSIS, Bali, Indonesia (1st – 3rd February 2005)*

frequency cost, public switched telephone network (PSTN) interconnectivity, and transmission constraints are concerns.

As the frequency bandwidth increased, so did the end-user frequency cost. Initially, the government of India permitted the use of VSATs only on the INSAT satellites. Recognizing the need to address demand for Internet services, the government implemented a policy permitting Internet Service Provider (ISP) licensees to access any satellite in any frequency band. Although this increased availability of bandwidth, it also elevated the cost of service to the user. Secondly, VSAT connectivity to the PSTN network was not permitted (although this may now be changing). This typically limited the means to expand into areas where there was no communications optical-fibre infrastructure. Finally, the VSAT providers were also constrained by a cap on the transmission rate. This also may be changing following Telecom Regulatory Authority's recommendation to increase the limit from 64Kbps to 512Kbps.

The VRC is a significant step towards achieving Mission 2007, a national initiative launched by an alliance comprised of 80 organizations including various civil society organizations to implement an ICT knowledge centre in all rural villages by August 2007[13]. The Government of India has joined the national alliance, and has pledged Rs100 crore (US$23 million) through the Rural Infrastructure Development Fund (RIDF). India's space programme, built up on a shoestring budget for the past 41 years to benefit the poor and the military, is now poised to take on a larger role.



[13] *Chidambaram, Shri P., "The Finance Minister's Budget Speech: Budget 2005-2006", 28/2/2005, http://mssrf.org/special_programmes*

The goal is to connect all of India's 600,000 rural villages[14]. Representatives of all the industries were unanimous in their commitment to the task of reaching the benefits of high technology to the rural population[15]. Much of the population is isolated in terms of access to information, materials and markets. Expanding market access for agricultural and non-agricultural output of rural areas is important to ensure the rural population can source agricultural inputs in the most cost-effective manner. In addition, the Internet can help find buyers for the goods produced within the local community. Transforming rural India to improve education, access to health services, sanitation, and empowerment is a challenge. Space technology is used as a strategy to harness the power of the villages.

[14] *"Manmohan Singh launches village resource centre", Indo-Asian News Service, 18/10/2004, http://www.apnic.net/mailing-lists*

[15] *"IT majors in pact for rural scheme", 5/11/2004, http://www.isro.org*

MALAYSIA

Internet Development to Help Marginalized Community

The Bario community is located on the Kelabit Highlands, at least 3,000 feet above sea level. The Kelabit Highlands are the highest inhabited area of Borneo, Malaysia, and home to the Kelabit tribe. Bario is barricaded by thick forests, and has defied discovery by the outside world until 1945. The community's main economic activity is agriculture, mainly growing rice and citrus fruits. There are just over 5,000 Kelabits today, probably one of the smallest ethnic groups in the Malaysian state of Sarawak. Due to economic and social factors, many have migrated to urban areas. It is estimated only 1,000 Kelabits are living in Bario today. School children were disadvantaged both economically, socially, and had little or no exposure to the outside world. Local population has limited income. Due to the rugged geographical terrain, Bario has limited access by road, limited or non-existent access to telecommunication services, and no public electricity. Radio Channel Services (RCS), a half-duplex communication system with only one channel for voice transmission and reception, was the only available means of communication to the outside world. The Bario community was a highly isolated and remote area, until a university project was started.

A university experiment labelled "e-Bario" helped this community to connect to the information highway. The project was organized under three categories: school, community, and communications. After a feasibility study, data and voice communications were decided as the services to implement. As part of the Government of Malaysia's knowledge-economy initiative, and the Eighth Malaysia Plan, a remote, isolated district was needed to determine the effective methods for connecting rural communities to the Internet. The goal of the Eighth Malaysia Plan was to "expand ICT infrastructure into rural areas to bridge the digital divide and enable all citizens to have equitable access to knowledge and information".[16] Bario met the qualifications for the pilot project. It presented an opportunity to meet the goals of the Eighth Malaysia Plan and test the idea of rural connectivity under a challenging environment. The rationale was if a rural connectivity project succeeded in a highly isolated and remote area, then similar projects could be replicated to other areas.

