

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DEPARTMENT GENERAL OF POSTS AND TELECOMMUNICATIONS (DGPT)
THE SOCIALIST REPUBLIC OF VIETNAM

**THE STUDY
ON
TELECOMMUNICATIONS DEVELOPMENT
IN
THE SOCIALIST REPUBLIC OF VIETNAM**

**FINAL REPORT
SUMMARY**

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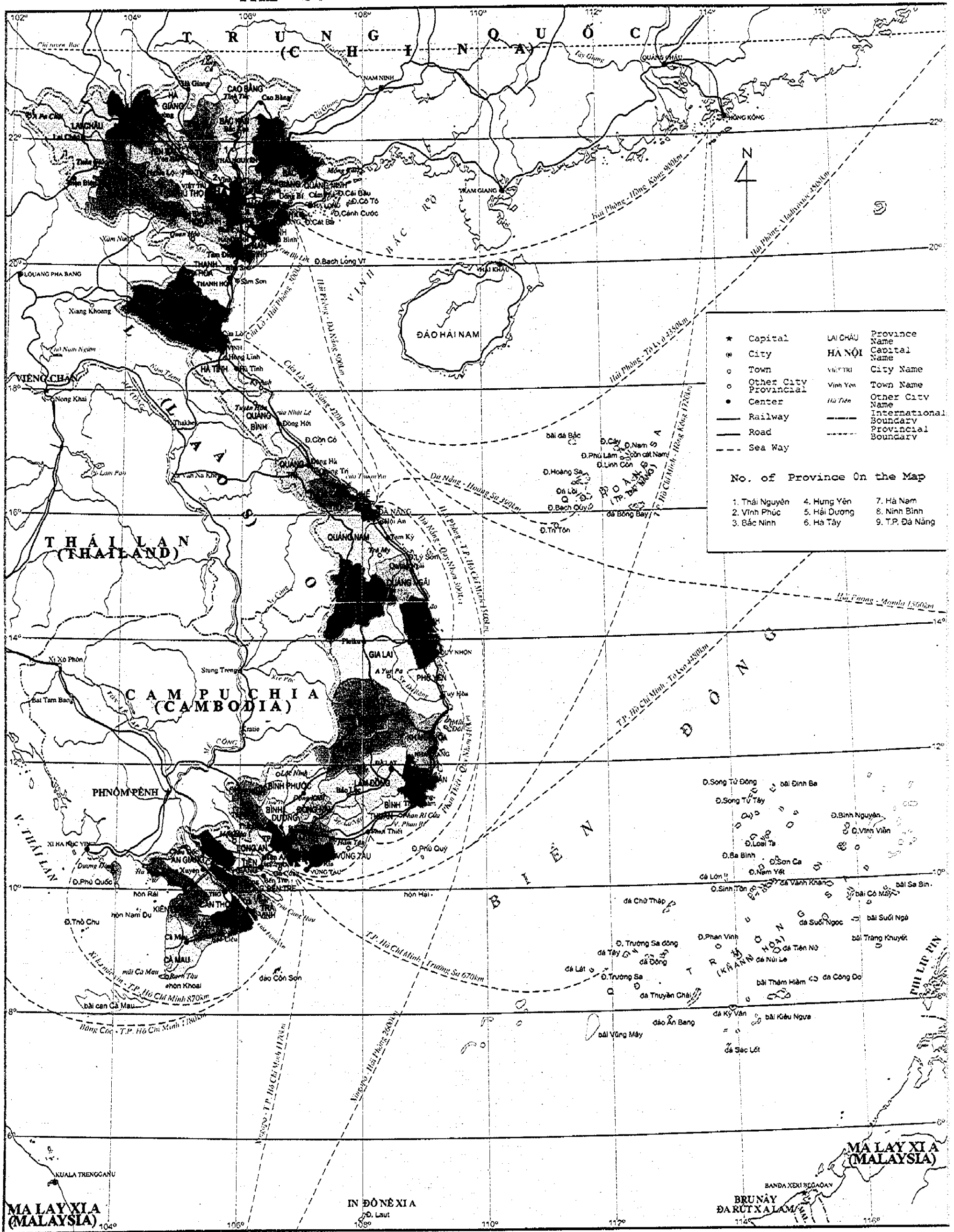
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THE SOCIALIST REPUBLIC OF VIETNAM



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○	Town	VIỆT TRÍ	City Name
◦	Other City Provincial	Vinh Yen	Town Name
●	Center	Hà Tiên	Other City Name
—	Railway	—	International Boundary
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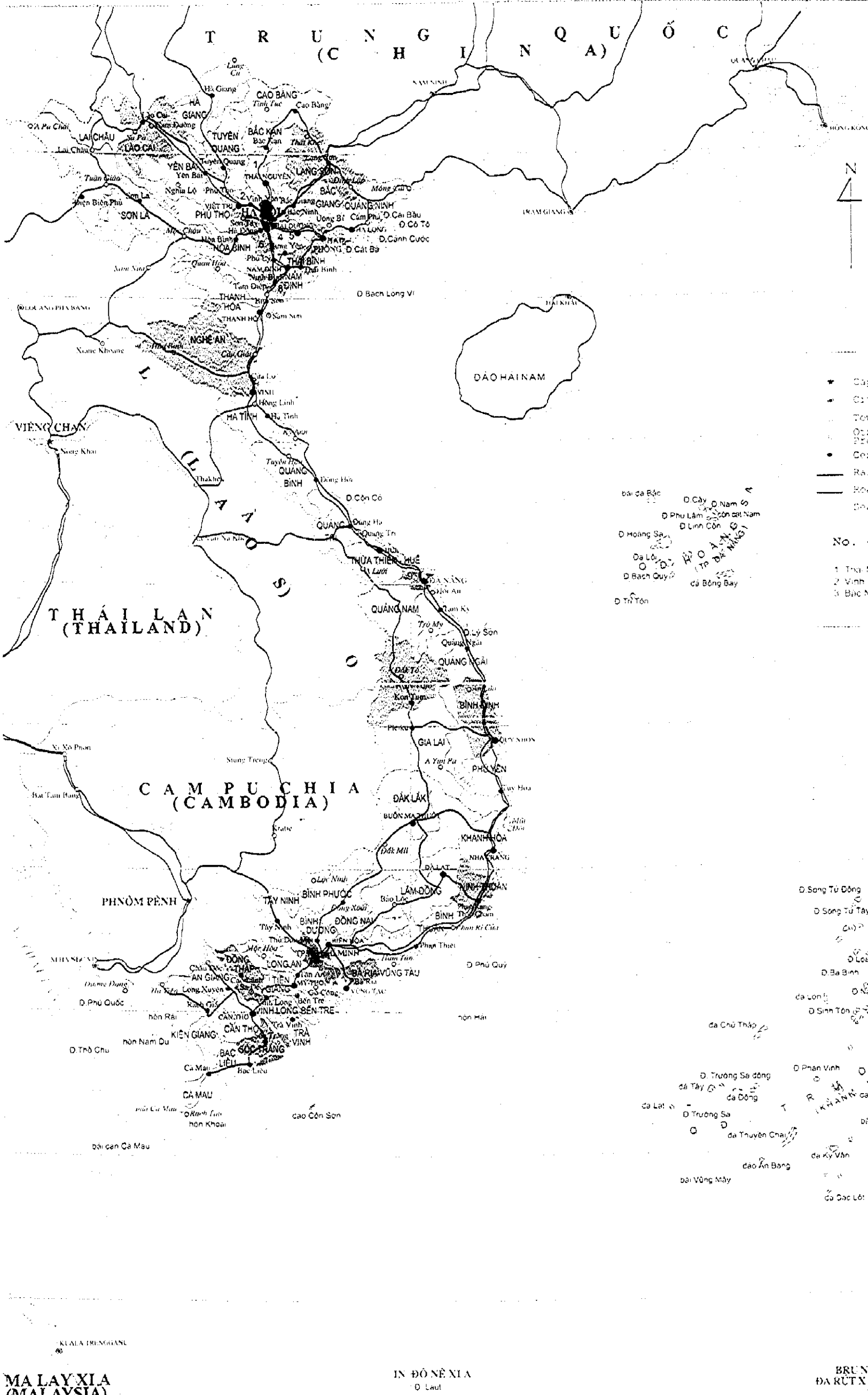
No. of Province On the Map

