

CHAPTER 10
HUMAN RESOURCE DEVELOPMENT

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10.1 General

There are numerous agencies, organizations and businesses in the Telecommunication sector. Human Resources Development in the Telecommunications sector, therefore, shall cover a huge area. In this chapter, the target will be to focus on the selected organizations such as an administration body (MCTPC), major telecommunication services providers (ETL and LTC), and training institutes (Telecommunication and Communication Training Institute: TCTI and National University of Lao: NUOL). There are two aspects, i.e. demand side and supply side of Human Resources Development (herein after called HRD). All the organizations are positioning at the demand side but the major mission of the training institutes (TCTI and NUOL) is to provide well trained or educated personnel to the society so that situation will be discussed in the following section.

10.2 Current Situation of Human Resources in the Relevant Organizations

(1) MCTPC

The telecommunication sectors in MCTPC are mainly broken into two Divisions under the Department of Post and Telecommunication¹, the Division of Telecommunication (herein after called DT) and Division of Radio Frequency Management (herein after called as DRFM). The number of staff in DT is five and six in DRFM including two Directors. The adequacy of the human resources in the Divisions depends on the quality and quantity of tasks assigned. The official tasks and job descriptions, therefore, will be an index for the adequacy.

The Official Tasks of the telecommunication sectors in MPTPC are summarized in the following table (Table 10.1). There are 23 major tasks implemented by the telecommunication related divisions, DT and DRFM with only 11 staff including Directors. These two Divisions are obviously suffering from a shortage, both in quality and quantity, of human resources in comparison with the tasks. While each task is a carried out by an individual, all staff have more than three tasks.

In addition to such relatively excessive task levels, the Telecommunication Act promulgated in 2001 assigns more tasks for the Divisions. The comparative table of the current tasks and newly required tasks are summarized and attached as

¹ All the organizations except NUOL aforementioned are under MCTPC but here the discussion will be focused on the organization of the administration body.

Chapter 1 Current Official Task and Official Tasks under Telecom Act in Supporting for Human Resource Development. In the Act, staff is required to exercise not only technical but also social and economic expertise as well as have basic knowledge of law and accounting. The MCTPC, for example, are requested to formulate the rules and regulations to determine the level of telecommunication administrative, service and copyright fees and evaluate the proposed fees and tariffs by the telecommunication service providers in accordance with the rules and regulations and corresponding to the social and economic situation. However it is almost impossible to presume the existing staff can operate at this level due to the shortage in number and their professional backgrounds. Another highlight of the Act is to require enhancing the Administrative capability for the MCTPC. The new tasks are to study and define strategic plans for the development of telecommunications and to formulate policies, plans, programs, and projects and to obtain funding for the development of telecommunications². In addition, in the Act, the Provincial and District officials of Communication, Transport, Post and Construction (DCTPC) are responsible for the management and inspections in each area. The Act aims to smoothly manage the national telecommunications system and to standardize business conditions however, from the point of view of human resources development, the Divisions are under-resourced.

Table 10.1 Current Official Tasks of the Telecom Division in MPTPC

Official Task Current	Job Description
Draft national telecommunications regulations and legislation	DT*
Determination of standardizations for telecom equipment and radio telecommunications	DT
Study telecommunications technologies	DT
Promotion and supervision of the enterprises	DT
Maintenance of the relationship with ITU, ITU-T, ITU-R, APT, etc.	DT
Technological study on switching and data communications	DT
Study and inspection of switching and data communication equipment	DT
Study and inspection of radio communication equipment	DT
Study frequency pricing and relations with Intersputnik and Intelsat organization	DT
Recording the radio communication statistics	DT
Recording the switch and data communications statistics	DT
Technical study on radio communication HF, VHF, UHF, SHF, EHF	DT
Study telecommunications tariffs and accounting rates	DT
Draft regulation on frequency management	DRFM
Promotion and Monitoring the application of the regulation of frequency management	DRFM
Frequency allocation and revocation	DRFM

² There is a Division of Planning and Budgeting in the Department but the Division is responsible for the preparation of financial information to submit to the Financial Department and for conducting the budget plan.

Official Task Current	Job Description
Preparation of permission to import radio equipment and license to authorized users	DRFM
Billing for allocated frequency	DRFM
Notification of frequency to ITU-R / Liaison of International Organization	DRFM
Recording the allocated frequencies	DRFM
Monitoring the allocated frequencies and search for unauthorized use of frequencies and unauthorized frequencies	DRFM
Inspection and adjustment of radio stations causing harmful interference	DRFM
Monitoring and measuring the frequency causing harmful interference	DRFM

Note: DT: Division of Telecommunications, DRFM: Division of Radio Frequency Management
Source: The Study Team Summarizes based on "MCTPC Support to the Regulatory Body for Telecommunications, December 1999".

(2) ETL

ETL was established in 2000 so it possesses only two years experience³. The total number of employment stands at 126 personnel including the provincial staff. Almost of all the staff was transferred from LTC therefore they trained in the LTC.

ETL is composed of seven divisions; Administration Division, Finance & Accounting Division, Planning & Development Division, Transmission Division, Switching Division, Customer Service Division, and Audit Division (there was no staff in 2001) and five provincial branches; Louang Prabang, Paksan, Thakhek, Savannakhek, and Champasak in 2001 (refer to Chapter 2 Organization Chart of ETL in Supporting for Human Resource Development). Around 90 % of the total staff works in the Vientiane headquarters. The proportion of technical sector to the total in the headquarters was around 60 % in 2001. ETL has a future plan of employment targeting the year 2005. The plan indicates that the number of employees in 2005 will be 536 and the proportion in the provinces will increase slightly. On the other hand, the proportion of technical section personnel in the headquarters will decrease from 60% to 50%.

Table 10.2 ETL Staff for year 2001 and target for year 2005

Location	Oct. 2001		Future (e.g. 2005)	
	Male	Female	Male	Female
Headquarters	93	19	286	73
Administration Division	24	6	72	18
Finance & Accounting Division	3	4	15	24
Planning & Develop Division	13	0	30	2
Transmission Division	20	1	60	3
Switching Division	28	5	90	9

³ The ETL here is different from the former ETL, which was merged with Shinawatra to be LTC.

Location	Oct. 2001		Future (e.g. 2005)	
	Male	Female	Male	Female
Customer Service Division	5	3	15	15
Audit Division			4	2
Branch Provinces	12	2	122	55
Louangprabang	3		10	5
Paksan	3		10	5
Thakhek	2		10	5
Savannakhck	2	1	10	5
Champasak	2	1	10	5
Louangnamtha			7	3
Houaphan			5	2
Boukeo			5	2
Phongsali			5	2
Saravane			7	3
Sayaboury			7	3
Xiengkhouang			7	3
Vientiane Province			7	3
Oudomxay			7	3
Attapeu			5	2
Special Zone			5	2
Xekong			5	2
Grand Total	105	21	408	128

Source: ETL

During the next 4 years, ETL plans to employ more than 400 staff. It will carefully assess the capability of supply side since it will be difficult to make LTC be a labor pool.

The staff training in ETL is limited now. Around 10 technical staff are dispatched to TCTI to train in long-term courses.

(3) LTC

LTC, established in 1996, was a monopolistic telecommunication service provider until the establishment of ETL. Under the change of role as a player in the telecommunications market in Lao P.D.R, the number of employees is increasing slightly.

ETL is composed of 9 Departments; Administration, Human Resources, Accounting, Finance, Corporate, Customer Services and Sales Promotion, Switching, Installation, Maintenance and Outside Plant, and Transmission & Mobile and works out of 16 Provincial Branches.

The total number of staff was 1,145 and of that, 592 staff or 51% of the total, belonged to the headquarters in 2001. This proportion is much higher than that of ETL.

Table 10.3 Number of Staff by Province

No.	Location	1999	2001	Increment
1	Vientiane Municipality	589	592	3
2	Phongsaly Province	23	27	4
3	Luangnamtha Province	23	25	2
4	Bokeo Province	22	28	6
5	Oudomxai Province	28	31	3
6	Luangprabang Province	50	51	1
7	Xayabouli Province	28	37	9
8	Houaphanh Province	25	31	6
9	Xiengkhuang Province	28	35	7
10	Vientiane Province	36	45	9
11	Bolikhamxai Province	34	37	3
12	Khammouane Province	35	33	-2
13	Savannakhet Province	54	55	1
14	Champasack Province	50	52	2
15	Salavan Province	25	27	2
16	Sekong Province	16	16	0
17	Attapeu Province	22	23	1
	TOTAL	1,088	1,145	57

Source: LTC

The proportion of technical staff was around 54%, with 50% of those in the headquarters and 57% in the Provincial Branches in 1999⁴ (refer to Chapter 4 Number of Staff by Province and by Description (1999) in Supporting for Human Resource Development).

The training for the staff in LTC is divided into two courses; Short-term in house training and Long-term training in TCTI. The contents of the training will be discussed in the next section.

10.3 Current Situation of HRD

This section is composed of three sub sections; one is training by the demand-side, second is the training provided by the training/education organizations (supply-side), and last is the training overseas.

(1) Training by LTC

The training by LTC, except regarding dispatch to TCTI, focuses on short-term

⁴ This proportion excludes the number of Managers and workers in the Telecom Section.

professional training not only in Vientiane but also in the various provinces. The reason training needs to be provided in the provinces is to distribute technical staff to the provinces and to upgrade the local skills. The training courses funded by LTC in 2000 and 2001 (first half) are summarized as in the following tables (10.4 and 10.5)

The number of training courses provided in the Provinces and in Vientiane is almost the same. Evidently to satisfy the local needs, the same courses, such as Managing & Checking Billing Information Systems, were provided in multiple provinces. In total, around 300 staff participated in the courses.

Table 10.4 LTC Funded Local Seminars and Training Courses as of 2000

No	Course Title	Duration	Province	Participant	Remark
1	Basic Theory of O & M of S12 E Family	2 weeks	Oudomxay	16	Training
2	Information & Business Analysis	4 hours	Vientiane	17	Seminar
3	O & M on Rutel	1 week	Vientiane	12	Training
4	Basic Theory of O & M of S12 E Family	2 weeks	Vientiane	16	Seminar
5	Government & Economy	1 week	Vientiane	2	Seminar
6	Basic Theory of O & M of S12 E Family	3 months	Vientiane	2	Training
7	Using Computers in managing Billing Systems SSA	1 week	Vientiane	12	Training
8	Managing & Checking Billing Information Systems	4 days	Xiengkhuang	3	Training
9	Managing & Checking Billing Information Systems	1 week	Sayabouly	4	Training
10	Managing & Checking Billing Information Systems	4 days	Luang Prabang	5	Training
11	Managing & Checking Billing Information Systems	4 days	Oudomxay	5	Training
12	Managing & Checking Billing Information Systems	5 days	Luangnamtha	4	Training
13	English Language Courses	5 months	Vientiane	60	Training
14	Roles of a Good Negotiator	3 days	Vientiane	2	Seminar
15	Basic Theory of O & M of S12 E Family	9 days	Champasack	20	Training
16	New Strategies in Managing Personnel	5 weeks	Vientiane	3	Training
17	Installation & Maintenance of Outside Plant	2 weeks	Vientiane	16	Training
18	ISO 9000	4 hours	Vientiane	22	Training
19	Installation & Maintenance of Outside Plant	2 weeks	Luang Prabang	19	Training
20	O & M of FETEX 150	2 weeks	Luang Prabang	8	Training
21	Installation & Maintenance of Outside Plant	2 weeks	Savannakhet	15	Training
22	Basic Theory of O & M of S12 E Family	2 weeks	Vientiane	20	Training
23	Cashier	1 week	Vientiane	2	
24	O & M of GSM Switching (Huawei)	1 week	Savannakhet	13	Training
TOTAL				298	

Source: LTC

In the first half of 2001, 10 courses were provided to the LTC Staff. In comparison with the year 2000, the duration period in 2001 was shortened.

Table 10.5 LTC Funded Local Seminars and Training Courses as of 2001(1st Half)

No.	Course Title	Duration	Province	Participant	Remark
1	Microwave Spur Route	4 days	Luang Prabang	12	Training
2	Pre-Paid M-Phone Service	2 days	Vientiane	39	Training
3	Installation & Usage of Server Systems for Chipcard IMI	3 days	Vientiane	9	Training
4	O&M of Outside Plant	7 days	Vientiane	25	Seminar
5	3M Products Training Course	3 days	Vientiane	12	Training
6	Micro MBA	2 days	Vientiane	35	Training
7	System Service of Lao Internet in the Provinces	5 days	Vientiane	4	Training
8	High Reach Radio	2 days	Champasack	12	Training
9	O&M Rutel	2 weeks	Luang Prabang	12	Training
10	Changing Information of Public Phone TAMAC	4 hours	Vientiane	9	Training
TOTAL				169	

Source: LTC

(2) Training provided by Training and Educational Organizations

The supply of technical personnel for the telecommunication sector is carried out by TCTI under MCTPC and by NUOL under MOE. TCTI aims to nurture the Technicians and Senior Technicians, mainly to supply the telecommunication sector. In parallel with such long-term training, it has been providing short-term specialized courses aiming at upgrading the employees' skills.

NUOL, established to merge the existing colleges and vocational training schools, is the only higher education organization in Lao P.D.R. There is a Faculty of Engineering including Departments of Mechanics, Electronics, Electrics, and Architecture in NUOL relating to the telecommunication sector. NUOL, therefore, contributes to the telecommunication sector by providing engineers.

a) TCTI

The Telecommunication and Communication Training Institute (TCTI) was established as the Post and Telecommunication Training Center (PTTC) initially in 1973. Since establishment, TCTI (or PTTC) has been supplying around 80 % of the senior technicians and technicians per annum to the telecommunication sector in Lao P.D.R.

At present, TCTI is composed of 5 divisions; 1) Organization and Administrative, 2) Finance and Cooperation Division, 3) Basic Science Division, 4) Telecommunication Division, and 5) Road Construction and Repair Division. In the Telecommunication Division, there are three Units; 1) Transmission, 2) Switching, and 3) Cable or Outside Plant (refer to Figure 10.1 Organization Chart of TCTI).

TCTI mainly provides two kinds of training, one is pre-employment training and the other is post employment short-term training.

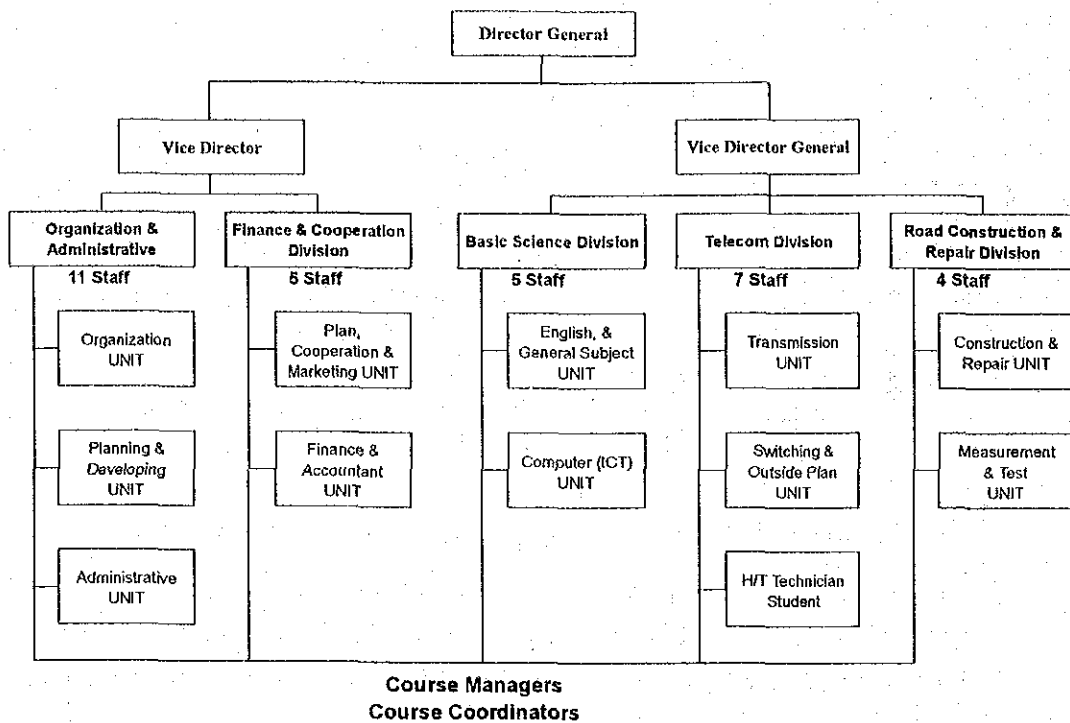


Fig.10.1 Organization Chart of TCTI

The telecommunication division of TCTI has mainly the three subjects; Radio (including transmission), Switch, and Cable (Outside Plant) and 5 classes as shown in Table 10.6. The Radio and Switch courses are divided into two courses respectively; Senior Technician course and Technician course. On the other hand, cable or Outside Plant course are only for the Technicians (or Middle Technicians). As of June 2002, the total number of trainees was 172. In addition, 130 trainees are taking night class.