The e-Bario project was initiated in 1999, and by 2002 project implementation was achieved. Data and voice communication services were implemented for two schools, SK Bario (primary school), and SMK Bario (secondary school), and a community telecentre.

Each school received ten computers, as well as an IT literacy training programme for students and teachers. The community telecentre received four computers with access to the Internet, printers, copier, and fax machines. For voice communication purposes, telephone public booths were also installed.

Very Small Aperture Terminals (VSATs) were utilized to connect the Bario community to the Internet. Numerous tests were carried out on various technologies for providing improved telephone access and Internet connectivity. Technology of VSAT was decided due to its capability of using satellites to link signals from remote places to central exchanges[17]. VSAT would enable a number of remote users to have data access via a central hub dish. From a technical standpoint, satellite systems, particularly those employing TDMA technologies, have established a competitive edge over many types of leased line services. VSAT communications now are extremely reliable (up to 99.9 per cent), and capable of providing near error-free digital transmissions. An added benefit for the Bario community is that VSATs are also solar-powered.

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[16] *"Eighth Malaysia Plan (2001-2005)", 23/4/2001, http://www.ids.org.my/planpolicy/focus*

[17] *"VSAT Satellite Communication Systems", 5/3/2005, http://www.satsig.net*

Bario relies on solar-power or diesel power generators for electricity. Computers at the school are powered by diesel generators, while computers at the telecentre are solar-powered.

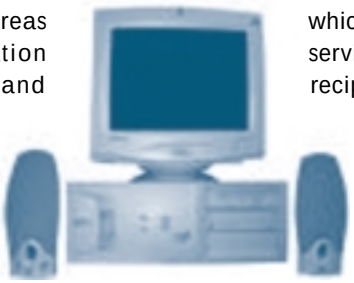
Using VSAT technology, the satellite connection consisted of four dishes installed by Telekom Malaysia, a provider of information communication technologies in Malaysia. The VSAT satellite dishes were distributed to the airport, clinic, telecentre, and school. The dish at the airport was used primarily for voice communications. The dish for the clinic provided data communications for health and telemedicine purposes, and the clinic was connected via a wireless network to the community telecentre. The dish for the telecentre was utilized for e-government, e-commerce, and personal communication services with access to the Internet. Computers at the telecentre were linked via a local area network, and connected to the Internet using a switching hub.

From a financing perspective, e-Bario is an example of a public/private partnership. The project was coordinated by the Universiti Malaysia Sarawak (UNIMAS), a public supported university, and funded by Canada's International Development Research Centre (IDRC), and the Malaysian Institute of Microelectronic Systems (MIMOS) Berhad, the organization that administers the National IT Council, and the Demonstrator Application Grants Scheme (DAGS). DAGS is funded by the Government of Malaysia through the Ministry of Science, Technology, and Environment to provide seed money for ICT-enabled projects. UNIMAS secured funding in the amount of RM200,000 (US$52,000) from IDRC, and RM620,000 (US$164,000) from DAGS. The project constraint was that IDRC, and DAGS would provide funding support for five years.

Telekom Malaysia provided VSATs powered by diesel fuel and solar energy panels, and provided installation services of public phone booths. Initial cost for satellite communications installation was RM30,000 (US$7,900). The recurring monthly maintenance cost was RM330 (US$87), but this monthly cost was already included as part of the funding amount designated for five years. Public utility such as electricity was not available therefore the generators were

provided by the Government of Malaysia to supply electricity to schools, and clinic for limited number of hours due to the expensive cost of fuel. Fuel must be flown into Bario and is therefore very costly. Additionally, the Government of Malaysia provided funding for one hour of satellite time each day, and the school generated additional revenue by requiring each student to pay an annual fee to have access to the computer laboratory.

