

Lao

Lao PDR

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Overview

As of March 2005, Lao PDR, a landlocked country in Indochina with a land area of 236,800 sq km, had a total population of 5.62 million. Majority (73 per cent) live in rural areas, down from 83 per cent in 1995 as a result of significant rural–urban migration. The population density in 2005 was 24 persons. Of the 952,386 households in the country, almost 50 per cent have access to electricity through the national grid, another 10 per cent have electricity from generators or car batteries, and about 40 per cent have no access to any electricity supply.

More than a fifth of the population (23 per cent) has never been to school, 28 per cent are in school and 47 per cent have left school. A much higher percentage of women than men have never been to school (30 per cent of women compared to 16 per cent of men). About 16 per cent have completed primary school, 6 per cent have completed lower secondary and 5 per cent have completed upper secondary. Few are able to complete the highest level of education even with increasing basic education enrolment rates. According to the 2005 census, 73 people out of 100 are literate.

From 2000 to 2005, GDP growth averaged 6.2 per cent annually. The growth of the economy in 2005 was 1.3 times more than that of 1995, with an average annual per capita of USD 490. All economic sectors have grown both qualitatively and quantitatively. Agricultural production reached 3.4 per cent, industry reached 11.3 per cent and services reached 6.7 per cent growth in 2005.

The ICT sector in Laos is lagging behind the ICT sectors of its neighbouring countries. Even within the country the ICT sector is making slow progress compared to other sectors. This is

Total population	5.62 million ^a (73 per cent rural population)
GDP per capita	USD 490 ^a
Telephone lines per 100 inhabitants	1.62 ^b
Cell phone subscribers per 100 inhabitants	12.8 ^b
Computer ownership per 100 inhabitants	0.88 ^c
Internet users per 100 inhabitants	0.35 ^d
Websites in Lao languages	30 ^d
Websites in English	250 ^d
National transmission backbone	2.5 Gbps via fibre, 34 Mbps via microwave and 512 Kbps via satellite ^b
International bandwidth	310 Mbps (256 Mbps via fibre, 34 Mbps via microwave, 20 Mbps via satellite) ^b

Sources: a. National Statistics Center
b. Ministry of Communication, Transport, Post and Construction
c. Science Technology and Environment Agency
d. Lao National Internet Committee

because ICT has not yet been identified as a priority programme for national development and there is a lack of trained human resources. Consequently, Laos relies on foreign cooperation for both specialists and consultants, as well as for financing, soft loans and financial grants.

The government recognizes that ICT is essential to the country's overall social and economic growth and development, and that it is necessary to increase ICT service penetration to the levels that are available among Lao PDR's regional neighbours and major trading partners. Increased availability of modern telecommunications services and ICT services will stimulate domestic economic growth and enable greater participation in ASEAN and in the global information economy. For this reason, and in spite of its technical, financial and human resource problems, the government is working hard to narrow the digital divide between Lao PDR and other Asian countries.

Technology infrastructure

Although telecommunications has second priority status to roads, water and electrical power, Laos has an aggressive programme to establish a national information infrastructure based on optical fibre. At least 15 provinces are already connected and operable. So far, the passive fibre optic connection has been installed, connecting all 17 provinces. The national fibre backbone is already being used for domestic telecommunication, both fixed and mobile, as well as for international Internet access. The domestic part of the Internet, however, is still not developed. In order to better exploit the existing national fibre backbone,

the transmission capacity of the links in the domestic part of the Internet should be increased to provide for more users, new domestic applications and new services (the so-called triple play services of data, audio and video services require a capacity that is several orders of magnitude larger than the existing). All of these will lead to a dramatic increase in domestic traffic volumes. And thanks to the existence of the local Internet exchange (called Laonix) operated by the Science Technology and Environment Agency (STEA), domestic traffic can be kept local and will not depend on international links.

The current telecommunication network infrastructure being provided by ETL (Enterprise Telecommunication of Laos), LTC (Lao Telecommunication Company Ltd), LAT (Lao Asia Telecommunication Company Ltd) and Sky Telecom enables all types of telecommunication services such as international gateway, fixed-line, mobile telephone and Internet services, including VoIP. MILLICOM provides mobile telephone service.