1. Thái Nguyên	4. Hưng Yên	7. Hà Nam
2. Vĩnh Phúc	5. Hải Dương	8. Ninh Bình
3. Bắc Ninh	6. Hà Tây	9. TP. Đà Nẵng

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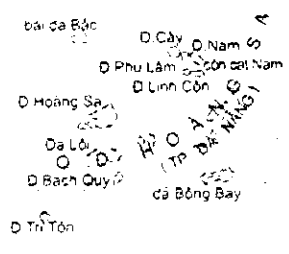
THE SOCIALIST REPUBLIC OF VIETNAM



Capital	LAO CAI	PROVINCE NAME
City	HANOI	CAPITAL NAME
Town	VIET XAI	CITY NAME
Other City Provincial	YEN XAI	TOWN NAME
Center	HA LU	OTHER CITY NAME
Railway		INTERNATIONAL BOUNDARY
Road		PROVINCIAL BOUNDARY
Sea Way		

No. of Province On the Map

1. Thai Nguyen	4. Hung Yen	7. Hu Nam
2. Vinh Phuc	5. Hai Duong	8. Ninh Binh
3. Bac Ninh	6. Ha Tay	9. TP. Da Nang

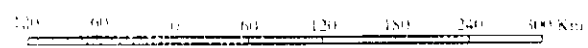


MALAY XIA (MALAYSIA)

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PREFACE

In response to the request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct a master plan study on Telecommunications Development in the Socialist Republic of Vietnam and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Shiro Tamura of NTT International Corporation to Vietnam, three times between July 1998 and June 1999. In addition, JICA set up an advisory committee headed by Mr. Takayuki Hatazoe, Deputy Director, International Cooperation Division, International Affairs Department, Ministry of Posts and Telecommunications (MPT) between July 1998 and August 1999, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Vietnam and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Vietnam for their close cooperation extended to the Team.

August, 1999



Kimio Fujita
President

Japan International Cooperation Agency

August 1999

Mr. Kimio Fujita
President
Japan International Cooperation Agency

Letter of Transmittal

It is our pleasure to submit to you the study report on Telecommunications Development in the Socialist Republic of Vietnam.

This report was conducted by NTT International Corporation, under a contract to JICA, during the period of July 1998 to August 1999. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Vietnam, and formulate the most appropriate master plan up to the year 2010, covering the whole territory of Vietnam, including state management for telecommunications, network plans, operation and maintenance plan, project evaluation, and recommendations.

We wish to take this opportunity to express our deep gratitude to the officials concerned of the Japan International Cooperation Agency and other authorities concerned of the Government of Japan. We would like to express our gratitude to the officials concerned of the DGPT, VNPT and other authorities concerned of the Government of Vietnam, the JICA Vietnam Office, and the Embassy of Japan in Vietnam for their cooperation and assistance extended to the study team in connection with the execution of their duties.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



Shiro Tamura

Team Leader

Study on Telecommunications
Development in the Socialist
Republic of Vietnam

Composition of the Reports

The Final Report on Telecommunications Development Plan in the Socialist Republic of Vietnam is classified into two (2) volumes: Volume I "Telecommunications Network Development" and Volume II "Telecommunications Management".

Volume I "Telecommunications Network Development" describes main parts on the telecommunications network development, excluding a study on the state management to telecommunications out of the whole items of study that are specified in the Instruction and Guidelines as "Telecommunications Development Plan".

For the purpose of formulating the Final Report, those common and overlapping items in the Study such as current situations of Vietnam, outlook of telecommunications, setting up of target levels on the telecommunications network, selection of the priority projects, project evaluation of Master Plan, etc. are compiled in Volume I.

Therefore, Volume I involves the Telecommunications Network Development Plan and recommendations up to 2010 on the specific aspects of "Telecommunications Network Development" such as the present situations on the facilities, demand forecasting, network planning, operation and maintenance plan, and human resource development plan as well as the common items mentioned above.

In the mean time, Volume II "Telecommunications Management" covers the items and contents such as a necessary state policy in transition for a competitive market of telecommunication from monopoly markets, telecommunications industry development plan and the like, which should be handled to be independent from items of Volume I of Telecommunications Development Plan.

As a result, the Final Report of Volume II "Telecommunications Management" includes descriptions on law and regulations in Vietnam, policy of state management, telecommunications industry development, organization and management plan, spectrum management and numbering management and the related recommendations to each chapter together with targets up to the year 2010.

In this connection, each chapter of Volume II stress on the policy and management aspects in describing contents of the reports that are different from Volume I "Telecommunications Network Development, thus making it very useful for describing the each chapter much more independently and of deciphering the report more easily.