Table 10.6 Number of Trainees in TCTI in June 2002

	Radio		Telephone (Switch)		Cable
	Senior Technician	Technician	Senior Technician	Technician	Technician
1 st Year	-	23	29	-	23
2 nd Year	24	-	25	24	24
Total	24	23	54	24	47
Day Class	172				
Night Class	130				

Source: TCTI

The day-class trainees are dispatched by various organizations; 60% from

LTC, 5 % from ETL, 2% from MCTPC, (8% from MOE, and other Governmental organizations. The tuition fees are categorized as follows; first, the dispatching organization bears the tuition fee of US\$500 per annum per trainee (trainees dispatched by LTC and ETL), the second applies to Government agencies wherein the dispatching organization bears a fee of US\$4 per annum per trainee and the last is that the trainees themselves pay fees of US\$100 per annum (Night-Class trainees).

Table 10.7 Proportion of Trainees by Original Organization and Tuition Fees

	LTC	ETL	MCTPC	MOE	Other*
Day Class	60%	5%	2%	8%	25%
Fee: D/C**	US\$500/year	US\$500/year	US\$4/year	US\$4/year	US\$4/year
Fee: N/C	Own Expense: US\$100/year				

Source: Interview

In the telecommunication division in TCTL, there are 8 permanent instructors. The academic background of Instructors is summarized as follows:

Academic Background of Instructors

- Master 1
- Bachelor 1
- Diploma 1
- Sr. Technician 4
- M. Technician 1

In the early 1990's, ITU dispatched an expert to develop course syllabi in transmission, switching, and outside plant with the collaboration of the professors from King Mongkut Institute of Technology Ladkrabang, Thailand. In 1993, a curriculum for two year training was produced and implementation started in order to supply telecommunication technicians for EPTL. In this era, there was no higher education organization in Lao P.D.R. since the curriculum focused on long-term training. In parallel with the long-term training, professional training (targeting post employment) for the telecommunication sector was required however there was no curriculum. In 1995, the National University Of Lao (NUOL) was established to merge some colleges and vocational training schools however PTTC remained as the training institute for supplying technicians. Since then, the priority for the program was changed to focus on the short-term technical training. In 1996, an Expert for Curriculum Development was dispatched by ITU to monitor the existing curriculum, to develop the short-term courses including management and to organize the computer courses. The current short-term

curriculum is the result of this project and the long-term curriculum (two to three years training) is that produced in 1993. Therefore it took around 10 years for the long-term curriculum to be produced and more than 5 years for the short-term courses.

The long-term curriculum as well as short-term courses should be revised or renewed to cope with the technological change. In TCTI, not all the courses listed in the long-term and short-term curriculum are actually provided because of several obstacles including a shortage of training materials, equipment, instructors, and so on.

The existing curriculum for long-term training is divided into two levels; one is core subjects and the other specialized sections. The core subjects are summarized as follows⁵:

Mathematics	Physics	English Language
Basic Electricity	Basic Electronics	<i>Engineering Drawing</i>
<i>Workshop</i>	Telecommunications	Communication Networks
Computer Applications		

The specialized section consists of following three units summarized as follows:

Transmission Microwave, Advanced telecommunications, Digital Multiplex System, Microwave Systems, Radio Communications Networks, Satellite Communications, Optical Fibers, Safety and Accident Prevention, *Management of Telecommunication Networks*

Switching Communication Networks, Switching Techniques, Safety and Accident Prevention, *Management of Telecommunication Networks*

Outside Plant Outside Plant Materials, External Plant Planning, Optical Fiber Lines, Supervision, Subscribers' Facilities, Safety and Accident Prevention, *Management of Telecommunication Networks*

In the short-term courses, there are 4 units, namely 1) Radio Units (9 titles),

⁵ The subject titles shown in italics are not currently offered. There is no instructor for engineering drawing and a shortage of lab equipment, tools, measurement instruments, etc exists. The curriculum proposed and implemented are illustrated in chapter 5 in Supporting for Human Resource Development.

2) Switching Units (9 titles), 3) Management Units (4 titles), and 4) Outside Plant (Cable) Units (7 titles). The implementation of such titles (or courses) is not sufficient. The Management Unit is mostly dormant. And the Outside Plant Unit faces difficulties such as the lack of measurement instruments, parts, testing equipment, and adequate tools for troubleshooting and repair to provide the courses. The proposed short-term courses and a comparison of proposed subjects with those implemented are attached as chapter 6 in Supporting for Human Resource Development.

There is a shortage in training equipment, materials including textbooks, appropriate tools for measurement and test, etc. in the Center. In the outside plant unit, for example, practical training in the center is impossible so only the theoretical study is implemented and on-the-job training at the LTC site is implemented. Regarding to the switching unit, the switching equipment in the lab is obsolete therefore, it is impossible to implement training.

PC and LAN systems are quite important for training especially in the telecommunication sector. Knowledge of computers for the technicians in the telecom is essential. There are only 10 PCs in the computer unit in the TCTI; in addition all the PCs are outdated.

b) NUOL

There are 10 Faculty and 11,740 students in NUOL, which is the only organization to provide higher education in Lao P.D.R. The number of enrolled students in each faculty is summarized as follows (Table 10.8). Faculty of Economics & Management and that of Law & Administration might be the supplier to the administrative section in the telecom. Since the average graduates from those faculties are around 60 and 200 respectively, the supply capacity is considered to be adequate. Regarding to The Faculty of Engineering & Architecture will supply technical personnel and engineers.

Table 10.8 Number of Enrolled Students in NUOL (2001)

Faculty		School of Foundation Students		Diploma and Bachelor (3-5Y)
		Year 1	Year 2	
1	Engineering & Architecture	1,721	1,402	3,180
2	Science			133
3	Agriculture			345
4	Forestry			537
5	Medical Science			*542
6	Education			192
7	Social Science			100
8	Philosophy			2,249
9	Economics & Management			291
10	Law & Administration			1,048
Sub-total		3,123		8,617
Total		11,740		

Note: * 3 to 6 Years

Source: NUOL

The Faculty of Engineering & Architecture is composed of 7 Departments and number of students each graduates is summarized as follows. The potential supply capacity per year to the telecom sector will be around 160⁶.

Table 10.9 Number of Graduates in Faculty of Engineering & Architecture (2000)

Department	Bachelor	Higher Diploma	Medium Diploma	Total
1 Mechanical	12	0	0	12
2 Electrical	37	58	0	95
3 Civil Engineering	93	72	14	179
4 Electronics	0	68	0	68
5 Transportation	0	112	85	197
6 Architecture	35	0	23	58
7 Irrigation	0	70	32	102
Total	177	380	154	711

Source: NUOL

NUOL plans to establish an IT Faculty to cope with the current technological change. After establishment, the supply capacity to the Telecom sector will expand.

(2) Overseas Training and Seminars

In Lao P.D.R., there is limited access to current technology in telecommunications. The telecommunication organizations, therefore, dispatch their staff overseas in cooperation with foreign countries. In the year 2000, 27 personnel participated in

⁶ The Electrical Department and the Department of Electronics will be the major players. Obviously all the graduates do not find work in the telecom sector.

training overseas as shown in the following Table. Since the capabilities of the training institutes in Lao P.D.R. are quite limited, the participation in overseas seminars and training are important to stay abreast of technological change. On the other hand, the numbers of participants must be limited so the establishment an efficient transfer system of the knowledge acquired shall be required.

Table 10.10 Overseas Seminars and Training Courses as of 2000

No.	Course Title	Duration	Country	Funded by	Participant	Remark
1	Managing Modern Telecommunications	4 weeks	Sweden	SIDA	1	Training
2	Access Network Design	5 weeks	Sweden	SIDA	1	Training
3	International Telephone Communications	7 weeks	Japan	JICA	1	Training
4	Operation Software	2 days	India	APT	1	Seminar
5	Rutel Engineering	5 weeks	Japan	JICA	1	Training
6	Information and Technology Policy	1 week	Singapore	Singapore G	1	Training
7	Outside Plant Planning Basic Training Course	2 weeks	Japan	JITEC	1	Training
8	Digital Cellular Telephone	1 week	Japan	APT	5	Training
9	IP Technology	2 weeks	China	APT	1	Training
10	Sales and Marketing Management	2 weeks	Singapore	PSB Sing.	1	Training
11	Basic Network Engineering	6 weeks	Japan	JICA	1	Training
12	E-Commerce Strategy	3 days	India	APT	1	Training
13	CDMA Technology	4 weeks	Korea	Korean G.	2	Training
14	Digital Telecommunications Network Planning	9 days	Japan	APT	1	Training
15	Telecom Outside Plant Construction Supervision	5 weeks	Indonesia	Indonesia G.	1	Training
16	APT Training on Synchronous Digital Hierarchy	2 weeks	India	APT	1	Training
17	Advanced Telecommunication Technology	7 weeks	Thailand	JICA	1	Training
18	Technology and Management in Telecommunication	6 weeks	Japan	JICA, BHN	1	Training
19	Rural Telecommunications	2 weeks	India	APT	1	Training
20	Asynchronous Digital Subscriber Lines	1 week	Korea	APT	1	Training
21	Integrated Services Digital Networks	1 week	Korea	APT	1	Training
22	Rural Telecommunications	2 weeks	India	APT	1	Training
	TOTAL				27	

Source: LTC

10.4 Supply and Demand of Human Resources

(1) Demand for Telecommunication staff

Based on the estimates of the main lines, the required telecommunication human resources, especially technical staff, will be estimated. Since there is a correlation between teledensity and the number of main lines per telecommunication employee, the estimates are calculated to form a correlation function using the cross section data of 192 countries and regions (ITU data). Since the result of partial tests (extrapolation of the observed figure to the function) shows over shooting in the case of Lao P.D.R., the estimates have been adjusted. On the other

hand, the capacity of the switch facilities will satisfy around 60% of the total demand in 2005 therefore the number of persons engaged in the telecom sector will be reduced from the estimated figures (assessed by the micro approach)⁷. Total number of employment is estimated as 1,900 personnel in 2005, 4,100 personnel in 2010, and 5,900 personnel in 2015⁸.

Table 10.11 Number of Employees for the Telecommunication Sector (Estimates)

	2001	2005	2010	2015
Number of Main Lines	52,600	104,000	285,000	438,000
Teledensity (per 100 inhabitants)	1.46	1.73	4.15	5.56
N. of Main Lines per Employee	41.4	54.7	69.5	74.2
Number of Employees	1,271	1,900	4,100	5,900

Note: Study Team estimates based on ITU Data.

The estimated employment of HRD, illustrated in Table 10.11, will be divided into two categories, technical and administrative. Based on the data of LTC in 1999, the distribution of the employment to each category is calculated. The results are tabulated as follows⁹.

Table 10.12 Estimates of Employment by Category

Year	Description	Technical				Finance, Accounting, Marketing & Administration			Total
		Manager	Engineers	Technician	Workers	Manager	Officers	Workers	
2005	Vientiane Municipality	72	150	365	40	71	292	40	1,030
	Provinces	90	92	407	45	68	142	26	870
	Total	162	242	772	84	139	434	67	1,900
2010	Vientiane Municipality	147	312	758	80	148	606	84	2,135
	Provinces	205	209	918	102	154	318	59	1,965
	Total	352	521	1,676	182	302	924	143	4,100
2015	Vientiane Municipality	206	430	1,047	110	205	837	115	2,950
	Provinces	307	313	1,378	154	231	479	88	2,950
	Total	513	743	2,425	264	436	1,315	204	5,900

Note: Study Team estimates.

⁷ The detail procedure of calculation is described in chapter 7 in Supporting for Human Resource Development.

⁸ 5,900 employees in the year 2015 in Lao P.D.R. is nearly equivalent to that of Panama in the year 2000. The number of Cellar phone subscribers in Panama was around 600 thousand and the total number of the telephones was 1 million in 2000.

⁹ The estimates are obtained by the macro approach and distribution of the employment is based on the existing data. The details are described in chapter 7 in Supporting for Human Resource Development.

In proportion to the increase of telephones in the local area, the allocation of employees in the telecom sector will gradually be changed so that the number in Vientiane becomes similar to the number in the other provinces in 2015.

The demand of employment per year is summarized as follows¹⁰ (Table 10.13).

Table 10.13 Demand of Employment by Types of Job per Year

		'01-'05	'06-'10	'11-'15
Technical	Manager	15	40	35
	Engineers	20	60	50
	Technician	70	200	165
	Sub-total	105	300	250
Administration. & Finance	Manager	15	35	30
	Officer	40	110	85
	Sub-total	55	145	115
Grand Total		160	445	365

Source: Study Team estimates.

(2) Feasibility of supplying the required Personnel

a) Technical Sector

- Technician

TCTI, which is now supplying the technicians and senior technicians, should be requested to continue in that role. Since the supply capacity of TCTI is, at most, 100 technicians per annum, presuming the current situation continues, the supply capacity of technicians until 2005 is adequate. The demand for the technicians from 2006 to 2015, on the other hand, will treble compare to the former period so expansion of TCTI is required.

- Engineers

Since TCTI does not educate engineers, it is required to find an organization to be able to supply 20 engineers per annum until 2005, 60 engineers between 2006 and 2010, and 50 engineers between 2011 and 2015. NUOL will be a domestic supplier of the engineers and will be able to supply engineers at least until the year 2005.

- Managers

The managers will be nurtured by each organization through post-job

¹⁰ The Demand is not equal to the increment of employment.

training¹¹.

b) Administrative Section

The candidate officers and managers will be supplied by the existing organizations such as NUOL.

10.5 Human Resources Development Plan

(1) Capacity Building of MCTPC Staff

One of the most important issues for the MCTCP, especially Department of Post and Telecommunication, is to implement the Telecommunications Law since the Law covers all the activities of the telecommunications sectors. In order to achieve the mission required of the Ministry, it is quite important to enhance the organization as well as the staff themselves.

In order to carry out the responsibility, the Department of Post and Telecommunication (especially Division of Telecommunication and that of Radio Frequency) is should increase the number of staff.

There are Departments of Communication, Post, Transportation and Construction (DCPTC) in each Province to carry out activities similar to those of MCTPC. In fact, the Telecommunication Law required DCPTC to carry assume the responsibility however there is no staff to implement the activities related to the Telecommunications Law. In the target year of 2015, the number of telephones in the Provinces will be around 217,000 lines in fixed phones and 287,000 in cellular phones so, for customer protection and ensuring competitiveness, staff in provinces will be required in adequate numbers. The strategy of enhancement of the staff in provinces is as follows:

a) Staff Distribution Plan

+ Criteria for staff assignment in Provinces: 1 staff per 10,000 lines

+ Target:

In 2005 Luangprabang (1), Khammuan (1), Savannakhet (2)

In 2010 Luangprabang (1), Khammuan (1), Savannakhet (3), and Champasak (2)

In 2015 Luangprabang (2), Vientiane (1), Khammuan (2), Savannakhet (4), and Champasak (3)

b) Staff Nurturing Plan

¹¹ When Managers are promoted from amongst the engineers or technicians, the demand for engineers and technicians will increase.