However, as of October 2003, funding for the e-Bario project has ceased, as per IDRC, and DAGS project contract conditions. Sustainability options have been talked about, and considered since the beginning of the project. The financial cost of introducing information technology in rural areas which do not have access to telecommunication services can be expensive to both promoters and recipients in terms of high implementation costs, high operational costs, and high capital costs of equipment. Limited usages of equipment at telecentre to generate revenue, and high maintenance/upgrade costs are concerns. Therefore, to ensure project is sustainable it is necessary to explore revenue generating financing initiatives. An externally funded community telecentre will always run the risk of sustainability after external funding has stopped. Therefore, sustainability options such as license or franchise fees, and usage charges for phone, email, Internet access, and other telecentre services need to be explored.



Telecentre activities should focus on developing a central website that fosters sharing of information such as entrepreneurial business plans, discussions and access to technical information, open forum discussions on community, and similar community issues, availability of training materials for awareness, and educational purposes. Scheduled release of newsletters highlighting telecentre progress, issues, and ideas in localized language formats. Promote and develop a "service brokerage" where e-commerce activities, and distance education functionalities can be utilized. For example, Bario is promoting tourism for jungle trekking, and cultural encounters, and networking with local agricultural authorities to boost rice sales through the Internet.

The creation of an IT Club was initiated to promote ICT awareness, and community members were required to pay a fee to attend training sessions. Generating income by charging for Internet use, and charging for maintenance

of computer network, and computers at the Health Clinic has been considered. If cash is unavailable, community members can also pay in terms of rice. Community involvement is necessary to ensure awareness, and aims of the project potentials. Additionally, e-commerce initiatives in selling Bario products such as handicrafts, rice, and citrus fruits on the Internet have also been considered. Recent discussions are now also revolving towards the introduction of "mobile Internet boats." The plan is to encourage computer specialists and university researchers to reach remote villages through Sarawak's rivers to raise ICT awareness, and teach the use of computers.

Private enterprise participation and continuous sponsorship is required. In August 2004, the communications link to Bario shutdown due to insufficient power. Communication was incapacitated for three months until Royal Dutch/Shell Group of Malaysia provided funding in the amount of RM3,000 (US$800) for the purchase of additional solar panels. Periodic funding and ICT training will be required to maintain/upgrade computer hardware, communication devices, and software to limit outages. As part of the Government of Malaysia's National Broadband Plan, private enterprises have been awarded contracts to provide wireless broadband access in rural schools. For example, Smart Digital Communications Berhad in Malaysia provided broadband Internet access to 2,000 schools in rural areas via satellite. The value of the contract was estimated at US$4 million[18]. The complete joint public/private partnership funding effort includes private enterprises Smart Digital with local Internet Service Provider Jaring, and a combination of government ministries of education, telecommunications and finance.

The e-Bario project has received at least three awards from 2000 onwards for demonstrating excellence in the application of information technology in public, private, and socio-economic sectors. The project received the Industry Innovators Award for Systems

[18] *"Smart Digital Communications Expands Internet Access in Malaysian Schools", ViaSat, 14/6/2004, http://www.spacenewsfeed.co.uk/2004*

Development and Applications from the Society of Satellite Professionals International in 2002; the Top Seven Intelligent Communities by the World Teleport Association in 2001, and the Information Technology Premier Award in 2003. The project serves as a model of good practice for sustainable ICT development. The achievement of the overall Internet development objectives and the participatory approach taken in the design and implementation of the e-Bario project will serve as a benchmark on how ICT development projects should be implemented, and how ICT can improve the lives of people in rural areas. The success of the project has also been attributed to the Kelabit people. In spite of their small numbers, one of the most remarkable things about this race is their openness and willingness to embrace change, confidently seeking better lives[19].

Funding Provision for Under-Served Areas

There is support from the Government of Malaysia to ensure connectivity in rural areas specifically through favourable tax incentives and policies to promote ICT growth, and through the creation of a Universal Service Provision Fund to develop telecommunication services in under-served remote areas.

