CHAPTER 14

FINANCIAL AND SOCIO-ECONOMIC EVALUATION

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14.1 Introduction and Objectives

The performance of the telecommunications sector in Vietnam is still immature, but the sector is generating considerable profit as a characteristics of initial stage of growth, most of the current subscribers in Vietnam are still limited to those who pay more than the future subscribers.

In this chapter, financial viability and socio-economic effects of the master plan, investment for expansion of telecommunications network, are analyzed as a part of project evaluation of the master plan.

14.1.1 Methods of Financial and Socio-Economic Evaluation

The overall approach of financial analysis is to compare an investment and operating cost with the revenue that can be attributed to the investment over its lifetime. In general, Discounted Cash Flow (DCF) method is used as a well established basis for testing the financial viability of a project in order to eliminate the time dimension from the decision and compare present value of cash inflows against present value of cash outflows.

DCF is relevant whenever a company contemplates an action entailing costs or benefits that extend beyond the current period. Net Present Value (NPV) is present value of cash inflows less present value of cash outflows and Internal Rate of Return (IRR) is a discount rate at which project's net present value equals zero.

Financial and socio-economic evaluation here is composed of the following steps:

(1) Estimation of Project Costs (capital expenditure and operating expenditure)
(2) Revenue Forecast
(3) Financial Analysis
(4) Socio-economic Analysis

The Capital Expenditure (CAPEX) is derived directly from the Summary of Cost Estimation in the Chapter 11. Operating Expenditure (OPEX) are estimated based on the operator's details of expenses, demand forecast and projection of the number of telecommunications staffs.

The projection of the operators' revenue is based on the demand and traffic forecast and other revenue information.

14.1.2 Investment Program

The investment plan in the Master Plan was designed to fully satisfy the demand under the Scenario 3, the highest demand forecast.

The investment program of the master plan should allow the number of connected fixed telephone subscribers to expand from present level of about 1.8 Million to 7.7 Million in 2010. In order to meet growth targets, expansion under the investment program will significantly increase the number of subscribers each year.

The investment plan was estimated by three phases, A (1999-2000), B (2001-2005), and C (2006-2010) under the Scenario 3 for demand forecast. However, the CAPEX for each year was calculated by multiplying the additional demand for each year and its unit cost assumed.

14.1.3 Base Case and Sensitivity Analysis

At first, the case of the Scenario 3 under the current tariff is financially analyzed as an optimistic base case and the analyses for the demand forecast of the Scenario 1 will be followed as a sensitivity analysis. After that, another sensitivity analysis was made for the case that the international settlement rates decreased to USD 0.23 per minute from the year of 2002 based on the FCC benchmarks for international settlement rates. At last, the impact of revenue decrease and OPEX increase was studied. However, only the base case was studied for socio-economic evaluation because of its conceptual characteristics.

14.1.4 Inflation and Exchange Rate

Exchange rates of VND against USD were estimated based on purchasing power parity methods. That is, the exchange rate of VND against USD will be devaluated with the ratio of Consumer Price Index (CPI) of the United States against that of Vietnam.

In terms of the CPI of the United States, in 1998, its Congressional Budget Office (CBO), Federal Reserve Board (FRB), and Mitsubishi Research Institute (MRI) in Japan made a forecast of the increase rate of CPI for the years of 1998 and 1999. The CBO's forecast was +1.7% and +2.6%, FRB's projection was +1.75 to 2.0%, and +2.0 to 2.5%, and MRI's one

was +1.6% and +2.1% in 1998 and 1999 respectively. In addition, in the State of the Union Message in February, 1999, increase rates of CPI were forecasted +2.2% for 1999 and +2.3% between 2000 and 2004.

In this evaluation, 2.2% of increase are assumed to the year 1999 and 2.3% of increase per year are assumed to the years between 2000 and 2010.

On the other hand, as stated in the chapter 2, the inflation rate was more than 70% in 1991 but it was reduced rapidly to reach 6.2% in 1996 and 5.1% in 1997, which showed the end of hyperinflation. However, in 1998, it was estimated to raise to 10% as a result of regional financial crisis.

In terms of the CPI of Vietnam, in this evaluation, 5% of increase was temporarily assumed for the whole period of the appraisal.

As a result of such assumptions, the foreign exchange rate of USD against VND was derived as the Table 14.1.4-1.

Table 14.1.4-1 Change of CPI (U.S.A. / Vietnam) and Foreign Exchange Rate

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Increase of CPI (Vietnam)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Increase of CPI (U.S.A.)	2.2%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
USD 1 = VND	13,000	13,356	13,709	14,070	14,442	14,823	15,214	15,616	16,028	16,451	16,885	17,331	17,788

14.2 Cost and Revenue Estimation

14.2.1 CAPEX

As stated in the Chapter 11, the facilities plan for domestic telecommunications services was designed to fully satisfy the demand under the Scenario 3. The total CAPEX, including facilities for international services, was estimated at USD 5,855 million (excluding Value Added Tax) of which USD 1,464 million represent local cost and USD 4,392 equivalent foreign exchange. The total CAPEX can be summarized as shown in the Table 14.2.1-1 and it is distributed in each year of the master plan period as shown in the Table 14.2.1-2.

Table 14.2.1-1 CAPEX by Facilities

Items	Total amount (million USD)	Share (%)
Fixed telephone system	4,598	81.5%
Cellular mobile system	1,045	18.5%
Paging system	2	0.0%
Total	5,645	100.0%

Note: V.A.T. is not included.

In terms of the investment schedule for domestic telecommunications facilities, the CAPEX was assumed to be appropriated in the first year of each phase, that is, in 1999, 2001, and 2006.

Since the current ratio of imported goods against the total CAPEX was estimated to be 75% by information from VNPT, the ratio was assumed to continue to the year 2010 for this analysis. However, the ratio of imported goods will be affected by telecommunications industries development plans.

Table 14.2.1-2 CAPEX in Each Project Year

Unit: million USD

Year	CAPEX (w/o duties)	Import duties	Total CAPEX
1999	424	22	446
2000	309	16	325
2001	343	18	361
2002	356	18	374
2003	391	20	411
2004	417	21	438
2005	446	23	469
2006	452	23	475
2007	489	25	514
2008	531	27	558
2009	576	30	606
2010	634	33	667

Note: Rate of import duties was assumed to be 7%.
V.A.T. is not included.

In addition, the average rate of import duties which affect to the CAPEX was assumed to be 7% of C.I.F. prices based on the analysis of import duties on telecommunications equipment in the Section 14.3.3 (9) and the estimation of Foreign Exchange Premium in the Section 14.4.4 (1).

14.2.2 OPEX

The OPEX does not include interest and depreciation expenses for project's financial evaluations. The annual OPEX will be generally increased due to the increase of number of

staffs or subscribers.

(1) Details of the VNPT's expenses (Telecommunications)

In accordance with the VNPT's past expenses records for existing telecommunications network, the total OPEX can be divided into personnel expenses, other OPEX and the distribution of management expenses. The revenue tax was not included in the expenses. In order to study the OPEX for the business plan, interest and depreciation expenses were deducted from the VNPT's total expenses.

The details of expenses of the VNPT for telecommunications services were summarized in the Table 14.2.2-1.

Table 14.2.2-1 Details of Expenses of VNPT (Telecommunications)

(Unit : million VND)

	1993	1994	1995	1996	1997
Personnel Expenses	156,297	226,819	568,522	851,770	542,159
per staff	*7.081*	*8.857*	*19.277*	*25.384*	*14.874*
Other OPEX (w/o interest & depreciation)	*199,990*	*298,753*	*543,342*	*820,828*	*1,017,439*
per subscriber	*0.973*	*0.857*	*0.923*	*0.848*	*0.726*
Sub Total (w/o interest & depreciation)	356,287	525,572	1,111,864	1,672,598	1,559,598
Distribution of management expenses	101,642	142,731	298,166	496,740	137,664
% of subtotal expenses	*28.5%*	*27.2%*	*26.8%*	*29.7%*	*8.8%*
Total OPEX (w/o interest & depreciation)	457,930	668,303	1,410,030	2,169,339	1,697,262
Fixed Assets Depreciation	591,145	762,868	650,225	724,931	1,046,909
Interest Expenses	22,371	50,512	187,254	45,273	177,010
Total expenditure	1,071,446	1,481,682	2,247,509	2,939,543	2,921,181

Note: Other OPEX per subscriber was calculated with the average total subscribers.
Source: VNPT

In addition, the numbers of staffs and subscribers of VNPT for telecommunications services was summarized as the Table 14.2.2-2 based on the data from VNPT. However, since the average number of staffs or subscribers are not available, the average numbers of staffs or subscribers were estimated as the mean of the number at the end of a year and that of the end of the previous year.

Table 14.2.2-2 Staffs and Subscribers of VNPT (Telecommunications)

	1993	1994	1995	1996	1997
Number of staffs (end)	23,840	27,376	31,610	35,500	37,400
Number of staffs (average)	22,072	25,608	29,493	33,555	36,450
Number of telephone subscribers (end)	254,506	442,658	734,355	1,110,115	1,407,534
Number of telephone subscribers (average)	205,553	348,582	588,507	922,235	1,258,825
Number of mobile subscribers (end)	-	-	-	69,910	146,550
Number of mobile subscribers (average)	-	-	-	34,955	108,230
Number of paging subscribers (end)	-	-	-	21,900	45,000
Number of paging subscribers (average)	-	-	-	10,950	33,450
Total subscribers (Fix + Mob + Pag) (end)	254,506	442,658	734,355	1,201,925	1,599,084
Total subscribers (Fix + Mob + Pag) (average)	205,553	348,582	588,507	968,140	1,400,505

Note: Each average number was estimated by adding the number of the previous year and the half of increase in the year.
Source: VNPT

(2) Personnel Expenses

(a) Personnel Expense per Staff

As shown in the Table 14.2.2.-1, the personnel expense per staff increased from 7,081 thousand in 1993 to 25,384 thousand in 1996. In 1997, it suddenly fell to 14,874 thousand. However, the reasons of this fall have not been explained by the VNPT. Therefore, the figure of 1997 should be tentatively ignored for the future projection.

Therefore, 26,000 thousand VND was tentatively assumed to the personnel expenses per staff for the year of 1999 and to be increased by the rate of inflation rate in Vietnam, 5% per annum.

(b) Calculation of Personnel Expenses

Total personnel expenses are calculated by the "Personnel expenses per staff" multiplied with the "Average number of additional staffs (cumulative)".

(3) Other OPEX

(a) Other OPEX per Subscriber

As shown in the Table 14.2.2.-1, the other OPEX per subscriber fluctuated between 726 and 973 thousand for the years between 1993 and 1997.

From the conservative point of view, 1,000 thousand VND was assumed to the other OPEX per subscriber during the whole project appraisal period.

(b) Calculation of Other OPEX

Total other OPEX are calculated by the "Other OPEX per subscriber" multiplied with "Average number of additional subscribers (cumulative).

(4) Distribution of Management Expenses

In addition to the direct OPEX, personnel expense and other OPEX above, distribution of management expenses should be considered as a general and administrative expenses.

(a) Management Expenses and Direct OPEX

The management expenses of the VNPT have been distributed by the ratio of direct expenses with the accounts of postal services.

As shown in the Table 14.2.2.-1, the distribution of management expenses has been rather stable against the total direct OPEX except 1997, that is between 26.8% in 1995 and 29.7% in 1996.

Therefore, 30% of direct OPEX was assumed to the management expenses during the whole project appraisal period.

(b) Calculation of Management Expenses

Total OPEX is calculated by the total direct OPEX multiplied by 30%.

(5) Total OPEX

In accordance with the aforesaid assumptions, annual direct OPEX, excluding the distribution of management expenses, under the base case has been calculated as the Table 14.2.2-1 bellow.

The total OPEX including the management expenses will be USD 4,136,446 thousand for the appraisal period.

14.2.2-1 Total Direct OPEX

Year	Average Cumulative Additional staffs (thousand)	Personnel expense per staff (thou. VND)	Total personnel expense (thou. USD)	Average Cumulative Additional subscribers (Thousand)	Other OPEX per subscriber (thou. VND)	Total other OPEX (thou. USD)	Total direct OPEX (thou. USD)
1999	3	26,000	6,108	253	1,000	18,914	25,022
2000	9	27,300	18,198	687	1,000	50,129	68,327
2001	15	28,665	31,195	1,096	1,000	77,884	109,079
2002	22	30,098	46,609	1,557	1,000	107,824	154,433
2003	30	31,603	62,973	2,050	1,000	138,306	201,279
2004	36	33,183	79,065	2,583	1,000	169,798	248,863
2005	44	34,842	97,697	3,153	1,000	201,894	299,591
2006	51	36,585	115,985	3,765	1,000	234,899	350,884
2007	58	38,414	135,610	4,426	1,000	269,065	404,675
2008	66	40,335	156,822	5,143	1,000	304,578	461,400
2009	74	42,351	179,878	5,921	1,000	341,630	521,508
2010	82	44,469	205,051	6,772	1,000	380,680	585,731
2011	84	46,692	214,369	7,217	1,000	395,308	609,677
2012	81	49,027	213,208	7,217	1,000	385,143	598,351
2013	78	51,478	209,387	7,217	1,000	375,239	584,626
2014	74	54,052	203,357	7,217	1,000	365,590	568,947
2015	72	56,755	200,423	7,217	1,000	356,189	556,612
Total	-	-	2,175,936	-	-	4,173,072	6,349,008

Note: Interest and depreciation expenses are not included.
Average Cumulative Additional Subscriber is consists of fixed telephone, mobile telephone and paging service.
Distribution of management expenses is not included.

14.2.3 Revenue

(1) Penetration and Revenue per Subscriber

Telephone subscribers can be classified, on the basis of their attributes, into two broad categories: business and residential users. In general, the ratio of business users to total subscribers decreases as penetration improves. As the result, the revenue per subscriber decreases.

However, this trend is not always applied in the very early stage and it sometimes shows irregular fluctuation. In addition, changes of accounting standards and division of the revenues with BCCs and regional P&Ts which are not mentioned in the financial statements have made it difficult to grasp the trend of revenues and expenses of VNPT.

(2) Revenue per Subscriber (Fixed Telephone)

(a) Trend

The revenues per subscriber are generally expected to drop. As is shown in the Table 14.2.3-2, the revenues per subscriber in Vietnam have also been gradually declining as a whole.

Table 14.2.3-1 Telephone Revenue per Subscriber (VNPT)

Unit: thousand VND

	1994	1995	1996	1997
Installation	1,780	1,138	1,597	2,858
Monthly subscription	716	743	720	705
Local call (surcharge)	158	198	174	149
Long distance call (inter-district)	205	321	287	269
Long distance call (inter-province)	1,770	1,635	1,390	1,231
International call	2,644	2,184	1,618	1,254
(USD)	239	198	147	107
International settlement	1,137	1,302	1,052	842
(USD)	103	118	99	78
Other telephone revenue	80	47	48	36

Note: International settlement is total of fixed and mobile telephone revenue.
Source: VNPT

(b) Assumed projection

i) Installation fee

Installation fees in the tariff until 1998 were VND 700 thousand to 1,800 thousand. However, the revenue per subscriber in 1997 exceeds this range. Therefore, the figure in 1997 should be ignored and the average between 1993 and 1996 was applied to the revenue projection.

That is, VND 1,414 thousand can be assumed to the average installation charge per subscriber.

On the other hand, since the V.A.T. was introduced from 1999, the projected revenue should be calculated reducing the portion of V.A.T..

As a result, VND 1,286 thousand per subscriber was assumed for the whole appraisal period.

ii) Subscription fee

The subscription fee per subscriber fluctuated in the range between VND 743 thousand and VND 705 thousand for the period between 1994 and 1997. VND 721 thousand for the average of the period can be assumed to be the

average installation charge per subscriber for the revenue projection.

After adjusting the V.A.T. portion, VND 655 thousand per subscriber was assumed for the average subscription charges for the whole appraisal period.

iii) Call charges

- Local call (surcharge)

The local call charge (surcharge) has shown linearly decreasing tendency since 1995 and the charge in 1998 was expected to be VND 125 thousand.

After excluding V.A.T., it was assumed that surcharge for the year of 1998 was VND 114 thousand (without V.A.T.) for the year 1998 and would be changed as local traffic (call minutes) per subscriber changes.

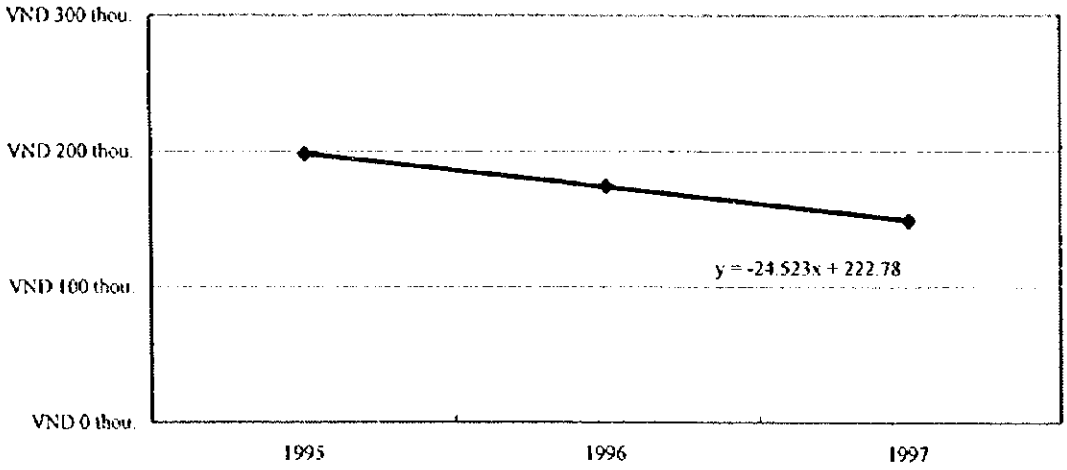


Figure 14.2.3-1 Local Call (Surcharge) per Subscriber

- Long distance calls (inter-district)

The long distance call charge (inter-district) has also shown linearly decreasing tendency since 1995 and the charge in 1998 was expected to be VND 240 thousand.

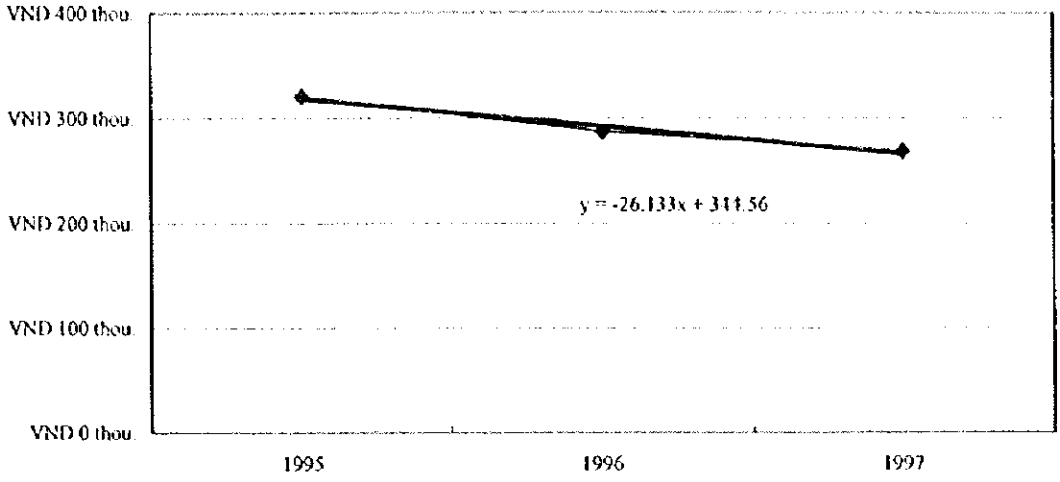


Figure 14.2.3-2 Long Distance Call (Inter-District) per Subscriber

It was assumed that long distance (inter-district) call charge per subscriber for the year of 1998 was VND 218 thousand (without V.A.T.) and would be changed as long distance (inter-district) traffic (call minutes) per subscriber changes.