- + Short-term and mid-term curriculum
- + Invitation of Candidates for transferring to the telecom section
- + Implementation

(2) Enhancement strategy of TCTI

TCTI has an enough supply capacity until the year 2005. From the year 2006, the demand for technical personnel will increase rapidly so TCTI must enhance its supply capacity. The strategy to enhance TCTI is summarized as follows:

- a) Short-term (to 2005)
 - + Enhancement of existing Courses: Providing the complete Curriculum¹²
 - + Implementation of Trainer's education abroad¹³
 - + To prioritize the enhancing courses: It will be recommended to enhance the practical training of outside plant (including the equipment).
- b) Mid-term (from 2006 to 2010)
 - + Establishment of new training courses to correspond to the technological changes: e.g. LAN, IP
 - + Installation of the training equipment¹⁴
 - + Partial implementation of Trainer's education in TCTI
- c) Long-term (from 2011 to 2015)
 - + Full implementation of Trainer's education in TCTI

In addition to the above targets, TCTI shall make every effort to solidify its financial bases. Currently the financial resources of TCTI are Government Subsidy and Tuition Fees and the financial bases are weak. The short-term specialized training courses sponsored by LTC (refer to Tables 10.4 and 10.5) are carried out by TCTI however, such training courses haven't contributed to TCTI financially. TCTI shall make the provision of such short- and mid-term training a financial resource to enhance the ability of training.

(3) Skill enhancement Training in ETL/LTC

LTC has been providing short-term training for its employees both in Vientiane

¹² Please refer to chapter 8 Proposed Curriculum in Supporting for Human Resource Development

¹³ Regarding the trainer's education, TCTI in cooperation with ITU dispatched its trainer to Malaysia to train the Switch (Fetex150). It is necessary to find locations to which the trainers can be dispatched. The candidate sites will be Thailand, Vietnam, etc.

¹⁴ Please refer to chapter 9 Proposed Training Equipment in Supporting for Human Resource Development.

Municipality and the Provinces (refer to Table 10.4 and 10.5). The number of courses in 2001 is almost the same as the previous year but the duration of the training has been reduced. To expand the telephone lines and to diversify the telecom services both in Vientiane Municipality and each province will require ETL/LTC to provide more training for their staff¹⁵. At least in the short-term, ETL/LTC will provide practical training for the newly employed personnel. In the mid- and long-term, skill enhancement training for the employees shall be required. Since the number of training courses will be increased (refer to foot note 15), out-sourcing of the training will be recommended.

Additionally training for the administrative personnel is rather weak so the enhancement of such training will be required¹⁶.

¹⁵ In 2000, 25% of technical people except managers and workers engaged in short-term training. If ETL/LTC will provide the short-term training at the same level in 2000, ETL/LTC shall provide the technical training for 250 personnel in 2005, 550 personnel in 2010 and 800 personnel in 2015. In other words, the number of training courses will be 17 in 2005, 37 in 2010, and 53 in 2015 assuming the same number of attendants as in 2000. In addition, training for the administrative section will be required.

¹⁶ Examples of the management skill training are shown in chapter 6 Management Units (especially M3 and M4) in Supporting for Human Resource Development.

CHAPTER 11

FINANCIAL AND ECONOMIC EVALUATION

CHAPTER 11 FINANCIAL AND ECONOMIC EVALUATION

This chapter assesses the financial and economic feasibility of the proposed development plan, which requires investment of \$452 million from 2004 to 2015. Financial internal rate of return (FIRR) and economic internal rate of return (EIRR) are the criteria used for the evaluation. The result is summarized at the end of the chapter.

11.1 Analytical Framework

11.1.1 Capital Expenditure (CAPEX)

This chapter assesses financial and economic feasibility of the proposed investment during the period from 2004 to 2015 as discussed in Chapter 7 and in Chapter 8. The investment includes fixed phones, mobile phones, Internet¹, and the rural project from 2004 to 2015. Two scenarios are set for the analysis. The first scenario is the case in which all the proposed investment is implemented from 2004 to 2015 (Table 11.1). The second scenario assumes implementation of all the projects from 2004 to 2010 and part of the proposed projects with the highest priority from 2011 to 2015 (Table 11.2 and Fig. 11.1).

Furthermore, the analysis is carried out in two levels in each scenario. The first level includes all the components while the second level excludes the investment on the mobile phones from the first level. The analysis on the second level is set in order to focus on the portion of the investment that is harder to receive investment from the private companies because of lower profitability.

The CAPEX in the first scenario is \$452 million (Table 11.3) while that in the second scenario is \$405 million (Table 11.4). Excluding the mobile phones, the CAPEX in the first scenario is \$293 million while that in the second scenario is \$250 million.

¹ The investment on the Internet is only for the IP network and does not include the facilities that are necessary as an internet service provider such as Web servers, proxy servers, and mail servers.

Table 11.1 First Scenario

	Base Data
Switch	Table 7.15, P.7-73
OSP	Table 7.15, P.7-73
Transmission	Table 7.14, P.7-67
IP	Table 7.19, P.7-92
Rural	P.8-16, P.8-17 (excluding the investment in 2003)
Mobile	Table 7.20, P.7-96

Table 11.2 Second Scenario

2004-2005	Same as 1 st Scenario
2006-2010	Same as 1 st Scenario
2011-2015	<p>All IP and rural investment plus following transmission system as well as adjacent switching, OSP, and mobile facilities:</p> <p>No. 18 M. Xaignabouri to M. Boten via M. Paklay (180 km)</p> <p>No. 19 M. Xanakham to Sylom (198 km)</p> <p>No. 20 M. Hinheup to M. Viangkham (90 km)</p> <p>No. 21 M. Paklay to Xanakham (36 km)</p> <p>No. 24 M. Xam-Nua to M. Xam-Tai (108 km)</p> <p>No. 25 M. Kham to M. Nonghet (45 km)</p> <p style="text-align: right;">(See Fig. 11.1)</p>

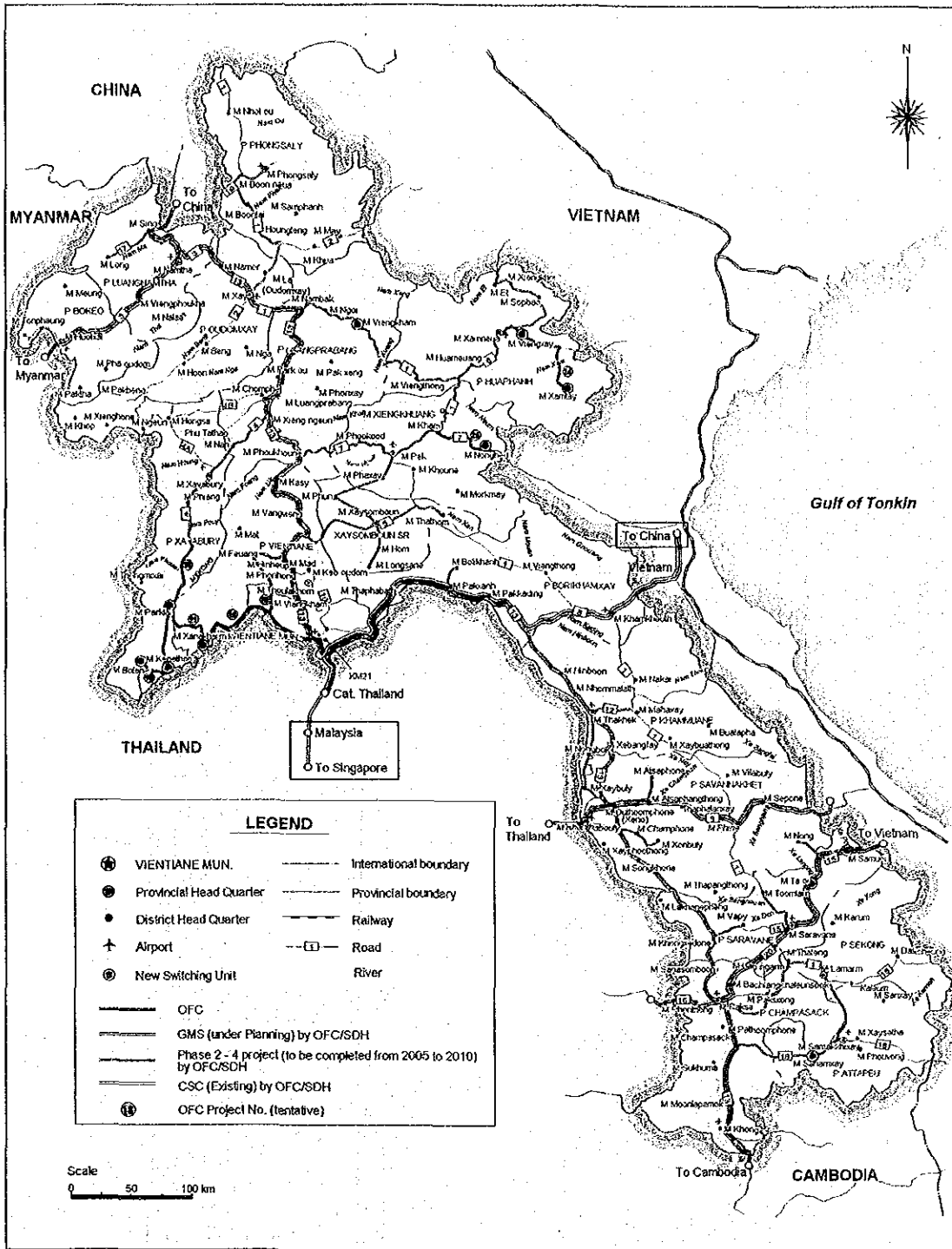


Fig. 11.1 Second Scenario (2011-2015)

Table 11.3 CAPEX (Scenario 1)

(Unit: Thousand US \$)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Swich	3,245	572	6,045	7,635	2,799	4,383	5,132	5,790	5,468	3,785	4,545	4,181	53,578
OSP	6,663	1,174	12,412	15,677	5,747	9,000	10,537	11,889	11,227	7,771	9,332	8,584	110,013
Transmission	21,735	11,490	1,839	1,839	1,839	1,839	1,839	9,690	9,690	9,690	9,690	9,690	90,870
IP	3,363	3,363	779	779	779	779	779	1,005	1,005	1,005	1,005	1,005	15,646
Rural	1,480	1,480	1,776	1,776	1,776	1,776	1,776	2,220	2,220	2,220	2,220	2,220	22,940
Subtotal	36,485	18,079	22,851	27,706	12,940	17,777	20,062	30,594	29,609	24,470	26,793	25,680	293,046
Mobile	14,580	13,851	11,664	5,103	11,664	5,832	8,748	14,580	14,580	5,103	29,160	24,057	158,922
Total	51,065	31,930	34,515	32,809	24,604	23,609	28,810	45,174	44,189	29,573	55,953	49,737	451,968

Table 11.4 CAPEX (Scenario 2)

(Unit: Thousand US \$)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Swich	3,245	572	6,045	7,635	2,799	4,383	5,132	5,393	5,237	3,507	3,935	4,091	51,971
OSP	6,663	1,174	12,412	15,677	5,747	9,000	10,537	11,073	10,752	7,201	8,079	8,399	106,714
Transmission	21,735	11,490	1,839	1,839	1,839	1,839	1,839	1,971	1,971	1,971	1,971	1,971	52,275
IP	3,363	3,363	779	779	779	779	779	1,005	1,005	1,005	1,005	1,005	15,646
Rural	1,480	1,480	1,776	1,776	1,776	1,776	1,776	2,220	2,220	2,220	2,220	2,220	22,940
Subtotal	36,485	18,079	22,851	27,706	12,940	17,777	20,062	21,661	21,185	15,904	17,209	17,686	249,546
Mobile	14,580	13,851	11,664	5,103	11,664	5,832	8,748	14,333	14,148	4,888	27,598	22,863	155,272
Total	51,065	31,930	34,515	32,809	24,604	23,609	28,810	35,995	35,332	20,792	44,808	40,549	404,818

11.1.2 Beneficiaries

The beneficiaries of the investment are all the new telecommunication subscribers from 2004 to 2015. The number of the subscribers for the fixed phones is set at the lower value between the demand and the supply in the respective province. For the mobile phones and Internet, 100% of the demand as forecasted in Chapter 4 is assumed to be supplied by the end of each year (Table 11.5).

Table 11.5 Number of Subscribers at the End of the Year²

	Fixed Phones		Mobile Phones		Internet	
	1st Scenario	2nd Scenario	1st Scenario	2nd Scenario	Dial up	ADSL
2003	93,950		50,900		7,592	0
2004	114,801		77,460		10,559	500
2005	135,164		120,210		15,402	750
2006	144,437		141,552		18,689	824
2007	194,385		167,024		22,712	905
2008	212,537		197,535		27,647	994
2009	242,984		234,243		33,718	1,092
2010	278,199		278,615		41,209	1,200
2011	304,678	303,336	330,400	324,810	49,827	1,342
2012	335,266	333,463	392,290	380,655	60,300	1,501
2013	366,437	363,017	466,412	446,718	73,043	1,679
2014	398,846	390,798	555,376	525,629	88,570	1,878
2015	438,177	427,727	662,410	629,545	107,514	2,100

For calculating FIRR and EIRR, the revenues from the existing subscribers before 2004 are excluded.

² The fixed phones and the mobile phone subscribers include the users in the rural area.

11.1.3 Methodologies

(1) Financial Analysis

The aim of the financial analysis is to assess the financial feasibility of the project while FIRR is an indicator to estimate the level of return from the investment in the given period. Financial Internal Rate of Return (FIRR) is the rate (fr), which equalizes the present value of cash outflows (fC) to the present value of the cash inflows (fR) associated with the project.

$$\sum_t \frac{(fR_t - fC_t)}{(1 + fr)^t} = 0$$

where: t is the time,

fR_t is cash inflow of the time t , and

fC_t is cash outflow of the time t .

Because the telecommunication service has public characteristics, cut off line of the FIRR in deciding whether to implement or not to implement the project should be decided in conjunction with the social and economic needs of the society.

(2) Economic Analysis

The purpose of the economic analysis is to encourage efficient use of the national resources. Economic Internal Rate of Return (EIRR) is used to measure the return on investment, i.e. economic cost, from the viewpoint of the national resources. EIRR is the rate (er) that equalizes the present value of economic cost (eC) to the present value of the economic benefit (eB) associated with the project.

$$\sum_t \frac{(eB_t - eC_t)}{(1 + er)^t} = 0$$

where: t is the time,

eB_t is economic benefit of the time t , and

eC_t is economic cost of the time t .

Economic cost is converted from the financial cost by eliminating a transfer of payment within a country and by rectifying distortion by the market failure. On the other hand, the economic benefit is calculated from the consumer surplus and the supplier's revenue in the with-project situation subtracted by those in the without-project.

11.2 Assumptions

11.2.1 Revenue Assumptions

Per subscriber revenue is considered in relation to the price setting. The telephone charges in Lao P.D.R. are set low for the domestic calls and high for the international calls; however, the competition facing to the international calls by the substitute goods, such as VoIP and E-mail, calls for the needs to balance the tariff settings. Moreover, it is desirable that the price be rectified to cover the actual cost.

There is no relationship between the level of the domestic call charges and the income level of the nation. Regardless of the income level, the domestic call charges are likely to stay twice as much as the level in Lao P.D.R. (see Fig. 11.2). However, in theory, increase in price is likely to result in decrease in demand.

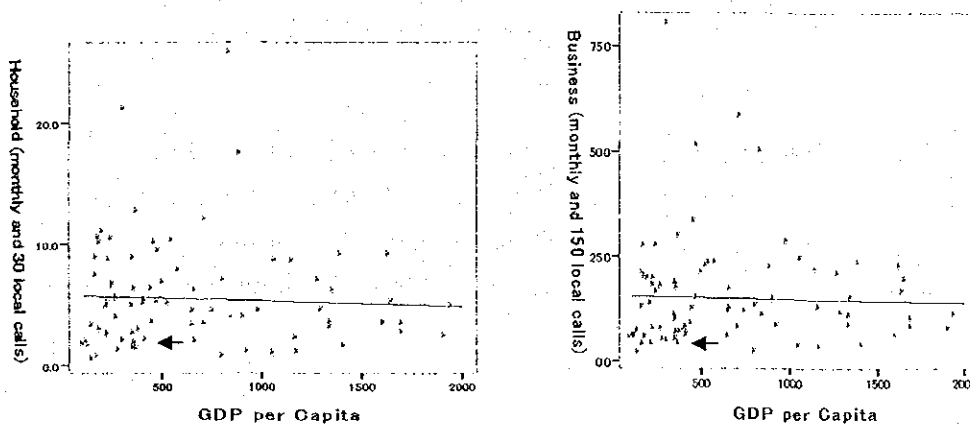


Fig. 11.2 Domestic call charges and GDP per capita (2000)

(← : Lao P.D.R. after the price increase in March, 2003)

Above plots represent the sum of the monthly charge and three-minute local calls. The local call charges are multiplied by 30 for the households and by 150 for the business users.