By 2007, under the e-government action plan, STEA is mandated to establish the national e-government infrastructure of the following networks:

- **Multi-service Transport Backbone**—The 2.5 Gbps greater terrestrial transport backbone to be built in Vientiane will interconnect 50 ministry offices within a 20 km radius to the National Data Center (National e-Government Service Center) in a ring and star-topology. This will be a true multi-service transport backbone capable of carrying a mix of TDM, IP, Ethernet, ATM and FR traffic. Each ministry office will be equipped with a two-fibre core (in one of four optic fibre cables) carrying the bandwidth between offices and the National Data Center. To accommodate future growth, a minimum 18-core fibre optic cable is recommended.
- **Metropolitan Area Network (MAN) by Wireless Broadband Access**—Ministry offices that are not located on the Multi-service Transport Backbone or have distances of more than 20 km will use various forms of wireless access technologies, such as bridge Wi-Fi, 802.16 rev d/e WiMAX, or Point-to-Point Microwave. This wireless broadband access sub-project will provide 50 ministry offices with a high-speed link to the nearest Multi-service Transport Backbone to enable these remote offices to gain access to the National Data Center.
- **Communication Infrastructure for the Rural Communities**—The existing network infrastructure of LAT and, if necessary, ETL and LTC (such as LAT optic fibre transmission network) will be used to deliver public services to provide last mile connectivity to 17 provincial offices, 141 district offices and 1,200 village administration offices. Depending on the current state of LAT or ETL or LTC infrastructure and the geographic areas and terrain condition, the plan is to

bring in a mix of wireline and wireless technologies to build a cost-effective solution for rural communities. This way the current digital divide can be bridged and e-government programmes and services can be brought closer to the rural communities.

ICT industries and services

Currently there are five telecommunication operators with a PSTN line capacity of 145,729 lines of which 91,289 lines are in use. A fibre optic STM-16 with a capacity of 2.5G connects all 17 provinces. There are 338 public telephones and 793 rural telephones covering 118 of 141 districts.

Twelve companies, including five telecom operators, have been granted Internet Service Provider (ISP) licenses. However, only six companies are able to provide the service, as the rest have problems setting up their own Internet infrastructure and marketing plan. There are about 300 Internet cafés in the country; about half of these are in Vientiane and about a sixth are in the Luang Prabang province. Around 20,000 Laotians use the Internet regularly; most of them are students. The main purpose of Internet use appears to be chatting as well as other forms of online entertainment. Internet use for education and research is limited as students connect to the Internet via Internet cafés and Internet use in universities and colleges is reserved for the administration only. Government and project staff who access the Internet in their offices comprise the next biggest group of Internet users.

There is generally no problem finding computer equipment and software in Vientiane, where there are around 67 computer companies (resellers) of which half are joint ventures with foreigners or local distributors of international brand names. The same cannot be said of the provinces however. In fact, three provinces in the north and two provinces in the south do not have any computer service companies.

A relatively large number of small businesses import computer parts and assemble computer systems according to customer specifications. There is a 5 per cent import tax on office supplies, computers, photocopiers and peripherals, which in many countries would be marginal but which is high in Lao PDR, since the purchasing power is so constrained. If it is intended for resale or retail, the import tariff is 10 per cent for office equipment. For telecom equipment, the import tariffs are 3 per cent for office use and 10 per cent if intended for resale/retail. There is also a 3–5 per cent profit tax, bringing the total tax to 18–20 per cent. There is an ongoing debate on whether to lower the tariffs to stimulate the sector. Specialized items, larger servers, telecom equipment and the like are generally ordered

internationally. There is an important second-hand market serving the large segment that finds new computers and equipment too costly. A new PC costs around USD 1,200 in Lao PDR.

Most ICT-related consulting services, including system administration, development, integration and programming, can be found in Vientiane. However, perhaps due to limited capacity or the low quality of services, large ICT projects tend to be awarded to foreign companies or companies with foreign consultants.