- Long distance calls (inter-province)

The long distance call charge (inter-province) has shown linearly decreasing tendency since 1994 and the charge in 1998 was expected to be VND 1,041 thousand.

It was assumed that long distance (inter-province) call charge per subscriber for the year of 1998 was VND 946 (without V.A.T.) and would be changed as long distance (inter-province) traffic (call minutes) per subscriber changes.

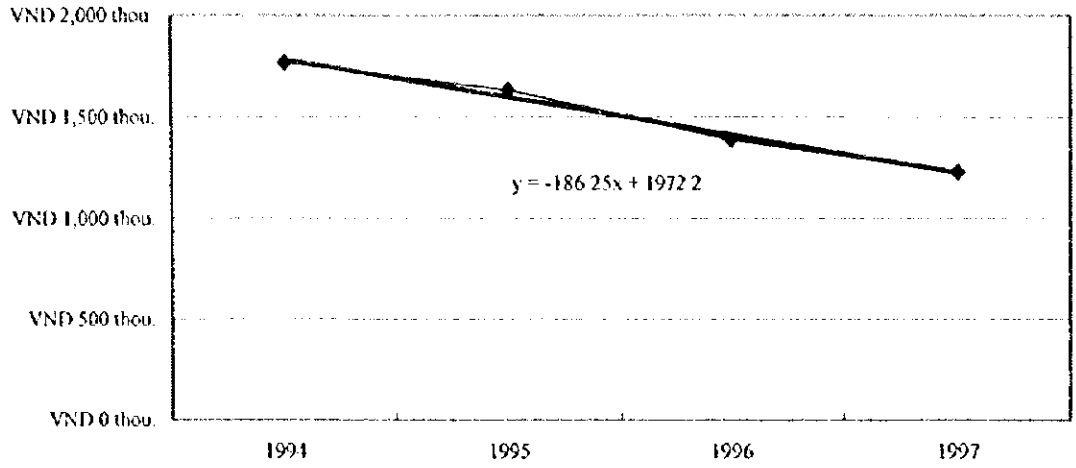


Figure 14.2.3-3 Long Distance Call (Inter-Province) per Subscriber

- International call

The international call revenue per subscriber in 1998 was estimated at USD 61. However, this figure does not include the revenue shared to the BCC partner.

With the 32% of revenue sharing ratio, it was assumed that international call charge per subscriber for the year of 1998 was USD 74 (without V.A.T.) and would be changed as international outgoing traffic (call minutes) per subscriber changes.

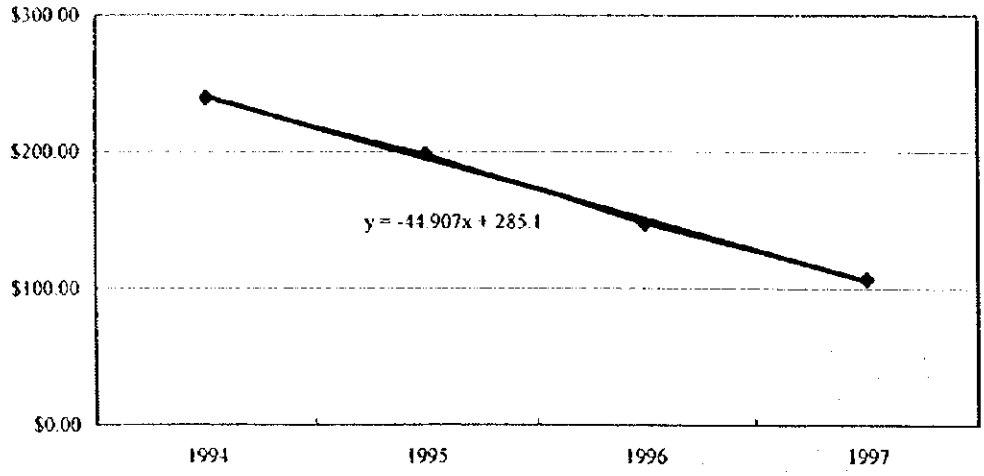


Figure 14.2.3-4 International Call per Subscriber

- International settlement

The international settlement per subscriber for 1998 can be estimated USD 49. After eliminating V.A.T., the estimated revenue was USD 44 for Vietnamese partner.

With the 18% of revenue sharing ratio, it was assumed that the total international call charge per subscriber for the year of 1998 was USD 59 and would be changed as the balance of international incoming traffic (call minutes) against outgoing traffic per subscriber changes.

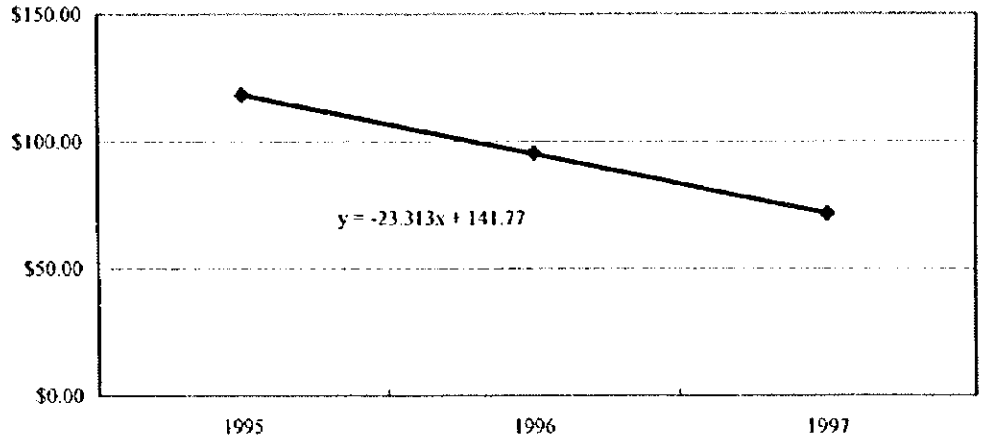


Figure 14.2.3-5 International Settlement per Subscriber

iv) Other domestic telephone revenues

It was assumed that other domestic telephone revenue per subscriber can be estimated by the following formula and the revenue for the year of 1998 was estimated VND 30 thousand (without V.A.T.) .

Other telephone revenue per subscriber (in thousand VND)

= 76.923*(year - 1993)^(-0.5235)/1.1

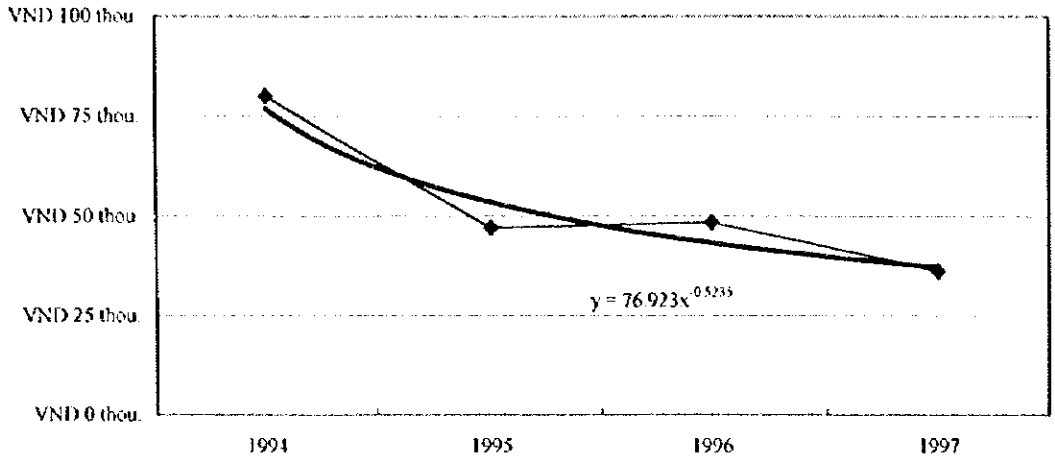


Figure 14.2.3-6 Other Telephone Revenue per Subscriber

(3) Revenue per Subscriber (Cellular Mobile Telephone)

(a) Trend

As the revenue per subscriber for fixed telephones, mobile revenues per subscriber can be also expected to drop. However, it is difficult to capture the trend with a limited data for such rather newly introduced services in Vietnam such as mobile phones, paging and etc..

The Table 14.2.3-3 shows the mobile revenue per subscriber for revenue projection.

Table 14.2.3-3 Cellular Mobile Telephone Revenue per Subscriber

Unit: thousand VND

	1994	1995	1996	1997
Installation	-	-	-	-
Monthly subscription	-	-	263	609
Domestic call	-	-	3,768	3,255
International call	-	-	USD 380	USD 17
International settlement	-	-	USD 99	USD 78

Note: International settlement per subscriber is considered to be same as the fixed telephone.
Source: VNPT

(b) Assumed projection

i) Installation charge

Installation charge in the tariff until the end of 1998 was VND 1,500,000. Since the V.A.T. was introduced in 1999, this charge includes 10% of V.A.T..

Therefore, VND 1,364 thousand (without V.A.T.) per subscriber was assumed for the whole appraisal period.

ii) Monthly subscription charge

Monthly subscription charge was VND 300,000 until the end of 1998, and the total amount of the charge is now still VND 300,000 but it includes V.A.T..

Therefore, VND 2,727 thousand (without V.A.T.) per subscriber was assumed for the whole appraisal period.

iii) Call charges

- Domestic

Since the financial data of mobile telephone are limited to 1996 and 1997, the estimation was made under the assumption that the call charge per subscriber would be decreased linearly to the year of 1998 and 1999.

In addition, the revenue shared to the BCC partner, 50 % of the total revenue, was not included in the figures in the Table 14.2.3-3.

As a result, it was assumed that mobile domestic call charge per subscriber for the year of 1998 and 1999 were VND 4,986 thousand and VND 4,053 thousand (without V.A.T.) respectively and would be changed as domestic traffic (call minutes) per subscriber changes.

- International

Since the mobile international call revenue for the year of 1997 in the Table 14.2.3-3 is not reasonable, it was assumed that the international call revenue per subscriber would decrease as the international settlement revenue decrease. That is, since the international settlement revenue per subscriber decrease from USD 99 in 1996 to USD 59 (60% of USD 99) in 1998 and 1999, it was assumed that mobile international call charge per subscriber for the years of 1998 and 1999 were USD 226 (60% of USD 380 in 1996) (without V.A.T.). In addition, it would be changed as international outgoing traffic (call minutes) per subscriber changes.

- International settlement

Since the international settlement for fixed telephone includes that of

mobile telephones, it was assumed that mobile international settlement per subscriber for the years of 1998 and 1999 were USD 59 and would be changed as the balance of international incoming traffic (call minutes) against outgoing traffic per subscriber changes. It is the same unit revenue as the fixed telephones.

(4) Revenue per Subscriber (Paging)

(a) Trend

The Table 14.2.3-4 shows the paging revenue per subscriber for revenue projection.

Table 14.2.3-4 Paging Revenue per Subscriber

	1994	1995	1996	1997
Total paging revenue (mill. VND)	-	-	53,854	79,467
Number of Additional subscribers			21,900	23,100
Average number of subscribers	-	-	10,950	33,450
Revenue per subscriber (thou. VND)	-	-	4,918	2,376

Note: Average number of subscribers is estimated.
Source: VNPT

(b) Assumed projection for revenue per subscriber

The current installation fee of VND 1,100,000 was assumed to last until the end of the appraisal period. Adjusting the V.A.T. portion, VND 1,000 thousand was assumed to be the installation charge for the appraisal period.

The current monthly subscription fee of VND 80,000 per month (VND 873 thousand without V.A.T.) for Hanoi and Ho Chi Minh City was assumed to apply to the whole appraisal period.

(5) Estimation of Total Revenues

Total revenue was estimated under the following formula with demand forecast and the revenue per capita.

(a) Telephone revenue

i) Installation charge

Revenue per subscriber × Number of additional subscribers

ii) Monthly subscription charge, call charges, and other telephone revenue

Revenue per subscriber × Number of average additional subscribers

(cumulative)

iii) International settlement

Revenue per subscriber × Number of average additional subscribers (cumulative)

or

International traffic (call minutes) of the balance of incoming per subscriber × USD 0.23 × Number of average additional subscribers (cumulative)

(b) Mobile revenue

i) Installation fee

Revenue per subscriber × Number of additional subscribers

ii) Monthly subscription fee and call charges

Revenue per subscriber × Number of average additional subscribers (cumulative)

(c) Paging revenue

i) Installation fee

Revenue per subscriber × Number of additional subscribers

ii) Monthly subscription fee

Revenue per subscriber × Number of average additional subscribers (cumulative)

(d) Internet revenue

Internet service is new and financial data for revenue and expenses are not available. In addition, at present, it can be observed that most of Internet service providers worldwide do not enjoy their profitability .

In this analysis, from the conservative point of view, the costs to be accrued for Internet services were assumed to be same as the benefits from the Internet services. Therefore, the financial analysis for Internet services was ignored for the financial evaluation.

14.3. Financial Analysis on the Master Plan

14.3.1 Concept for Evaluating the Master Plan

The telecommunications network was estimated to have only 1,792 thousand subscribers for fixed telephones and 264 thousand for mobile telephones at the end of 1998. After the deduction of shared revenue to the BCCs, the sales revenue generated from the telecommunications network in 1997 was about VND 6,863 billion. On the other hand, the OPEX (including interest and depreciation expenses) for the telecommunications network will reach VND 3,580 billion. Vietnamese telecommunications operators have a sound financial status.

14.3.2 Method of Financial Analysis

The method of financial analysis contrasts the total amount of the costs of construction, operation, etc. with the revenue obtained by installation charge, subscription charge, and call charges and etc. to calculate the profit and make the various financial statements. The section deals mainly with the calculation of Financial Internal Rate of Return (FIRR) which, by definition, is the discount rate which achieve a net present value of zero, when discounting sets of financial cash flows expected in the master plan.

While the existing facilities are still in operation, it is difficult to evaluate the degree of contribution of the new investment.

Actually, the aforementioned expected revenues per subscriber are a little higher than those from the real additional subscribers increased by the master plan because they include the higher revenues from the existing subscribers. On the other hand, the traffic of existing subscribers will be increased as an effect of network expansion by the Master Plan. Therefore, the expected revenues per subscriber for the whole subscribers were regarded as the revenues from the additional subscribers increased by the master plan.

14.3.3 Basic Assumptions for Financial Analysis

(1) Fiscal Year
January 1 to December 31

(2) Project Appraisal Period

From the year of 1999 to 2015

(3) Current Price Base

Financial projections have been made in current price base. Therefore, all costs are also expressed in current price base.

(4) Exchange Rate

Official foreign exchange rate of VND against USD was assumed to be USD1=VND13,000 in 1998 and it is devaluated by the purchasing power parity method as stated in the section 14.1.4.

(5) Revenue Tax and VAT

Until the end of the 1998, revenue tax was applied to telecommunications services, and the rate of the tax was 6 %. Telecommunications operators have paid the revenue tax from their revenues.

Since the beginning of 1999, the Value Added Tax (V.A.T.) has superseded the revenue tax. The rate of V.A.T. is 10% and imposed on goods or services. The V.A.T. payable or claimable was calculated by counterbalancing the input V.A.T. suspense and output V.A.T. suspense, and assumed to be adjusted within the same year of payments or receipts. Therefore, the balance of V.A.T. payable or claimable does not influence to amount of working capital.

On the one hand, the introduction of V.A.T. caused reduction in expenditure as revenue tax for the telecommunications operators. On the other hand, it also caused reduction in their revenues by the tariff revision, that is, the total amount of payment shared by subscribers, with its V.A.T., has not exceeded the former tariff. As the result, the revenue portion of the tariff, without V.A.T., has been changed to about 91% (1/1.1) of the former tariff.

(6) Import Duties

The rates of import duties are summarized as follows:

Table 14.3.3-1 Rates of Import Duties

Items	Rate
Telecommunications equipment	5 – 10 %
Mobile telephone	20 %
Receiver	40 %
Optical fiber cable	5 – 15 %

Source: DGPT

However, since the facility plan for the master plan was not made by such categories. Therefore, the average rate of duties imposed on telecommunications equipment and facilities should be assumed for project evaluation.

Since the rates for most of telecommunications equipment are located from 5 to 10 %, the 7% was assumed to be the rate of duties applied to the business plan.

(7) Depreciation

Full value of assets is depreciated without residual value over the estimated useful lives of these assets. Depreciation methods for telecommunications related assets are summarized as the Table 14.3.3-2 for reference. However, since the investment plan for the master plan is not classified into such categories, 7 years of lives are applied to average investment for the sake of convenience.

Table 14.3.3-2 Depreciation Method

Items	Depreciation method
Building	10 or 30 years straight line
Structure	6 years straight line
Exchange & switching equipment	7 years straight line
Transmission equipment	6 years straight line
Cables	8 years straight line
Satellite	7 years straight line
Other telecommunications equipment	7 years straight line
Electric equipment	5 years straight line
Management equipment	4 - 5 years straight line
Electric equipment	5 years straight line
Computer or printer for switch	4 years straight line
Air-conditioning for switch	5 years straight line

Source: VNPT

(8) Loan Conditions

The loan conditions were assumed as follows:

Currency: United States Dollars

Interest rate: 8.5% p.a.

Repayment:	Annually made in the middle of each year
Term:	8 years
Grace period:	Not applicable

In case of shortage of funds during the operation period, the short term finance is required to fulfill the cash deficits. However, in this business plan, such loan was not considered for financial evaluation.

(9) Corporate Income Tax

The current tax rate of 45% was applied to the whole period. However, it does not effect to the project viability or FIRR at all.

(10) Revenue Collection Ratio

Since any historical data for revenue collection or bad debt ratio in Vietnam is not available, we have to ignore the expected collection ratio and 100 % of expected collection ratio was assumed for the business plan.

(11) Working Capital

Since the balance sheet related data are not available, the amount of working capital was ignored for the financial evaluation.

14.3.4 Evaluation Result

Evaluation ran through the fiscal year (FY) 2015, when investments to be made in the Master Plan will have been depreciated about 98% during the appraisal period. The Table 14.3.4-1 shows the results of financial analysis. Under the Master Plan, annual profit can be enjoyed from the first year of the project.

In terms of free cash flow, the fiscal year cash flow will turn to be positive in FY 2002, and the cumulative cash flow will turn to be positive in FY 2005 to remain until the end of appraisal period.

The Financial IRR (FIRR) on project and NPV for this base case were as follows:

FIRR on project has been calculated at 38.0% (1999 – 2015).

NPV (discounted by 10%) has been calculated at USD 3,229,205 thousand.

On the other hand, the revenue structure can be summarized as follows:

(1) Revenue by Service

Revenue from fixed telephones: USD 14,393 million (58.7%)
Revenue from mobile telephones: USD 10,118 million (41.3%)
Revenue from paging services: USD 6 million (0.02%)

(2) Revenue by Domestic and International Services

Revenue from domestic services: USD 11,354 million (46.3%)
Revenue from international services: USD 13,163 million (53.7%)

Table 14.3.4-1 Result of Financial Analysis

Unit: thousand USD

Year	CAPEX	Import duties	Revenue	OPEX	Free cash flow
1999	424,511	21,904	167,563	32,529	-311,381
2000	308,725	15,929	326,205	88,826	-87,275
2001	343,249	17,711	469,443	141,804	-33,321
2002	355,480	18,342	617,651	200,763	43,066
2003	391,195	20,184	779,750	261,662	106,709
2001	416,338	21,482	958,890	323,522	197,548
2005	446,013	23,013	1,151,949	389,469	293,454
2006	452,134	23,329	1,351,325	456,149	419,712
2007	489,103	25,236	1,568,480	526,078	528,062
2008	530,533	27,374	1,805,701	599,820	647,974
2009	576,559	29,749	2,064,527	677,960	780,259
2010	634,494	32,738	2,292,004	761,450	863,323
2011	0	0	2,300,253	792,580	1,507,674
2012	0	0	2,243,937	777,856	1,466,081
2013	0	0	2,189,600	760,014	1,429,586
2014	0	0	2,137,954	739,632	1,398,323
2015	0	0	2,091,565	723,596	1,367,969
Total	5,368,335	276,990	24,516,797	8,253,710	10,617,762

Note: V.A.T. is not included; CAPEX excludes import duties; OPEX excludes depreciation, and interest expense.