The Universal Service Provision Fund (USP Fund) was initiated to provide financing for the establishment of telecommunication facilities in rural areas identified for USP. Telekom Malaysia was the only industry player responsible for USP without receiving any contributions from other licensed network operators. The USP Fund would ensure an equitable distribution and access to ICT infrastructure in rural and less developed areas. The rollout of the communication services in designated areas is financed by the USP Fund, and all licensed service providers in Malaysia must contribute to the USP Fund. By 2003, the USP programme was implemented in three underserved areas as pilot projects at a cost of RM29 million (US$7.6 million). The implementation

[19] *Bulan, "The Waking of a Lost World", http://www.geocities.com/RainForests*

of an additional 86 underserved districts was initiated at the start of 2004. Malaysian Communications and Multimedia Commission (MCMC) disbursed RM344 million (US$91 million) from the USP Fund for the implementation of the 86 rural districts.

As of 2005, the USP Fund contained RM420 million (US$108 million). Investments in USP projects are sourced from the USP Fund contributed by licensed service providers through a formula outlined by the USP Regulations. A total of RM2.2 billion (US$579 million) is needed for the Universal Service Provision of which RM1 billion (US$263 million) will be provided by the government for implementing infrastructure to rural schools and other government agencies. And, the remaining RM1.2 billion (US$316 million) will be contributed by the industry for widening public access to rural and other under-served areas.

NEPAL

Accessible Communication Services and Information Resources

ICT initiatives for rural development in Nepal began in 1994. As a result, in 1999, a national pilot programme to develop 15 telecentres in nine districts within the country was started by His Majesty's Government of Nepal (HMG/N), and the United Nations Development Programme (UNDP). The objective was to utilize ICTs to induce development in the areas of agricultural information, distance learning, telemedicine, environment protection, and natural disaster mitigation.

The telecentre in Panauti, Kavre District of Nepal, is a community-based organization operated by the local user's committee. Three computers, photocopier, and fax machine are contained within the telecentre. Services such as ICT training, email, Internet access, photocopy, fax, and digital imaging are provided. To ensure sustainability, community based ICT services were embedded with existing governance, economic and social structures. This integration of social mobilization and ICT for development was labelled info-mobilization. The telecentre conducts research by developing, testing, and applying info-mobilization through the analysis of statistical data accumulated.

Operational income of NRs 60,000 (US$835) is required to maintain/support the telecentre activities. Approximately NRs 50,000 (US$695) is received through subsidy. There is a sustainability gap of at least NRs 10,000 (US$139).

Three staff personnel are available to provide telecentre services, including staff responsible for telecentre promotional activities. However, salary levels are very low. Two full-time staff salaries range between NRs 4,000 (US$55) to

NRs 5,000 (US$70) per month, and the part-time staff salary is NRs 2,000 (US$28) per month. Repair of telecentre hardware, and technical support requests are provided free of charge by the Kathmandu University IT Club.

The membership fee structure is as follows: For individuals, a lifetime membership costs NRs 4,000 (US$55), an annual membership costs NRs 600 (US$8), a bi-annual membership costs NRs 300 (US$4), and a monthly membership costs NRs 50 (US$0.70). Organizational annual membership costs are between NRs 1,500 (US$21) and NRs 4,500 (US$62). Additional fees are associated with computer training topics.

As part of Nepal Telecommunication Corporation's (NTC's) policy, the Rural Telecommunications Fund (RTFD) was also created in 2000. The concept of the RTFD was to require the service provider to contribute four per cent of gross revenues to the fund[20], similar to the Universal Service Provision Fund concept. NTC is the fund administrator, and funding is distributed through a competitive bidding process. Unfortunately, contributions to this fund, and administration of the fund were halted due to the political turmoil in the country, and then disbursements were further delayed due to lack of funding resources. Also, as part of the ICT Policy of His Majesty's Government of Nepal (HMG/N), there is a mandate to establish a fund at the national level by mobilizing funding resources from HMG/N, international donor agencies, and private enterprises to promote research and development among ICT activities.

The establishment of an information technology bond and a venture capital fund based on public – private partnership was proposed as a measure to

[20] *"Peru and Nepal Funds", Intelecon Universal Access Project Profiles, Intelecon Research and Consultancy, http://www.inteleconresearch.com*

mobilize additional financial resources. HMG/N proposed an initial investment of NRs 100 million (US$1.37 million)[21]. Private enterprise contributions were requested through revenues generated from the sales of software. For example, the export of software developed in Nepal would levy a service charge of 0.5 per cent for the purposes of contributing to the fund.