There is a limited understanding of intellectual property (IP) rights. Software piracy is common, due mostly to inability to pay for proprietary software. There is great interest in open source software. However, Linux platforms have not yet taken off.

There is hardly any investment—whether foreign or local—in IT production in Lao PDR. Yet the government has been successful in attracting some investment (both foreign and domestic) into the telecom sector as well as for IT human resources generation. The investment policy encourages private investment in telecommunication and in IT training. Though there is no explicit policy for attracting investment in ICT, the Decree of the Prime Minister (No. 46/PM) states that hardware consultancy, software consultancy and supply, data processing, maintenance and repair of office, accounting and computing machinery, and areas relating to human capital formation like general education, technical and vocational secondary education, and adult and other education, are open to foreign (as well as domestic) investment without any restrictions.

Investments in the country’s ICT sector have so far been confined mostly to ICT services. There is a need to focus on promoting investment in the production of ICT goods. This is because in an economy like Lao PDR, investment in ICT production might act as a catalyst in sustaining the use of ICT. Moreover, the production of information technology goods offers an opportunity for the country to diversify its export basket. Given the landlocked nature of the country, engaging in the production of any transport-intensive goods may not be advisable. However, it might be possible to enter into the production of certain ICT goods with a low level of technology like passive components, electromechanical components and other intermediate goods for the ICT industry and less skill-intensive IT-enabled services.

Digital content

The National Data Center established under the Lao PDR-India cooperation on ICT was inaugurated on 28 May 2006. This state-of-the-art centre is designed to be the nerve centre of all e-governance activities in Lao PDR. It has a storage area network (SAN) with a capacity of 1 Terabyte backup from a

Tape Library, multiple Web servers, application servers and database servers.

The national portal (www.laopdr.gov.la) was launched at the same time as the National Data Center. It is intended to be the gateway to a variety of information and services provided by different government departments. It shall also provide base infrastructure for various government entities to launch their own websites and other e-governance initiatives on the Internet. Considered the digital face of the Government of Lao PDR, the portal is based on an Open eNRICH v4.0 Community Software Solution framework developed by the National Informatics Centre, the Government of India in collaboration with UNESCO, and OneWorld International Foundation.

In addition, the Government of Lao PDR has identified as core activities of the national and provincial government back-office computerization with a citizen interface and the development of Web-based content in the Lao language in the areas of government reporting, culture and heritage. To be developed by STEA in the next two years are systems for e-reporting, e-documentation, e-procurement, e-registration, e-project management, e-maps, e-taxation, decision support, SMS and teleconference.

Other ongoing initiatives with donor assistance are:

- The e-tax system of the Department of Tax with assistance from the Swedish International Development Agency (SIDA).
- A database of government employees being developed by the Public Administration and Civil Servant Agency with assistance from the United Nations Development Programme (UNDP).
- A Social Insurance System being developed by the Ministry of Labour and Social Welfare with assistance from the International Labour Office (ILO).
- A driver’s license and transport database being developed by the Ministry of Communication, Transport, Post and Construction with assistance from the Australia International Development Centre.
- An education database being developed by the Ministry of Education with assistance from the French Development Agency.

However, there is still very limited online content in the Lao language. This is due to the lack of Lao language versions of most software applications, as well as low Internet and computer penetration especially in the rural areas.

There are some online newspapers in Lao, such as the *Pasaxon Newspaper* (<http://www.pasaxon.org.la>), the *Lao News Agency* (<http://www.kpl.net.la>) and the *Vientiane Mai*

Newspaper (<http://www.vientianemai.net/indexder.php>). Lao National Television (<http://www.lntv.gov.la>) has a website, as does Lao National Radio (<http://www.lnr.org.la>).

Other local websites are those of the:

- Lao National Tourist Information Service (<http://www.tourismaos.gov.la>)
- *Vientiane Times Newspaper* (<http://www.vientianetimes.org.la>)
- *Lerenovateur* (<http://www.lerenovateur.org.la>), a newspaper in French
- Lao Trade Promotion Center (<http://www.laotrade.org.la>)
- National Statistics Center (<http://www.nsc.gov.la>)
- *Update Magazine* (<http://www.laoupdate.com>)
- Lao Localization Development Effort (<http://www.laol10n.infor.la>)
- Inlao.net contains stories, jokes and entertainment in both Lao and English, while mahasan.com is an information resource on Laos.