14.3.5 Sensitivity Analysis

Sensitivity analysis in case of short demand, the case of the Scenario 1 for demand forecast, was studied first. Secondly, the case of reduction in international settlement rates was considered here. At last, sensitivity of revenue decrease and OPEX increase was also studied.

(1) Scenario 1

Evaluation ran through the fiscal year (FY) 2015, when investments to be made in the

Master Plan will have been depreciated about 98% during the appraisal period. The Table 14.3.4-3 shows the results of financial analysis. Under the Master Plan, annual profit comes from the first year of the project.

In terms of free cash flow, the fiscal year cash flow will turn to be positive in FY 2002, and the cumulative cash flow will turn to be positive in FY 2006 to remain until the end of appraisal period.

The Financial IRR (FIRR) on project and NPV for this base case were as follows:

FIRR has been calculated 34.1 % (1999 - 2015).

NPV (discounted by 10%) has been calculated at USD 2,793,682.

Table 14.3.5-2 Result of Financial Analysis (Scenario 1 – Current tariff)

Unit: thousand USD

Year	CAPEX	Import duties	Revenue	OPEX	Free cash flow
1999	424,511	21,904	167,968	32,529	-310,977
2000	308,725	15,929	324,957	88,826	-88,522
2001	343,249	17,711	448,287	136,727	-49,400
2002	355,480	18,342	572,532	183,244	15,466
2003	391,195	20,184	699,192	228,198	59,615
2004	416,338	21,482	844,284	273,359	133,105
2005	446,013	23,013	1,005,109	319,472	216,611
2006	452,134	23,329	1,170,731	366,115	329,152
2007	489,103	25,236	1,352,152	413,746	424,066
2008	530,533	27,374	1,552,262	460,046	534,308
2009	576,559	29,749	1,772,904	510,580	656,016
2010	634,494	32,738	1,963,677	563,156	733,289
2011	0	0	2,000,728	585,681	1,415,046
2012	0	0	1,983,314	574,253	1,409,060
2013	0	0	1,967,622	566,576	1,401,046
2014	0	0	1,953,227	555,943	1,397,284
2015	0	0	1,940,979	548,883	1,392,096
Total	5,368,335	276,990	21,719,923	6,407,335	9,667,263

Note: V.A.T. is not included; CAPEX excludes import duties; OPEX excludes depreciation, and interest expense.

On the other hand, the revenue structure can be summarized as follows:

(a) Revenue by service

Revenue from fixed telephones: USD 12,477 million (57.4%)

Revenue from mobile telephones: USD 9,237 million (42.5%)

Revenue from paging services: USD 6 million (0.03%)

(b) Revenue by domestic and international services

Revenue from domestic services: USD 9,175 million (42.2%)

Revenue from international services: USD 12,545 million (57.8%)

(2) International Settlement Rate Reduction

Based on the FCC benchmarks for international settlement rates, another sensitivity analysis was made. It was studied the case that the international settlement rates would be reduced to USD 0.23 per minute from the year of 2002.

Evaluation ran through the fiscal year (FY) 2015, when investments to be made in the Master Plan will have been depreciated about 98% during the appraisal period. The Table 14.3.4-4 shows the results of financial analysis. Under the Master Plan, annual profit comes from the first year of the project.

In terms of free cash flow, the fiscal year cash flow will turn to be positive in FY 2002, and the cumulative cash flow will turn to be positive in FY 2006 to remain until the end of appraisal period.

The Financial IRR (FIRR) on project and NPV for this base case were as follows:

FIRR has been calculated at 31.0 % (1999 - 2015)

NPV (discounted by 10%) has been calculated at USD 2,421,447.

On the other hand, the revenue structure can be summarized as follows:

(a) Revenue by service

Revenue from fixed telephones: USD 13,135 million (58.0%)

Revenue from mobile telephones: USD 9,496 million (41.9%)

Revenue from paging services: USD 6 million (0.03%)

(b) Revenue by domestic and international services

Revenue from domestic services: USD 11,349 million (50.1%)

Revenue from international services: USD 11,289 million (49.9%)

Table 14.3.5-3 Result of Financial Analysis (Int'l settlement rate reduction)

Unit: thousand USD

Year	CAPEX	Import duties	Revenue	OPEX	Free cash flow
1999	424,511	21,904	159,511	32,695	-319,598
2000	308,725	15,929	304,023	89,308	-109,939
2001	343,249	17,711	435,743	143,426	-68,643
2002	355,480	18,342	571,128	201,929	-4,622
2003	391,195	20,184	718,501	263,207	43,915
2004	416,338	21,482	880,858	327,329	115,709
2005	446,013	23,013	1,054,603	391,737	193,840
2006	452,134	23,329	1,233,697	461,440	296,794
2007	489,103	25,236	1,428,571	532,054	382,178
2008	530,533	27,374	1,640,936	606,504	476,525
2009	576,559	29,749	1,871,854	685,384	580,162
2010	634,494	32,738	2,097,708	769,652	660,824
2011	0	0	2,114,210	805,058	1,309,152
2012	0	0	2,080,197	785,775	1,294,423
2013	0	0	2,046,438	771,356	1,275,083
2014	0	0	2,013,821	753,731	1,260,090
2015	0	0	1,985,386	733,491	1,251,895
Total	5,368,335	276,990	22,637,186	8,354,074	8,637,787

Note: V.A.T. is not included; CAPEX excludes import duties; OPEX excludes depreciation, and interest expense.

(3) Revenue decrease and OPEX increase

At last, impact of revenue decrease and OPEX increase on IRR was studied as follows. The Table 14.3.5-4 and the Figure 14.3.5-1 show the IRRs on project by changes of revenue and OPEX. In addition, the Table 14.3.5-5 and the Figure 14.3.5-2 show the IRRs on project by combination of revenue decrease and OPEX increase.

The Figure 14.3.5-1 indicates that impact of revenue decrease is larger than that of OPEX increase. Therefore, it should be carefully considered how to keep or increase revenue by the proper management of telecommunications operators and tariff control by the government.

Table 14.3.5-4 IRR on Revenue Decrease & OPEX Increase

Changed parameters		Revenue	OPEX
Change ratio	0%	38.0%	38.0%
	5%	33.6%	36.6%
	10%	29.3%	35.2%
	15%	25.1%	33.8%
	20%	21.0%	32.5%

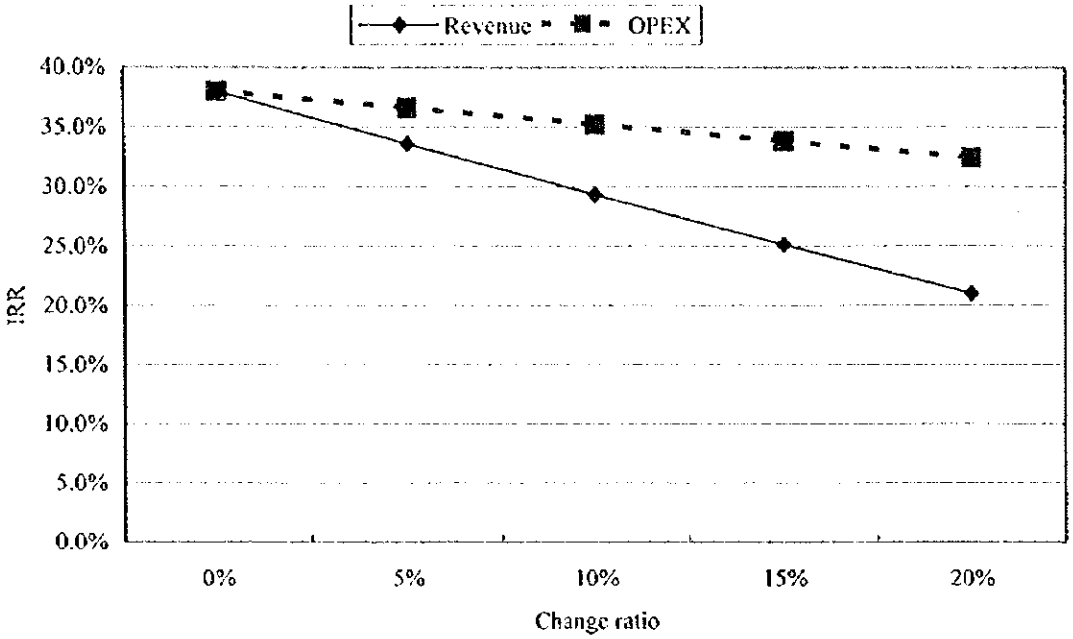


Figure 14.3.5-1 IRR on Revenue Decrease & OPEX Increase

Table 14.3.5-5 IRR on Revenue Decrease & OPEX Increase (Combination)

OPEX increase ratio		0%	5%	10%	15%	20%
Revenue decrease ratio	0%	38.0%	36.6%	35.2%	33.8%	32.5%
	5%	33.6%	32.2%	30.9%	29.5%	28.2%
	10%	29.3%	28.0%	26.6%	25.3%	23.9%
	15%	25.1%	23.8%	22.4%	21.1%	19.7%
	20%	21.0%	19.6%	18.3%	16.9%	15.5%

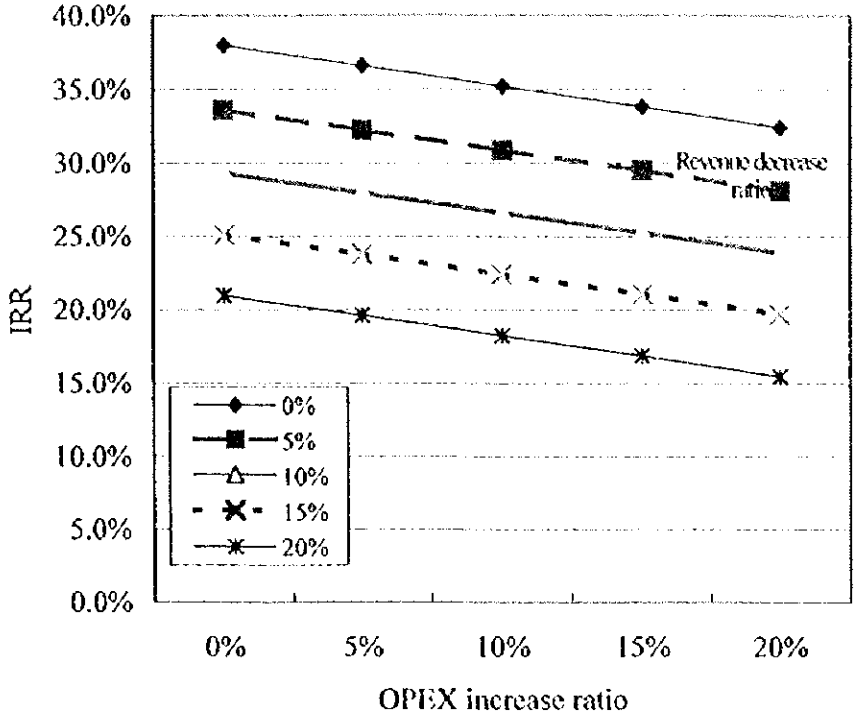


Figure 14.3.5-2 IRR on Revenue Decrease & OPEX Increase (Combination)

14.3.6 Financing Requirement

As a result of financial analysis for the Master Plan, the Table 14.3.6-1 shows the amount of financing arrangement to be required. However, those figures were calculated for the whole telecommunications operators in Vietnam under the most efficient allocation of capital. That is, those figures can be just a reference. Actual financing requirement should be studied for each operator or project.

Table 14.3.6-1 Requirement for Financing

Unit: thousand USD

Year	Amount to be required
1999	311,381
2000	152,665
2001	127,462
2002	72,912
2003	18,296
Total	682,715

In addition, loan repayments and interest payments schedule were studied in the business

plans in the Appendixes, the "Financial Cash Flow" and "Loan repayment & interest payment schedule".

14.3.7 Comprehensive Financial Evaluation for Master Plan

At present, telecommunications operation in Vietnam is supported by key subscribers who pay more than the future subscribers. As the economy grows and with the expansion of scale of telecommunications market in Vietnam in the future, demand for telephone installation increase as new subscribers seeking to enjoy the benefits of relatively low tariffs.

This demand, however, comes mostly from general subscribers who pay less than existing subscribers. The master plan's projected profitability would be inferior to that of the existing network. To implement the master plan, the government should consider cross subsidies to be provided from the existing operational entities.

Although continued investment is required at this stage of development, telecommunications operators alone cannot accommodate it; outside funds must be introduced. In implementing an investment program, it is important to prevent the profit ratio from suffering and to focus on fulfilling demand. The government then has to support financially and to prepare a government's guarantee for foreign loans. Especially, for the unprofitable telecommunications development in rural area, in addition to cross subsidies, it is essential to introduce foreign grant aids or low interest loans.

Table 14.3.7-1 Summary of Profitability and Revenue Structure

FIRR	38.0%
NPV (thou. USD)	3,229,205
International revenue share	53.7%
International traffic share	5.23% (In: 4.10%) (Out: 1.13%)

Note: Traffic share means the share of call minutes.

14.4 Socio-Economic Analysis

The economic appraisal is undertaken to ascertain the overall impact of the Master Plan on the Vietnam's socio-economy. The financial analysis was made from the view point of investors, whereas the economic analysis is made from that of a government decision

concerned with broader economic development objectives of the country.

The result of financial analysis of the Master Plan suggest that the new investment program is classified a low profitable project, although considerable efforts are still necessary. It would be a mistake, when evaluating the Master Plan, to assess and discuss only one issue whether the large-scale investment will pay off or not. It will also be necessary to recognize and assess other issues; for example, the benefits of a countrywide communications network, solving the 100% demand fulfillment, and etc..

14.4.1 Method of Socio-Economic Evaluation

In this economic analysis, the economic effect expected from the performance of these projects will be assessed dealing mainly with the calculation of Economic Internal Rate of Return (EIRR) when discounting sets of economic cost and benefit streams for the master plan. Through elimination of the value of transfer items and application of appropriate shadow price to the financial cost and benefit streams, the financial cash flows are transferred into economic cost and benefit streams to calculate the EIRR.

14.4.2 Economic Benefit

Economic benefit of the master plan can be divided into direct and indirect benefit.

(1) Direct Benefit

Sales revenue generated by the master plan can be considered as the economic direct benefit.

(2) Indirect Benefit

The expansion and improvement of telecommunications networks will contribute a great deal to the improvement of the national well-being not simply in the form of economic benefit but also in term of social benefit.

Such indirect benefits conceivable are:

For nations:

- Greater ease in emergency access to medical institutions
- Improved emergency communications, leading to upgrading and diversification of government and private services
- Economic effects to enhance business activities

- Increase in employment opportunities, improvement in security, etc.

For telecommunications operators:

- Nation-wide expansion of telecommunications services
- Improvement of telecommunications services
- Rapid innovation in telecommunications
- Simplification of network management
- Creating new services

With the combination of above effects, national economic growth will be promoted and the people's life standard will be improved.

14.4.3 Economic Costs

For the economic costs, the following items must be considered.

(1) CAPEX

The equipment and facilities costs, engineering services costs, pre-operation costs and initial working capital will be necessary as the initial cost for the economic value.

(2) OPEX

As the OPEX, the personnel expenses and the other OPEX are required to be analyzed economically considering their economic values.

(3) Items of Transfer

The taxes imposed on telecommunications operators are actual expenditure for the operators. However, looking at the taxes from a social perspective, it is only a transfer of cash from the operators to the government. Since it does not require any resources, it will not be considered a cost.

14.4.4 Economic Parameters

The financial value projected in the financial analysis will be converted to the economic value using the following factors.

(1) Foreign Exchange Premium

The foreign exchange premium utilized in converting the market value into economic value can be derived from the following Standard Conversion Factor (SCF) formula.

SCF = (M+X)/{(M+Tm)+(X-Tx)}

where,

M: CIF value of imports
X: FOB value of exports
Tm: All taxes on imports
Tx: All taxes on exports

Each value of the above parameters to obtain SCF and the result of calculation are summarized in the Table 14.4.4-1 based on the following assumptions:

(a) The amount of imports and exports were assumed to increase by 6.3 % and 10.6 % respectively, the same rates in the average of 1998 and 1999 as shown in the Table 14.4.4-2.

(b) The tax rate on imports was assumed to be 14.4% of import values, which is the average rate between 1993 and 1996 as shown in the Table14.4.4-3.

(c) Since information for the taxes on exports is not available, the tax rate on exports was assumed to be 0%.

Table 14.4.4-1 Foreign Exchange Premium (Estimation)

Unit: million USD

	Export	Import	Tax on Export	Tax on Import	SCF
Increase Rate	10.6%	6.3%	-	-	-
Tax rates	-	-	0.0%	14.4%	-
1999	10,817	12,651	0	1,822	0.93
2000	11,964	13,448	0	1,937	0.93
2005	19,799	18,253	0	2,628	0.94
2010	32,765	24,774	0	3,567	0.94
2015	54,224	33,625	0	4,842	0.95
Average SCF					0.94
Foreign Exchange Premium					1.07

The estimation was conducted with the Tables 14.4.4-2 and 14.4.4-3, that is, it was assumed the rates of increase of export and import are the same as the average for 1998 and 1999, and tax rate on import was the average for the years between 1993 and 1996.

Table 14.4.4-2 Import (CIF) and Export (FOB)

(Unit: million. USD)

	Import (CIF)		Export (FOB)	
1990	2,841		2,524	
1991	2,483	-12.6%	2,189	-13.3%
1992	3,027	21.9%	2,918	33.3%
1993	3,924	29.6%	2,985	2.3%
1994	5,826	48.5%	4,054	35.8%
1995	7,544	29.5%	5,471	35.0%
1996	11,144	47.7%	7,330	34.0%
1997	11,200	0.5%	8,850	20.7%
1998	11,670	4.2%	9,735	10.0%
1999	12,651	8.4%	10,817	11.1%

Note: The figures for 1998 and 1999 were estimated by the Economic Intelligence Unit Ltd..

Source: IMF, "Direction of Trade of Statistics"

Table 14.4.4-3 Import (CIF) and Taxes on the Import

	Duties (Mill. USD)	Import (Mill. USD)	Rate	USD1=VND
1993	544	3,924	13.9%	10,850
1994	905	5,826	15.5%	11,050
1995	1,208	7,544	16.0%	11,006
1996	1,362	11,144	12.2%	11,015
Average			14.4%	

Source: IMF, "Direction of Trade of Statistics"
IMF, IMF Staff Report No. 98/30, "Vietnam: Selected Issues and Statistics"

(2) National Parameter

The financial values of costs items presented in the financial evaluation will be divided into local and foreign currencies. Although the value of national parameter is not announced by the government, the value is set up for the master plan with the assumption that socio-economic environment in the country will reach the average level of South-Asia Region which was applied to the telecommunications master plan for Sri Lanka in **** by the JICA. Then the economic values will be calculated using the value of national parameters (premium of economic value) as shown below:

- Construction*: 0.73
- Unskilled labor*: 0.50
- Foreign exchange premium**: 1.07

*: These shadow price ratios were obtained from the IBRD.