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SUMMARY OF THE STUDY ON TELECOMMUNICATIONS DEVELOPMENT IN THE SOCIALIST REPUBLIC OF VIETNAM

I. Background and Objective of the Study

Since the introduction of the "Doi Moi" policy in 1986, Vietnam has made an effort to remarkably increase the growth in social and economic activities with a higher development rate of Gross Domestic Product (GDP) and Gross National Product (GNP). For this purpose, the Vietnam government has been putting much more emphasis in the national development policy on the construction of an adequate, efficient and reliable infrastructure.

Under these circumstances, the Vietnam Government has set up a development target to aim at increasing the density to 4 telephone lines per 100 inhabitants by the year 2000. To achieve the target, it is very important to take into account the following problems:

- (1) Insufficient penetration to rural areas of telephone services
- (2) Some difficulty in getting access to the remote areas,
- (3) Difficulty of securing necessary funds for expansion programs
- (4) Recent Asian economic crisis
- (5) Insufficient human resource development.

In order to cope with the above-mentioned problems, a long-term telecommunications development plan (Master Plan) based on a viable strategy is essential. This Plan covers telecommunications development up to the year 2010 and will proceed in line with the General Development Plan for socio-economic development of the country and the latest directions in policy, management and telecommunications circumstances. This telecommunications master plan also involves a planning framework of reliable telecommunications network structuring, technology development, telecommunications industry development, and human resource development suitable for the 21st Century.

The objectives of the Study are:

- (1) to formulate a master plan for the development of telecommunications in Vietnam up to the year 2010
- (2) to pursue the technology transfer (including methodology, know-how for formulating the master plan) to the counterparts of Vietnam in the course of the Study.

2. Basic Principle of the Study

In views of implementing the Study, by taking into accounts the contents and the outstanding remarks mentioned in a background of the Study request made to Japan's Government by Vietnamese Government, request contents, the [Pre-Study Report on Telecommunications Development in the Socialist Republic of Vietnam] together with Scope of Work and Instruction by Japan International Cooperation Agency , the Study shall be conducted in accordance with principles described in the followings.

2.1 Basic Principle of the Study Administration and Management

The Study shall be conducted based upon the following principle of the Study Administration and Management;

- (1) To implement the Study effectively. For that purpose, for instance a network design software tool is used.
- (2) To receive a powerful support from the associated corporations
- (3) To make maximum use of similar study work experience and know-how.

2.2 Study Principle on Technical Aspects

The following basic principles on technical aspects are designated for the Study implementation.

- (1) To make coordination with related Vietnamese National Development Plans
- (2) To set up a development target and to form a telecommunications network development plan
- (3) To make a state management for telecommunications
- (4) To formulate an operation and maintenance plan and to make a human resource development plan
- (5) To determine priority projects and propose related recommendations to Vietnam

3. Implementation Principle of the Study

The implementation period of the Study Work was from the beginning of July 1998 until the end of July 1999 and the whole study work consists of seven (7) stages as shown in the following figure.

In accordance with the work schedule mentioned above, the JICA Study Team has completed the following 3-time works in Vietnam together with Vietnamese Counterparts and 4-time works in Japan, including Preliminary Work.

The counterpart training in Japan was carried out each time in Japan in 1998 and 1999.

The seminar on Master Plan was held on 23rd June 1999 in Vietnam.

Study Stages	July 1998-December 1998			January 1999- August 1999	
(1) Preliminary work in Japan	□				
(2) First Work in Vietnam	■				
(3) First Work in Japan	□				
(4) Second Work in Vietnam	■				
(5) Second Work in Japan				□	
(6) Third Work in Vietnam				■	
(7) Third Work in Japan				□	
Submission of Reports	IC/R	P/R	IT/R	D/F	F/R
Reports	IC/R : Inception Report IT/R : Interim Report F/R : Final Report		P/R: Progress Report D/F: Draft Final Report		

Work Schedule of the Study

4. Outline of Master Plan of Telecommunications Development

4.1 Establishment of Targets

This Telecommunications Development Plan (Master Plan) aims at forming a telecommunications development plan in Vietnam up to 2010. In addition, a development scenario toward 2020 is also recommended in this Report.

(1) Basic Principle of Master Plan

The Vietnamese Government emphasizes the structuring of a more effective and reliable telecommunications infrastructure in accordance with the national development policy in Vietnam. Therefore, the telecommunications development plan as a basis to provide a nationwide service throughout the country in line with the nation economic development policy in Vietnam.

This master plan covers long-term development plan for the telecommunications networks up to 2010 in whole Vietnam. The planning period up to 2010 is divided into several milestones as target year i.e. a 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).

(2) Expansion Target of Telephone and Cellular Mobile Subscribers

Department General of Posts and Telecommunications (DGPT) intends to achieve that

the telephone and cellular mobile services are to be made available on demand nationwide. In consequence, all the planning components consisting of supply plan, network plan, facility plan, manpower plan, etc. are prepared based on the above condition. Telephone and Cellular Mobile density are targeted at more than 10 lines per 100 inhabitants up to 2010, a target level of Master Plan period.

(3) Target Level of the Development in Rural and Remote Areas

To reduce a gap of telephone services between urban and rural/remote area, the introduction of telephone services in rural/remote areas shall be carried out by the year 2010. It is estimated that the telephone services have not yet provided in about 3,000 communes at the end of 1997. To provide telephone services in these communes, the applications systems for access networks is established the demand forecasting and geographical conditions.

4.2 Demand Forecasting

Demand forecasting for telecommunications services in Vietnam is carried out for telephone services, cellular mobile telephone services and Internet services in accordance with the requests by Vietnam. For the forecasting purpose, the national development targets have been reset as follows:

- Population: 76,900,000(1998) --102,707,000(2020)
- Economic Growth Rate: 4% (1998-2000)- 7%~ 10%(2001-2020)

(1) Number of Telephone Subscriber and Teledensity

A forecasting model is created to calculate demand in accordance with the available data (teledensity and economic growth rate) obtained from 125 countries of ITU. The model is revised to be used for an appropriate demand forecasting based upon the above-mentioned data on growth in population and the economic growth rate of which the result are given in the followings:

Number of Fixed Telephone(in thousand) and Teledensity (per 100 inhabitants)

Year	1997	2000	2005	2010	2020
No. of Telephone	1,408	2,398	4,529	7,660	18,094
Teledensity	1.86	3.01	5.25	8.29	17.62

(2) Cellular Mobile Telephone Users

The mother population of potential Cellular Mobile Telephone Service(CMTS) users has been assumed to be the business users of Telephone Subscriber.