Private enterprise participation may increase with the development of an IT Park in Banepa, Nepal. The idea to create IT Parks was conceived in 1994, but government funding to commence building was received in 2000. Estimated cost of the Banepa IT Park is NRs 250 million (US$3.4 million), out of which NRs 130 million (US$1.8 million) has been spent on construction work. Also, as of May 2004, the first private telecommunication operator, United Telecom Limited, has come into existence, and the first private rural operator, STM Telecom Media, will establish a minimum of two telephone lines via VSAT to each of the 534 village development councils by May 2006[22]. STM Telecom Media will pay royalty fee to HMG/N for running the telecommunication service. HMG/N in turn will waive the Rural Telecommunications Development Trust Tax for five years.

HMG/N's long-term goal is to establish telecentres in 1,500 Village Development Centres (VDCs) around the country with strategic focus on content development and social appropriation, sustainability and community ownership issues. HMG/N requires private sector participation to expand telecommunication access to rural areas. Accordingly, VSAT, Wireless Local Loop (WLL), and Global System for Mobile Communications (GSM) have been opened for private sector participation. Equipment and service usage of the telecentre requires membership. Based on information received from Rural Telecentre Panauti-2[23], only nine of the 15 telecentres have been established.

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[21] *"Information Technology Policy (2000) – Nepal", National Planning Commission, http://www.logos-net.net/ilo*

[22] *"STM Telecom Media to run phone service in eastern region", Kathmandu Post, Nov. 23rd, 2003, http://www.nepalnews.com/content*

[23] *"Rural Telecentre Panauti-2", Subbagawn, Kavre, kavretc@ric.net.np*

Lack of electricity, telecommunications infrastructure, and funding are major obstacles, similar to any under-served area within the Asia-Pacific region. Additionally, the volatility of the current political situation, leadership vacuum due to the dissolution of the local governance body, and lack of security in rural districts are limiting community mobilization work. Sustainability of funding is a concern especially since HMG/N is initiating the necessary funding, and private partnership is required to ensure funding continues for equipment maintenance, upgrade, and support purposes. Creation of locale specific content is important for community user's to visualize the benefits of ICT.

THAILAND

Increasing Computer Ownership

Before 2002, telecommunication services in Thailand were handled by the Ministry of Transport and Communications. Information technology was grouped within the Ministry of Science and Technology until the Ministry of Information and Communication Technology (MICT) was created in October 2002. The purpose of the MICT was to focus on five key development goals such as e-government, e-commerce, e-industry, e-education, and e-society[24].

The budget PC project or the **ICT Computers for Thais Project** as it was officially known, was introduced in 2003 by the MICT. The purpose of the project was to bridge the digital divide and turn Thailand into a knowledge-based society, by increasing IT literacy, through enabling the local population, primarily low-income citizens, students and government officials to purchase and own their first computer. The project was also responsible for stimulating the market and competition from entry-level PCs.

[24] *"Thailand's Road to Better ICT and Software Industry", http://www.business-in-asia.com/telecom_software_electronic.html*

The project was initiated in three phases (May 2003-Jan. 2004): the Budget PC project, the Notebook for Civil Servants project and the Notebook for General Public project[25]. The Royal Thai Government (RTG) in public-private partnership collaboration with local hardware vendors, software vendors, and commercial banks decided to sell desktop computers at a cost of US$250, and laptop computers at a cost of US$400-1,000, inclusive of software costs. The desktop PCs were produced by private enterprises such as Belta, Atec, and Computec, and laptop computers by Dell, SVOA and IBM. The PCs utilized three necessary components such as CPU chip, hard disk, and CRT that were locally assembled in Thailand. The PCs were typically equipped with Intel Celeron 1.0 GHz processor, 128 MB RAM, 20 GB hard disk capacity, 15-inch CRT (monitor), and peripherals such as mouse, keyboard, and speakers. Both desktop and laptop PCs are bundled with either the open-source Thai Linux OS & Office Program or Microsoft Windows XP Home & Office XP Thai Edition.