**: Estimated in the Table 14.4.4-1.

The factor for construction is applied to all locally source equipment and services and the factor for unskilled labor is applied to all local labor.

14.4.5 Economic Evaluation

Economic evaluation is more conceptual approach than the financial evaluation with the assumption that economic evaluation employs perspective of society while financial evaluation is based on business entity's perspective. Therefore, economic benefit and cost are not directly related to actual monetary flow.

(1) Determination of Economic Direct Benefit

Only the sales revenue was considered as the total economic benefits for the economic evaluation from the conservative point of view, and it was partly summarized in the Table 14.4.5-3.

Table 14.4.5-3 Benefit Stream

Year	Total Benefit (thousand USD)
1999	167,563
2000	326,205
2005	1,151,949
2010	2,292,004
2015	2,091,565

(2) Economic Cost Streams

The total CAPEX (excluding import duties) and OPEX in each project year are summarized in the Table 14.4.5-4 and the Table 14.4.5-5 for economic analysis.

Table 14.4.5-4 Total CAPEX (Economic Cost) in each project year

Unit: thousand USD

Year	Total CAPEX	Year	Total CAPEX
1999	424,511	2005	446,013
2000	308,725	2006	452,134
2001	343,249	2007	489,103
2002	355,480	2008	530,533
2003	391,195	2009	576,559
2004	416,338	2010	634,494

Table 14.4.5-5 Total OPEX (Economic Cost) in each project year

Unit: thousand USD

Year	Personnel expenses	Other OPEX	Management expense	Total OPEX
1999	3,054	13,807	5,480	22,341
2000	9,099	36,594	14,964	60,657
2001	15,598	56,856	23,888	96,342
2002	23,305	78,712	33,821	135,837
2003	31,486	100,963	44,080	176,530
2004	39,532	123,953	54,501	217,986
2005	48,849	147,383	65,610	261,842
2006	57,993	171,476	76,844	306,312
2007	67,805	196,417	88,624	352,846
2008	78,411	222,342	101,047	401,800
2009	89,939	249,390	114,210	453,539
2010	102,526	277,896	128,275	508,697
2011	107,184	288,575	133,519	529,278
2012	106,604	281,154	131,039	518,797
2013	104,693	273,925	128,033	506,651
2014	101,679	266,881	124,599	493,159
2015	100,212	260,018	121,898	482,128
Total	1,087,968	3,046,342	1,390,433	5,524,743

The costs are converted into the economic cost using value of national parameters (shadow premium). In this case, the rate of import duties assumed was 7% and the foreign exchange premium is 1.07. Therefore, the total economic CAPEX was regarded to be equal to the financial CAPEX without import duties.

(3) Assessment of Result of Economic Analysis

Economic Internal Rate of Return (EIRR) during the economic life span is calculated with the economic benefits and costs. Economic cash flow for the Master Plan to calculate EIRR, the measures to assess the economic viability, was summarized as shown in Table 14.4.5-6.

Table 14.4.5-6 Economic Cash Flow

Unit: thousand USD

Year	Economic Benefit	CAPEX	OPEX	Economic cash flow
1999	167,563	424,511	22,341	-279,290
2000	326,205	308,725	60,657	-43,177
2001	469,443	343,249	96,342	29,852
2002	617,651	355,480	135,837	126,334
2003	779,750	391,195	176,530	212,026
2004	958,890	416,338	217,986	324,566
2005	1,151,949	446,013	261,842	444,094
2006	1,351,325	452,134	306,312	592,878
2007	1,568,480	489,103	352,846	726,530
2008	1,805,701	530,533	401,800	873,368
2009	2,064,527	576,559	453,539	1,034,429
2010	2,292,004	634,494	508,697	1,148,814
2011	2,300,253	0	529,278	1,770,975
2012	2,243,937	0	518,797	1,725,140
2013	2,189,600	0	506,651	1,682,948
2014	2,137,954	0	493,159	1,644,795
2015	2,091,565	0	482,128	1,609,437
Total	24,516,797	5,368,335	5,524,743	13,623,719

Note: OPEX includes the distribution of management expense.

The EIRR for the proposed master plan has been calculated at 51.3% with a net present value of USD 4,464,289 thousand. In addition, the Master Plan is expected to benefit the economy, through higher economic activities, due to improved telecommunications facilities which are difficult to quantify.

In general, the benefits of the master plan have been distributed widely, with significant shares being realized by low-income countries. If the government is weighted for social objectives, EIRR would, therefore, exceed the calculated EIRR.

The proposed master plan is expected to have economy-wide benefits. It will help the sectors to improve telecommunications facility and efficiency to enhance service quality, to expand network capacity, to fulfill the 100% demand, and to increase geographical coverage. For business fields, improved telecommunications services will help to enhance productivity, and the presence of a sound regulatory framework will help to build investors confidence.

14.5 Conclusions

14.5.1 Profitability and Importance

(1) Financial Profitability

From the view point of private investors, this study indicates that this Master Plan is profitable as a whole, with 38.0 % of FIRR.

(2) Impact on the Socio-Economy

On the other hand, from the view point of socio-economy in Vietnam, this Master Plan will produce larger socio-economic benefits than financial ones. Furthermore, unquantified indirect benefits can be expected. To establish and maintain telecommunications infrastructure is closely associated with the nation's well-being and industrial base, such as a manner as to help developing nations achieve sound growth.

(3) Importance of Rural Development

In spite of low return, the importance of rural telecommunications development for nation-wide balanced network will not be reduced as a step for nation-wide economic growth of Vietnam. On the other hand, in spite of the fact that telecommunications services have a role of trigger for socio-economic growth, it can be also said that the current rural socio-economic activities are still closed and completed within a small area in Vietnam. Therefore, that might be a risk factor that hinders socio-economic effects caused by rural telecommunications development. That is, without activated socio-economic interchanges among the rural and the cities, the socio-economic effects of rural telecommunications developments might not be fully expected. Especially, improvement of GDP per capita might not be followed by the forecasted demand and traffic. Therefore, the government should adopt a policy to emphasize activate interchanges among rural areas and cities in the socio-economic development plans.

(4) ODA

Under the current circumstances in Vietnam, the government has to allocate funds to meet the needs of low profitable rural development. To put it more precisely, the government and ODA are expected to draw up a scenario that enables the Vietnam's telecommunications sector to maintain tariff accessible to low-income people.

14.5.2 Cross Subsidies

(1) Existence of Cross Subsidies

Vietnam's current revenue structure clearly indicates the existence of cross subsidies between international and domestic revenues. Although the current cross-subsidy system should be rectified and cost-based tariff system should be achieved in the future, immediate and complete rectification or transfer is not possible but its modification is still considerable.

(2) Transition to Cost-based Tariff System

At this stage of development in Vietnam's telecommunications sector, the essential task is to expand the telecommunications network while ensuring a stable operational base. In addition, this Master Plan will support construction of a well-balanced network only if the entire plan is implemented.

Tariff system also has a substantial influence on the financial performance of telecommunications operators. The government should first analyze the circumstances carefully and then settle tariffs including operator access charges for a sound operations. The government has to take steps to ensure that telecommunications services are both reliable and available to all, and establish charges at a level that will promote market competition.

In addition, it will be necessary to introduce a gradual re-balancing of the tariff system with the goals of utilizing the beneficiary payment principle more thoroughly and of improving the efficiency of resource allocation.

14.5.3 Others

In addition to the above, some recommendations in terms of management and accounting were summarized as bellow. Especially, the government should have power to establish consistent accounting standards and to control the operators' disclosure obligation for future competitive market.

(1) Management

(a) Revenue increase

- To activate inter-provincial or inter-district socio-economic relations
- To promote marketing

(b) Expense reduction

- To improve management efficiency with introduction of new technologies
- To improve working efficiency by human resource development and allocation
- To improve cost and efficiency management

(2) Accounting

(a) Accounting standards

- To establish consistent accounting standards applicable to every telecommunications operators, including cost accounting by service

(b) Disclosure

- To establish information disclosure system to protect investors

CHAPTER 15

PRIORITY PROJECT

CHAPTER 15 PRIORITY PROJECT

15.1 Candidates of Priority Project

This master plan covers long-term development for the telecommunications networks up to 2010. The planning period up to 2010 is divided into several milestones as target years i.e. short-term plan up to 2000 (Phase A), a medium-term plan up to 2005 (Phase B) and a long-term basis up to 2010 (Phase C). The priority projects are selected from phase-B as an urgent program.

The proposed priority projects are chosen out of telephone service (POTS) and other telecommunications services.

15.1.1 Telephone Service (POTS)

(1) Rural Telecommunication Project

The P&T's provincial telecommunications expansion projects are grouped to six as shown in Table 15.1-1 and Figure 15.2.2-1.

Table 15.1-1 Rural Telecommunications Projects for POTS

No.	Project Name	Description
1	North East Province	12 Provinces with 40,000lines
2	North West Province	8 Provinces with 50,000lines
3	Central Province (1)	10 Provinces with 85,000lines
4	Central Province (2)	7 Provinces with 51,000lines
5	South East Province	5 Provinces with 52,000lines
6	Mekong River Delta	12 Provinces with 124,000lines

(2) BCC (Business Cooperation Contract) Project

BCC Projects are listed in Table 15.1-2, which consists of rather profitable areas with high demands of the telephone service. At present, five (5) BCC projects have started business work with foreign partners.

Table 15.1-2 BCC Projects

No.	Project Name	Description	Status
1	HCM P&T area 1	Business partner: Alcatel	On-going
2	HCM P&T area 2	Business partner:	
3	HNI P&T Area 1	Business partner: C&W	On-going
4	HNI P&T Area 2	Business partner: NTT	On-going
5	H.Phong, Q.Ninh, H.Duong, H.Yen	Business partner: Korea Telcom	On-going
6	International Network	Business partner: Telestra	On-going
7	Da Nang City	Business partner: -	-

(3) Inter-Province Network Project

Inter-Province Network is broken down into 5 Projects, which are listed in Table 15.1-3. Inter-Province Network carries all traffic among 61 provinces and these project are an important infrastructure in Vietnam, however, currently traffic is carried by small capacity radio transmission system except central area (Ha Noi-Ho Chi Minh).

Table 15.1-3 Inter-Province Network Projects

No.	Project Name	Description	Cost (US$)
1	Ha Noi to Ho Chi Minh	Expansion of SDH OFC system 3,869km OFC, Backbone & 5 regional loops	71 M
2	North Provinces	New SDH OFC plan 2,057km OFC, 5 regional loops	36 M
3	South Province	New SDH OFC plan 1,210km OFC, 4 loops	23 M
4	MW Radio	HNI-HCM and other 3 spurs	20 M
5	Submarine OFC	2,300km OFC with WDM technology.	190 M

15.1.2 Other Telecommunication Services

Telecommunication Projects other than telephone service (POTS) is nominated in Table 15.1-4.

Table 15.1-4 Projects for Other Services

No.	Project Name	Description	Cost (US$)
1	Expansion of Mobi Fone Network (VMS)	Expansion of cellular mobile telephone network. 440,000 sub	345 M
2	Expansion of Vina Phone Network (GPC)	Expansion of cellular mobile telephone network. 160,000 sub	122 M
3	Tele-Satellite	Launching of satellite for VSAT system.	300 M
4	Postal Saving Data Communication Project	Establishment of the data communication system for postal savings	44 M
5	Frequency Monitoring System	Improvement of monitoring centers. Yen Bai (new center) and others.	8.3 M
6	OPMC (Outside Plant Management Center)	Establishment of OPMC in HNI	-
7	VSAT Communication System	Establishment of Government emergency communications system.	-
8	Internet Network System	Expansion of Internet Network Service.	-

15.2 Priority Projects

15.2.1 Selection of Priority Projects

The Priority Projects are selected to be implemented by year-2005. The Table 15.2-1shows the result of selection for the priority projects.

Table 15.2-1 Priority Project List

Priority	Description	Cost
1	a) North Province Project : 20 Provinces, 101,000 lines	$ 91M
2	b) Mekong Delta Province Project : 12 Provinces, 124,000 lines	$ 112M
3	c) Central Province Project : 12 Provinces, 92,000 lines	$ 83M
4	d) Inter-Province Network Project : 14 SDH OFC Loops, 4 Radio & SDH links	$ 150M
5	e) Frequency Monitoring Project : 8 location including Yen Bai	$ 8M
6	a) OPMC(Outside Plant Management Center) : Hanoi	-
7	b) VSAT for government emergency communications system : Nationwide	-

15.2.2 Outline of Priority Projects

(1) Rural Telecommunication Project

The rural telecommunication projects are formulated into three (3) regions as shown in Figure 15.2.2-1. The average telephone density in these regions is low, and many small communes located in remote area have no telephone. Therefore, the expansion of rural telecommunications network is an urgent matter not only for

VNPT but also Vietnam Government.

(a) North Province

Northern Provinces consists of 20 provinces. Most of the areas are located in hilly or mountain area. It is recommended that this area has the highest priority due to the lowest telephone density of 3 regions.

(b) Mekong Delta Province

Mekong Delta province consists of 12 provinces, which have the second priority, following North Province. Telephone density at 2000 is 2.0 %.

(c) Central Province

This area locates lower half of central area and the telephone density is rather higher than other regions (3.2%). So this area has the lowest priority of three regions.

Estimated Cost for Central, North and Mekong Delta Province Project

The break down of project cost is estimated based on similar telecommunication project in neighboring countries. The results of calculation are shown in Table-15.2-1.

Table 15.2-1 Project Cost of Rural Telecommunication Project (US$)

Project Name	S/F	SW	T/R	OSP	RSS	NMS	CS	Total
Northern Province	6.0	18.8	6.6	42.7	13.1	1.2	2.6	91 M
Mekong Delta Province	7.4	23.2	8	52.5	16.1	1.5	3.3	112 M
Central Province	5.5	17.2	5.9	38.9	12.0	1.1	2.4	83 M
Total	18.9	59.2	20.5	134.1	41.2	3.8	8.3	286 M

i) S/F (Supporting Facilities)
New installation/expansion of the building for MSU, RSU and Transmission system
ii) SW (Switching Facilities)
New installation/replacement of MSU and RSU
iii) T/R (Transmission Facilities)
New installation of OFC and SDH
New installation/replacement of digital radio
iv) OPS (Outside Plant Facilities)
New installation of primary and secondary cable
v) RSS (Radio Subscriber System)
New installation of base station and subscriber stations
vi) NMS (Network Management System)
New installation of server and workstation in NMS center
vii)CS (Customer Service and Billing Facilities)
New installation of DCN, Customer service and billing system

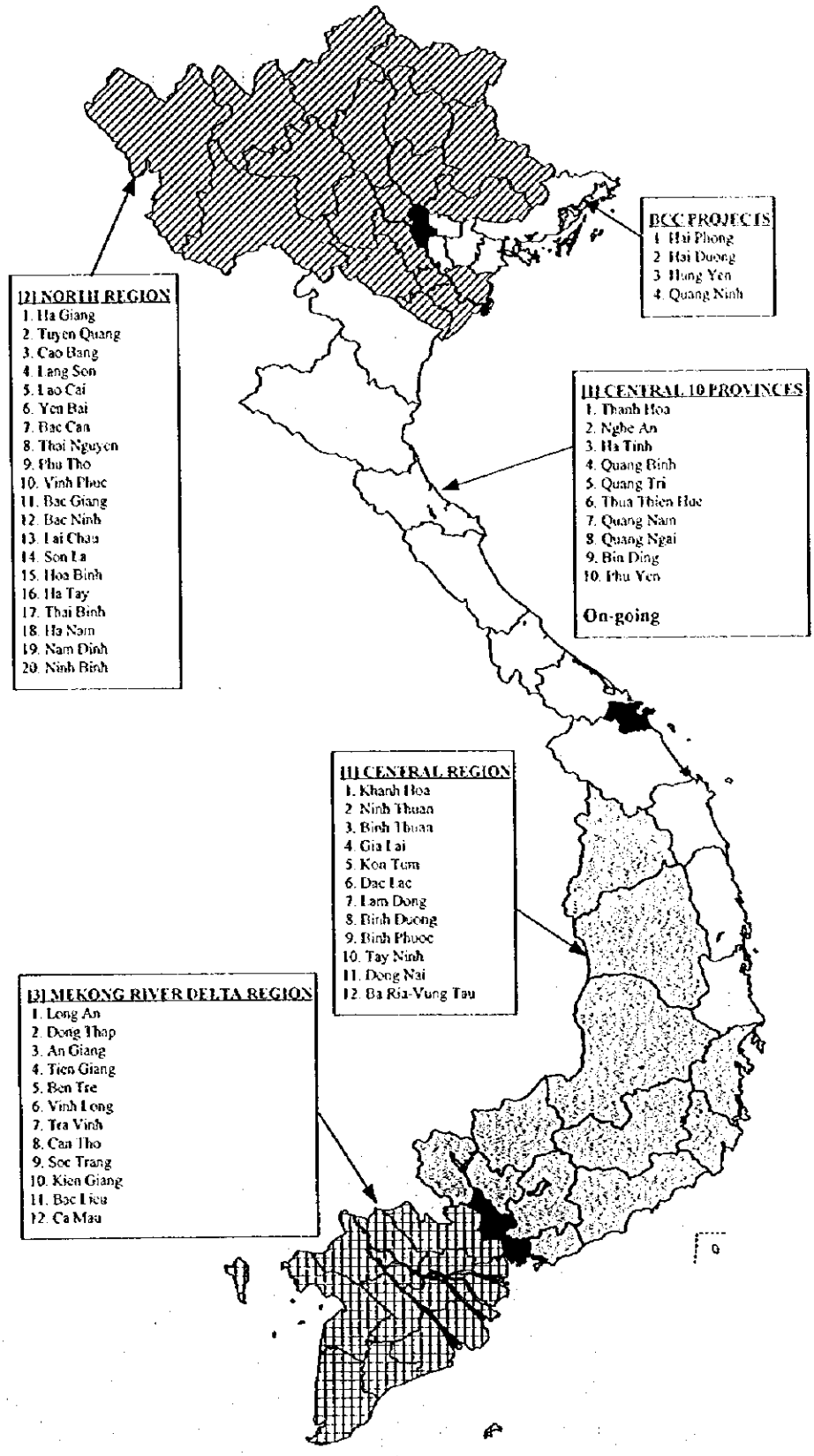


Figure 15.2.2-1 Rural Telecommunication Projects

A detailed study for the selected projects should be further conducted in a subsequent stage of Feasibility Study (F/S). Because, the project expansion scope by province, facilities replacement plan, application technologies for access networks would become more specific.

(2) Inter-Province Network Project

The SDH OFC system is expanded to whole capital cities in provinces. Consequently, the length of OFC is extended from 4,000km to 12,611km of the total length. The plan of Inter-Province Project is shown in Chapter 10 Figure 10.2.1-3～6.

(a) SDH OFC system

- 14 Loops including of backbone Loop with STM-1, 4 and 16.
- 7,136 km of new installation.
- Spur links (D.Bien, L.Cai, and T.Ninh)

(b) Digital Radio system

- Backbone (Ha Noi-Ho Chi Minh) SDH STM-16 (2+1)
- Spur links (D.Bien, L.Cai, and T.Ninh)

(3) Frequency Monitoring Project

To improve the frequency monitoring system, the monitoring centers are expanded which covers the whole country.

(a) Improvement of monitoring centers

- New center is introduced in Yen Bai.
- Facilities of 7 existing locations are improved.

(b) System to be introduced

- Improvement of semi-fixed equipment
- Improvement of mobile monitoring systems (16systems)
- Improvement of spare equipment
- Establishment of data network

(4) OPMC (Outside Plant Management Center)

OPMC establishment is expected nationwide for efficient and cost-effective OSP maintenance/installation activities. As a starter, the construction of OPMC in Ha Noi is recommended in the Priority Projects.