Source: ITU (2002) *World Telecommunication Development Report*, Geneva: ITU

The demand curve implies the level of pricing that maximizes the supplier's revenue. When the demand curve is explained in the equation of $y=a-bx$ where y is 'unit price', and x is 'quantity demanded'; the price that maximizes the supplier's revenue is at $a/2$ (See Fig.11.3).

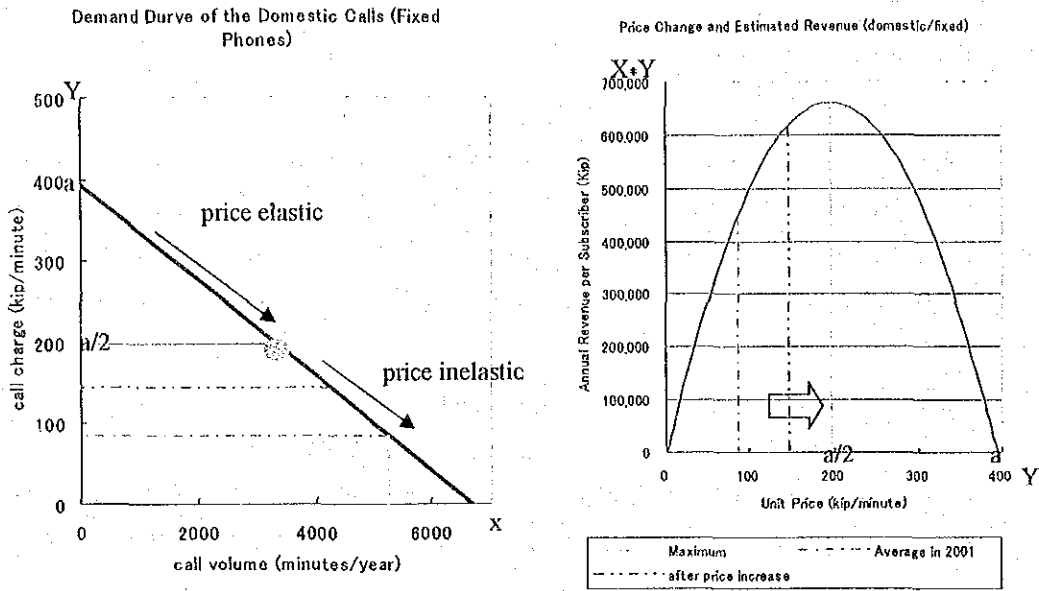


Fig. 11.3 Price Change and the Revenue (domestic/fix)

Based on the demand curve, identified by the revenue classified by province, the optimal pricing towards 2010 is proposed (Fig. 11.4). The traffic is identified in accordance with the change in unit price along the demand curve. Then the per-subscriber revenue is calculated from the traffic multiplied by unit price.

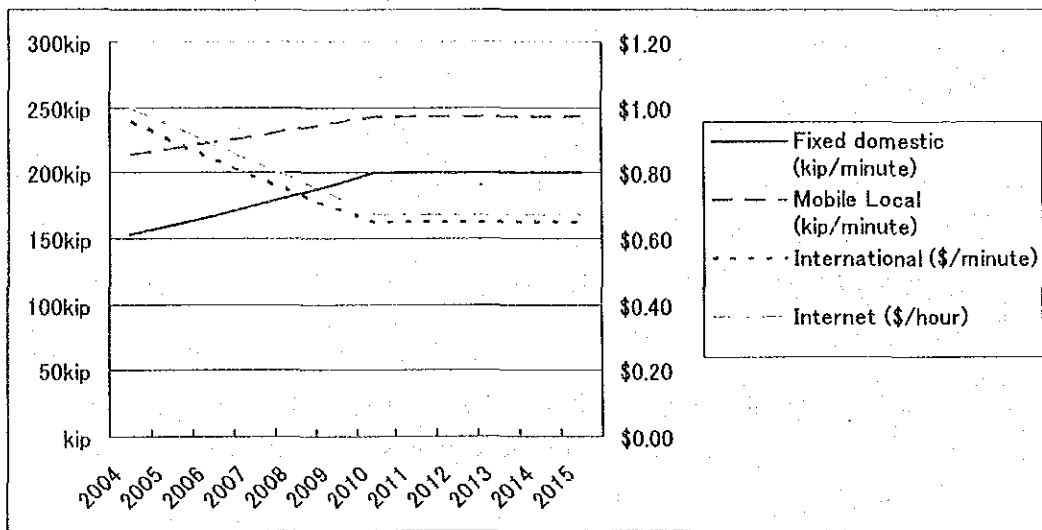


Fig. 11.4 Price Setting

Table 11.6 summarizes price assumptions used in the analysis.

Table 11.6 Price Assumptions

Initial Charge	fixed phones	\$80
	mobile phones	\$50
	Internet Account	0 ³
	ADSL	\$200
Monthly Charge	fixed phones	increased to 50,000 kip by 2010
	mobile phones	\$12
	Internet Account	0
	ADSL	\$20
Unit Price	fixed phones/domestic	increased to 200kip/minute by 2010
	mobile phones/local	increased to 243kip/minute by 2010
	mobile phones/long distance	constant (The average price is calculated by the gravity model.)
	fixed and mobile/international	decreased to \$0.65/minute by 2010
	Internet Access	decreased to \$0.68/hour by 2010

In addition, following assumptions are made with regard to the revenue projections.

- a. Incoming international revenue is assumed to be 30% of the outgoing international revenue.
- b. Revenue of the IP network is 50% of the access charge paid by the customers to the Internet service provider.
- c. International calling rate of the mobile phone subscriber is one-sixth of that of the fixed phone subscriber.

11.2.2 Financial Cost Assumptions

(1) CAPEX

In order to adjust to the proposed CAPEX and beneficiaries, certain portion of the CAPEX on the transmission system is excluded from calculation⁴. The first scenario excludes 25% of the CAPEX on the transmission system for the use of existing subscribers before 2004 while the second scenario excludes another 25% for the use of the mobile phone users.

³ Initial charge for the Internet account is not included in the revenue based on assumption that this is attributable to the revenue of the internet service provider.

⁴ The excluding ratio is calculated by the estimated traffic of without-project against that of with-project. 25% of the bandwidth is assumed to be reserved for IP network in preparation for the growing demand towards ICT.

(2) . Operating Expenditure (OPEX)

Based on the following assumptions, OPEX is summarized in Table 11.7, Table 11.8, Table 11.9, and Table 11.10.

- a) The personnel expenditure is calculated based on the employment projection discussed in Table 10.12, Page 10-14. The personnel fee per person is estimated to be 20 million kip/annum for a manager and 10 million kip/annum for other staff. The number of employees in the second scenario is discounted by the decrease ratio of the number of subscribers and by that of the transmission distance.⁵

In order to adjust to the revenue and expenditure stream, expenditure on 70% of the staff in 2003 is discounted as this serves for the existing subscribers before 2004. For the analysis without the mobile phones, expenditure on 50% of the administrators and 8.5% of the technicians are subtracted in addition.

- b) 80% of the machinery investment is reserved for the operation and maintenance cost during the life time of the equipment.
- c) 50% of the revenue from the international call charges is allocated to the international settlement expense.
- d) \$10,000/month is reserved for the international leased line for the Internet.⁶
- e) 6% of the annual revenue is allocated for other OPEX.

⁵ 15% of the technicians are discounted by the decrease ratio of the transmission distance while the other technicians are discounted by the decrease ratio of the number of fixed phone subscribers. Administrators are discounted by the decrease ratio of the number of fixed phone subscribers and that of the mobile phone subscribers.

⁶ The fee for the international leased lines is expected to drop from the present level since the introduction of Internet exchange and the domain name server helps to decrease the payment to the foreign carriers for connecting the Internet abroad.

Table 11.7 OPEX of the 1st Scenario with the mobile phones

	Number of Workers (persons)		Personnel Expense (Million kip)			Repair & Maintenance (thousand \$) (million kip)		International Settlement (million kip)	Leased Line (Internet)	Other OPEX	OPEX Total (million kip)
	Manager	Engineer/ Officer	Manager	Engineer/ Officer	Cost adjustment						
2003	232	1,228	4,631	12,281							
2004	261	1,387	5,229	13,870	(11,839)	3,249	33,230	13,785	1,227	8,634	64,135
2005	301	1,599	6,026	15,987	(11,839)	5,425	57,363	31,953	1,269	18,871	119,629
2006	372	1,968	7,432	19,684	(11,839)	7,662	83,693	45,877	1,311	26,486	172,645
2007	442	2,338	8,843	23,379	(11,839)	9,767	110,112	68,641	1,353	39,040	239,529
2008	513	2,707	10,257	27,072	(11,839)	11,381	132,323	94,284	1,395	49,952	303,443
2009	584	3,076	11,675	30,763	(11,839)	12,422	148,801	112,998	1,438	63,565	357,399
2010	655	3,445	13,096	34,452	(11,839)	13,800	170,182	136,960	1,480	80,690	425,021
2011	714	3,746	14,270	37,465	(11,839)	16,531	209,692	167,108	1,522	97,993	516,211
2012	772	4,048	15,447	40,477	(11,839)	17,937	233,818	198,102	1,564	118,484	596,053
2013	831	4,349	16,626	43,487	(11,839)	18,677	249,987	233,482	1,606	142,532	675,881
2014	890	4,650	17,807	46,496	(11,839)	19,654	269,880	272,694	1,648	170,864	767,551
2015	950	4,950	18,991	49,505	(11,839)	21,272	299,398	318,617	1,689	205,335	881,696
Total			145,698	382,635	(142,067)	157,777	1,998,480	1,694,500	17,502	1,022,445	5,119,193

Table 11.8 OPEX of the 1st Scenario without the mobile phones

	Number of Workers (persons)		Personnel Expense (Million kip)			Repair & Maintenance (thousand \$) (million kip)		International Settlement (million kip)	Leased Line (Internet)	Other OPEX	OPEX Total (million kip)
	Manager	Engineer/ Officer	Manager	Engineer/ Officer	Cost adjustment						
2003	232	1,228	4,631	12,281							
2004	261	1,387	5,229	13,870	(14,037)	1,915	19,585	11,298	1,227	4,402	41,574
2005	301	1,599	6,026	15,987	(14,686)	2,976	31,466	25,494	1,269	8,548	74,104
2006	372	1,968	7,432	19,684	(15,837)	4,405	48,113	35,736	1,311	11,474	107,912
2007	442	2,338	8,843	23,379	(16,988)	6,139	69,206	55,864	1,353	19,747	161,404
2008	513	2,707	10,257	27,072	(18,137)	6,945	80,742	78,456	1,395	25,441	205,226
2009	584	3,076	11,675	30,763	(19,284)	7,566	90,630	93,639	1,438	32,681	241,541
2010	655	3,445	13,096	34,452	(20,430)	8,330	102,727	113,513	1,480	41,997	286,836
2011	714	3,746	14,270	37,465	(21,363)	9,928	125,932	137,581	1,522	49,948	345,355
2012	772	4,048	15,447	40,477	(22,296)	11,172	145,635	161,185	1,564	58,886	400,898
2013	831	4,349	16,626	43,487	(23,227)	12,334	165,086	187,502	1,606	68,843	459,923
2014	890	4,650	17,807	46,496	(24,157)	12,346	169,521	215,591	1,648	79,968	506,875
2015	950	4,950	18,991	49,505	(25,085)	12,155	171,082	247,850	1,689	93,400	557,431
Total			145,698	382,635	(235,526)	96,209	1,219,726	1,363,708	17,502	495,335	3,389,078

Table 11.9 OPEX of the 2nd Scenario with the mobile phones

	Number of Workers (persons)		Personnel Expense (Million kip)			Repair & Maintenance (thousand \$) (million kip)		International Settlement (million kip)	Leased Line (Internet)	Other OPEX	OPEX Total (million kip)
	Manager	Engineer/ Officer	Manager	Engineer/ Officer	Cost adjustment						
2003	232	1,228	4,631	12,281							
2004	261	1,387	5,229	13,870	(11,839)	3,249	33,230	13,785	1,227	8,634	64,135
2005	301	1,599	6,026	15,987	(11,839)	5,425	57,363	31,953	1,269	18,871	119,629
2006	372	1,968	7,432	19,684	(11,839)	7,662	83,693	45,877	1,311	26,486	172,645
2007	442	2,338	8,843	23,379	(11,839)	9,767	110,112	68,641	1,353	39,040	239,529
2008	513	2,707	10,257	27,072	(11,839)	11,381	132,323	94,284	1,395	49,952	303,443
2009	584	3,076	11,675	30,763	(11,839)	12,422	148,801	112,998	1,438	63,565	357,399
2010	655	3,445	13,096	34,452	(11,839)	13,800	170,182	136,960	1,480	80,690	425,021
2011	699	3,663	13,987	36,634	(11,839)	16,053	203,620	166,341	1,522	97,087	507,352
2012	742	3,878	14,845	38,780	(11,839)	16,999	221,594	196,015	1,564	116,387	577,346
2013	786	4,097	15,716	40,971	(11,839)	17,286	231,366	229,761	1,606	138,756	646,337
2014	823	4,282	16,466	42,824	(11,839)	17,656	242,439	265,493	1,648	164,458	721,488
2015	864	4,480	17,283	44,803	(11,839)	18,791	264,476	307,781	1,689	197,329	821,522
Total			140,854	369,216	(142,067)	150,490	1,899,199	1,669,888	17,502	1,001,254	4,955,847

Table 11.10 OPEX of the 2nd Scenario without the mobile phones

	Number of Workers (persons)		Personnel Expense (Million kip)			Repair & Maintenance (thousand \$) (million kip)		International Settlement (million kip)	Leased Line (Internet)	Other OPEX	OPEX Total (million kip)
	Manager	Engineer/ Officer	Manager	Engineer/ Officer	Cost adjustment						
2003	232	1,228	4,631	12,281							
2004	261	1,387	5,229	13,870	(14,037)	1,915	19,585	11,298	1,227	4,402	41,574
2005	301	1,599	6,026	15,987	(14,686)	2,976	31,466	25,494	1,269	8,548	74,104
2006	372	1,968	7,432	19,684	(15,837)	4,405	48,113	35,736	1,311	11,474	107,912
2007	442	2,338	8,843	23,379	(16,988)	6,139	69,206	55,864	1,353	19,747	161,404
2008	513	2,707	10,257	27,072	(18,137)	6,945	80,742	78,456	1,395	25,441	205,226
2009	584	3,076	11,675	30,763	(19,284)	7,566	90,630	93,639	1,438	32,681	241,541
2010	655	3,445	13,096	34,452	(20,430)	8,330	102,727	113,513	1,480	41,997	286,836
2011	699	3,663	13,987	36,634	(21,190)	9,594	121,701	137,128	1,522	49,745	339,528
2012	742	3,878	14,845	38,780	(21,882)	10,537	137,355	160,094	1,564	58,569	389,324
2013	786	4,097	15,716	40,971	(22,577)	11,388	152,429	185,641	1,606	68,252	442,038
2014	823	4,282	16,466	42,824	(23,178)	11,025	151,395	211,401	1,648	78,577	479,131
2015	864	4,480	17,283	44,803	(23,862)	10,561	148,638	240,923	1,689	91,458	520,932
Total			140,854	369,216	(232,086)	91,380	1,153,987	1,349,187	17,502	490,890	3,289,549

(3) Depreciation

CAPEX is to be depreciated by the straight line without leaving any residual at the end of the depreciation period. The residual values at the end of 2015 are placed in the cash inflow in 2015 in order to adjust to the evaluation term. Two sets of the depreciation rate is used in the analysis. The economic useful life is used for calculating IRR and OPEX while the accounting depreciation period is used for calculating the income tax.