Cellular Mobile Telephone (CMTS) Users

Year	1999	2000	2005	2010	2020
CMTS Users	295,200	341,000	1,109,400	2,785,600	4,717,100

(3) Internet Users

The forecast of the Internet users is still subject to uncertainty due to the immaturity of the Internet services market in Vietnam. Three qualitative cases, i.e., Pessimistic, Moderate and Optimistic are considered. The Optimistic case is shown as follows:

Internet Users

Year	1999	2000	2005	2010	2020
Internet Users	42,100	59,600	311,600	1,077,600	2,128,800

4.3 Targets for Telecommunication Development

The most important factor in performing the telecommunications development Plan in Vietnam consist in (1) Service provision method; that is to say, what kinds of services should be provided for how much, (2) Service quality; quality or performance in providing the services and (3) Business management; efficient performance of the business or project.

(1) Service Provision

At present, the most important task in Vietnam is how to expand the telephone services which is not able to comply with the demand adequately . The pending problems can be summarized as follows:

- (a) Shortage of the subscriber network facilities for fulfill the demand increase
- (b) Insufficient capacity of networks
- (c) Elimination of villages that have no telephone services

(2) Service Quality

The important factor to provide the telephone services involves a telephone service quality. To improve the service quality , the following measures should be taken:

- (a) Improvement of operation and maintenance
- (b) It is necessary to establish three factors of service quality: Successful call ratio, failure rate and average time of fault clearance and these three factors should be standardized for the succeeding improvement.

In order to resolve the above-mentioned pending issued (a) and (b), an integrated operation and maintenance center should be unified as much as possible for reorganizing the national , international and cellular mobile operation and maintenance. At the same time, decentralization between functions of Headquarters and provincial organization should be promoted and the

standardization of service quality of three factors must be in prevail throughout the country.

(3) Business Management

The telecommunications service should be provided nationwide toward the maximum satisfaction of public benefits at a lower cost and with a higher service quality.

For this purpose, adequate staff allocation and productivity per staff should be always enhanced so that the business management can be improved as much as possible through the implementation of a long-term human resource development and efficient organization and institution plans.

4.4 Implementation Plan of Telecommunications Development by Phase

(1) Implementation Plan of Development for Telephone and Cellular Mobile Facilities

This master plan covers long-term development plan for the telecommunications networks up to 2010 in whole Vietnam. The planning period up to 2010 is divided into several milestones as target year i.e. a 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).

Development Plan of Telephone and Cellular Mobile

	Existing 1998	Phase A 2000	Phase B 2005	Phase C 2010
Telephone Density per 100 people	2.33	3.01	5.25	8.29
Total main lines (X1000)	1,792	2,398	4,529	7,660
Cellular Mobile Density per100 people	0.27	0.44	1.12	1.74
Total Mobile Terminal (X1000)	208	347	968	1,607

(2) Development Plan of Telephone Development in Regional Areas

To reduce a gap of telephone services between urban and rural/remote area, the introduction of telephone services in rural/remote areas shall be carried out by the year 2010. It is estimated that the telephone services have not yet provided in about 3,000 communes at the end of 1997.

Implementation Plan for Villages to be Served

	Phase A 2000	Phase B 2005	Phase C 2010	Total
Metallic Cable	200	500	500	1,200
VSAT	50	125	125	300
Radio Subs System	300	600	600	1,500
Total	550	1,225	1,225	3,000

(3) Summary of Cost Estimation

Based on the facilities plan and cost estimations on each system, the investment costs

are summarized as shown in following table.

Item	Phase A 1999 - 2000	Phase B 2001 - 2005	Phase C 2006 - 2010	Total
Fixed Telephone System (POTS, Radio Subscriber Systems, VSAT)	546	1,705	2,348	4,599
Mobile Communications	124	485	475	1,084
Cellular Mobile System	(122)	(484)	(474)	(1,080)
Paging System	(2)	(1)	(1)	(4)
Total	670	2,190	2,823	5,683

5. Project Evaluation of Master Plan

(1) Financial Evaluation

The Master Plan aimed at completing the target up to 2010 is analyzed financially and the results show that the project profitability and the international portion out of the total revenue are shown in the following table.

FIRR	38.0 %
NPV (thou. USD)	3,229,205
Int'l revenue share	53.7 %

NPV is discounted by 10%.

The result of financial analysis suggests this development plan up to 2010 is viable and profitable, as shown in the above Table.

(2) Economic Evaluation

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.

(3) The expansion and improvement of telecommunications networks will contribute a great deal not only to economic benefit but also to social benefit, the improvement of the national well-being.

Such indirect benefits conceivable for nation are:

- Greater ease in emergency access to medical institutions and etc.
- To enhance business activities
- To increase employment opportunities, improvement in security, etc.

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

6. Priority Project

(1) Medium Term Project

(a) Selection of Listing Project

The priority projects are selected out of the listing projects to be implemented during a period up to 2005 (Phase B). Listing projects are compiled from ① Projects related to regional telephone expansion ② BCC projects (Business Cooperation Contract project for big urban telephone expansion) ③ Projects related to long distance network expansion program ④ Projects related to the service development other than the telephone ⑤ Subordinate Projects directly linked with the improvement of a corporate management. A total of 26 big-scale and small-scale projects are selected for Phase B project.

(b) Selection of Proposed Projects

The proposed projects are selected out of the listed project mentioned above in Item (a) by excluding BCC projects and the projects related to the service development other than the telephone. The excluded projects are also subordinate projects with less urgency and lower ranked importance.

(c) Selection of Priority Projects

The priority rankings are put in order based upon the following criteria in relation to the agreed items in Vietnam such as a priority degree in Vietnam, social benefit and the like.

In accordance with the priority ranking, seven (7) priority projects are selected as listed in the following table. The priority rank for regional network projects of a) b) c) is put in higher order from lower teledensity for the subjective regional areas.