Online services are provided by the Planet Internet Service Provider (<http://www.planet.com.la>), Lanexang Internet Service Provider (<http://www.lanexangnet.com/>), Lao Airline Service Company (<http://www.laoairlines.com>), Lao Telecom Company Ltd. (<http://www.laotel.com>), Enterprise Telecom of Laos (<http://www.etllao.com>) and Lao National Internet Exchange (<http://www.laonix.net.la>).

ICT policies and programmes

National ICT policies

The overarching national goal is to advance beyond LDC (least developed country) status by the year 2020 through sustainable and equitable development. To realize this vision, the Government of Lao PDR aims to bring the country into the information age by increasing general access to ICT through the provision of modern telecommunications infrastructure and computer networks, by fostering enterprise and industry, by promoting research and development in ICT and by developing the necessary human resources and institutional capacities. Nine priority policy areas have been identified by the government: Infrastructure and Access, Enterprise and Industry, Research and Development, Applications, Human Resource Development, Legal Framework, Awareness, Poverty Alleviation and Standardization and Localization.

The National Policy on ICT aims to ensure that the necessary institutional, human capacity, sectoral conditions and legal frameworks are in place for leveraging and applying ICT to meet

the needs of the country. A National ICT Board (NICTB) will be formed to carry out the tasks outlined in this policy document.

Telecommunications policies

Following a review of the state of the telecommunication sector and the future telecommunication requirements of its citizens, the government has formulated a new telecommunications sector policy framework. The policy objectives are to develop the national telecommunication infrastructure especially in regional and remote areas of the country; to establish a financially viable telecommunications sector through sustainable investment in telecommunications infrastructure by the private and public sectors as well as aid agencies; to improve the efficiency and effectiveness of telecommunications service delivery to end users; to achieve cost-effectiveness in meeting end-user demand for telecommunications services at affordable prices; and to strengthen regulatory capability and skill sets within government so as to ensure a high standard of sector governance and oversight of market participants.

The government has adopted the following major policy initiatives which are collectively designed to achieve the telecommunications sector policy objectives mentioned previously:

- Issuance of telecommunication regulations based on the existing Telecommunication Act 2001 for the effective governance of the telecommunications sector.
- Overhaul of sector regulation to ensure efficient and effective supervision and management of the sector. Specifically, a new Telecommunications Regulatory Authority within the Ministry of Communication, Transport, Post and Construction will be created.
- Requiring all operators to secure the relevant licenses under the Licensing Regulation. Licensing fees will be paid into the Consolidated Revenue and/or the Telecommunications Development Fund (as originally created pursuant to Article 5 of Telecommunication Act 2001).
- Encouraging network interconnections to ensure non-discrimination between operators and to ensure good communication quality.
- A moratorium on the issuance of new major network facilities or service licenses to any new entity pending a review of sector policy in 2007.
- Promotion of fair competition, facility sharing and collocating of equipment.
- Appropriate management of telecommunication resources such as radio frequencies, numbering, rights of way and Internet domain names.

- Monitoring and control of the cross-subsidization and accounting separation of the significant market power operator.

e-Government action plan

The vision for implementing e-governance in the country is to adopt ICT tools across various tiers of administration at the ministries, departments, provinces, districts and villages of Lao PDR to bring about SMART Government and offer appropriate interfaces to the people (in cities as well as villages) through electronic delivery channels. The e-government objectives are: anywhere, anytime access to government information to bring about transparency, efficiency and empowerment of citizens; e-delivery of government services to citizens through Web and Integrated Citizen Service Centres, which are expected to be particularly beneficial to poor communities in remote areas; increased internal efficiency and prompt delivery of citizen services; and strengthening of communitization.