The following objectives are aimed for the OPMC system.

(a) Centralization of the works

The OSP manpower, vehicles, materials and tools/equipment assigned in the telephone offices are centralized in an OPMC.

(b) Improving the work conditions

It covers to equip state-of-the-art OSP tools/equipment, materials, construction vehicles and welfare facilities for more convenient, comfortable and reliable works.

(c) Improving the training environment

For all the OSP workers, the training opportunities are given sufficiently, in parallel with the provision of Training facilities (e.g. necessary tools/equipment, materials and training room).

(d) Computerized office work and management

It covers demand data and OSP plant record management, job administration, inventories management and so on.

(5) VSAT Project

VSAT system is installed nationwide and used as means for the governmental work in normal and emergency communications.

(a) System configuration

The communications system is configured by VSAT system, and its Hub station is newly introduced in Ha Noi, and VSAT stations are deployed in each provincial capitals. The system configuration is shown in figure 15.2.2-2.

(b) Project scale

Hub station (1), VSAT station (70), Portable VSAT station (6), Mobile VSAT station (3)

The charge for leasing transponder is not included in this project.

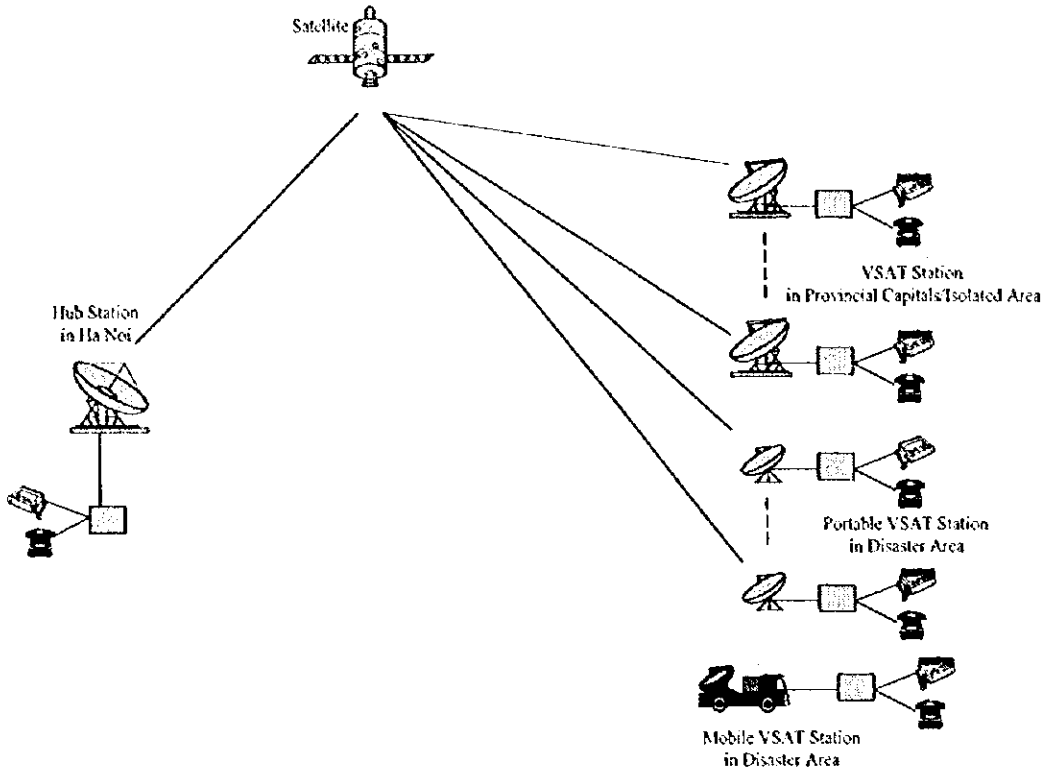


Figure 15.2.2-2 VSAT Communication System

15.2.3 Other Priority Projects

The following projects are strongly requested to add as priority projects by DGPT.

(1) Vietnam Telecommunications Satellite (VINASAT)

The satellite network shall be developed and deployed for the governmental use and public security, Vietnam Television and other public utilities to use the satellite as a multi-purpose multimedia satellite.

(2) Domestic Submarine Optical Fiber Cable System (Figure 15.2.2-3)

The domestic submarine optical cable trunk network should be completed along the coastline to enhance the reliability of the backbone network and to comply with increase in both quality and quantity of telecommunications traffic demands in the domestic and international telecommunications services.

For these priority projects, further study should be conducted to give the higher priority and urgency on the priority implementation, especially in relation to the necessity and the time.

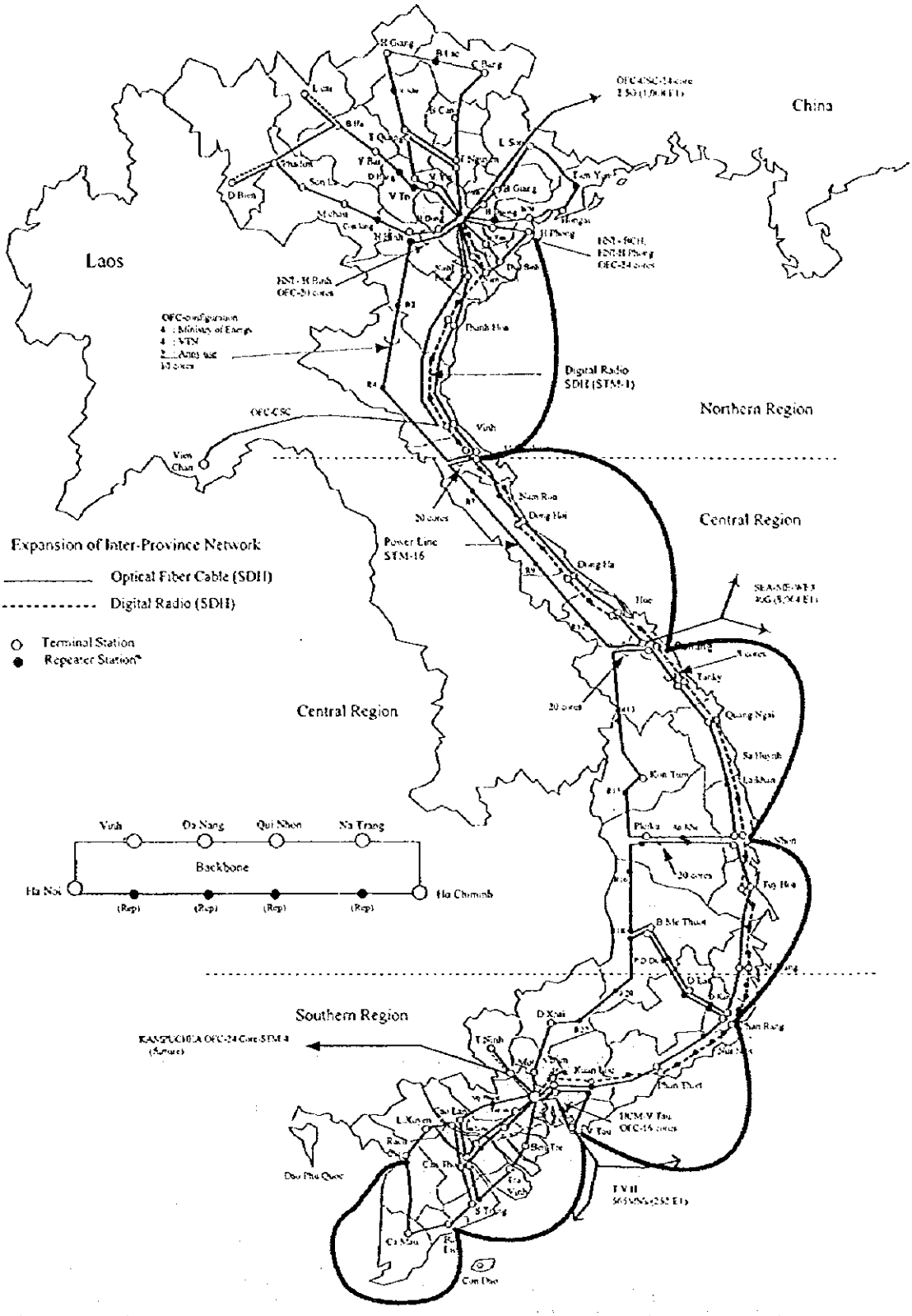


Figure 15.2.3 Planned Domestic Submarine Optical Fiber Cable Network

15.3 Financial Analysis for the Priority Projects

The rural telecommunications development for the rural provinces in the North for the Phase B (2001 – 2005) was financially analyzed as a priority project in this chapter.

Except the project appraisal period, which was set between the years 2001 and 2010 for this analysis, all other basic assumptions were followed those in the Chapter 14 for the financial and socio-economic evaluation of the whole master plan.
The OPEX and revenue per subscriber were estimated for the whole region, 20 North provinces, and applied to the analysis for the rural project area out of the region.

The following analyses were also conducted under the Master Plan for the demand forecast and the current tariff.

15.3.1 Cost Projection

(1) CAPEX

(a) CAPEX per subscriber and investment schedule

Although the CAPEX per subscriber for the whole master plan for the Phase B was assumed to be USD 800, that for the priority projects in rural provinces was assumed to be USD 900 and appropriated in the first year of the Phase B.

(b) Subscribers for the projects

In the aforesaid proposal, some rural portion of telephone network expansion in the rural provinces in the North, Central, and Mekong Delta regions were picked up as rural telecommunications projects, and the total subscribers to be increased in the projects were as stated in the Table 15.3.1-1.

Table 15.3.1-1 Subscribers for the Priority Projects in the Regions

No. of subscribers in the regions	216,011
No. of subscribers for the projects	101,000
Share in the region	46.8%

Note: Subscribers in the table mean additional subscribers in the Phase B.

(2) OPEX

(a) Personnel expense

Personnel expense per staff for the rural projects was assumed to be lower than that of the whole master plan, that is, VND 13,000 thousand for 1999 and to be increased by the rate of inflation rate in Vietnam, 5% per annum.

(b) Other OPEX

Other OPEX per subscriber was assumed to be the same as that of the whole master plan, that is, VND 1,000 thousand.

(c) Distribution of management expenses

30% of direct OPEX was assumed to be the management expenses during the whole project appraisal period as same as the whole master plan.

15.3.2 Revenue per Subscriber

(1) Installation fee

VND 1,286 thousand per subscriber was assumed to be the average installation fee for the whole appraisal period as the evaluation for the whole master plan.

(2) Monthly subscription fee

VND 655 thousand per subscriber was assumed to be the average subscription fee for the whole appraisal period as the evaluation for the whole master plan.

(3) Call charges

Call charge revenues per subscriber were converted from that of the whole master plan with the conversion rates as bellow. The call charge revenues were calculated by the forecasted call charges per subscriber for the whole master plan multiplied with the conversion rates and the average number of the cumulative subscribers contributed by the projects.

(a) Fixed telephones

The conversion rate for local call (surcharge), long distance call (inter-district and inter-province), international (call and settlement) per subscriber contributed by the project were assumed to be the ratios of traffic per subscriber against the national average.

(b) Mobile telephones

A part of domestic call revenue from mobile telephones can be regarded as the effect of the increase of fixed telephones as a network effect.

The conversion rate for mobile charges contributed by the project was assumed to be half of the ratio of the number of the subscribers for the project against the total number of subscribers including mobile telephones.

(4) Other telephone revenues

The other telephone revenue per subscribers contributed by the projects was assumed to be the same as that of the whole master plan. The total other telephone revenues was calculated by the other telephone revenue per subscribers multiplied with the number of average additional subscribers (cumulative) for the project.

15.3.3 Financial Analysis

(1) Results

As the result of financial analysis, the project showed 5.2% as Financial IRR under the current tariff.

Table 15.3.3-1 Result of Financial Analysis (Rural in the North Provinces)

Unit: thousand USD

Year	CAPEX	Revenue	OPEX	Free Cash Flow
2001	16,506	4,326	1,081	-13,261
2002	17,291	9,598	3,230	-10,923
2003	18,104	14,876	5,397	-8,625
2004	18,995	19,177	7,556	-7,375
2005	20,005	24,195	9,770	-5,579
2006	0	24,441	10,732	13,709
2007	0	23,632	10,494	13,137
2008	0	21,948	10,265	11,683
2009	0	21,232	10,044	11,188
2010	0	19,946	9,831	10,116
Total	90,900	183,370	78,400	14,070

One of the main reasons which affect to the low return is low domestic tariff. Therefore, the domestic tariff should be enhanced to promote remote development.

(2) Financial conclusions

The rural telecommunications developments were proved low profitable under the current circumstances in Vietnam. However, the importance of rural development is inevitable problem for Vietnam, even for future national socio-economic development.

Therefore, the Vietnam Government should take an initiative in terms of finance and policies for rural developments, not only telecommunications development but also socio-economic development in rural area. ODA, such as OECF soft loan, should be introduced as a financing source.

CHAPTER 16

RECOMMENDATIONS FOR NETWORK DEVELOPMENT

CHAPTER 16 RECOMMENDATIONS FOR NETWORK DEVELOPMENT

16.1 General

(1) General

This describes recommendations for network development obtained through the study on the Master Plan in Vietnam. The items to be improved in order to implement effectively and smoothly the telecommunications services are listed. Based on the listed results, several items are described as recommendations together with a target of milestone. The summary of recommendations is itemized in the followings and is shown in Table 16-1.

(2) Itemized Recommendations

The recommendations are itemized as follows:

(a) Policies for Network Development

(b) Telecommunications Management
- i) Organization
- ii) Human Resource Development
- iii) Telecommunications Productivity
- iv) Planing Work
- v) Standardization
- vi) Preparation for Project Implementation
- vii) Operation and Maintenance
- viii) Review of Tariff Structure
- ix) Management of Data and Information
- x) Computerization

(c) Telecommunications Service and Facilities
- i) Switch
- ii) Transmission
- iii) Access Network
- iv) Mobile Communications
- v) Non-Voice Communications
- vi) International Telecommunications
- vii) Private Network Development
- viii) National Information Infrastructure

Table 16-1 Summary of Recommendations (Milestone)

Item	Up to 2000	2001 - 2005	2006 - 2010	2011 - 2020
Policies for Network Development	* Expansion of Services, * Penetration of Conventional Technologies, * Introduction of New Services/Technologies			
	- Telephone Density: 3.01 - Mobile Density: 0.41	- Telephone Density: 5.25 - Mobile Density: 1.12	- Telephone Density: 8.29 - Mobile Density: 1.74	
Organization	* Fair Competition and Strengthening of DGPT Administration, * Establishment of Communications Policy Bureau and Telecommunications Bureau			
	- Reorganization of Policy Department and Telecommunications Department		- New Organizations for Info-Communications Era	
Human Resource Development	- Staffing Plan & Job Classification - Improvement of Training Activity - Development of Manpower - Establishment of Policy of Human Resource Development	- Standardization of Staffing Plan - Improvement of Training Activities - Development of Manpower for New Services - Upgrading of Human Resource Development Policy	- Human Resource Development Plan for IT - Relocation Plan of Manpower	- Reorganization of Staffing Plan & Training Activities - Training Development Plan for Multimedia and NII - New Human Resource Development Policy
Telecommunications Productivity	* Indicators for Telecomm. Productivity, * Measures for Improvement of Productivity			
	- Productivity: 65 lines/staff	- Productivity: 91 lines/staff	- Productivity: 114 lines/staff	- Productivity: 165 lines/staff
Planning Work	* Review and Formulation of Annual Plan			
	- Prioritizing of Projects			
Standardization	* Establishment of Standards for Telephone Services, * Establishment of Telecommunications Technical Standards (Fundamental Network Plan, Service Quality)			
Preparation for Project Implementation	* Project Implementation Procedure, * Project Administration and Management			
Operation and Maintenance	- Service Order Management and Outside Plant Center - Plant Record Control - Review of Unified O/M Center - Quality Control of Telecommunications Services - Failure Control & Spare Part Storage System	- Rationalization of O/M Center - Improvement of Billing Center, Quality Control - Failure Control & Spare Part Storage System - Review on New Job Control System	- Introduction of Telecommunications Management Network (TMN)	- Preparation for Multimedia System
Review of Tariff Structure	* Review of Tariff Structure			
	- Revision of Tariff (June 1999)			
Management of Data and Information	* Management and Standardization of Statistic Data/Information, * Establishment of Database			
Computerization	* Managerial Utilization, * Technical Utilization			
Switch	* Repetition of Examinations, *Types of Switching Systems, *Designing			
	- Network Configuration - Expansion of National Transit Switch		- Expansion of National Transit Switch - Location of Switch	- Ultra High Speed NW - Non-SW NW, Optical SW - TV Conversation Equip. - Terminal Equip.
Transmission	* Role of Backbone, * Loop Formation, *Preparation for TV, * Types of Transmission Systems, * Improvement of Reliability, *Expansion of Transmission Capacity, *Frequency Reuse			
	- Expansion of SDH Backbone/Inter-Provincial Network - Upgrading of Intra-Provincial Network (Replacement of Irregular Usage) - Introduction of Domestic Submarine Cable Network	- Completion of Backbone and Regional Loop - Upgrading of Intra-Provincial Network (1/3)	- Upgrading of Intra-Provincial Network (half)	- Introduction of WDM - Upgrading of Intra-Provincial Network
Access Network	* Selection of Suitable Systems, * Frequency Assignment			
	- N-ISDN, xDSL - Improvement and Expansion of Radio Subscriber Systems - Supplemental Utilization of WLL - Expansion of VSAT Systems	- Expansion of FTTB/FTTCab - FTTC, FTTH Trial - Introduction of New Radio Subscriber Systems	- Introduction of All types of Access NW - Penetration of Telecommunications Services in All Communes - Introduction of New Hub Station for VSAT Systems	- Introduction & Expansion of FTTC, FTTH - Provision of High-Speed Data Communications - Provision of Sufficient Telephone Lines in Remote/ Rural Areas
Mobile Communications	* Selection of Suitable Systems, * Expansion of Service Area, * Frequency Reuse and Assignment			
	- Expansion of GSM Service - Removal of Analog AMPS - Introduction of CDMA - Introduction of GMPCS	- Introduction of PCS/PHS/PCN	- Trial of IMT-2000	- Expansion of IMT-2000 - Convergence between Cellular and Paging Systems
Non-Voice Communications	* Expansion of Services			
	- Expansion of Existing Services - Introduction of N-ISDN(BRI) - Trial of FR/ATM	- Introduction of N-ISDN (PRI) - Introduction of FR/ATM Bearer Services	- Introduction of B-ISDN - Introduction of Switched ATM Service	- Expansion of High-Speed Data Communications
International Telecommunications	* Promotion of Fixed and Mobile Networks, * Promotion of High-Speed Internet Backbone			
	- Completion CSC Optical Fiber Cable over the Land - Introduction of International FR,ATM	- Launch of VINASAT - Completion of GMDSS - Introduction of Gateway ATM Switch	- Introduction of TMN	- Establishment of Total Digital Network
Private Network Development	* Private Network to Virtual Private Network, * IP Network to IP-VPN, * Outsourcing of Operation and Maintenance Work			
National Information Infrastructure	* Telecommunications Network Development, * Information Service Development, * Human Resource Development			

16.2 Policies for Network Development

(1) Planning Targets

Telephone and mobile density is planned to be increased. The targets for higher telephone and mobile density and more extensive network coverage were set based on the present status of telecommunication facilities and demand forecasts.

It is recommended that the DGPT recognize the importance of telecommunications and give a higher priority to telecommunications, and to achieve the targets of telephone and mobile density up to 2010 which are listed in Table 16.2-1.