Priority Project List

Project description	Cost	Priority
a). North Province Project : 20 Provinces, 101,000 lines	\$ 91 M	1
b). Mekong Delta Province Project : 12 Provinces, 124,000 lines	\$ 112 M	2
c). Central Province Project : 12 Provinces, 92,000 lines	\$ 83 M	3
d). Inter-Province Network Project : 14 SDH OFC Loops, 4 Radio & SDH links	\$ 150 M	4
e). Frequency Monitoring Project : 8 location including Yen Bai	\$ 8 M	5
f). OPMC(Outside Plant Management Center) : Hanoi	\$ 8 M	6
g). VSAT for government emergency communications system : Nationwide	\$ 10 M	7

(2) Other Priority Project

The followings are the other priority project strongly requested by DGPT:

- (a) Vietnam Telecommunications Satellite (VINASAT)
- (b) Domestic Submarine Optical Fiber Cable System

7. Recommendation

The recommendation items are roughly divided into policies for network development, telecommunications administration and management, telecommunications services /facilities and state management policy.

7.1 Policies for Network Development

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 the following table.

Target of Telephone and Mobile Density

	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	2,398	4,529	7,660
Mobile Density	0.30	0.44	1.12	1.74
Subscribers (x1000)	234	347	967	1,607

7.2 Telecommunications Administration and Management

(1) Human Resource Development

The necessary number of staff up to the years 2010 and 2020 should be allocated by effectuating an adequate introduction of new technologies, enhancement of operation efficiency and improvement of organizations. The number of staff necessary for the year 2010 should be adequately more than doubled as compared with that of 1998. In addition to this, the staff allocation plan by telecommunications sector, staff functioning and assignment should be carried out in accordance with a qualification level and job classification.

(2) Telecommunications Productivity

A study from the world telecommunications development report 1997/1998 issued by ITU shows that the average subscriber line per staff in Vietnam accounts for 55 lines

as of end of 1998. This figure can be defined as a staff productivity. Since Vietnam will basically become an industrialized country by the year 2020, they should enhance the staff productivity more than twice by 2010 and three times up to 2020 through the an effective introduction of new technologies, human resource development, significant efficiency to operation and organization/institution improvement.

(3) 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 Fundamental Telecommunications Network Plan.

(4) Operation and Maintenance

By the year 2010, the fixed telephone line and mobile line will increase to about 7.7million and 1.6 million respectively as a result of telecommunications development plan. In proportion to the increase in telecommunications subscribers, the operation and maintenance works will become more sophisticated and diversified. To cope with the tendency, the operation and maintenance works should be simplified and standardized for better performance of works.

7.3 Telecommunications Services and Facilities

(1) Fundamental Services and Facility Plan

It is necessary to provide 7.7 million of fixed telephone subscribers and 1.6 million lines of mobile telephone up to 2010 and to expand various kinds of services around the country. To fulfill this target, the following measures should be taken stage by stage for a completion of Mater Plan up to 2010.

Short-term Plan(Phase A up to 2000)

- Basic network: Expansion of ISDN and development of incumbent services
- Mobile communication: Introduction of mobile CDMA system
- International communication: Introduction of submarine cable system and international ATM
- Non-voice system: Trial introduction o Frame Relay system and ATM and provision of high speed data communication services

Medium-term Plan(Phase B up to 2005)

- Basic network: To provide promptly the services with subscribers and expansion

- of regional telecommunications services to meet the demand.
- Transmission/Mobile communication: Enhancement of present inter-provincial trunk line and introduction of personal communication services
- Access network: Development of access network by optical fiber cable and introduction of a new radio subscriber system
- International /Non-voice system: Launch of Vietnam own satellite, expansion of internet and TV conference services

Long-term Plan(Phase C up to 2010)

- Basic Network: Universal services throughout the country and introduction of broad band ISDN services
- Mobile communication: Next generation mobile system IMT-2000
- Regional: Completion penetration of telephone services to all villages in Vietnam. (Full coverage of universal service to provide telephone services with all villages “ Communes”)
- International/Non-Voice : Introduction of international ATM switch, new telecommunications network control system (TMN) and B-ISDN.

(2) National Information Infrastructure (NII)

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 conception and available programs shall be planned and scheduled in Vietnam.

Considering the current situations of education and medical environments in Vietnam , Telemedicine and Remote Education services, optionally adding video conference trials, shall be put in trial, especially in metropolitan areas and the newly planned commercial/industrial areas. Later on, if the universal services would be completed, these two services should be provided at large throughout the country together with a high-speed and broad band transmission network.

7.4 State Management for Telecommunications

(1) Regulations and Policies toward Competitive Telecommunications Market

The pending issues that the government of Vietnam is confronting toward competitive telecommunications market can be classified into “regulations”, “industry policy” and “resource administration”. In the field of the regulations, there exist the pending issues on a policy for “Regulatory Issues for Market Entry” accomplishment of “Universal Access”, “Standardization”, etc..

(2) Telecommunications Industry Development

To attain targets of industry development plan, it is recommendable to plan required policies of the industry development by dividing following three steps;

Step 1 (2005)

- Implementation of a national telecommunications expansion
- Promotion of education on computer/software,
- Preferential investment in protection of, and development of domestic core companies to manufacture private network equipment and networking equipment manufacturing

Step 2 (2010)

- Establishment of national information infrastructure
- Establishment of software technology parks in several cities in the country
- Introduction of competition into the for private network equipment manufacturing

Step 3 (2020)

- Encouragement of advancement to overseas market for equipment manufacturing companies

(3) Organization and Management Plan

With purpose of achieving the expansion program for 10 % penetration target (fixed telephone and mobile telephone) of the telecommunication development plan up to 2010, the organization and management of DGPT should be strengthened.

- (a) For strengthening the DGPT administrative organizations, it is recommended to set up an independent and proper organizations of telecommunications separated from the postal services in DGPT up to 2005.
- (b) It may be recommendable to organize a new Communication Policy Bureau as a policy department and Telecommunications Bureau as a regulation department in DGPT.

(4) Spectrum Management

Although frequency is an invaluable resource, the adequate spectrum control is not taken properly. The recommendation items can be summarized as follows;

(a) Frequency Allocation and Reuse

By transition to new service/system, it is better that the aged/superannuated radio systems would be removed, and their radio frequencies would be reused by new services/systems.

(b) Legal Systems

The principal law (Radio Law) for spectrum management shall be completely established as soon as possible.

(c) Frequency Licensing

Illegal users besides the new licensee should be comprehended as soon as possible.

(d) Frequency Monitoring System

To reduce illegal users, available frequency monitoring area should be expanded nation-wide, especially in bordering and mountainous areas.