ICT for development

The first multi-purpose telecentre in Laos

The developmental opportunities arising from strategic use of ICT are to be demonstrated with the establishment of a multi-purpose telecentre in the provincial capital in Luang Prabang and eventually in rural communities. The project started in 2003 with support from the International Development Research Centre (IDRC) of Canada. The ultimate goal of the project is to 'help create opportunities and reduce poverty by utilizing the benefits of connecting rural communities and integrating ICT in their daily activities'.

The telecentre at Luang Prabang is running at full capacity. Nicknamed 'e-Way', it is open seven days a week. There is a long queue of people who have signed up to attend the courses being given at the e-Way Centre. The centre is actively supporting training to increase the number of people in the community with basic computer skills and English language competence. In the last three years, the centre has trained over a thousand trainees, which contributed to the ICT development of the province. For example, the number of computer training schools in the area increased to more than 10 and a third of the school owners and at least one teacher from each training school were trained at the e-Way Centre. Moreover, there are now more than 50 Internet cafés in the area, with many of the Internet café owners trained at the e-Way Centre.

However, the e-Way has not achieved all of its objectives. In particular, it has not become a place for information access and dissemination for the people of Luang Prabang because of the lack of Internet connectivity, which in turn is due to the centre's inability to afford the fees (telephone charges). Potentially, the telecentre can sustain itself, but there is a difference of opinion between local government and project personnel regarding the management of the telecentre. The management was revamped toward the end of 2004 and the telecentre now offers telephone and fax facilities mostly to small business people. The services have not yet been extended to the rural areas as envisaged.

The National Internet Exchange Point

The project aims to connect the six different ISPs in Laos through an Internet Exchange Point (IXP). Currently, each ISP has its own leased line to a foreign country where they connect to the global Internet. If the ISPs could be connected through an IXP in Laos, there will be both economic and technical gains, since the ISPs could have a reduced traffic load on their leased lines and therefore pay less. Laonix, as the IXP is called, will make Laos less dependent on the narrow interconnection to the international Internet as it will be possible to keep local traffic local by interconnecting all commercial Lao ISPs and the academic network. End users will benefit from a faster network when they access local content within Laos. The project was initiated by LANIC, which hopes that with the support of SIDA, IXP will create an environment suitable for local ICT development within Laos.

A policy framework and digital standardization for information exchange in Lao

This ICT4D Project supported by UNDP aims to harness the potential of ICT for enhancing progress towards national development goals, by strengthening the capacities of STEA to establish and manage national ICT standards. The project consists of two components: (a) strengthening the government's strategic framework for ICT policy development; and (b) improving the utilization of the Lao language in electronic communication through the development of a standard Lao character set.

The first component builds on a UNDP sub-regional project that helped develop a national ICT policy which sets the foundation for an ICT Master Plan. This draft plan outlines the priority development initiatives involving ICT, and the required coordination arrangements and funding. The project aims to help raise awareness of and to disseminate the approved national ICT policy.

Through the second component, the project provides initial assistance to STEA in formulating and implementing standards for entering, storing and processing digital information in the Lao language. The ability to communicate electronically using the Lao language is currently hampered by the absence of a standard Lao character set, that is, the standards to enter, store, display, print and exchange Lao text on computers. Standardized use and application of the Lao language in digital data exchange will enable use of the Lao language on the Internet, enhance public and private sector performance and help preserve Lao culture. Activities in this regard will be developed under the guidance of a broad-based network of stakeholders led by STEA.

Legal and regulatory environment for ICT

The Ministry of Communication, Transport, Post and Construction (MCTPC) is responsible for national telecommunication policy and regulation. The Department of Post and Telecommunications is the functional unit within MCTPC whose tasks include telecom and post policy, frequency management, long-term development strategy, licensing and regulation. The MCTPC issued Telecommunications Act No. 02/NA in 2001.

The Lao National Internet Committee (LANIC) is responsible for national Internet policy and regulation, including the approval of ISP licenses and Internet café licenses. On 15 April 2000, LANIC issued Regulation No. 141/pmo on the implementation, service and usage of Internet systems in Laos.

The Science Technology and Environment Agency (STEA) is responsible for national information technology policy and regulation, including approval of computer-related business licenses. STEA is currently developing cyber law and e-government regulation.