Table 16.2-1 Target of Telephone and Mobile Density

	Existing 1998	Phase A 2000	Phase B 2005	Phase C 2010
Telephone Density	2.33	3.01	5.25	8.29
Main Lines (x1000)	1,792	2,399	4,529	7,660
Mobile Density	0.30	0.44	1.12	1.74
Subscribers (x1000)	234	347	967	1,607

(2) Expansion of Services

The telecommunications services are concentrated in urban areas and have not yet covered many communes, especially in remote and rural areas in Vietnam. Therefore, the rapid and steady expansion of telecommunications services shall be carried out not only in urban areas, but also in remote and rural areas.

(3) Penetration of Conventional Technologies

Not only new technologies, but also the conventional technologies, which provide stable quality and are popular in the world, shall be penetrated as conventional telecommunications systems nation-wide.

(4) New Services and Technologies

New services shall be introduced in Vietnam not only from technical orientation, but also demand-orientation. Therefore, the demand to new telecommunications services shall be carefully investigated. Many trials of new services are being carried out in Vietnam, so the results of the trials shall be reflected to the full-scale introduction of the new services.

In addition, the introduction of new technologies to telecommunications sector are indispensable, however, the new technologies shall be investigated and ascertained their effectiveness from the technical and economical viewpoints through trials of new technologies. At present, many trials regarding new technologies are being

carried out in Vietnam, so the results of the trials shall be reflected to the full-scale introduction of the new technologies.

16.3 Telecommunications Management

16.3.1 Organization

(1) Fair Competition and Strengthening of DGPT Administration

With the licensing for two (2) new Posts and Telecommunications operators,

- Access and interconnection of new operators to existing telecommunications network should be made on a just and fair basis for the fixed and mobile networks.
- Interconnection technical standards should be set up as soon as possible; Strengthening of R & D is urgent for this reason.
- Interconnection tariff system should be established.
- Strengthening the state administrative organizations, such as planning, financial investment, accounting, frequency control regulation and inspection for the telecommunications. It is recommended to set up an independent organizations from the postal services;

(2) Establishment of Communications Policy Bureau and Telecommunications Bureau

It may be recommendable to reorganize new Communication Policy Bureau and Telecommunications Bureau (Refer to Vol. II Chapter 3 Organization, Institution and Management Plan)

[From 2006 to 2010]

(a) Preparation of new organizations and functions for an info-communication era

16.3.2 Human Resource Development

[Toward 2000]

(a) Staffing Plan and Job Classification

According to the results of Development Study, the necessary number of staff for the telecommunications sector will be as follows in relation to the growth of subscribers:

Table 16.3.2-1 Staff and Growth of Subscribers

Items/Year	1998	1999	2000	2005	2010	2020
No. of Staff (thous.)	37.4	38.6	43.2	63.6	85.8	139.9
Productivity per Staff	55	61	65	91	114	165

Total number of the required staff or employees for telecommunications sector must be shared in harmony and in effectiveness among operation company, organizations (fixed telephone, mobile, data, video, etc), academic level (worker, technician, engineer, expert, etc), professional works (switching, radio, transmission, outside plan, customer services and administration). In addition to this, it must be noted to put more emphasis on importance of assignment for function level such as clerk, office worker, assistant, manager, director, etc. since the free and open competition will become more and more severe throughout the world.

(b) Improvement of Training Activities

Priority and urgent need for training are as follows: New Technology training (Digital Communication, ATM, Frame Relay, CDMA, ISDN, LAN, etc), Software Development, CAI, Remote Learning, Information Technology (IT), High level education and training (University and Doctorate Level) and International Training

(c) Modernization of Training System and Development of Manpower

The success of VNPT and other operators depend on the efforts and quality of individual staff because manpower may be the most important resource. It is expected that the works will become large-scaled and more complicated in order to improve the telecommunication networks, and to provide new customer services; especially, VNPT must develop skills and abilities of its employees up to the sufficient level so that they can operate/provide the complex, massive, sophisticated facilities and new services such as multimedia.

(d) Establishment of Policy for Human Resource Development

For establishment of human resource development, it is necessary to monitor the current business activities first and then to forecast the business trend in order to set up the rational plan for the Human Resources Development (HRD). The HRD needs to establish a proper human resource management plan that should have:

- the service level as the target for staff allocation;

- the required manpower reflected by work volume, service level, and costs;
- close links with the operators; total management plan and operation/ maintenance plan of each division and unit;
- For doctorate, post-graduate and senior engineer qualifications for technocrats should be prepared through scholarship and ODA funds both abroad and domestic fields.
- Utilization of assistance by foreign partners for manpower development
- Persons with international experience should be more in number and in skill.

[From 2001 to 2005]

(a) Standardization of Staffing Plan

In the case of establishment of staffing plan, plans for new recruitment and retirement plan must be taken into account carefully.

(b) Improvement of Training Activities

In conformity with the facilities expansion program and human resource development plan, the training activities should be reinforced and improved to the extent that the targets will be achieved.

In this respect, more emphasis should be put on the higher level and advance training, new services and information technology, etc.

(c) Development of Manpower for New Services

Development items for new services; software technology, information communications, ATM, CDMA and ISDN.

(d) Updating Human Resource Development Policy

When facilities and customer services expanded, in general, manpower must also be expanded at the same time. Massive facilities will be merely wasted without proper expansion policies and allocation of human resources. Expenses related to human resources are the major expense items in business operations; therefore, they need to be efficiently and carefully managed.

[From 2006 to 2010]

(a) HRD Plan for IT

The human resource development plan for Information Technology (IT) should be implemented during this period.

(b) Relocation Plan of Manpower

During this period, not only new technologies such as ATM, IT, CDMA, etc., but also the target of 8 % penetration of main telecommmunications lines will be achieved. Therefore, a new allocation plan for manpower will be necessary. Since the universal services throughout the country will be performed, relocation plan of manpower may be worked out in order to balance the assignment in both urban areas and rural areas.

[From 2011 to 2020]

(a) Reorganization of Staffing Plan and Training Activities

Toward the year 2020, Vietnam will become an industrialized country in all aspects of industry infrastructure, including the telecommunications sector.

It is probable that a deregulation of telecommunications will be predicted for telecommunications sectors in Vietnam during this period. Therefore, reorganization of staffing plan and training activities should be worked out for the effective implementation as the timing will require.

(b) Training Development Plan for Multimedia and NII

Since Multimedia and NII will be introduced during this period, a new training development plan should be formulated.

(c) New Human Resource Development Policy

In conformity with the introduction of multimedia and NII, a new human resource development must be prepared during this period.

16.3.3 Telecommunications Productivity

(1) Indicators for Telecommunications Productivity

Telecommunications productivity may be represented by (1) Telecommunications revenue per line, (2) Outgoing traffic per line (international-minutes) and (3) Number of lines per staff. The number of main telephone lines per staff shows the level of productivity of the telecommunications sector, and can be used as a denominator of productivity, shown in the followings:

Table 16.3.3-1 Average Number of Main Telephone per Staff versus Teledensity (ITU-1997 data)

Teledensity (Lines per 100 people)	0.2 -	1.0 -	10.0 -	50.0 -
Main telephone Lines per Staff	10 lines -	20 lines -	80 lines -	200 lines -
Countries		**55:Vietnam** 82: Indonesia 72: Philippines 99: Thailand	99: Thailand 116: Malaysia	289: Japan

Vietnam has improved the level of productivity per staff recently, but the figure may be rather low as compared with other Asian countries. In this stage, the average lines per staff should be over 65 per staff by the year 2000.

(2) Measures for Improvement of Productivity

The Vietnam's telecommunications sector productivity will be improved so much to the level that the average indices of the industrialized countries have achieved (average index is about 146 line per staff in 1990).

For this purpose, the human development plan must be worked out in such way that the staff has to make efforts for enhancing the service quality on one side and for achieving the expansion target of facilities quantity on the other hand.

(a) To improve the telecommunications productivity by increasing large users, mobile services lines and leased circuits.

(b) Telecommunications Quality Control (Reduction of both faults rate and repair time, and improvement of Successful Calls) has to be set up to upgrade the new services reducing investment costs and to elevate the staff productivity.

[From 2001 to 2005]

During this period, the number of telecommunications subscriber main lines per staff should be more than an average of 70 lines per staff.

[From 2006 to 2010]

With the achievement or the targets of 10% penetration of main lines and new service introduction, average lines per staff should be over 82 per staff by the year 2010.

[Toward 2020]

The telecommunications productivity should reach about 120 lines per staff by the year 2020.

16.3.4 Planning Work

To smoothly provide telecommunications services in Vietnam, the planning regarding telecommunications network shall be carried out referring to the following recommendations:

(1) Review/Formulation of Annual Plan

The long-term plan is also divided into three (3) implementation phases, that is, Plan Phase A toward 2000, Plan Phase B from 2001 to 2005 and Plan Phase C from 2006 to 2010. In addition, this Master Plan is furthermore designed for proposing a telecommunications development plan up to 2020 with a various kinds of deployment indicators.

The preconditions and statistical data utilized for the plan might be changed in the course of the Master Plan implementation, for example, economic and financial changes (GDP growth, population increase, funding, etc.) in Vietnam.

Therefore, the Master Plan should be reviewed and modified on an annual basis, short-term and long-term planning basis.

[Toward 2005]

(a) Prioritizing of Projects

Rural telecommunications network expansion projects should be prioritized to achieve universal service covering the whole country especially rural areas.

The government finance including ODA should be considered, because of low profit areas.

16.3.5 Standardization

(1) Establishment of Standards for Telephone Services

Carriers including VNPT have obligations to build the public telecommunications network under the Vietnam Standards and the international standards, set or announced by the DGPT, and to strictly comply with the service quality standards set by the DGPT and the optional service quality standards registered with the DGPT.

To comply with above circulation, it is recommended to set (a) National Technical Standards, (b) Service Quality Standards and (c) Technical Standards such as:

(a) Fundamental Telecommunications Network Plan

In accordance with the technical plan described in Chapter 4, the following

technical standards should be established for networks and equipment:

i) Network Structure
ii) Routing Plan
iii) Numbering Plan
iv) Signaling Plan
v) Synchronization Plan
vi) Grade of Service

(b) Service Quality Standards

In accordance with the recommendations described in Chapter 12 (Section 12.7), the following standards should be established for networks and equipment:

i) Average waiting time for telephone connection
ii) Average waiting time for repair
iii) Successful call ratio
iv) Subscriber complaints per 100 subscriber per month

(c) Technical Standards

In accordance with the technical plan described in Chapter 4, the following technical standards should be established for networks and equipment:

i) Connection Standard
ii) Transmission Standard
iii) Stability Standard

(2) Establishment of Telecommunications Technical Standards

ITU recommendations often have alternative standards, sometimes prescribed in an abstract way. Each country must determine their own standards either based on ITU recommendations or their own standards relevant to their special conditions.

It is recommended to establish a Telecommunications Technology Standards Organization composed of telecommunications operators, manufacturers, representatives of users and government organizations, to develop the Vietnam standards in the telecommunications field. It would pursue the same activities as TTC (Telecommunication Technology Committee) in Japan, ETSI (European Telecommunications Standards Institute) in Europe and T1 Committee in North America, standardizing such as network-connection protocols and terminal equipment.

Its main activities would be as follows:

(a) study the establishment of standards for telecommunication network,

(b) study and research standards for connection within the national telecommunications network

(c) disseminate the standards

16.3.6 Preparation for Project Implementation

(1) Project Implementation Procedure

The projects shall be implemented according to the following procedure:

(a) Planning of Feasibility Study oriented by the Master Plan

Projects shall be planned according to the Master Plan, and necessary feasibility study on the project shall be planned prior to the implementation of the project.

(b) Implementation of Feasibility Study

The feasibility study on urgent and high priority projects, which are recommended by the Master Plan, should be implemented in the year 2001 - 2005.

(c) Implementation of Projects

Based on a result of the feasibility study, a project shall be carried out. Some of projects mentioned in the Master Plan may be implemented by ODA in the year 2000 - 2005 based on the result of the feasibility study.

(2) Project Administration and Management

It is recommended that the organization and management system be strengthened by setting up a harmonized and centralized project control and management institution, which will be linked with a computer operation network for the government use.

To make the project more effective and more fruitful, it is recommendable to adopt a plan-do-check-action method in order to supervise the overall project implementation by use of such tools of check sheet, diagrams, charts and graphs.

16.3.7 Operation and Maintenance

[Toward 2000]

(a) Service Order Management and Outside Plant Center for Access Network

In order to avoid any delay in the construction of telecommunications

infrastructure, the Outside Plant (OSP) Center should be introduced, and service order procedure should be improved for the following items because fault occurrence rate for the outside plant is very high as compared with other facilities such as switching, radio and transmission;

- Subscription and registration management
- Plant Record (Location Map)
- Priority (Order of New Connections)
- Control of Payment of Telecommunication Charge

(b) Plant Record Control

Since there are pending problems for Outside Plant (OSP) operation and maintenance such as application registering, fault control, plant record should be properly kept in order to improve the service order works.

(c) Review of Unified Operation and Maintenance Center

It is recommended that a unified Operation and Maintenance (O/M) Center be established to control uniformly the operation and maintenance in relation to the regional aspect and facilities (switch, radio, transmission, outside plant, etc.).

(d) Quality Control of Telecommunications Services

In order to improve the reliability and productivity of telecommunications sectors throughout the country, it may be urgent to set up a standardized target and levels of telecommunications quality control (fault rate, successful call completion rate and repair time).

(e) Failure Control and Spare Part Storage

It may be better to store necessary spare parts for facilities of switching, OSP, radio, transmission, data, mobile, etc. in accordance with the calculated results of the equipment availability (MTBF). For example, 6 - 8 percent of the existing facilities may be used for the spare part storage. And an organization should be set up for this control.

[From 2001 to 2005]

(a) Rationalization of Maintenance and Operation Center

i) Service Order Control Center

The main purpose of introducing New Service Order control center can be summarized as follows:

1) To improve the efficiency of Customer Service System operation and management in line with the growth of telecommunications services for customers
2) To improve the operation and management on customer services and to enhance the quality of telecommunications service through the following actions:
   - Service order analysis (Subscriber Register/Facilities/Billing Control)
   - Multi-purpose utilization of customer database-Complaints, Faults, etc.

ii) Consolidation of Maintenance and Operation Center

Since the telecommunications equipment and network are operated and maintained independently by region and by system, it has become very an essential matter to introduce an efficient and integrated network management system in Vietnam so that the quick provisioning, reliable restoration of any faults and other maintenance activities could be worked out effectively. In line with this, it is recommendable to introduce TMN-based management system for SDH/PDH mixed large-scale transmission system. By means if this, the network will be managed by network-efficiency-driven regions and consolidation of the present maintenance centers in domestic and international telecommunications network will be realized.

(b) Improvement of Billing Center

Since the telecommunications services have been expanded and different new services such as ISDN, Frame Relay, WLL and CDMA are going to be introduced, in addition, new two (2) carriers entered the fair competition market, billing procedure would become more complicated.

To ensure the desired grade of services at the possibly lowest costs and to unify call detailed information, which are generated during the associated call processing, the Centralized Operations Support System is requested in Ha Noi and Ho Chi Minh after the year 2001. Accounting management includes billing data, information for fraud detection and subscribers' profiles (i.e. authorization to charge, etc.)

(c) Review of Unified Operation and Maintenance Center

During this period, the plan of the unified Operation and Maintenance Center,

which would have been already implemented up to 2000 should be reviewed.

(d) Improvement of Quality Control of Telecommunications Service

Based upon the improvement plan for the quality control of telecommunications services during a period up to 2000, the following items should be normalized:

i) Faults ratio: faults per month/year per 100 subscriber lines

ii) Call completion rate (Successful Call Rate)

iii) Fault Clearance Rate (Hours)

(e) Establishment of Failure Control and Spare Part Storage System

In accordance with the results of countermeasures to be taken up to 2000, the failure control and spare parts storage system have to be standardized during this period.

(f) Review on New Job Control System

It is recommended to introduce a new job control system called PDCA (PDCA: Plan-Do-Check-Action cycle) which stresses the need for constant interaction among activities of research, design, production and sales development, and the PDCA asserts that every managerial action can be improved by careful application of the sequence ; Plan, Do, Check and Action.

[From 2006 to 2010]

(a) Introduction of Telecommunication Management Network

Telecommunication Management Network (TMN) is intended to support a wide variety of management areas which cover the planning, installation, operations, administration, maintenance and provisioning of telecommunications networks and services.

The specifications, development of the required range and functionality of applications to support the above management areas is a local matter.

[From 2011 to 2020]

(a) Preparation for New Multimedia System

Since a multimedia system will be introduced in Vietnam during this period, it will be necessary to prepare and set up a new operation and maintenance plan.

16.3.8 Review of Tariff Structure

[Toward 2000]

(a) Review of Tariff Structure

For the improvement of telecommunications productivity, it is recommended that the current tariff system in terms of subscription fee, installation fees, services fees, local call charge, long distance call charge, international call charge, access charge, VAT, etc. and the rebalance of tariff among each tariff system be reviewed.

16.3.9 Management of Data and Information

(1) Management of Statistic Data and Information

For the preparations of the Master Plan, a great deal of data and information are necessary for collection and evaluation in order to make the Plan more reliable and more useful one. In addition to this, data and information have to cover the statistics on the state management, policy, regulations, socio-economy and statistics of telecommunications (networks, revenue, tariff, operation/maintenance, human resource, etc.) as well. Moreover, the data and information must range from the nation-wide basis to the provincial/district basis from the viewpoints of the macroscopic aspect and microscopic fields.

At present, it is necessary to take much time and manpower for the directorates of Headquarter and Provinces/District to gather the official data and information regarding the above-mentioned subjects. One of the countermeasures for this matter, it is recommended that the data and information management system be strengthened by installing a centralized management center which will be linked with a computer operation network for the government use.

The following information should be recorded and updated at least annually in a standard format.

(a) Financial statement
(b) Statistic data for services
(c) Data for facilities
(d) Trouble complaints per 100 main station
(e) Call completion rate

(2) Standardization of Statistic Data and Information

Vietnam has become a member of ASEAN and APEC until the end of 1998 and is on the way to WTO membership on one side. On the other hand, a fair competition has started in the national telecommunication market since two (2) new operators - VIETEL and SAIGON POSTEL - obtained operation licenses besides VNPT under State Regulatory body DGPT.

The official statistic data and information which will be released/disclosed to the public and utilized among operators/companies should be standardized and uniform so that the parties concerned can share the resources in common. In parallel with this, it will be recommendable to provide a standard documentation with parties concerned in order to make the any project more effectively and more smoothly.

(3) Establishment of Database

Databases regarding telecommunications services shall be established and maintained in detail. By the establishment of the database, the telecommunications services can be provided in time corresponding to the demand.

(a) Service Data

The databases regarding the services shall be properly kept and maintained. These databases shall include such as historical data and statistics data so as to easily forecast the future demand/services.

(b) Facilities Data

Telecommunications facilities data shall be maintained so as to manage the facilities. These data shall include such as inauguration date, technical specifications and quantity, and can be used for network planning such as introduction of new systems and expansion of the systems.

16.3.10 Computerization

The computerization shall be promoted from the following viewpoints:

(1) Managerial Utilization

The databases mentioned above shall be managed using computers, and administrative work shall be also computerized so as to promote effective and smooth activities.

(2) Technical Utilization

By the introduction of computers, the technical study and designing can be easily/effectively carried out in a short period.

In addition, the computers shall be connected each other through the network, so that the databases can be used in common nation-wide. By the computer networking, the work can be done speedily and overall utilization of database may be available.

16.4 Telecommunications Services and Facilities

16.4.1 Switch

The conditions of communication network will significantly change in the future. Therefore, it is important to develop communications network considering the change of the conditions. To develop efficient network, the following items shall be carried out:

(1) Repetition of Examinations

Responding to the changing of conditions of communications network, examinations shall be repeated prior to the full-scale introduction of the communications network.