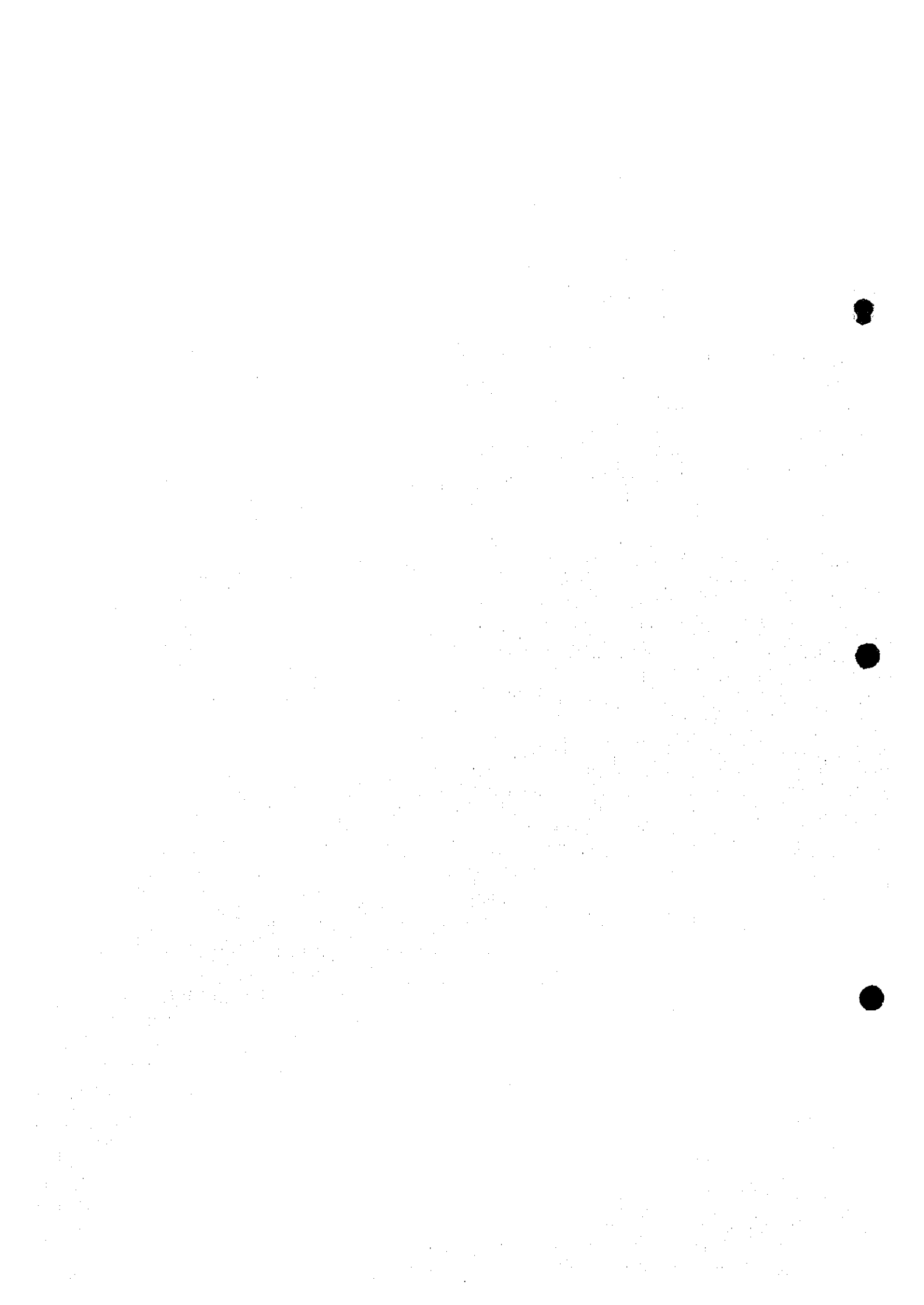
(5) Numbering Management

(a) Numbering Administration/Transition of Regulatory Body

DGPT planned to open up telecommunication market to outside companies. Under these competitive environment, it is recommended that independent regulatory authority for numbering administration should be established somewhere in DGPT and smooth transition of numbering administration from the State-owned Carrier (VNPT) to the independent regulatory authority (DGPT) should be made.