However, a major problem is that the areas of responsibility of MCTPC, LANIC and STEA have not been properly defined. Lack of coordination and overlapping responsibilities have contributed to a situation where these organizations are engaged in drafting competing ICT policy and regulation papers to be presented before the legislature for selection and approval. In sum, although significant progress has been made particularly in fibre infrastructure networks, ICT4D efforts in Laos have generally been rather slow, fragmented and uncoordinated. In this connection, there are discussions about establishing a Ministry of Information Communication Technology that would combine the ICT-related activities of MCTPC, LANIC and STEA. There are also talks of establishing an independent ICT regulatory body.

Open source

The Lao government supports open source software because it is free and anyone can develop it. It saves a lot of money when compared to other software applications, according to the Department of Science and Technology. However, there is no concrete policy and strategy for promoting open source software. In the national ICT policy paper, there are few statements related to open source. For example, in the Human Resources Development section it states that the Government of Lao PDR shall focus on world-class curriculum development for the Bachelor and Master’s degrees in Computer Science/Engineering and degrees related to ICT, and that the government shall promote the integration and teaching of free and open source software (FOSS) in the computer science/engineering curricula. The section on Standardization and Localization stipulates that the government shall establish a network of national and international experts from the academe, government and the private sector to give advice on all issues relating to the localisation of ICTs, including open source and proprietary software.

The UNDP-supported ICT4D project being managed by Anousak Souphavanh, the author of LaoNux, has made much progress on the localization of open source software into the Lao language. Specific achievements include:

- Phetsarath Fonts—With the assistance of a calligrapher and graphic designers, a new aesthetically pleasing font has been developed. Called Phetsarath OT, it will be released for public use soon. The font is UNICODE Open Type, and therefore based on open standards.
- An open source e-mail client called ‘Salika’ is being developed as an option for Lao users to replace Microsoft Outlook. It is also UNICODE-enabled, with Lao language menus.
- A Lao version of Open Office (named Xangdao) is being developed to lower the threshold for low-income Lao people with limited English skills to benefit from computers. The product is a multi-platform productivity application suite that can be installed on Windows or any other computer operating system.

Research and development

There are hardly any publications available that would indicate that there is genuine research going on. There is also no research institute in Lao PDR. Independent researchers customize foreign software applications for resale in the local

market. The significant research initiative can be seen only at the Information Technology Center of STEA, which has established the open source laboratory and R&D division for software development.

The Information Technology Center is implementing the Lao Localization Project under the PAN Localization Project, the regional initiative to develop local language computing capacity in Asia supported by IDRC of Canada. The Natural Language Processing (NLP) Group of Lao PDR composed of an architecture team, a linguistics team and a programmer, was established in 2003 to carry out the research on Lao localization. During the first phase, from 2003 to 2006, the NLP completed the development of a Lao character set, Lao fonts, Lao keyboard, Lao ASCII to Unicode converter, Lao syllabification and line breaking utility, and Lao collation and sorting utility. In the second phase, from 2007 to 2009, the NLP will conduct the research work on translation of gTLDs and ccTLDs in Lao, Corpus Translation Phonetic Module for Lao TTS, Lao Speech Corpus, English-Lao Parallel and Aligned Tagged Corpus 100k words, Lao TTS and Lao Diphone Database. This phase will also include the localization of Open Office and the creation of e-content.

Education

As of now, computer and IT-related education in Lao PDR is provided not only by the National University of Lao PDR (NUOL) but also by the private sector. The computer science programme of the NUOL began in 1998 under the Faculty of Science, Department of Mathematics. Every year since 2002, the programme has produced around 30 graduates.

The Faculty of Engineering and Architecture (FEA) is considered to be the best equipped with IT facilities in the NUOL system. The main component of these facilities is the Lao-Japan Technical Training Center (LJTTC), which offers a combination of general application courses, computer-aided engineering courses and a course on network software. In 2002, with assistance from the Japan International Development Agency (JICA), the faculty implemented an IT bridging course, a two-year programme leading to a Bachelor of Information Technology Application after completion of a Bachelor's degree in mathematics, electronics, engineering or management. Forty ICT specialists have graduated from this programme, which has a capacity of 20 students per year. The target is to graduate 100 graduates and to establish a Master's level phase.