(2) Types of Switching Systems

There are many types of switching systems in Vietnam, so it causes difficulty to sufficiently maintain/operate the systems. Therefore, the number of manufacturers and the models in each province shall be reduced to one (1) or two (2) kinds of equipment.

(3) Designing

The current designing of communications network is significantly influenced by various factors such as transmission capacity and investment cost. The network investment cost can be minimized by economical design of exchange nodes.

In the past, structuring of direct circuits in a network by increasing of exchange nodes and/or hierarchies can contribute to cost reduction by efficient use of the transmission. Besides, at present, direct circuits can not so contribute to the cost compared with the past.

(a) Cost

By technical innovation such as enlargement of capacity, the cost reduction of

transmission system is available, and its reduction is larger than those for subscriber/exchange equipment.

Service functions of exchange equipment can be expanded by enlargement of capacities, and the cost per circuit of exchange can be dramatically fallen.

(b) Function

By application of Internet protocol or ATM technologies, advanced functions may be equipped with terminals rather than networks composed of transmission and switch, etc. The expansion of capacity may realize reduction of cost in the future.

(c) Lifetime

By development of technologies, switching equipment may be frequently changed their model in a short time, so the lifetime of exchange system is expected shorter than that of optical transmission system. In addition, switching technologies such as Packet, ISDN, Frame Relay and ATM may create the most convenient services for the end user.

[Toward 2000]

The policy of network expansion shall be clearly established as follows:

(a) Network Configuration

The national network shall be structured by two (2) hierarchical layers,; Local Exchange and National Transit Exchange.

(b) Expansion of National Transit Switch

Demand and traffic concentrate in Hanoi and Ho Chi Minh, where National Transit Switches have been installed. With the increase of traffic volume, two (2) more units of switches are required other than Hanoi and Ho Chi Minh City by 2000.

[Toward 2010]

(a) Expansion of National Transit Switch

In accordance with the increase of traffic volume, twelve (12) national transit exchange units are required. Five (5) units shall be introduced in five (5) provinces other than Ha Noi and Ho Chi Minh City by 2010.

(b) Location of Switch

At present, National Transit Switches are accommodated in one (1) building in Ha Noi and Ho Chi Minh City, but they shall be distributed in the different locations by 2010 for the improvement of reliability. In addition, the locations for new switches shall be selected considering the geographical conditions in order to avoid simultaneous damage from various calamities.

[From 2011 to 2020]

In this stage, next generation telecommunications network shall be established by the following technologies:

(a) Ultra High Speed Network

The telecommunications services will be accelerated by the introduction of high-speed and broadband technologies. It is expected that the high-speed/broadband infrastructure over Terabit per second may go ahead of the requirements/demand of service.

(b) Non-Switching Network

The non-switching network will be developed, that is the broadcast type telecommunication network.

(c) Optical Switch

An optical switching technology may be established as the next generation standard. The optical switching systems can function in stream of optical signals, so the speed exceeds that of the electrical switch.

(d) TV Conversation Equipment

TV conversation equipment, which has a same quality as TV broadcast, can provide 50 Mbps (700 times of telephone required) of terminated interface speed.

(e) Terminal Equipment

It is expected that terminal equipment would have sophisticated functions corresponding to various kinds of services. Terminal equipment such as telephone and facsimile may be replaced by a kind of personal computer in the future. The future terminal will function higher and faster than those of personal computer, and also smaller and cheaper.

16.4.2 Transmission

(1) Role of Backbone

The role of backbone (BB) should be recognized as a Network that accommodates long distance path. Figure 16.4.2-1 shows the traffic stream picked up more than 100 E1 in Vietnam in the year 2010, and it is obviously that direct traffic stream Ha Noi (HNI) – Ho Chi Minh (HCM) will reach 616 E1 (STM-1 × 10). In case BB is excluded from network plan, 10 × STM-1 is carried by regional loop.

The 616 E1 stream should be accommodated in Backbone loop to release the burden from regional loop.

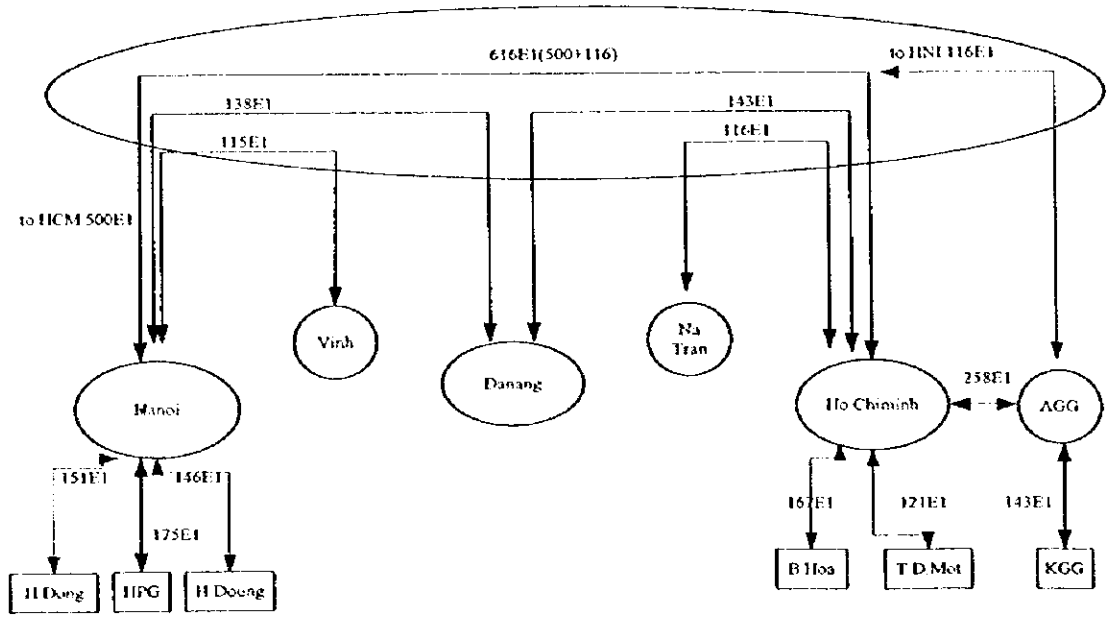


Figure 16.4.2-1 Traffic required between HNI-HCM

(2) Path Accommodation Manner with Loop Formation

The margin of transmission capacity can be squeezed by the accommodation manners. For example, the trial 2 & 3 of Network planning in Chapter 10 shows the different value of link capacity (E1) in spite of the same volume size of traffic demand. Figure 16.4.2-3 shows the result of trial 3, which is an example of economical CII Plan of Loop 6. It is recommended to compare the E1-figure with result of trial 2 (Attachment-1 in Chapter 10).

Path accommodation should be scrutinized carefully to economize the transmission capacity.

(3) Preparation for TV Broadcasting Program

The redundant capacity should be prepared for important traffic such as TV broadcasting program between HNI - HCM.

The capacity STM-1 × 2 should prepared in SDH OFC and also digital radio system.

(4) Types of Transmission Systems

Too many types of transmission systems have been utilized in Vietnam, so it causes difficulty to sufficiently maintain/operate the systems. Therefore, types of transmission systems shall be focused on several types from the technical and economical viewpoints, so that operation and maintenance work could be done effectively and the spare parts for the systems could be effectively utilized.

(5) Improvement of Reliability

By upgrading of telecommunications services, the transmission network requires to keep higher reliability.

Therefore, the transmission network shall be ensured their reliability by duplication or looping of links.

(6) Expansion of Transmission Capacity

At present, the transmission systems require frequent expansion of capacities, and many transmission systems are relocated according to these requirements.

Therefore, the capacity of transmission systems shall be decided considering the expansion of telecommunications services and provisioning period so as to avoid frequent replacement of the system.

In addition, the minimum capacities of transmission system other than specific system shall be one (1) E1 (2 Mbps), so the small capacity systems less than 2 Mbps shall be replaced by new systems with capacity of 2 Mbps or more.

(7) Frequency Reuse

By the frequent relocation of the radio transmission systems, it is suspected that radio frequencies might be irregularly utilized in Vietnam. This condition may cause interference and degradation of service quality.

Therefore, radio transmission systems shall be utilized complying with the frequency utilization plan.

[Toward 2000]

(a) Expansion of SDH Backbone Network

Current SDH system transports the traffic with 2 Fiber-BSHR, however transmission capacity will be exhausted soon. According to VTN, the time will come in year-1999. At that time, the capacity of SDH system should be expanded from 2 Fiber-BSHR to 4 Fiber-BSHR.

(b) Expansion of Inter-Province Network

The survey of the new route stipulated in the Master Plan should be conducted prior to implementation of Inter-Province Network Project.

(c) Upgrading of Intra-Provincial Network

Aged intra-provincial transmission systems such as open wire systems shall be upgraded to the systems with capacity of 2 Mbps or more.

[From 2001 to 2005]

(a) Completion of Backbone and Regional Loop

i) Partition of Backbone Loop

The length of Optical Fiber Cable on the Power Line is 1,557 km, which occupies the 44% of total length 3,557 km. So that reliability of Backbone Loop seems to be very high, however reliability of OFC route along the road No.1 is obscure at present. On the other hand, excessive length of OFC will impair the switch completion time described in ITU-T G.841.

In case reliability of OFC route along the road No.1 is rather low, Backbone Loop should be separated into two (2) loops to keep the high reliability as shown in Figure 16.4.2-2. Additionally, the Master Plan recommends that the VNPT should consult the SDH manufacturer on switch completion time prior to project implementation.

ii) Regional Loop

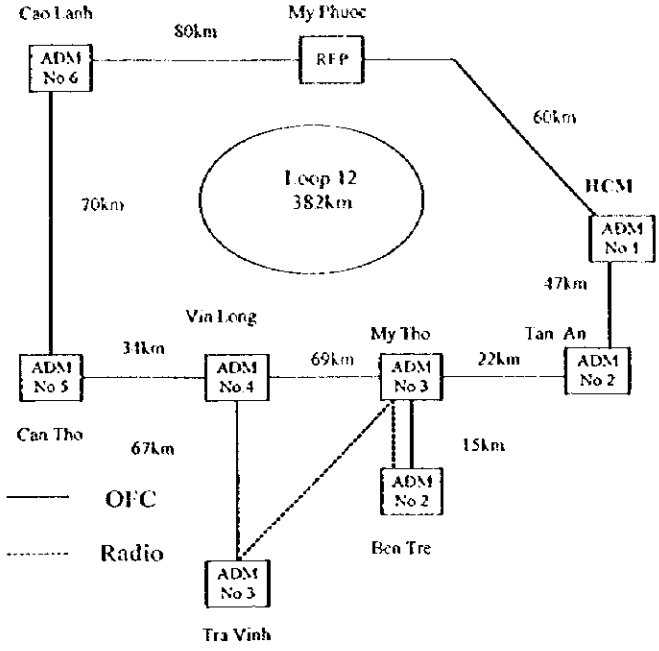
1) Loop 5

Hung Yen is the No.7 ADM in Loop 5 in the Master Plan and is adjacent HNI ADM, however geographically a big river run through between Phu Ly and Hung Yen. Additionally, there is no plan to install the bridge. In case it is difficult to install the OFC, it is recommended that Hung Yen is assigned as a spur link from HNI and Thai Bien.

2) Loop 13

In case the determination of the route for the Link HCM - Ben Tre - Tra

Vinh - Soc Trang is faced difficulty due to river crossing, the Master Plan recommends temporary solution that Both Tra Vinh and Ben Tre should be connected as the spur link mentioned below.



(b) Intra-Provincial Network

One third of intra-provincial systems shall be upgraded by larger capacity systems with the capacity of 2 Mbps or more.

[From 2006 to 2010]

(a) Intra-Provincial Network

Half of intra-provincial systems shall be upgraded to optical cable systems/microwave systems with capacity of 2 Mbps or more.

[From 2011 to 2020]

(a) Introduction of WDM

WDM (Wavelength Division Multiplexing) has been introduced mainly in USA. The system provides higher capacity per fiber, which reaches up to 40Gb/s (STM-16 ×16) at present. The advantage of WDM is to add capacity on existing fiber cable without cost of installing new optical cable. When high capacity is required on Backbone, WDM technology may be an adequate solution.

(b) Upgrading of Intra-Provincial Network

Most of intra-provincial systems shall be upgraded to optical cable systems/microwave systems with capacity of 2 Mbps.

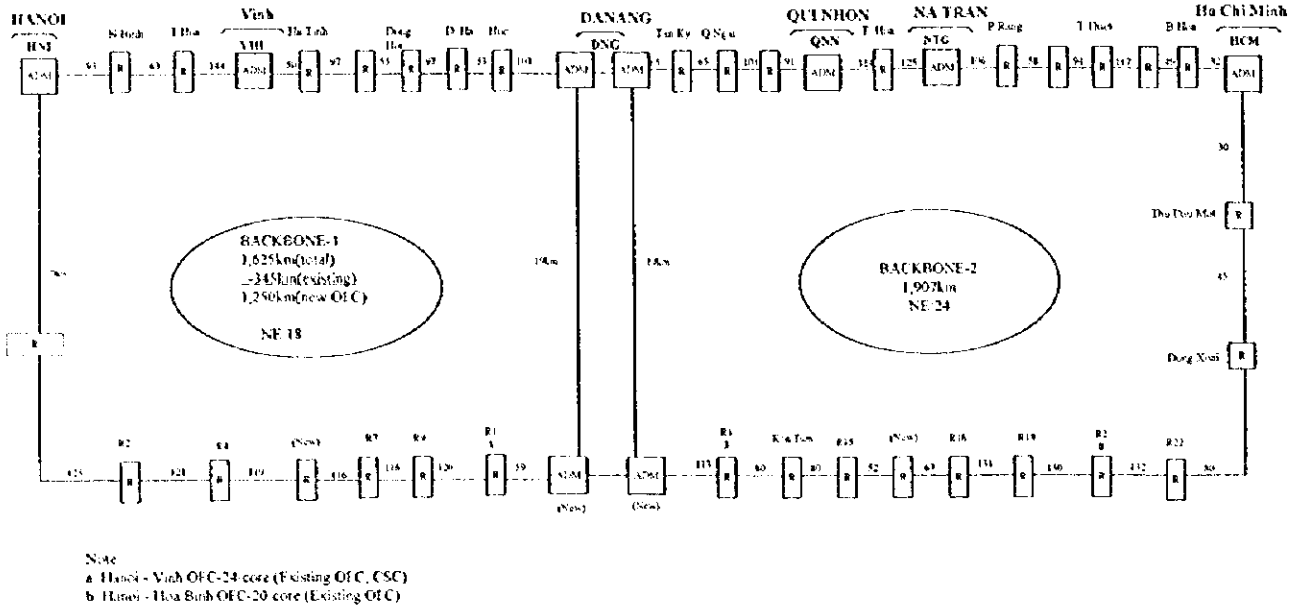


Figure 16.4.2-2 Partition of Backbone Loop

[Other Project]

(a) Submarine Cable Plan

Inter-province SDH Network is already planned with 2-layer structure. However, geographically Vietnam has the narrow shape along South China Sea, the possibility of nature disasters such as earthquake, typhoon is still issue to be considered. The Master Plan recommends the plan of submarine cable from Hai Phong to Bac Lieu with SDH STM-16 to enhance the Network reliability as shown in Figure 16.4.2-4.

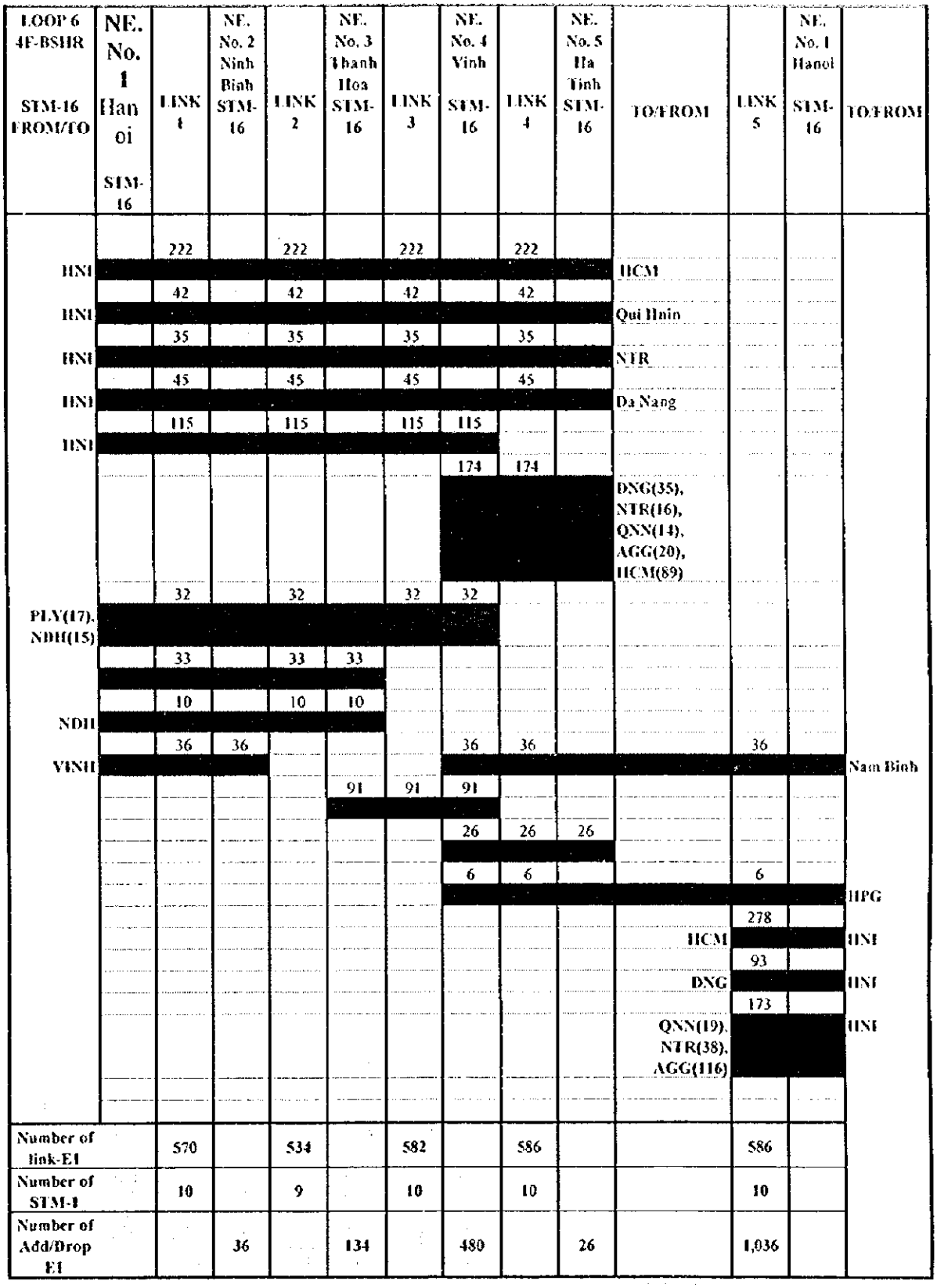


Figure 16.4.2-3 CH Plan (Loop 6 : Optimum option)