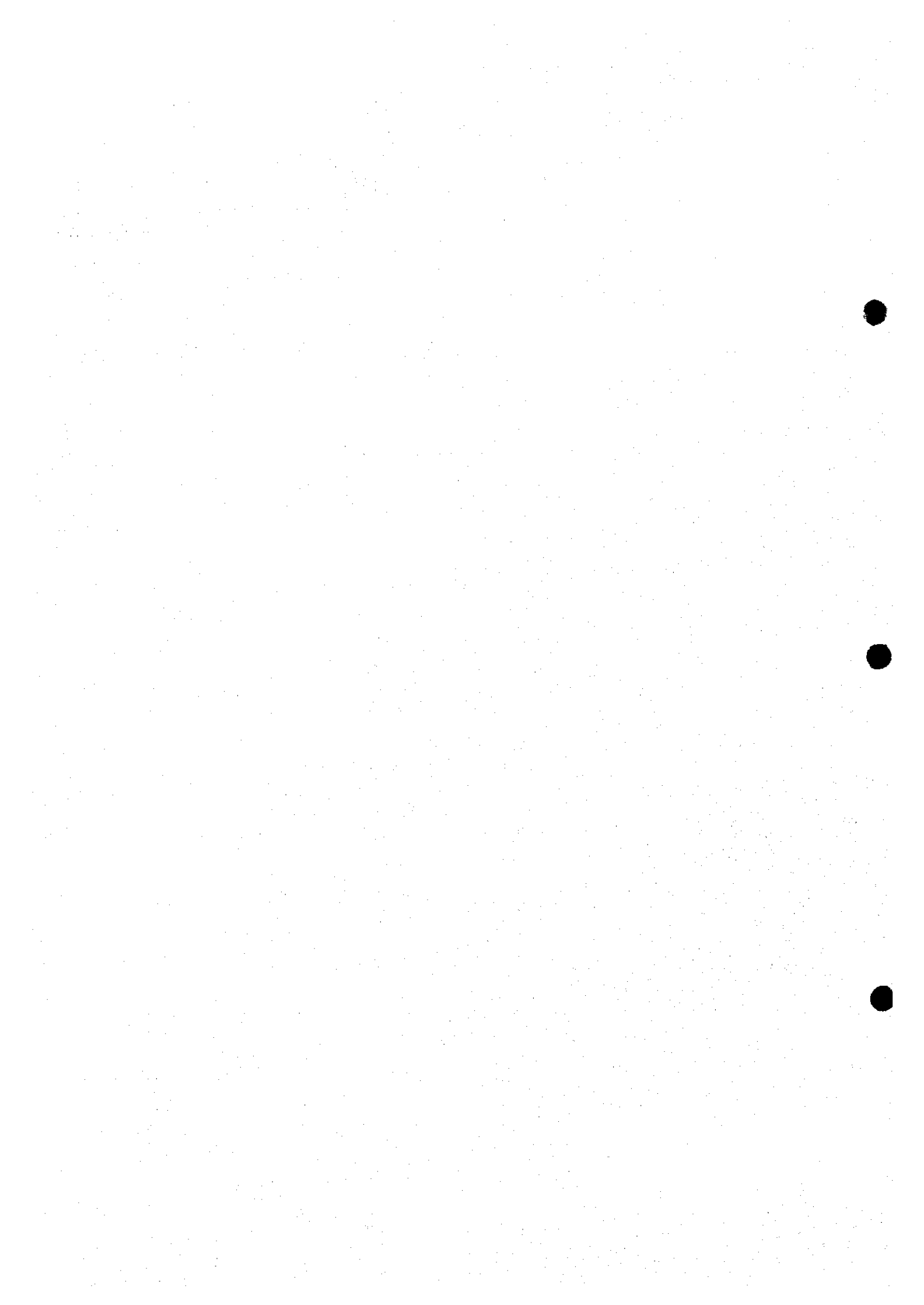
(b) Number Portability

Number Portability has the aim of improving user convenience and promoting competition between carriers, by assuring user freedom in the choice of carriers. In order to introduce number portability at the earliest juncture, studies should be made involving the participation of the carriers.



PART I

**TELECOMMUNICATIONS
NETWORK DEVELOPMENT**



CHAPTER I INTRODUCTION

1.1 General

This Draft Final Report describes a telecommunication development plan up to 2010 and recommendations for the Study on Telecommunications Development in the Socialist Republic of Vietnam.

The Report consists of the followings:

- (1) VOLUME I : Telecommunications Network Development
- (2) VOLUME II : Telecommunications Management
- (3) VOLUME III: Supporting for Master Plan (Appendix)
- (4) FINAL REPORT SUMMARY

The Study has been carried out in accordance with the work plan and schedule of the study which were discussed and agreed upon between Department General of Posts and Telecommunications of Vietnam (DGPT) and Japan International Cooperation Agency (JICA).

1.2 Background of the Study

As is well known, Vietnam introduced the "Doi Moi (Reform)" policy for the first time in 1986 for the purpose of recovering and normalizing the economy quickly. The main features of the policy consist in establishing a market economy and invitation of foreign capital and technology to Vietnam.

The Vietnamese Government has worked out the development plan towards 2010 and 2020 in accordance with the main objectives of the policy by promoting the industrialization and modernization process in Vietnam. By the year 2020, Vietnam will become an industrialized country.

Since the introduction of the "Doi Moi" policy, Vietnam has made an effort to remarkably increase the growth in social and economic activities with a higher development rate of Gross Domestic Product (GDP) / Gross National Product (GNP). For this purpose, the Vietnam government has been putting much more emphasis in the national development policy on the construction of an adequate, efficient and reliable infrastructure.

In accordance with this, the Vietnamese Government has put a higher priority on telecommunications development, because the telecommunications play an important role in providing diversified and copious services to comply with all demands of socio-

economic development of the country.

Under these circumstances, the Vietnam Government has set up a development target to aim at increasing the density to 4 telephone lines per 100 inhabitants by the year 2000. To achieve the target, it is very important to take into account the following problems:

- (1) insufficient penetration to rural areas of telephone services,
- (2) some difficulty in getting access to the remote areas,
- (3) the difficulty of securing necessary funds for expansion programs,
- (4) the recent Asian economic crisis, and
- (5) as yet insufficient human resource development.

In order to cope with the above-mentioned problems, a long-term telecommunications development plan (Master Plan) based on a viable strategy is essential. This Plan covers telecommunications development up to the year 2010 and will proceed in line with the General Development Plan for socio-economic development of the country and the latest directions in policy, management and telecommunications circumstances. This telecommunications master plan also involves a planning framework of reliable telecommunications network structuring, technology development, telecommunications industry development, and human resource development suitable for the 21st Century.

1.3 Objectives of the Study

The objectives of the Study are:

- (1) to formulate a master plan for the development of telecommunications in Vietnam up to the year 2010
- (2) to pursue the technology transfer to the counterparts of Vietnam in the course of the Study.

1.4 Overall Time Schedule of the Study

The study period is from 2nd July 1998 until 27th August 1999 and the whole study work consists of seven (7) stages as shown in the following Figure 1.4-1:

Study Stages	July 1998-December 1998	January 1999- August 1999			
(1) Preliminary work in Japan					
(2) First Work in Vietnam					
(3) First Work in Japan					
(4) Second Work in Vietnam					
(5) Second Work in Japan					
(6) Third Work in Vietnam					
(7) Third Work in Japan					
Submission of Reports	IC/R	P/R	IT/R	D/F	F/R
Reports	IC/R : Inception Report IT/R : Interim Report F/R : Final Report		P/R: Progress Report D/F: Draft Final Report		

Figure 1.4-1 Work Schedule of the Study

1.5 Progress of the Study both in Vietnam and in Japan

The main purpose of this Study work consists in the preparation of the Final Report that should include the overall progress results in the following stages:

- First Work in Vietnam : from 16th July 1998 to 24th October 1998
- First Work in Japan : from 26th October 1998 to 6th December 1998
- Second Work in Vietnam : from 7th December 1998 to 13th February 1999
- Second Work in Japan : from 15th February 1999 to 28th March 1999
- Third Work in Vietnam : from 14th June 1999 to 24th June 1999
- Third Work in Japan : from 13th August 1999 to 27th August 1999

CHAPTER 2 SOCIO-ECONOMIC OVERVIEW

In this chapter, socio-economic situation and development plans of Socialist Republic of Vietnam was studied as a background information for demand forecast followed by the general consideration for telecommunications purchasing power. In addition, the role and importance of telecommunications development and guidelines for telecommunications development plans were also summarized.

2.1 Socio-economic Situation

The Socialist Republic of Vietnam has quite high potentiality of economic growth with the second largest land area in the ASEAN region, some 77 million people, and rich natural resources.