The vacuum in IT education facilities in the public sector is filled, at least partly, by the private sector. The following private colleges are currently providing IT education, albeit at a very preliminary level: Vientiane College, a private institution with

the academic and financial support of Monash University in Australia; Lao American College which has established working relations with the NUOL, City University of Washington State, USA, Ohio University, USA and Bangkok University, Thailand; and Quest Colleges which has a joint venture with Vaasa Polytechnic in Finland. In addition to these educational institutions with foreign investment, there are local initiatives like Rattana Business Administration College, Com Centre Collage, Sengsavanh Collage and Sousaka Collage. There are also a number of computer dealers providing short-term training in computer operations.

Through the Laos-India ICT Bilateral Cooperation, the National Informatics Centre is setting up an ICT Training Laboratory with 25 computers, software tools, training accessories and the required infrastructure at the Information Technology Center of Laos. In addition, a four-course computer training module (on Office Productivity Tools, Database, Web Development and Network System) for 150 government officials has been conducted.

Under the e-Government Action Plan, by 2007 STEA will be implementing an ICT human resource development programme with the following components:

1. Construction of three computer training rooms at STEA;
2. A three-month training scholarship at the ICT engineer level for 30 members of staff of various government organizations at Alcatel Shanghai Bell University;
3. Training courses at engineer level at the Training Center in Vientiane for 260 staff members (142 staff members from districts, 18 staff members from provincial offices and 100 staff members from government ministries);
4. Onsite computer training in the provinces for at least two weeks for 30 participants;
5. Development of the training curriculum and training materials for STEA to carry out further training. The curriculum for engineers aims to reach international accredited standards in the following areas: office automation, database, networking, Internet, security, decision support system, e-government system and computer programming; and
6. Development of e-learning applications for the training curriculum.

An adequate supply of IT human resources is needed not only for effective use of the Internet and the generation of Internet content, but also for the country to enter the rapidly growing area of IT-enabled services. To meet this need, the Ministry of Education has adopted a 'top-to-bottom' approach in which the Ministry first develops ICT access and skills within the Ministry

Education over IP

With the installation of a fibre network and ongoing development of new applications, in particular IP telephony and video conference facilities built by a team of KTH students (Royal Technology Institute of Sweden), the National University of Lao PDR (NUOL) is now able to conduct distance education, mainly between the main campus and the remote campuses. Distance education will help solve problems arising from a shortage of qualified teachers.

In addition, university staff can now make internal telephone calls for free within the university using new IP phones or with special software installed on their computers.

NUOL is expanding its data network. By upgrading the wireless backbone to fibre, it has all of the opportunities to implement new applications for students and staff. The project was supported by SIDA.

itself, and then at the university level, and then finally within the schools. Given that the younger generation considers 'Internet and English as their lifeline', it may be advisable for the Ministry to consider a 'bottom-up' approach in which computer access and computer education shall be provided in primary and/or secondary schools.

Conclusion

Lao PDR is a country with a small population and limited financial resources. It faces many challenges, including an undeveloped road network, limited water and electricity supplies and undeveloped educational and health systems.

The ICT situation is no exception: telephony and data connectivity is scarce and unevenly distributed, although it is improving due to an aggressive deployment of a national fibre network and expansion of mobile telephony. There is a lack of both basic and advanced ICT skills. The negative ICT situation in general, with the limited ICT capacity and low computer penetration, is exacerbated by the fact that English proficiency is low, which in turn represents another training obstacle since most literature and training materials are in English. This problem is amplified by the fact that Lao people are as yet unable to study and work on computers in their native language. Last but not least, most people cannot afford a computer and, even if they could, only major urban areas have access to electricity and telephony services.

Several major technical remedies are underway, while the task of accelerating human capacity building remains. Several

initiatives in this area are ongoing, but not yet at a scale that brings broad impact.

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