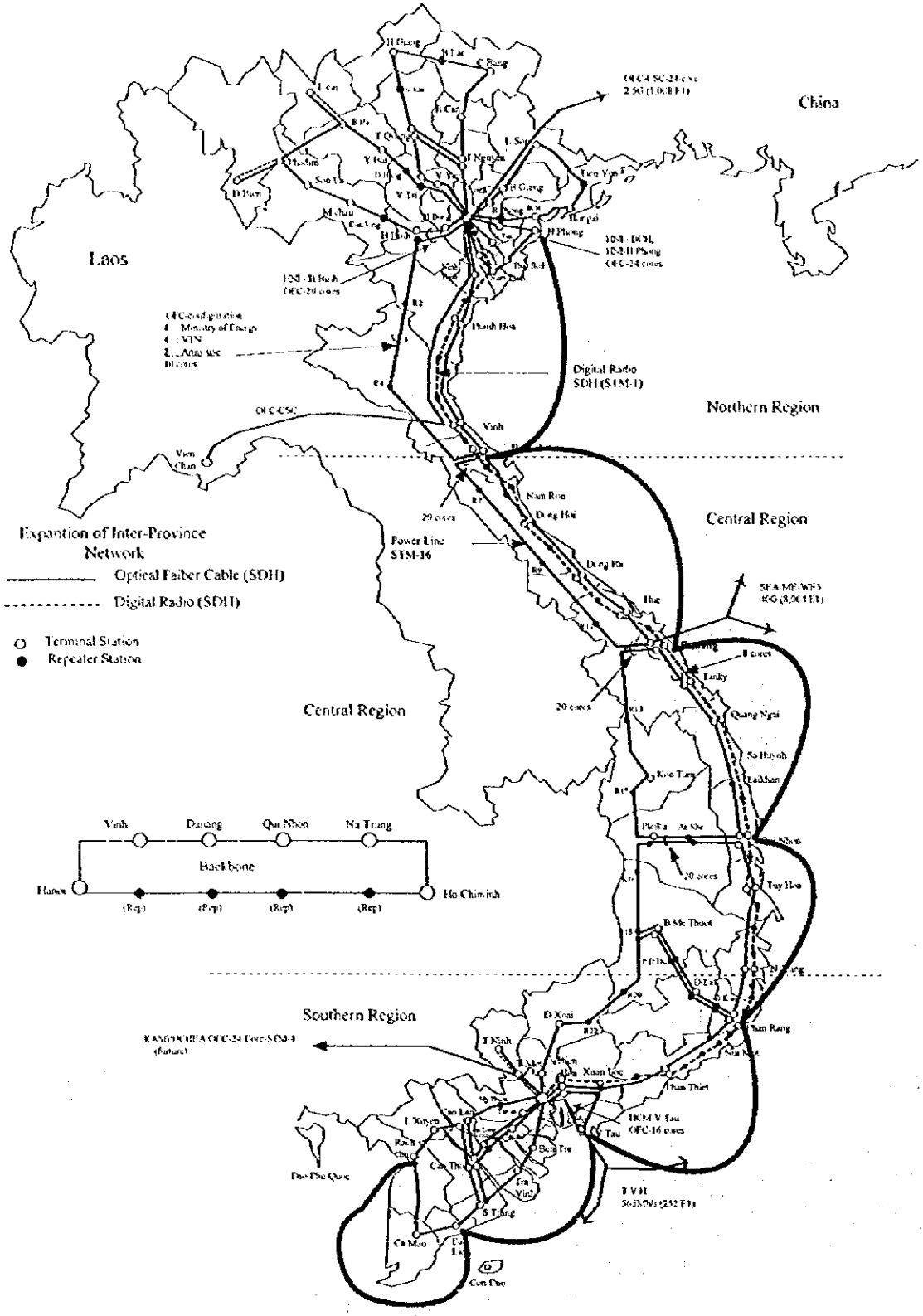


Figure 16.4.2-4 Inter-Province Network with Submarine

16.4.3 Access Network

(1) Selection of Suitable Access Systems

To promote and penetrate telecommunications services nation-wide, most suitable access network shall be selected area by area, especially in remote and rural areas. Radio subscriber systems including VSAT and GMPCS based system shall be utilized for the supplementation of the conventional cable access network.

In selection of systems to be applied, the types of systems shall be limited to several types from the technical and economical viewpoints.

(a) Access Network in Urban Areas

In urban areas, the construction of conventional metallic cable systems may be affected by some restrictions such as digging of roads.

To supplement cable access network in urban areas, radio subscriber systems such as WLL shall be utilized.

(b) Access Network to New Services

Corresponding to the introduction of new services, the most suitable access network shall be selected service by service and make broadband services possible.

(2) Frequency Assignment

In the case that the radio subscriber system is selected, the radio frequency shall be assigned considering the frequency utilization conditions including future frequency assignment plan.

[Toward 2000]

(a) Cable Access Network

Metallic access network shall be expanded nationwide according to the POTS demand and N-ISDN(BRI) service shall be introduced in order to provide digital access services on the metallic networks. For the users requiring much higher speed access on the current metallic network, introduction of xDSL technology, especially the standardized ADSL, is essential. In metropolitan areas of Ha Noi, Ho Chi Minh City and so on where the high-speed service demands are expected, DLC system as FTTB/FTTCab shall be popularized. The optical network architecture in the metropolitan area shall be designed as a reliable ring topology.

(b) Improvement and Expansion of existing Radio Subscriber Systems

At present, several types of radio subscriber systems, i.e., GMH-2000, DRMASS, IRT-2000 and T400, are utilized in Vietnam. The advantages and disadvantages of these systems shall be considered through actual utilization of the systems, and issues shall be improved and expanded reflecting features of these systems.

(c) Supplemental Utilization of WLL

To supplement the conventional cable access network, radio subscriber system, mainly utilization of cellular based system (WLL) based on CDMA, shall be utilized in urban areas, where the cable construction is difficult. To co-exist with the other radio systems such as cellular mobile systems and radio subscriber systems, the radio frequencies shall be kept in the radio frequency of 1800/1900 MHz bands.

(d) Expansion of VSAT Systems

For the urgent expansion and penetration in isolated areas, VSAT systems shall be expanded in specific areas.

[From 2001 to 2005]

(a) Cable Access Network

Popularized FTTB/FTTCab shall be extended to the provincial capital cities and industrial areas increasingly. In metropolitan areas, PON system that enables to provide FTTC (fiber much closer to the home) and FTTH shall be put into the trial for the future ATM-PON. As a complementary technology of high-speed/broadband access service performed on FTTCab or FTTC, VDSL shall be put into the trial and introduced.

(b) Introduction of New Radio Subscriber Systems

New radio subscriber systems such as cellular based WLL and fixed GMPCS shall be introduced in Vietnam during this phase.

[From 2006 to 2010]

(a) Cable Access Network

In this phase, all the type of optical access networks (FTTB, FTTCab, FTTC and FTTH) shall be deployed nationwide covering local small towns. Typically, for the big customers, who require large number of telephone lines and/or high

speed data communications systems, optical cable system (FTTH) shall be utilized.The xDSL metallic lines shall be replaced strategically with the optical fiber lines.

(b) Penetration of Telecommunications Services in All Communes

The telecommunications services shall cover all the communes by using metallic cable systems, radio subscriber systems and VSAT systems. In this stage, the radio subscriber system (TDMA system) can play a major role from the economical and technical viewpoints.

(c) Introduction of New Hub Station for VSAT Systems

At present, the hub station for the VSAT systems is located in Ho Chi Minh city, but it is better to introduce a new hub station according to the increasing of VSAT stations. A hub station shall be newly introduced in Ha Noi, which is the capital and center of administrative work, for the VSAT systems for easy and effective operation. This hub station shall be utilized for the VSAT systems for government emergency communications.

[Toward 2020]

(a) Cable Access Network

Toward 2020, FTTC and FTTH shall be introduced aggressively for the constructions of network expansion and maintenance. Other than the demand-based development plans, the following up-grade plans are recommended.

- Extending the fibers of in-service FTTCab to FTTC/FTTH
- Replacement of the deteriorated metallic networks with the OAN

(b) Provision of High Speed Data Communications Services

High-speed data communications services shall be provided nation-wide on the demand-basis.

(c) Provision of Sufficient Telephone Lines in Remote/Rural Areas

In the remote and rural areas, the telephone services shall be sufficiently provided in quality and in quantity on the demand-basis.

16.4.4 Mobile Communications

(1) Selection of Suitable Systems

There are various types of mobile communications systems, so mobile communications systems shall be selected in harmony with the demand, required functions and future service trend. Therefore, the systems shall be limited to several types for the time being as follows:

(a) Major cellular mobile systems
GSM and CDMA (D-AMPS shall be applied only in Ho Chi Minh area.)

(b) Supplemental cellular mobile systems
One of PCS/PHS/PCN and GMPCS

(2) Expansion of Service Area

Mobile communications shall be expanded nation-wide by the major cellular mobile systems (GSM and CDMA). For supplemental utilization, PCS/PHS/PCN and GMPCS shall be utilized in urban areas and isolated areas, respectively.

(3) Frequency Reuse and Assignment

To effectively utilize limited radio frequencies, the frequency reuse pattern shall be applied and the frequency assignment shall be carried out based on the consideration of future plans (trend of demand and new services).

[Toward 2000]

(a) Expansion of GSM Service

The cellular mobile services shall be expanded nation-wide by using the existing GSM systems. There are several service providers and several cellular mobile systems in Vietnam. To promote effective utilization of mobile services, roaming service shall be provided as soon as possible.

The required roaming functions are that between service providers and international roaming. In addition, dual mode handset shall be provided for internal communications service between GSM/CDMA/D-AMPS.

(b) Removal of Analog AMPS

The existing analog AMPS shall be replaced by the other digital cellular mobile systems such as CDMA, GSM or D-AMPS as soon as possible. However, D-AMPS shall be tentatively utilized prior to the expansion of CDMA systems, because both systems utilize the same frequency bands, so according to the

expansion of CDMA services the frequency band shall be expanded.

(c) Introduction of CDMA

CDMA systems may play a major role in cellular mobile services for the time being and may be utilized co-existing as a conventional mobile telephone system with IMT-2000, which is suitable to wide band mobile telephone system. Therefore, CDMA systems shall be provided in Vietnam by the new service providers, i.e., VIETEL and Saigon Postel. Prior to the full-scale introduction of CDMA systems, the trial shall be carried out, and the results of trial shall be reflected to the full-scale introduction of the systems.

(d) Introduction of GMPCS

The mobile communications services can not be expanded immediately nation-wide, so the GMPCS shall be utilized in isolated areas. The utilization charge of the GMPCS is more expensive than those of the conventional cellular mobile services, so the utilization may be limited as supplemental utilization of the terrestrial systems such as in specific areas and by the specific users.

[From 2001 to 2005]

(a) Introduction of PCS/PHS/PCN

To supplement cellular mobile services, PCS, PHS or PCN shall be partially introduced in urban areas such as Ha Noi and Ho Chi Minh. In harmony with the cellular mobile services and radio subscriber systems using PCS/PHS/PCN, the utilization of the system shall be carried out in the different way from the above systems, i.e., the utilization shall be limited in the specific areas, where the construction of the conventional cable systems are difficult corresponding to the urgent large demand. Of course, prior to the full-scale introduction of the systems, the trial shall be carried out, and the results of trial shall be reflected to the full-scale introduction of the systems.

[From 2006 to 2010]

(a) Trial of IMT-2000

The trial of IMT-2000 shall be carried out prior to the full-scale introduction of the systems, because the IMT-2000 is a new system and its specifications have not yet decided. By the demand of wide band mobile communications service, CDMA system may play a major role, so IMT-2000 may co-exist with that system for the time being.

[Toward 2020]

(a) Expansion of IMT-2000

According to the penetration and stabilization of IMT-2000 systems in the world, IMT-2000 shall be introduced in full-scale responding to the demand of wide band communications services in Vietnam. In addition the existing cellular mobile systems (the second generation systems) shall be gradually replaced by the IMT-2000 systems.

(b) Convergence between Cellular and Paging Systems

The existing cellular mobile systems including cordless based system include the paging function by short message service, and cellular mobile systems can cover the paging function. By the penetration of cellular mobile systems in the world the cost and charge of cellular system may be reduced to the same level as paging system, therefore, the convergence between two (2) systems can be expected in the future.

16.4.5 Non-voice Communications

(1) Expansion of Service

The service menu shall be expanded corresponding to the demand of non-voice communications. New services require high speed data transmission network, so non-voice communications services shall be expanded in transmission speed so as to correspond to new services.

[Toward 2000]

(a) Expansion of existing Service

At present, non-voice communications services are limited in specific areas, so non-voice communications shall be expanded nation-wide corresponding to the demand. Especially, the access points for Internet and Packet services are located only in big cities, so the service charge is expensive for users who live far from access points. By the expansion of access points the growth of users can be expected, and it may be possible to reduce the utilization fee, finally the services can be expanded by the interaction.

(b) Introduction of N-ISDN

N-ISDN services shall be provided in the major cities as soon as possible.

By the introduction of the N-ISDN, the data communications services can be expected to grow rapidly and new demand may be generated for higher data communications services.

The nation-wide expansion of N-ISDN services shall be carried out following the introduction in the major cities and B-ISDN shall be also introduced in major cities.

(c) Trial of Frame Relay and ATM

Prior to the full-scale introduction of Frame Relay and system for ATM bearer service, these systems shall be introduced as trial in specific areas.

[From 2001 to 2005]

(a) Introduction of N-ISDN (PRI)

The N-ISDN services shall be expanded to Primary Rate Interface (PRI) services.

(b) Introduction of Frame Relay and ATM Bearer Services

By the demand for high-speed data communications services, Frame Relay and ATM bearer services shall be provided in Vietnam. By the introduction of these services, various applications may be available, so the applications using these services shall be oriented according to the users.

[From 2006 to 2010]

(a) Introduction of B-ISDN

According to the requirements for high speed switched services, B-ISDN shall be introduced in the major cities.

(b) Introduction of Switched ATM Service

In parallel with the introduction of B-ISDN, switched ATM service shall be introduced in the major cities.

[Toward 2020]

(a) Expansion of High Speed Data Communications Services

The high-speed communications services such as B-ISDN, Frame Relay and ATM will be introduced in the major cities before the year 2010, but in this stage these services shall be expanded nation-wide and their applications shall also be provided.

By the upgrading of transmission speed, the convergence between telecommunications and broadcasting may be easily carried out, and contents of services will be also expanded.

16.4.6 International Telecommunications

Advanced telecommunications facilities should be designed and constructed in accordance with a long term strategic scenario taking account of future trend including new technologies today for providing telecommunications services flexibly and reliability.

Toward the year 2020 the information infrastructures shall be built in Vietnam to cope with the new demand of multimedia (voice, data, image, text and video) traffic in the expectation of expansion of the info-communications market.

To cope with this trend toward the realization of the info-communication society, the network infrastructure shall be changed in establishment of "Total Digital Networks " with high performance computer and multimedia network.

In this connection the following indicators to develop the network infrastructure in the international telecommunications services is recommended to make good base for info-communication market during the early of 21st century.

(1) Promotion of fixed network
   (a) Establishment of fiber-optic access networks (Fiber To The Zone, Fiber To The Office and Fiber To The Home)
   (b) Supplementary access network infrastructure for optical fiber network (Wireless local loop systems, xDSL)
   (c) Expansion of Frame Relay , ATM and SDH networks
   (d) Multimedia satellite communications systems

(2) Promotion of mobile network
   (a) Realization and deployment of next-generation mobile phone systems that meet world standards (IMT-2000/W-CDMA)
   (b) Development and deployment of multimedia mobile satellite communications systems that can be used around the world (LEO Systems)
   (c) Development and deployment of personal mobile satellite communications utilizing stationary satellites
   (d) Development and deployment of multimedia mobile communications systems that can be seamlessly interconnected to fiber-optic networks (multimedia

mobile access communications systems: MMAC)

(3) Promotion of High-speed Internet Backbone
ADSL Internet, CATV Internet, Satellite Internet

[Toward 2000]

(a) Completion of CSC Optical Fiber Cable over the Land
The construction project on the CSC optical fiber cable over the land to link up six countries in the Greater Mekong Subregions shall be completed.

(b) International Frame Relay and ATM
The facilities for the international Frame Relay and the international ATM services shall be introduced.

[From 2001 to 2005]

(a) Completion of GMDSS
The Global Maritime Distress Safety System (GMDSS) shall be completed for handling distress messages from international shipping and INMARSAT LES (Land Earth Stations) for the provision of global mobile satellite communications services at sea, in the air and on land.

(b) Introduction of Gateway ATM Switch
The second-generation large scale ATM-based digital switching system shall be developed and deployed to cope with increasing volume of multimedia traffic and with various customers needs such as B-ISDN (Broadband Integrated Service Digital Network) supplementary services, IN (Intelligent Network) services and convergence of the PSTN and Data networks.

(c) Launch of Vietnam's first Telecommunications Satellite
Vietnam's first Telecommunications Satellite (VINASAT) shall be launched and be into services. The Satellite Network shall be developed and deployed for the use of the Ministries of Defense and Public Security, Vietnam Television and other public utilities to use the satellite as a multi-purpose multimedia satellite.

[From 2006 to 2010]

(a) Introduction of TMN
The integrated network management system toward the realization of the TMN

concepts shall be developed and deployed, and also establish disaster and crisis management system of info-communications network infrastructure

[Toward 2020]

(a) Establishment of Total Digital Network

"Total Digital Network" along with the digitization of broadcasting by seamlessly interconnecting to cable/radio and mobile/fixed networks shall be established.

16.4.7 Orientation on Private Network Development

(1) Business Network Environment in the world

Many corporation are now facing the rapid change of business environment, such as growing global market, flexible alliance between corporations and the necessity for more efficient corporation management. At the same time, corporations have been experiencing rapid change of network environment, such as world-widely spreading Internet, growing usage of PC LAN and upcoming multimedia applications.

Under these dramatic changes in corporate activities, business network is expected to accomplish the following points.

- Speed up in information distribution
- Efficient information sharing
- Flexible alliance with other corporations
- Reduction of network cost

VPN, IP and Outsourcing of maintenance & operation work are the three keywords for meeting these demand, especially the demand for the reduction of network cost.

(2) The trend from PN (Private Network) to VPN (Virtual Private Network)

Traditional PN is connecting each site to site using leased circuits (mesh type connection). As a result, network cost become very expensive. On the other hand, VPN is connecting each site by site using shared network and virtual private connection. As a result, network cost can be reduced because many users can share the same network.

Furthermore, users can outsource the network maintenance and operating work by using VPN which is managed and maintained by telecommunications careers. Network maintenance and operating work is usually a big problem for users.

(3) Trend of IP networking

The Internet, open networking using Internet Protocol (IP), has been spreading

explosively in the world.

Under the competition of many venders, IP related equipment is getting better performance with less expensive price. IP-VPN, which is matching the VPN trend and IP networking trend, is expected to be the key issue for the future business network.

(4) Market demand for IP-VPN service in the world

Market size of IP-VPN is expected to grow explosively in the world under the trend from PN to VPN and the trend of IP networking.

(5) Advantage of VPN service

VPN service provides low-cost and secure connection service which makes users feel as if they are connected by leased circuits from anywhere in the world.

This service provides measures to share resources such as circuits, equipment and technology, and human resource for maintenance and operation.

This service provides users the following advantage:

- Reduction of network cost
- High performance by the direct connection to IP backbone.
- Outsourcing of maintenance and operating work

16.4.8 National Information Infrastructure

(1) General

In order for the Government to address itself to Vietnam's National Information Infrastructure (NII), it is indispensable to organize a task force, in which the conception and available program shall be planned and scheduled. The detailed plans shall be carried out in cooperation with the relevant sectors.

(a) Telecommunication Network Development

Phased universal service program and total network digitization to the customers shall be established.

(b) Information Service Development

Telemedicine and Remote Education services shall be put in trial, especially in metropolitan areas and the newly planned commercial/industrial areas.

(c) Human Resource Development

To develop the qualified personnel in the fields of technology, management and regulation, and to enhance the national information literacy are recommended.