The computers were available through favourable financing options provided by financial institutions and government subsidies in terms of interest on loan for government officials. The RTG assisted with maintenance/support calls. Government run banks, namely, Government Savings Bank, and Krung Thai Bank provided low-cost two-year loan arrangements.

Eighteen local manufacturers, all members of the Association of Thai Computer Manufacturing (ATCM) assembled the hardware. The MICT of the RTG managed the project, and handled the public relations. The Communications Authority of Thailand (CAT Telecom since August 2003), a state-owned telecommunications agency, provided after-sales service. National Electronics and Computer Technology Centre (NECTEC) localised the Linux operating system, certified the quality of the products, and Thailand Post, a state-owned postal operator, distributed the PCs and notebooks. Distribution channels were further expanded to enable users to order low-cost PCs through local convenience retail store chains such as the 7-Eleven, and local bookstores. The PC would then be delivered via the postal service.

Almost 40,000 people attended the launch of the budget PC project to purchase their first computers during phase one. By November 2003, over 127,000 desktops had been purchased by first-time PC users. By August 2004, over 200,000 desktop PCs had been purchased. Some follow-on phases included the distribution of laptop PCs. The laptops were configured with Pentium III –

[25] *Lui, John, "Cutting the costs of IT", August 13th, 2004*

1.3 GHz CPUs costing 27,000 baht (US$700), and a Pentium-M CPU costing 39,900 baht (US$1,000). Private enterprises Dell, IBM, and Jade Quantum responded to the distribution of laptop PCs[26]. From the beginning, Microsoft Corporation offered consumers Microsoft's Windows XP Home & Office XP Thai Edition, at US$40, compared to a retail cost of at least US$340. Microsoft was then under increasing pressure to adjust its policy of charging the same price for Windows across the world.

In the Asia-Pacific region, the single-price policy was considered cost prohibitive. Although Microsoft was not willing to make any changes to their universal software pricing scheme, they were willing to make adjustments to special educational or government funded initiatives such as the budget PC project. As a direct result of Microsoft's participation in this project, however, they eventually launched in the last quarter of 2004 localized versions of Windows XP in certain selected countries including Thailand where the Windows XP Starter Edition retails for only about US$50.

With a dramatic increase in PC penetration rate, from 2.43 per cent in 2001 to 6.5 per cent in 2004 on project completion, it is predicted that Thailand will attract both local and international businesses related to software development including system integrators, multimedia products, and content producers. The incentives for software businesses of the Board of Investments (BOI) include an exemption from corporate income tax for eight years, and an exemption from import duty on machinery/hardware for eight years.

The budget PC project benefited Thailand by increasing user awareness, and vendor competition at low price points. Other countries such as Malaysia, Indonesia, and Viet Nam also implemented similar programs[27] while Brazil, South Africa and Mongolia have shown their interest in the program.

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[26] *Yoong, Siat-Siah, and Bryan Ma, "Low-cost PC Programs Spread in Asia", IDC Opinion, Asia/Pacific Quarterly PC Tracker, September 2004*

[27] *Chai, Winston, "Microsoft joins low-cost PC scheme in Malaysia", CNET Asia, 2/3/2004*

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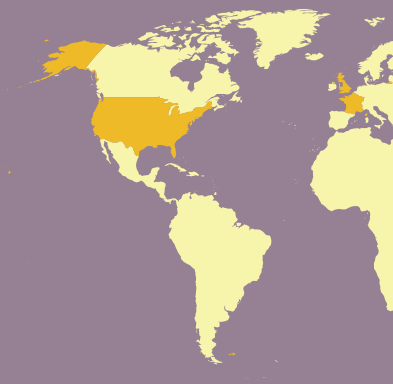

The regional perspective is an important intermediary stage between national particularities and the global requirements of the Information Society. Regional integration efforts contribute to the development of the global Information Society and make strong cooperation within and among regions indispensable. The regional dialogue is contributing to capacity-building and to the alignment of national strategies with the goals of the World Summit on the Information Society.

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