	For calculating IRR & OPEX	For calculating Income Tax
Switching	8 years	10 years
Transmission	10 years	10 years
Mobile	8 years	10 years
Outside Plant	11 years	11 years
IP	5 years	5 years
Rural	10 years	10 years

(4) Tax

- a) consumption tax: 9.1% of the customer's payment
- b) income tax: higher amount between 35% of profit or 1% of revenue
- c) import duty: 1% of the imported equipment

(5) Loan Conditions

The shortage of cash flow is assumed to be covered by the long-term debt every year. 5% is applied for the interest rate, and the principal is assumed to be paid back in equal amount for 8 years with 2-year grace period.

(6) Working capital

Account receivable is assumed to be 60 days of the revenue, and account payable is assumed to be 60 days of CAPEX in each year.

(7) Exchange Rate

Kip-to-US dollar exchange rate is estimated based on the purchasing power parity model (Fig. 11.5).

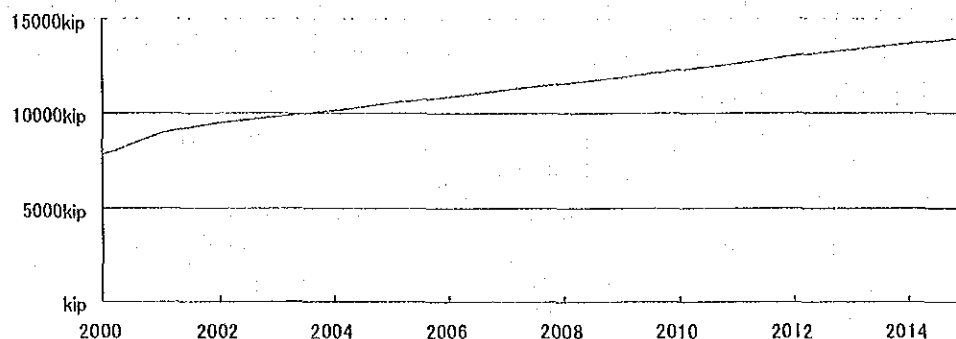


Fig. 11.5 Exchange Rate Projection

11.2.3 Economic Benefit Assumptions

Economic benefit is the difference between the economic benefit of with-project and that of without-project. Table 11.11 summarizes base assumptions for calculating the economic benefit. The 'with-project' demand curve was identified by the relative unit price in correlation to the annual traffic per subscriber in each province. The details of the calculation are discussed in the supporting document.

Table 11.11 Base assumptions for calculating the Economic Benefit

Category		Economic Benefit (With-Project)	The ratio of economic benefit in without-project against the economic benefit of with-project
Initial Charge		supplier's revenue	20.0%
Monthly Charge		supplier's revenue	20.0%
Call Charge	fixed / domestic	consumer surplus and supplier's revenue	32.7%
	mobile / local	consumer surplus and supplier's revenue	8.2%
	mobile /long distance	supplier's revenue	20.0%
	fixed /outgoing international	consumer surplus and supplier's revenue	18.6%
	mobile / outgoing international	consumer surplus and supplier's revenue	12.4%
	fixed & mobile/ incoming international	supplier's revenue	20.0%
Access Charge	Internet	consumer surplus and supplier's revenue	20.0%

11.2.4. Economic Cost Assumptions

Followings explain the methods to convert the financial cost to the economic cost.

(1) CAPEX

The equipment cost in the CAPEX, used in the financial analysis, is converted into the economic cost by the shadow exchange rate, which is the estimated official exchange rate divided by the standard conversion factor, 0.986.

(2) OPEX

- a. The labor cost of non-managers is converted into the economic cost with the conversion factor at 0.927, which is one minus the unemployment rate in Lao P.D.R. in 2000.
- b. 70% of the repair and maintenance cost is assumed to be imported and is converted to the economic cost by the standard conversion factor.

(3) Tax and duties

Tax and duties are excluded from the economic cost because they are only the transfer of benefit within the country.

11.3 Result

11.3.1 FIRR Estimation

Based on the inflow and outflow projection as discussed in the previous section, FIRR is calculated. The first scenario that implements all the plan results in FIRR at 19.9% (Table 11.12). On the other hand, the first scenario that excludes mobile phone results in FIRR at 9.3% (Table 11.13). Higher price setting and cheaper cost of the mobile phones as compared to the fixed phones caused the higher FIRR if calculated with the mobile phones.

In spite of the reduction of CAPEX by more than 10%, the second scenario does not contribute to a big leap of FIRR. FIRR with the mobile phone is estimated at 20.3% (Table 11.14) while FIRR without the mobile phone is at 10.2% (Table 11.15).

These results show that inclusion of the mobile phones in business increases the financial stability.

Table 11.12 FIRR of the 1st Scenario with the mobile phones

FIRR 19.9%

(unit: million kip except stated otherwise)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cash flow from operating activities												
Fixed Charges (domestic)	30,069	48,076	54,185	122,894	136,717	186,267	252,502	283,470	324,426	364,788	407,043	460,891
Mobile Charges (domestic)	64,057	155,264	223,845	288,342	367,357	464,392	583,912	723,975	897,307	1,108,596	1,366,455	1,681,597
International Call Charges	35,841	83,077	119,280	178,467	245,138	293,794	356,096	434,481	515,065	607,053	709,005	828,403
Internet Revenue (Dial Up)	11,969	25,157	40,825	57,227	79,082	108,184	146,941	185,103	230,817	286,925	355,854	440,614
Internet Revenue (ADSL)	1,956	2,943	3,303	3,743	4,232	4,776	5,375	6,189	7,114	8,169	9,373	10,745
CAPEX	(466,668)	(307,246)	(371,989)	(364,709)	(280,711)	(277,306)	(349,622)	(542,283)	(544,456)	(363,410)	(735,040)	(665,929)
CAPEX Adjustment												2,317,393
OPEX	(64,135)	(119,629)	(172,645)	(239,529)	(303,443)	(357,399)	(425,021)	(516,211)	(596,053)	(675,881)	(767,551)	(881,696)
Interest	(21,476)	(34,365)	(44,102)	(51,086)	(48,177)	(41,853)	(34,839)	(27,351)	(19,391)	(10,959)	(5,664)	(2,111)
Increase in Receivable	(25,498)	(18,957)	(31,268)	(27,176)	(33,906)	(42,652)	(43,097)	(51,035)	(59,896)	(70,565)	(85,856)	(85,856)
Increase in payable	(26,206)	10,643	(1,197)	(13,808)	(560)	11,887	31,670	357	(29,761)	61,090	(11,361)	(11,361)
Consumption Tax	(13,081)	(28,592)	(40,131)	(59,152)	(75,684)	(96,310)	(122,257)	(148,474)	(179,521)	(215,957)	(258,885)	(311,114)
Import Duties	(3,793)	(2,704)	(3,286)	(3,477)	(2,932)	(3,079)	(3,741)	(5,472)	(5,655)	(4,512)	(7,165)	(6,907)
Income Tax	(1,308)	(15,950)	(21,281)	(49,425)	(76,198)	(124,384)	(184,083)	(227,591)	(292,597)	(383,311)	(489,992)	(622,675)
Net Cash	(426,569)	(245,675)	(220,320)	(149,170)	4,398	124,615	194,499	154,408	286,378	631,844	573,957	3,151,997
Revenue (after consumption tax)	130,811	285,924	401,308	591,521	756,843	963,102	1,222,569	1,484,744	1,795,208	2,159,574	2,588,845	3,111,138
OPEX	(64,135)	(119,629)	(172,645)	(239,529)	(303,443)	(357,399)	(425,021)	(516,211)	(596,053)	(675,881)	(767,551)	(881,696)
Interest	(21,476)	(34,365)	(44,102)	(51,086)	(48,177)	(41,853)	(34,839)	(27,351)	(19,391)	(10,959)	(5,664)	(2,111)
Depreciation	(49,487)	(83,654)	(120,471)	(156,214)	(184,583)	(205,388)	(233,017)	(285,448)	(338,117)	(373,047)	(408,487)	(441,354)
Import Duties	(3,793)	(2,704)	(3,286)	(3,477)	(2,932)	(3,079)	(3,741)	(5,472)	(5,655)	(4,512)	(7,165)	(6,907)
Earning Before Tax	(8,080)	45,572	60,804	141,216	217,708	355,383	525,952	650,261	835,992	1,095,174	1,399,978	1,779,070
Tax	(1,308)	(15,950)	(21,281)	(49,425)	(76,198)	(124,384)	(184,083)	(227,591)	(292,597)	(383,311)	(489,992)	(622,675)
Net Income	(9,388)	29,622	39,522	91,790	141,510	230,999	341,869	422,670	543,395	711,863	909,986	1,156,395
Rate of Return	-7%	10%	10%	16%	19%	24%	28%	28%	30%	33%	35%	37%
Receivable	21,503	47,001	65,968	97,236	124,413	158,318	200,970	244,067	295,103	354,998	425,564	511,420
Payable	(76,713)	(50,506)	(61,149)	(59,952)	(46,144)	(45,585)	(57,472)	(89,142)	(69,500)	(59,739)	(120,828)	(109,468)
Proceeded Long-term Debt (\$1000)	42,000	23,000	21,000	18,000	3,000							
Repayment (\$1000)	0	0	(5,250)	(8,125)	(10,750)	(13,000)	(13,375)	(13,375)	(13,375)	(13,375)	(8,125)	(5,250)
Debt Balance (\$1000)	42,000	65,000	80,750	90,625	82,875	69,875	56,500	43,125	29,750	16,375	8,250	3,000

FIRR 9.3%

Table 11.13 FIRR of the 1st Scenario without the mobile phones

(unit: million kip except stated otherwise)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cash flow from operating activities												
Fixed Charges (domestic)	30,069	48,076	54,185	122,894	136,717	188,267	252,502	283,470	324,426	364,788	407,043	460,891
Fix Charges (International)	29,375	66,284	92,913	145,247	203,984	243,461	295,134	357,711	419,081	487,504	560,536	644,411
Internet Revenue (Dial Up)	11,969	25,157	40,825	57,227	79,082	108,184	146,941	185,103	230,817	286,925	355,854	440,614
Internet Revenue (ADSL)	1,956	2,943	3,303	3,743	4,232	4,776	5,375	6,189	7,114	8,169	9,373	10,745
CAPEX	(261,991)	(130,416)	(239,561)	(301,994)	(139,756)	(201,936)	(236,070)	(326,614)	(322,818)	(262,683)	(301,369)	(293,239)
CAPEX Adjustment												1,330,103
OPEX	(41,574)	(74,104)	(107,912)	(161,404)	(205,226)	(241,541)	(286,836)	(345,355)	(400,898)	(459,923)	(506,875)	(557,431)
Interest	(12,784)	(19,561)	(28,878)	(39,600)	(40,838)	(40,430)	(38,769)	(37,657)	(33,974)	(26,017)	(19,310)	(13,283)
Increase in Receivable		(10,325)	(7,288)	(20,605)	(14,183)	(18,033)	(23,203)	(19,804)	(22,261)	(24,799)	(27,709)	(33,453)
Increase in payable		(21,629)	17,942	10,263	(26,869)	10,221	5,611	14,884	(624)	(9,885)	6,359	(1,336)
Consumption Tax	(6,670)	(12,951)	(17,384)	(29,919)	(38,547)	(49,517)	(63,632)	(75,679)	(89,222)	(104,308)	(121,164)	(141,515)
Import Duties	(2,240)	(1,293)	(2,146)	(2,764)	(1,623)	(2,160)	(2,502)	(3,397)	(3,508)	(3,192)	(3,516)	(3,468)
Income Tax	(667)	(1,295)	(1,738)	(2,992)	(8,736)	(29,732)	(58,047)	(69,005)	(87,536)	(113,875)	(154,284)	(205,294)
Net Cash	(252,557)	(129,114)	(195,738)	(219,905)	(51,561)	(28,441)	(3,496)	(30,154)	20,598	142,705	204,939	1,637,746
Revenue (after consumption tax)	66,699	129,510	173,842	299,191	385,469	495,171	636,319	766,794	892,216	1,043,079	1,211,642	1,415,147
OPEX	(41,574)	(74,104)	(107,912)	(161,404)	(205,226)	(241,541)	(286,836)	(345,355)	(400,898)	(459,923)	(506,875)	(557,431)
Interest	(12,784)	(19,561)	(28,878)	(39,600)	(40,838)	(40,430)	(38,769)	(37,657)	(33,974)	(26,017)	(19,310)	(13,283)
Depreciation	(29,019)	(45,504)	(69,078)	(98,548)	(112,822)	(126,090)	(142,364)	(173,228)	(203,734)	(228,591)	(241,131)	(254,412)
Import Duties	(2,240)	(1,293)	(2,146)	(2,764)	(1,623)	(2,160)	(2,502)	(3,397)	(3,508)	(3,192)	(3,516)	(3,468)
Earning Before Tax	(18,918)	(10,952)	(34,171)	(3,125)	24,961	84,949	165,848	197,156	250,103	325,356	440,810	586,553
Tax	(667)	(1,295)	(1,738)	(2,992)	(8,736)	(29,732)	(58,047)	(69,005)	(87,536)	(113,875)	(154,284)	(205,294)
Net Income	(19,585)	(12,247)	(35,909)	(6,117)	16,225	55,217	107,801	128,152	162,567	211,481	286,527	381,260
Rate of Return	-29%	-9%	-21%	-2%	4%	11%	17%	17%	18%	20%	24%	27%
Receivable	10,964	21,289	28,577	49,182	63,365	81,398	104,600	124,404	146,666	171,465	199,174	232,627
Payable	(43,067)	(21,438)	(39,380)	(49,643)	(22,974)	(33,195)	(38,806)	(53,690)	(53,066)	(43,181)	(49,540)	(49,204)
Proceeded Long-term Debt (\$1000)	25,000	12,000	19,000	22,000	7,000	7,000	6,000	8,000	5,000			
Repayment (\$1000)	0	0	(3,125)	(4,625)	(7,000)	(9,750)	(10,625)	(11,500)	(12,250)	(13,250)	(10,750)	(9,250)
Debt Balance (\$1000)	25,000	37,000	52,875	70,250	70,250	67,500	62,875	59,375	52,125	38,875	28,125	18,875

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Chapter 11 Financial and Economic Evaluation

Table 11.14 FIRR of the 2nd Scenario with the mobile phones

FIRR 20.3 %

(unit: million kip except stated otherwise)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cash flow from operating activities												
Fixed Charges (domestic)	30,069	48,076	54,185	122,894	136,717	188,267	252,502	281,263	321,966	359,768	394,740	446,543
Mobile Charges (domestic)	64,057	155,264	223,845	288,342	367,357	464,392	583,912	713,068	870,248	1,060,366	1,290,718	1,590,683
International Charges	35,841	83,077	119,280	178,467	245,138	293,794	356,096	432,486	509,640	597,379	690,282	800,230
Internet Revenue (Dial Up)	11,969	25,157	40,825	57,227	79,082	108,184	146,941	185,103	230,817	286,925	355,854	440,614
Internet Revenue (ADSL)	1,956	2,943	3,303	3,743	4,232	4,776	5,375	6,189	7,114	8,169	9,373	10,745
CAPEX	(466,668)	(307,246)	(371,989)	(364,709)	(280,711)	(277,306)	(349,622)	(450,325)	(454,158)	(271,697)	(608,503)	(563,780)
CAPEX Adjustment												1,947,917
OPEX	(64,135)	(119,629)	(172,645)	(239,529)	(303,443)	(357,399)	(425,021)	(507,352)	(577,346)	(646,337)	(721,488)	(821,522)
Interest	(21,476)	(34,365)	(44,102)	(51,086)	(48,177)	(41,853)	(34,839)	(27,351)	(19,391)	(10,959)	(5,664)	(2,111)
Increase in Receivable		(25,498)	(18,967)	(31,268)	(27,176)	(33,906)	(42,652)	(40,839)	(48,071)	(55,714)	(64,014)	(81,670)
Increase in payable		(26,206)	10,643	(1,197)	(13,808)	(560)	11,887	16,554	630	(29,994)	55,365	(7,352)
Consumption Tax	(13,081)	(28,592)	(40,131)	(59,152)	(75,684)	(96,310)	(122,257)	(147,101)	(176,344)	(210,237)	(249,179)	(298,983)
Import Duties	(3,793)	(2,704)	(3,286)	(3,477)	(2,932)	(3,079)	(3,741)	(4,681)	(4,834)	(3,631)	(5,975)	(5,843)
Income Tax	(1,308)	(15,950)	(21,281)	(49,425)	(76,198)	(124,384)	(184,083)	(229,347)	(294,640)	(383,450)	(486,447)	(619,104)
Net Cash	(426,569)	(245,675)	(220,320)	(149,170)	4,398	124,615	194,489	227,667	365,631	700,587	655,062	2,836,167
Revenue (after consumption tax)	130,811	285,924	401,308	591,521	756,843	963,102	1,222,569	1,471,008	1,763,440	2,102,370	2,491,788	2,989,833
OPEX	(64,135)	(119,629)	(172,645)	(239,529)	(303,443)	(357,399)	(425,021)	(507,352)	(577,346)	(646,337)	(721,488)	(821,522)
Interest	(21,476)	(34,365)	(44,102)	(51,086)	(48,177)	(41,853)	(34,839)	(27,351)	(19,391)	(10,959)	(5,664)	(2,111)
Depreciation	(49,487)	(83,654)	(120,471)	(156,214)	(184,583)	(205,388)	(233,017)	(276,346)	(320,042)	(345,870)	(368,812)	(391,488)
Import Duties	(3,793)	(2,704)	(3,286)	(3,477)	(2,932)	(3,079)	(3,741)	(4,681)	(4,834)	(3,631)	(5,975)	(5,843)
Earning Before Tax	(8,080)	45,572	60,804	141,216	217,708	355,383	525,952	655,278	841,828	1,095,572	1,389,849	1,768,869
Tax	(1,308)	(15,950)	(21,281)	(49,425)	(76,198)	(124,384)	(184,083)	(229,347)	(294,640)	(383,450)	(486,447)	(619,104)
Net Income	(9,388)	29,622	39,522	91,790	141,510	230,999	341,869	425,931	547,188	712,122	903,402	1,149,765
Rate of Return	-7%	10%	10%	16%	19%	24%	28%	29%	31%	34%	36%	38%
Receivable	21,503	47,001	65,968	97,236	124,413	158,318	200,970	241,810	289,881	345,595	409,809	491,479
Payable	(76,713)	(50,506)	(61,149)	(59,952)	(46,144)	(45,585)	(57,472)	(74,026)	(74,656)	(44,663)	(100,028)	(92,676)
Proceeded Long-term Debt (\$1000)	42,000	23,000	21,000	18,000	3,000							
Repayment (\$1000)	0	0	(5,250)	(8,125)	(10,750)	(13,000)	(13,375)	(13,375)	(13,375)	(13,375)	(8,125)	(5,250)
Debt Balance (\$1000)	42,000	65,000	80,750	90,625	82,875	69,875	56,500	43,125	29,750	16,375	8,250	3,000

Table 11.15 FIRR of the 2nd Scenario without the mobile phones

FIRR 10.2%

(unit: million kip except stated otherwise)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cash flow from operating activities												
Fixed Charges (domestic)	30,069	48,076	54,185	122,894	136,717	188,267	252,502	281,263	321,966	359,768	394,740	446,543
Fixed Charges (International)	29,375	66,284	92,913	145,247	203,984	243,461	295,134	356,533	416,246	482,666	549,642	626,400
Internet Revenue (Dial Up)	11,969	25,157	40,825	57,227	79,082	108,184	146,941	185,103	230,817	286,925	355,854	440,614
Internet Revenue (ADSL)	1,956	2,943	3,303	3,743	4,232	4,776	5,375	6,189	7,114	8,169	9,373	10,745
CAPEX	(261,991)	(130,416)	(239,561)	(301,994)	(139,756)	(201,936)	(236,070)	(262,263)	(263,312)	(199,683)	(222,777)	(235,051)
CAPEX Adjustment												1,093,115
OPEX	(41,574)	(74,104)	(107,912)	(161,404)	(205,226)	(241,541)	(286,836)	(339,528)	(389,324)	(442,038)	(479,131)	(520,932)
Interest	(12,784)	(19,561)	(28,878)	(39,600)	(40,838)	(40,430)	(38,769)	(34,486)	(27,456)	(19,743)	(13,731)	(8,445)
Increase in Receivable		(10,325)	(7,288)	(20,605)	(14,183)	(18,033)	(23,203)	(19,298)	(21,976)	(24,117)	(25,716)	(32,084)
Increase in payable		(21,629)	17,942	10,263	(26,669)	10,221	5,611	4,306	173	(10,460)	3,796	2,018
Consumption Tax	(6,670)	(12,951)	(17,384)	(29,919)	(38,547)	(49,517)	(63,632)	(75,372)	(88,740)	(103,412)	(119,055)	(138,573)
Import Duties	(2,240)	(1,293)	(2,146)	(2,764)	(1,623)	(2,160)	(2,502)	(2,843)	(2,961)	(2,588)	(2,755)	(2,829)
Income Tax	(667)	(1,295)	(1,738)	(2,992)	(8,736)	(29,732)	(58,047)	(73,490)	(96,657)	(125,868)	(167,991)	(220,877)
Net Cash	(252,557)	(129,114)	(195,738)	(219,905)	(51,561)	(28,441)	(3,496)	26,114	85,888	209,620	282,249	1,460,646
Revenue (after consumption tax)	66,699	129,510	173,842	299,191	385,469	495,171	636,319	753,717	887,402	1,034,116	1,190,554	1,385,730
OPEX	(41,574)	(74,104)	(107,912)	(161,404)	(205,226)	(241,541)	(286,836)	(339,528)	(389,324)	(442,038)	(479,131)	(520,932)
Interest	(12,784)	(19,561)	(28,878)	(39,600)	(40,838)	(40,430)	(38,769)	(34,486)	(27,456)	(19,743)	(13,731)	(8,445)
Depreciation	(29,019)	(45,504)	(69,078)	(98,548)	(112,822)	(126,090)	(142,364)	(166,887)	(191,498)	(210,125)	(214,962)	(222,448)
Import Duties	(2,240)	(1,293)	(2,146)	(2,764)	(1,623)	(2,160)	(2,502)	(2,843)	(2,961)	(2,588)	(2,755)	(2,829)
Earning Before Tax	(18,918)	(10,952)	(34,171)	(3,125)	24,961	84,949	165,848	209,973	276,162	359,624	479,974	631,076
Tax	(667)	(1,295)	(1,738)	(2,992)	(8,736)	(29,732)	(58,047)	(73,490)	(96,657)	(125,868)	(167,991)	(220,877)
Net Income	(19,585)	(12,247)	(35,909)	(6,117)	16,225	55,217	107,801	136,482	179,505	233,755	311,983	410,199
Rate of Return	-29%	-9%	-21%	-2%	4%	11%	17%	18%	20%	23%	26%	30%
Receivable	10,964	21,289	28,577	49,182	63,365	81,398	104,600	123,899	145,874	169,982	195,708	227,791
Payable	(43,067)	(21,438)	(39,380)	(49,643)	(22,974)	(33,195)	(38,806)	(43,112)	(43,284)	(32,825)	(36,621)	(36,638)
Proceeded Long-term Debt (\$1000)	25,000	12,000	19,000	22,000	7,000	7,000	6,000	3,000				
Repayment (\$1000)	0	0	(3,125)	(4,625)	(7,000)	(9,750)	(10,625)	(11,500)	(12,250)	(12,625)	(9,500)	(8,000)
Debt Balance (\$1000)	25,000	37,000	52,875	70,250	70,250	67,500	62,875	54,375	42,125	29,500	20,000	12,000

11.3.2 Sensitivity Analysis of FIRR

Sensitivity analysis is conducted in each scenario in response to the change in revenue, which affects change in OPEX, tax, and working capital (Fig. 11.6). It is assumed that the same ratio of the revenue is changed against the base case in each year. The amount of CAPEX is kept constant. FIRR drops to 10% when the revenue is decreased by 32% in the first and 33% in the second scenario if calculated with the mobile phones. Since the assumed number of the subscriber is almost the same as the supplied capacity in the base case, earning lower revenue than the base case may well be expected.

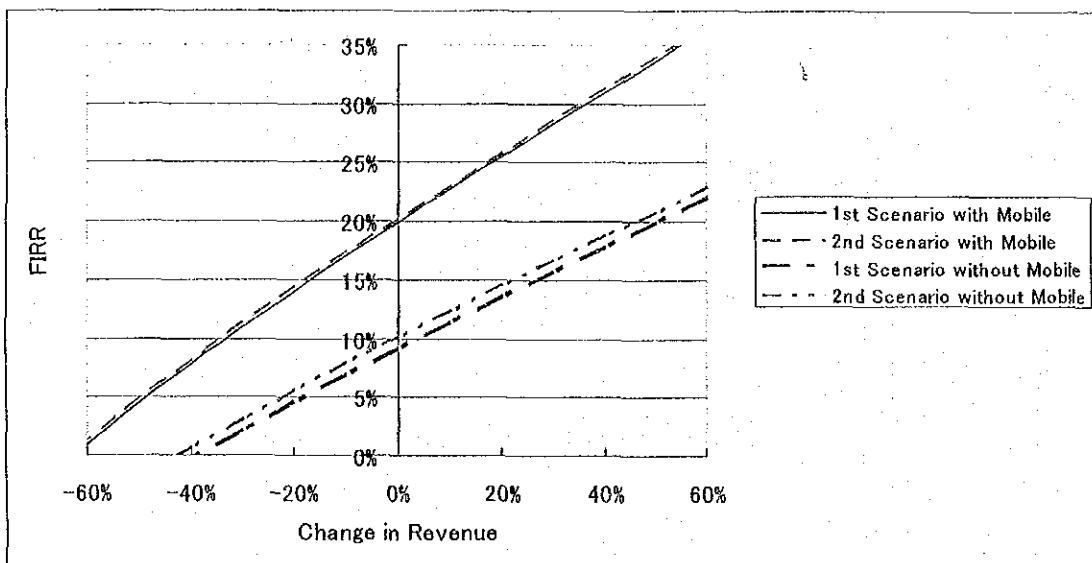


Fig. 11.6 Sensitivity Analysis of FIRR on the Change in Revenue

Secondly, the effect of the change in the number of the mobile subscribers is shown in Fig. 11.7. It is assumed that the same ratio of the subscribers is changed as compared to the base case in each year. Contrary to the analysis in Fig. 11.6, the amount of the supply is changed in accordance with the number of the subscribers. The rapid growth of the demand towards the mobile phones in recent years makes the prediction of the future demand difficult. This analysis is to check the effect of the change in the mobile subscribers on FIRR. The point at minus 100% along x-axis represents the analyses without the mobile phones in the base case. Regardless of the number of the subscribers, investment on the mobile phone in addition to other telecommunication services is predicted to contribute to increase in FIRR.

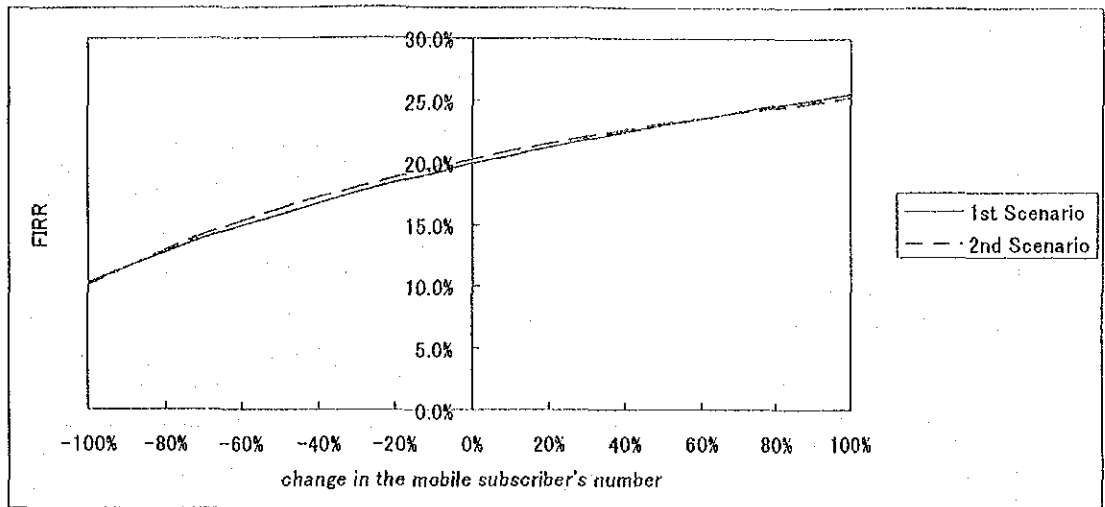


Fig. 11.7 Sensitivity Analysis of FIRR on the mobile phone subscribers

Furthermore, Table 11.16 shows the effect on FIRR by changing some major assumptions. FIRR estimated with the mobile phones shows stable result regardless of changes in the major assumptions. The most sensitive change in assumption is the monthly charge of the fixed phones. If the monthly charge stays constant at 10,000 kip, FIRR calculated without the mobile phones becomes 5.3% in the first scenario and 6.3% in the second scenario. Secondly, borrowing the long-term loan at the rate offered by the domestic bank to cover all the cash shortage results in FIRR at 6.6% in the first scenario and at 7.7% in the second scenario, which are calculated without the mobile phones. In reality, the shortage of the cash flow is likely to be covered not only by the commercial borrowing but also by earnings from without-project, ie. earnings before 2004, earnings from the Internet service, as well as foreign aid. Therefore, the total amount of interest is expected to be lower than 8.5% of the total amount of the cash shortage.

Table 11.16 Sensitivity Analysis of FIRR on the Major Assumptions

Inserted Variable	FIRR			
	with mobile phones		without mobile phones	
	1 st Scenario	2 nd Scenario	1 st Scenario	2 nd Scenario
Base Case	19.9%	20.3%	9.3%	10.2%
1) Monthly Charge of Fixed Phones				
increased to 80,000 kip by 2010	21.1%	21.5%	11.7%	12.6%
increased to 50,000 kip by 2010	Base Case			
remains constant (10,000 kip)	18.2%	18.6%	5.3%	6.3%
2) Ratio of the internet access charge shared with the internet service provider				
70% of the customer's payment	20.6%	21.0%	10.5%	11.5%
50% of the customer's payment	Base Case			
30% of the customer's payment	19.3%	19.6%	7.8%	8.8%
3) Economic life time of equipment				
IP 5 years Switching, Mobile 8 years Transmission and Rural 10 years Outside Plant 11 years	Base Case			
IP 5 years Switching, Mobile, Transmission and Rural 8 years Outside Plant 11 years	19.3%	19.9%	8.4%	9.6%
4) Loan Condition				
Interest rate 2.75% Repayment Period 8 years Grace Period 2 years (condition in Phase I)	20.9%	21.3%	10.6%	11.5%
Interest rate 5.0% Repayment Period 8 years Grace Period 2 years (borrowed from abroad)	Base Case			
Interest rate 8.5% Grace Period 1 year Repayment Period 10 years (borrowed domestically)	18.3%	18.7%	6.6%	7.7%

11.3.3 EIRR Estimation

Following tables show the result of EIRR calculations. Similar to FIRR, EIRR with the mobile phones shows much higher figure than that without the mobile phones, and EIRR between the first and the second scenarios do not show much difference.

The first scenario that implements all the plan results in EIRR at 35.5% (Table 11.17). On the other hand, the first scenario that excludes mobile phone results in EIRR at 21.4% (Table 11.18). In the second scenario, EIRR with the mobile phone is estimated at 35.8% (Table 11.19) while EIRR without the mobile phone is at 22.4% (Table 11.20).

All results show high EIRR that certify importance of the proposed telecommunication development plan for the economic benefit of Lao P.D.R.

Table 11.17 EIRR of the 1st Scenario with the mobile phonesEIRR 35.5%
(Unit: million kip)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Net Economic Benefit												
Fixed Phones	58,372	116,984	159,068	258,738	369,957	446,519	569,421	671,352	767,036	875,465	995,438	1,135,154
Mobile Phones	67,320	165,461	243,421	311,467	393,942	494,164	616,350	763,196	943,267	1,162,117	1,430,850	1,758,932
Internet (Dial Up)	9,996	21,085	34,348	48,344	67,101	92,227	125,899	158,796	198,256	246,743	306,374	379,778
Internet (ADSL)	1,590	2,429	2,753	3,135	3,566	4,051	4,595	5,287	6,077	6,979	8,007	9,179
CAPEX	(471,710)	(310,507)	(375,814)	(368,542)	(283,553)	(280,193)	(353,233)	(547,955)	(550,147)	(367,323)	(742,513)	(672,743)
CAPEX Adjustment	0	0	0	0	0	0	0	0	0	0	0	2,383,503
OPEX	(64,080)	(119,659)	(172,665)	(239,541)	(303,406)	(357,257)	(424,821)	(491,192)	(577,539)	(665,808)	(753,907)	(858,681)
Other Outflow	(21,476)	(34,365)	(44,102)	(51,086)	(48,177)	(41,853)	(34,839)	(27,351)	(19,391)	(10,959)	(5,664)	(2,411)
Total	(419,987)	(158,551)	(153,991)	(37,485)	199,430	357,659	503,372	542,133	767,559	1,247,214	1,238,586	4,133,012

Table 11.18 EIRR of the 1st Scenario without the mobile phonesEIRR 21.4%
(Unit: million kip)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Net Economic Benefit												
Fixed (domestic)	28,108	47,259	58,242	99,281	141,045	167,130	222,940	257,211	288,480	326,311	364,016	409,251
International (fixed)	30,264	69,725	99,826	159,456	228,912	279,389	346,481	414,141	478,556	549,154	631,422	725,903
Internet (Dial Up)	9,996	21,085	34,348	48,344	67,101	92,227	125,899	158,796	198,256	246,743	306,374	379,778
Internet (ADSL)	1,590	2,429	2,753	3,135	3,566	4,051	4,595	5,287	6,077	6,979	8,007	9,179
CAPEX	(264,969)	(131,935)	(242,123)	(305,222)	(141,254)	(204,097)	(238,595)	(330,176)	(326,342)	(265,568)	(304,669)	(296,454)
CAPEX Adjustment	0	0	0	0	0	0	0	0	0	0	0	1,359,731
OPEX	(40,756)	(73,249)	(106,952)	(160,383)	(204,050)	(240,194)	(285,339)	(323,398)	(383,009)	(442,680)	(505,000)	(558,217)
Interest	(12,784)	(19,561)	(28,878)	(39,600)	(40,838)	(40,430)	(38,769)	(37,657)	(33,974)	(26,017)	(19,310)	(13,283)
Total	(248,550)	(84,248)	(182,784)	(194,989)	54,483	58,076	137,211	144,203	228,044	394,922	480,841	2,015,889

Table 11.19 EIRR of the 2nd Scenario with the mobile phones

EIRR 35.8%

(Unit: million kip)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Net Economic Benefit												
Fixed Phones	58,372	116,984	158,068	258,738	369,957	446,519	569,421	668,679	761,255	866,148	973,892	1,101,166
Mobile Phones	67,320	165,481	243,421	311,467	393,942	494,164	616,350	752,510	915,539	1,112,400	1,352,454	1,663,353
Internet (Dial Up)	9,996	21,085	34,348	48,344	67,101	92,227	125,899	158,796	198,256	246,743	306,374	379,778
Internet (ADSL)	1,590	2,429	2,753	3,135	3,566	4,051	4,595	5,287	6,077	6,979	8,007	9,179
CAPEX	(471,710)	(310,507)	(375,814)	(368,542)	(283,553)	(280,193)	(353,233)	(454,936)	(458,808)	(274,547)	(614,562)	(569,433)
CAPEX Adjustment	0	0	0	0	0	0	0	0	0	0	0	2,003,486
OPEX	(64,080)	(119,659)	(172,665)	(239,541)	(303,406)	(357,257)	(424,821)	(478,464)	(564,879)	(642,394)	(716,260)	(805,367)
Other Outflow	(21,476)	(34,365)	(44,102)	(51,086)	(48,177)	(41,853)	(34,839)	(27,351)	(19,391)	(10,959)	(5,664)	(2,111)
Total	(419,987)	(158,551)	(153,991)	(37,485)	199,430	357,659	503,372	624,521	838,049	1,304,370	1,304,241	3,780,052

Table 11.20 EIRR of the 2nd Scenario without the mobile phones

EIRR 22.4%

(Unit: million kip)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Net Economic Benefit												
Fixed (domestic)	28,108	47,259	58,242	99,281	141,045	167,130	222,940	255,902	285,937	322,444	354,741	395,551
Fixed (international)	30,264	69,725	99,826	159,456	228,912	279,389	346,481	412,777	475,318	543,704	619,151	705,615
Internet (Dial Up)	9,996	21,085	34,348	48,344	67,101	92,227	125,899	158,796	198,256	246,743	306,374	379,778
Internet (ADSL)	1,590	2,429	2,753	3,135	3,566	4,051	4,595	5,287	6,077	6,979	8,007	9,179
CAPEX	(264,969)	(131,935)	(242,123)	(305,222)	(141,254)	(204,097)	(238,595)	(265,083)	(266,145)	(201,837)	(225,178)	(237,583)
CAPEX Adjustment	0	0	0	0	0	0	0	0	0	0	0	1,115,982
OPEX	(40,756)	(73,249)	(106,952)	(160,383)	(204,050)	(240,194)	(285,339)	(321,862)	(375,448)	(429,051)	(482,536)	(525,742)
Interest	(12,784)	(19,561)	(28,878)	(39,600)	(40,838)	(40,430)	(38,769)	(34,486)	(27,456)	(19,743)	(13,731)	(8,445)
Total	(248,550)	(84,248)	(182,784)	(194,989)	54,483	58,076	137,211	211,330	296,539	469,239	566,828	1,834,336

11.3.4 Sensitivity Analysis on EIRR

Sensitivity analysis is conducted in each scenario in response to the change in economic benefit, which affects change in OPEX (Fig. 11.8). If calculated with the mobile phones, EIRR drops to 10% when the economic benefit is decreased by 45% in the first scenario and by 46% in the second scenario. Excluding the mobile phones, EIRR drops to 10% when the economic benefit is decreased by 26% in the first scenario and 28% in the second scenario. This certifies that inclusion of the mobile phones in the development plan is beneficial not only for the financial stand point but also for the economic benefit of Lao P.D.R.

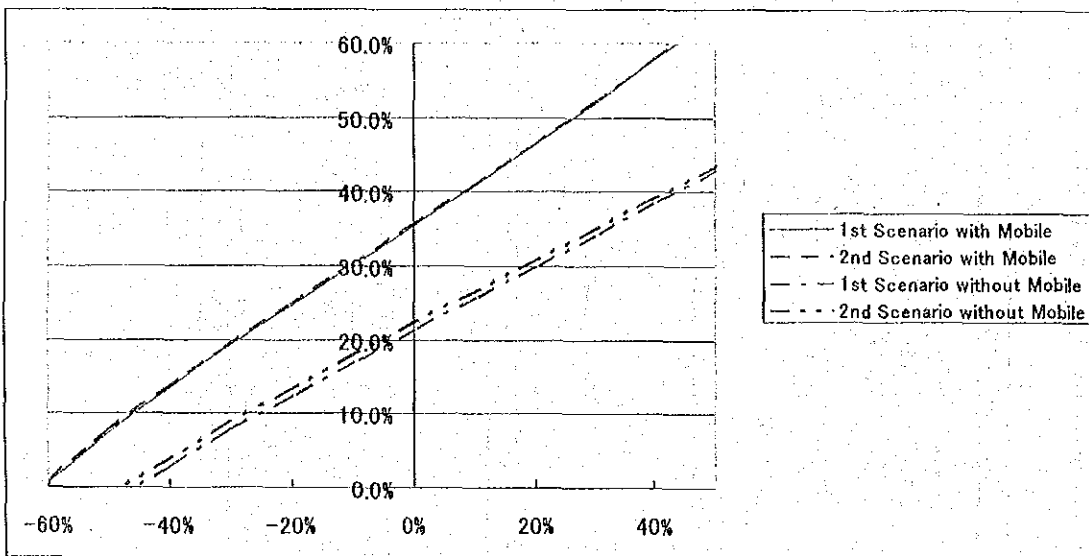


Fig. 11.8 Sensitivity Analysis of EIRR on the Change in Economic Benefit

Furthermore, Table 11.21 shows the effect on EIRR by changing the major assumptions as indicated in Table 11.16. Change in one assumption does not jeopardize the economic feasibility of the project. Especially if considered together with the mobile phones, the economic benefit of the proposed project is highly stable.

Table 11.21 Sensitivity Analysis of EIRR on the Change in Major Assumptions

Inserted Variable	EIRR			
	with mobile phones		without mobile phones	
	1 st Scenario	2 nd Scenario	1 st Scenario	2 nd Scenario
Base Case	35.5%	35.8%	21.4%	22.4%
1) Monthly Charge of Fixed Phones				
increased to 80,000 kip by 2010	36.8%	37.1%	24.1%	25.1%
increased to 50,000 kip by 2010	Base Case			
remains constant (10,000 kip)	33.6%	33.9%	17.0%	18.2%
2) Ratio of the internet access charge shared with the internet service provider				
70% of the customer's payment	36.5%	36.8%	23.1%	24.2%
50% of the customer's payment	Base Case			
30% of the customer's payment	34.6%	34.9%	19.4%	20.5%
3) Economic life time of equipment				
IP 5 years Switching, Mobile 8 years Transmission and Rural 10 years Outside Plant 11 years	Base Case			
IP 5 years Switching, Mobile, Transmission and Rural 8 years Outside Plant 11 years	34.7%	35.2%	20.5%	21.7%
4) Loan Condition				
Interest rate 2.75% Repayment Period 8 years Grace Period 2 years (condition in Phase I)	37.3%	37.6%	23.3%	24.3%
Interest rate 5.0% Repayment Period 8 years Grace Period 2 years (borrowed from abroad)	Base Case			
Interest rate 8.5% Repayment Period 10 years Grace Period 1 year (borrowed domestically)	39.5%	39.8%	25.6%	26.5%

11.3.5 Result of the financial and economic evaluation

The result of the financial and economic evaluation is summarized in the Table 11.22. Due to higher profitability of the mobile phones as explained by the price setting and lower investment cost, inclusion of the mobile phones in the business model relieves the financial constraints. With inclusion of the mobile phones, nearly three quarters of the investment is expected to be covered by earnings. On the other hand, without the mobile phones, only half of the investment is estimated to be covered by earnings unless the charges for the fixed phones are raised higher. From the economic point of view, the proposed telecommunication development is beneficial both with and without mobile phones.

Table 11.22 The Result of the Evaluation

	1 st scenario			2 nd scenario		
Assumption	All the proposed plan is to be carried out.			The lower priority projects from 2011 to 2015 are omitted from the first scenario. (Table 11.2 and Fig. 11.1)		
Targeted Subscribers	Fixed	Year	Subscribers	Fixed	Year	Subscribers
		2005	135,164		2005	Same as 1 st Scenario
		2010	278,199		2010	Same as 1 st Scenario
		2015	438,177		2015	427,727
	Mobile	2005	120,210	Mobile	2005	Same as 1 st Scenario
		2010	278,615		2010	Same as 1 st Scenario
		2015	662,410		2015	629,545
	Internet	2005	16,152	Internet	Same as Scenario 1	
		2010	42,409			
		2015	109,614			
CAPEX	Switch	\$54 million		Switch	\$52 million	
	OSP	\$110 million		OSP	\$107 million	
	Transmission	\$91 million		Transmission	\$52 million	
	IP	\$16 million		IP	\$16 million	
	Rural	\$23 million		Rural	\$23 million	
	Subtotal	\$293 million		Subtotal	\$250 million	
	Mobile	\$159 million		Mobile	\$155 million	
	Total	\$452 million		Total	\$405 million	
FIRR	with mobile phones	19.9%		with mobile phones	20.3%	
	without mobile phones	9.3%		without mobile phones	10.2%	
EIRR	with mobile phones	35.5%		with mobile phones	35.8%	
	without mobile phones	21.4%		without mobile phones	22.4%	
Estimated Required Long-term Loan ⁷	with mobile phones	\$113 million (cash shortage until 2007)		with mobile phones	\$111 million (cash shortage until 2007)	
	without mobile phones	\$131 million (cash shortage until 2011)		without mobile phones	\$113 million (cash shortage until 2010)	

⁷ The amount of long-term loan is adjusted back by the ratio of excluded CAPEX on the transmission against the total CAPEX.

CHAPTER 12

RECOMMENDATION

CHAPTER 12 RECOMMENDATION

12.1 Recommendation

Great efforts for telecommunications development in Lao P.D.R. have been made by MCTPC/ETC and other relevant organizations. Due to those efforts, the telecommunications situation in Lao P.D.R. has been dramatically changed since a decade ago. At present, new wave of telecommunications technologies has come to the surface of the earth, which will contain a greater possibility to change the world. Under the circumstance a lot of discussions and considerations were made among the Study Team and counterpart in order to find a best solution for people's welfare and the national prosperity in Lao P.D.R..

Through the master plan study, the team has understood the actual situations of the present telecommunications sector. On the basis of experience, the team wishes to recommend the following activities to be tackled by MCTPC/ETL for further improvement and well maintenance of the telecommunications sector of the Lao P.D.R..

- (a) Setting up firm policy of telecommunications for clearly showing a direction of development
- (b) Installation of backbone network for fundamental solution to lead to ICT development
- (c) Consideration for transition to IP network to receive cost benefit
- (d) Consideration for rural communications with multi solutions to secure telecom access
- (e) Setting up strategy and organization for better operation and maintenance
- (f) Introduction of strategic human resource development

12.1.1 Setting up Firm Policy of Telecommunications

Following policies are essential for telecommunications development in Lao P.D.R..

Policy measures for promoting ICT introduction into the Lao P.D.R.

(1) Strengthening ICT promotion committee

It is necessary to strengthen the position of the Committee and to assign more experts as the Committee members. Furthermore, in order to get much cooperation and support from Ministries as well as the public, it shall be necessary to provide a legal foundation for the Committee such as, say, Basic ICT Promotion

Act in which objectives and roles of the Committee must be defined explicitly and obligations of governmental offices must be clearly stated.

- (2) Developing human resource by introducing National Test for Qualified ICT Professionals

In order to keep qualification of ICT experts, it shall be better to hold National Test for those who are going to be engaged in developing information systems as a profession.

- (3) Providing a full support of the back-bone network by telecommunications sector

Since the transmission networks of the system must be operated and maintained by operators most likely, the networks shall be better owned by the operators regardless of whoever will construct the networks. In another words, the networks must be better to be owned, operated, and maintained only by operators except mere experimental projects, which is rather temporary. It implies that operators should have a full responsibility to provide the network services.

- (4) Liberalizing the one-gateway policy

The one-gateway policy depends on telecommunications policy towards liberalization. Only when all international gateway facilities are owned and operated only by ETL, then the one-gateway policy would be adopted. But since IP services via satellites shall be liberalized, there shall be other gateways to exist and to operate. This will be more practical and economical and will help telecommunications sector to develop.

- (5) Protecting intellectual property rights and privacy as well as customers from offensive contents

Some measures of protecting copy rights and privacy as well as limiting children to access to offensive contents shall be required. There are those measures such as establishing Telecommunication Business Act to allow providers to refuse any offensive contents to transmit and regulating access to violent contents by scrambling.

Policy measures for liberalizing the telecommunications sector

(1) Regulating PSTN services of ETL and LTC

It is the most urgent issue to develop the telephone network to provide the services to the people at both urban and rural areas. Furthermore, the IP network will also be developed at the same time. The telecommunication sector has a lack of development finance and will depend on soft loans or grant of ODA. These imply that ETL must operate together with LTC until the back-bone network and nation-wide telephone service provision to be completed.

(2) Liberalizing mobile telephone services and IP related services

In order to protect the interest of customers, both service providers must be given license by MCTPC of the policy-maker and regulator. Concerning mobile telephone service, licensing with allotment of radio frequency must be issued, so that availability of radio frequency will limit the number of operators.

(3) Securing to protect privacy and interest of customers

It is quite important for them to keep privacy of customers as a business moral at first. Interconnection shall be also a very critical aspect of telecommunications businesses for customer's interest. Furthermore many new services will appear and old services may cease to provide. There will be a lot of complaints about quality of service, contract of new services, termination of old services and errors of billing and the like, so that there must be the Office of Complaints and Disputes in MCTPC to keep telecommunication businesses to be straighten up.

Policy measures for developing rural telephone as universal service

The universal service fund shall depend on contributions from ETL, LTC and other telecommunication service providers, and will be used for ETL and LTC to construct rural telephone services. Accurate cost estimation and calculation will be required to make use of the fund. It may also possible to ask for provincial offices or municipality to contribute to financing rural telephone services in their provinces.

Policy measures for improving tariff formation

(1) Setting tariffs based on costs of the services

Estimation and calculation of cost of services must be done as accurately as possible. It will be the base to determine retail tariff of each serviced for customers, namely, end users, as well as whole-sale tariff for other operators and

service providers. This is quite urgent matter for operators and service providers to have reasonable and acceptable interconnection charges and to strengthen the revenue sources to run healthy business.

(2) Rebalancing tariff structure

Tariffs for local call service and long-distance call charge as well as monthly fixed charge are set so low that revenues from them share a smaller portion out of total revenue. Furthermore tariffs of international telephone services are given by hard currency, US\$, while tariffs of the domestic services are set by local currency, Kip, so that continuous devaluation of Kip may increase a divergence between tariffs for international telephone services and tariffs for the domestic telephone services. Therefore it is recommended to have rebalancing of tariffs as soon as possible.

(3) Adopting a price-cap regulation

As stated above, tariffs for telephone services in the Lao P.D.R. are given by double standards, Kip and US\$. In order to keep up with such a change with a possibility of cost reduction efforts in management and technological development, it is better to recommend that the price-cap regulation will be adopted in stead of rate-of-return regulation under political pressure.

Policy measures for securing interconnection

(1) Securing interconnection by law

The requirements for negotiation and the public announcement of conditions as well as other related matters shall be explicitly stated in the Law. It is recommended to spell out the requirements for negotiation and the public announcement of conditions in Telecommunication Business Act.

(2) Setting rules and procedure for negotiation of interconnection

It is recommended to set rules and procedures to be open to the public by stating explicitly in such as Telecommunication Business Law.

(3) Establishing the committee for a dispute settlement

It is strongly recommended to spell out those rules and procedures of dispute settlements as well as the organization and conditions for appealing the dispute in Telecommunications Business Law.

12.1.2 Installation of Backbone Network to lead to ICT Development

MCTPC is recommended to the following procedure to develop ICT in cooperation with other ministries and governmental agencies.

- (1) To set up taskforce specialize in ICT in MCTPC
- (2) To draw up National Information Infrastructure (NII) including vision and concept and formulate ICT Master Plan, ICT legislation, ICT Human Resource Development Plan in cooperation with other ministries.
- (3) To organize Application Committee consist of MCTPC, other ministries including academic and private sector to review contents, applications and multimedia plat form.
- (4) MCTPC will make presentation of this Master Plan to show what kind of application will be implemented when in the Application Committee. MCTPC will arrange seminar for ICT related hardware manufacture, software developer to demonstrate latest ICT products.
- (5) To gather proposals of ICT applications not only from other ministries but also from private sectors for the Application Committee to pre-qualify
- (6) MCTPC will consider request or proposal as opinion from demand side and MCTPC will consider accommodating and improving telecommunications infrastructure and network services.
- (7) MCTPC will coordinate implementation of those proposed ICT applications through the Application Committee.
- (8) To keep monitoring ICT development

In line with above procedure, following items are recommended to be implemented in terms of ICT development.

- (1) To keep increasing number of telephone lines and the Internet access by giving school and hospital and incentive and priority to install telephone and the Internet access.
- (2) To give incentive to ISP to increase the number of present access points in Vientiane, Savanakheth and Champasak. And to set up new additional access points in Luangpabang and Khammouane.
- (3) To promote ICT by demonstration of pilot project in cooperation with ETL and other ministries and governmental agencies to improve ICT literacy for the public which is equal to create new demand of telecommunications services.

12.1.3 Consideration for Transition to IP Network

Following transition to IP network is to be considered.

(1) IP-based Network for 2002 to 2005

(a) Limited IP Access services in Vientiane

In Vientiane, broadband IP services are provided along with city links. City links consist of SDH equipment and optical fibers. The proposed IP network will provide an interface to the edge routers which are interconnected to the core routers at the center. Edge routers are located at the telecom offices where SDH equipment or SDH ADM(add drop multiplexer) equipment is located.

(b) Wireless and ADSL for early users

Wireless and ADSL are used to connect users to the edge routers. As there are wireless access limitations and the subscriber loop which can be used as the access line is limited, these services are only provided in limited areas. Wireless LAN interface by IEEE 802.11b (10Mbps) may be adopted by public types of the services, but the service range is limited to several hundred meters. ADSL is able to provide 1.5 Mbps to 8 Mbps which should be utilized in most of all the cases when high speed access is necessary.

(c) Introduction of Core and Edge Routers

To start IX and DNS services to the Lao P.D.R., several numbers of edge routers and core routers are introduced during this period. One of the core routers may work as the IX which interconnects ISPs. ISPs may use ADSL or a high speed wireless link to the edge routers.

(2) IP-based Network for 2006 to 2010

Routers can be used to configure leased lines, but the number of ports in routers is limited and hence it is not economical to configure the network only by routers. The team recommends ATM or MPLS that is useful for multiplex leased lines at various speeds.

With the widespread introduction of ADSL services in Vientiane, and limited introduction to the major cities, ADSL will become a well-known service for the Internet and will be applied for ICT services. The growing demand for high speed Internet access in Vientiane may cause an increase in the number of core and edge routers. Several core routers are interconnected. One of the core routers will work as the IX which interconnects ISPs.

(3) IP-based Network for 2011 to 2015

(a) High-speed access in Vientiane

IP and Internet services will become commonplace in Vientiane. The network may be used for many applications and a limited number of users are provided high-speed access through optical fibers. ADSL services are common to ordinal users who need speed higher than 1.5 Mbps. They may utilize ADSL services for voice services.

(b) Wireless and ADSL for all the provinces

Wireless access is provided to users in most of province centers by use of fiber backbone network and edge routers.

12.1.4 Consideration for Rural Communications

The practical classification for the implementation of the rural telecommunications is as follows:

(1) Where the power supply is available

The co-installation of telecommunications cable with power lines using the poles of power lines is recommended. If the plan of the installation of power line is being planned in near future, this opportunity shall not be missed.

(2) For the purpose of ensuring the least communication method, Rutel shall be fully utilized. Furthermore, Rutel or similar systems shall be expanded even in the future.

(3) When the mobile telecommunications service area is being expanded along the road, the mobile terminals shall be installed as the fixed public telephones in the communities which are situated along the mobile telephone service areas.

(4) Where the above proposing methods are practically impossible, through using the near-by tower of microwave transmission, D-MAS or similar systems shall be introduced.

12.1.5 Setting up Strategy and Organization for better O & M

(1) Important items to offer the better services

1) Trouble clearing side

The target of trouble clearance time shall be set. Then adequate statistic shall be edited and compared with international trends, for example by referring ITU publications, so as to know own performance.

It will be advisable to have a Central Spare Parts Center in Vientiane for

storing expensive and rarely failed parts, and Provincial Spare Parts Centers attached to Provincial Operation and Maintenance Centers so as to facilitate O&M activities.

2) Traffic management side

It is important to measure the carrying traffic of equipment periodically for switching network. This action is related with knowing of adequacy of the size of equipment and this will lead to the improvement of call complete rate resulting increased revenue.

3) Action to subscriber complain

Received complain shall be immediately tested, and be classified which section among outside plant, switching and transmission be informed for trouble clearance. At this instance, complain detail and test result shall be informed not verbally but in the form of written or recorded information to the alerted section.

The concerning section shall immediately tackle to the problem, and after clearance of trouble the cause of trouble shall be reported back to the test board. The staff of test board shall record the cause of trouble as well as the time of trouble recovery.

(2) Training of O&M staff

For the better performance of O&M, training shall be given the preference position in the whole organization activities.

There shall be not only courses for new technology but also courses for conventional system and equipment.

Shortage of instructors shall be resolved by the instructors who have received the training through the suppliers training courses.

Difficulty of foreign language should be solved by training of mother language instructors. These instructors first of all should be trained a foreign language. However, as not all manuals supplied to equipment sites can not be translated to Lao language, O&M staff should have foreign language skill such as English.

(3) Organization of Operation and Maintenance

Organization of Operation and Maintenance will consist of National center, Provincial centers, and Subcenters.

The National center will be located in Vientiane, and its function will be different from other centers and it will supervise the status of international and national networks through observing traffic flow and fault in the networks. This center will cooperate with Provincial centers for lessening the traffic overload or clearing major troubles in various part of the country.

12.1.6 Introduction of Strategic Human Resource Development

(1) Capacity Building of MCTPC Staff

In order to carry out the responsibility, Department of Post and Telecommunication (especially Division of Telecommunication and that of Radio Frequency) is requested to increase the number of staff. The strategy of enhancement of the staff in provinces is as follows:

a) Staff Distribution Plan

- Criteria for staff assignment in Provinces: 1 staff per 10,000 lines
- Target:
 - In 2005 Luangprabang(1), Khammuan(1), Savannakhet(2)
 - In 2010 Luangprabang(1), Khammuan(1), Savannakhet(3), and Champasak(2)
 - In 2015 Luangprabang(2), Vientiane(1), Khammuan(2), Savannakhet(4), and Champasak (3)

b) Staff Nurturing Plan

- Short-term and mid-term curriculum
- Invitation of Candidates for transferring telecom section
- Implementation

(2) Enhancement strategy of TCTI

From the year 2006, the demand for technical personnel will increase rapidly so the TCTI shall enhance its supply capacity. The strategy to enhance TCTI is summarized as follows:

a) Short-term (to 2005)

- Enhancement of existing Courses: Completely carrying out the Curriculum
- Implementation of Trainer's training abroad
- To prioritize the enhancing courses: To enhance the practical training of outside plant will be recommended (including the equipment).

- b) Mid-term (from 2006 to 2010)
 - Establishment of new training courses to correspond to the technological changes: e.g. LAN, IP
 - Installation of the training equipment
 - Partial implementation of Trainer's Training in TCTI
- c) Long-term (from 2011 to 2015)
 - Full implementation of Trainer's Training in TCTI

In addition to above the targets, TCTI shall make effort to solidify its financial bases. Currently the financial resources of TCTI are Government Subsidy and Tuition Fees and the financial bases are weak. The short-term specialized training courses sponsored by LTC are carried out by the TCTI however such training courses haven't contributed to TCTI in financial aspect. TCTI shall make the provision of such short- and mid-term training be a financial resource subject to enhance the ability of training.

(3) Skill-up Training in ETL/LTC

In the short-term, ETL/LTC will provide the practical training for the newly employed personnel. In the mid- and long-term, the skill-up training for the employment shall be required. Since the number of training courses will be increased, out-sourcing of the training is recommended.

Additionally the training for the administrative personnel is rather weak so the enhancement of such training is required.

12.2 Priority Projects

On the basis of the Study, the team wishes to recommend the following activities to be tackled by MCTPC/ETL for further improvement and well maintenance of the telecommunications sector of the Lao P.D.R..

These recommendations are highly priority to be implemented in each phase of 2005, 2010 and 2015 for the consideration by MCTPC/ETL. Following Project Number. (P/J No.) is in line with the project number shown in transmission network as Fig. 7.27, Fig. 7.28 and Fig. 7.29.

- (a) OFC network installation of P/J No.3, 6, 7, and 11 for the year by 2005
- (b) OFC network installation of P/J No.5, 6 and 23 for the year by 2010
- (c) OFC network installation of P/J No.18, 19, 20, 21, 24 and 25 for the year by 2015

12.2.1 OFC network installation of P/J No. 3, 6, 7, and 11 for the year by 2005

(1) General

This project is to install new optical fiber cables, switching equipment and outside plant in order to expand the network to borders in Cambodia and Myanmar.

In this period of year up to 2005, back bone network expansion to country borders and to provincial areas are basic concepts. The priority can be put to expansion of network to country borders in Cambodia and Myanmar as follows.

P/J No.	Route	Distance (km)
3	M. Pakse to M. Khong	108
6	M. Luangprabang to M. Xay	207
7	M. Xay to M. Luangnamtha	108
11	M. Luangnamtha to M. Huoixai	153

By project number 3, optical fiber cable from Pakse to Cambodian border along the road 13 is installed. The cable will be connected to Great Mekong Subregion Telecommunications Backbone Project network at a point of Lao and Cambodia border.

By project number 6, 7 and 11, optical fiber cable from Luangprabang to Huoixai where is a point of Myanmar border is installed. The cable will be also connected to Great Mekong Subregion Telecommunications Backbone Project networks.

After the completion of above projects, backbone route from northern border in Myanmar to southern border in Cambodia will be installed.

(2) Effect of the Project

This project will promote physical distribution along the optical fiber route due to the establishment of information access network with enough transmission capacity.

This route will make a part of a Greater Mekong Sub-region Telecommunications Backbone which will contribute to better information transmission among neighboring countries of Thailand, Cambodia, Vietnam, Myanmar and China.

(3) Project cost

For the establishment of the above new fiber optical network for fixed

communications, following cost is approximately estimated. The cost includes equipment, installation and other miscellaneous materials.

13,000,000 USD

The above cost is about 27% of total capital expenditure of the year 2004 and 2005.

12.2.2 OFC network installation of P/J No.5, 6 and 23 for the year by 2010

(1) General

This project is on condition that all the planned networks up to year 2005 were completed to be installed. If remaining portion of network that could not be completed by the year 2005 still exist, the portion should be completed in the first place.

During the year from 2006 to 2010, following project numbers can be considered to be higher priority to implement. The reasons are that these optic fiber routes are access to neighboring countries like Thailand and Vietnam, by which economic activities will be expected to be promoted by better distribution of information. And one of the these fiber routes contributes to form as a part of Greater Mekong Sub-region Telecommunications backbone.

P/J No.	Route	Distance (km)
5	M. Saravane to M. Samouay	108
6	M. Pakse to M. Phonthong	54
23	Xamneua to Vietnam border via Mei	108

The above project number 5 is a project which optical fiber is installed from M. Saravane in southern province to M. Samouay in Vietnam's border along the road 15.

The project number 6 is a project which optical fiber is installed from M. Pakse to M. Phonthong in border in Thailand.

The project number 23 is a project which optical fiber is installed from Xamneua to Vietnam's border via Mei along the road 6.

(2) Effect of the Project

These projects will be expected to promote physical distribution in those areas by

which can create more opportunities to increase economic activities.

(3) Project cost

For the establishment of the above new fiber optical network for fixed communications, following cost is approximately estimated. The cost includes equipment, installation and other miscellaneous materials.

35,000,000 USD

The above cost is about 30% of total capital expenditure of the year 2006 and 2010.

12.2.3 OFC network installation of P/J No. 18, 19, 20, 21, 24 and 25 for the year by 2015

(1) General

Same as the above, these projects are on condition that all the planned networks up to year 2010 were completed to be installed. If remaining portion of network that could not be completed by the year 2010 still exist, the portion should be completed in the first place.

These projects are for to enrich the network in northwest region in Lao connected to Vientiane which is bordering on Thailand, and in northeast part adjacent to Vietnam as follows.

P/J No.	Route	Distance (km)
18	M. Xaignabouri to M. Boten via M. Paklay	180
19	M. Xanakham to Sylom	198
20	M. Hinheup to M. Viangkham	90
21	M. Paklay to Xanakham	36
24	M. Xam-Nua to M. Xam-Tai	108
25	M. Kham to M. Nonghet	45

(2) Effect of the Project

By establishing the above new route of network will promote physical distribution in the area.

(3) Project cost

For the establishment of the above new route, following cost is approximately

estimated. The cost includes equipment, installation and other miscellaneous materials.

33,000,000 USD