The economy of the country has been changing rapidly, and has shown remarkable performance for the last 7 years under the "Doi Moi" (Reform) policy to establish the market economy under socialism. However, the economic slump of the Asian economies, due to large depreciation of their currencies in the international money market in 1997, hit Vietnam's economy in 1998. Hence, the country also has to face the economic slow-down until a future recovery of the Asian economy, which may be achieved in a few years by regional and world economic cooperation.

2.2 Socio-economic Development Plans

In order to improve the living conditions of the broad mass of the people, almost 80% of the population, in rural areas, it is critically important to develop the rural economy in Vietnam. Therefore, the development of rural economy was given a high priority in the Public Investment Program 1996 - 2000. This policy would be expected to continue for the next decade.

In terms of development objectives of the telecommunications sector, it was planned to provide all villages in the country with telephone lines, including those villages located in remote areas.

On the other hand, loans and Business Cooperation Contracts (BCC) and mobilization of other resources have been considered in terms of main resources for telecommunications investment. Especially, foreign investment resources in the form of borrowing, aid, BCC were estimated to be about 65 - 70% of the total investment.

2.3 Outline of Related Telecommunications Development Plans to National Economic Development Plan

2.3.1 Economic Development Plan and Telecommunications Development Plan

A country's telecommunication development plan must be worked out carefully so as to be compatible with the government's targets for socio-economic development, such as its political objectives, the projected rate of economic growth, and the amount of public investment available.

In addition, the principles of the telecommunications development plan should be reflected in the telecommunication infrastructure development principles applied in the government's socio-economic development plan. This is because telecommunications infrastructure is a key component of the social infrastructure.

The following principles should be considered in forming a country's economic development plan:

- (1) Correcting the imbalance among economic segments
- (2) Promoting structural transition of industries
- (3) Promoting public welfare

2.3.2 Impact of Telecommunications Development to National Economy

There has been a strong correlation between telecommunications development and the performance of national economy. International comparisons have also proved that the correlation between telecommunications and economic growth is generally stronger in low-income countries than high-income countries. This suggests the importance of the role of telecommunications for a country's economy to take off.

The development of the information and communications industries can be also resulted in a strong impact on the economic growth of Vietnam in the future. In discussing the effects of investment in the information and communications industries on the national economy, a unit of increase in investment in telecommunications operators will trigger production several times as large as the amount invested in those industries, while new employment opportunities will also result.

2.3.3 Telecommunications Buying Power

In terms of correlation of affordability of telephone services and household revenues, in

countries like Vietnam with teledensity of less than 5 percent, ITU (International Telecommunications Union) statistic data shows from 2 to 8 percent of household expenditure tends to be spent on telephone services.

In developing countries with low income, telecommunications policy makers naturally tend to think that a similar proportion of household expenditure should set the threshold for affordability in their countries. However, if this relative measure of affordability is used to establish telephone tariffs in lower income countries, this would result in insufficient revenue being generated to recoup network operating and expansion costs.

On the other hand, establishing the average operating costs for a telephone network can be pointed out as an alternative approach. For those families for whom an average tariff is beyond their ability to pay, additional policies might be employed, such as financial assistance.

As well as considering operating costs for the network as a whole, it is also necessary to consider connection charges to cover a portion of the cost of installing a new telephone line.

In order to generate sufficient revenue to recoup operating costs and fund network development, low income countries must expect families to spend a greater proportion of household expenditure on telephone services than in higher income countries.

CHAPTER 3 OUTLOOK OF TELECOMMUNICATIONS SECTOR

This Chapter describes the current situations of telecommunication services and operations, and an outlook toward the development trends in the future is also summarized for the operators of VNPT, VIETEL and SAIGON POSTEL (SPT) including an analysis of the financial and economical status of VNPT together the incumbent tariff systems.

3.1 Services and Operation by Telecommunications Sector

In 1998, Vietnamese telecommunications operators entered into a fair competition market since in addition to VNPT of State Entity, two (2) companies -VIETEL and SAIGON POSTEL (SPT)- have been allowed to deal with Posts and Telecommunications services under the regulation of DGPT.

The scope of business of VNPT covers all aspects of telecommunications and that of the other two (2) companies is regulated by DGPT in the field of national services, as listed in Table 3.1-1.

Table 3.1-1 Services Classification by Operators

Services	In Service	Planning	Operators
- Basic Telephone Domestic	○		VTPN, VIETEL, SPT
- Telephone International	○		VTPN
- Video Phone	○		VTPN
- Card Pay Phone	○		VTPN
- Facsimile	○		VTPN, VIETEL, SPT
- ISDN, - ATM		○ under study	VTPN
- Telegram	○		VTPN, VIETEL, SPT
- Mobile Communication - CDMA	○	○	VTPN, Call Link VIETEL, SPT
- Paging	○		Vietnam Paging Center, Phone Link, Epro, MCC, ABC, etc.
- Data Communication - Packet Switching	○		VTPN, VIETEL, SPT, others VTPN, VIETEL, SPT, others
- Leased Circuits	○		VTPN
- Inter. Frame Relay		○	VTPN
- E-Mail	○		VTPN, VIETEL, SPT, others
- Internet	○		VTPN, FPT, SPT, VIETEL Information Technology Institution

3.2 Services of Telecommunications Sector

The fixed telephone services are mainly provided by VNPT. The other 2 operators - VIETEL and SPT will start their principal services from 1999.

Other telecommunications services such as mobile, data, telex, internet, etc have been provided by different operators. The index figures of principal telecommunications

services for past three (3) years from 1996 to 1998 are summarized in Table 3.2-1.

Table 3.2-1 Indices of Principal Telecommunications Services for Past 3 Years

	1996	1997	1998
Number of Telephone Subscribers (thousand)	1,110.2	1,407.6	1,792.0
Number of Mobile Subscribers (thousand)	59.0	108.2	234.1
Number of Internet Subscribers	-	1,200	18,170
Density of Main Subscribers(TEL.+Mobile)	1.57	2.00	2.63
Number of Population (thousand)	74,310	75,665	77,023

3.3 Functions and Organizations of Telecommunications Sectors

(1) State Regulatory Body -DGPT-

DGPT is organized in accordance with Vietnamese laws and regulations. DGPT is the state body which consolidates the role of state management in the Posts and Telecommunications fields and sets up the regulations, policies, standards to submit them to the Vietnam's Government for approval. There are 12 Headquarters departments under Secretary General and 2 Deputy Secretary Generals. The total staff of DGPT as of 1988 is about 500.

(2) Telecommunications Operator-VNPT

VNPT is a leading state-own enterprise which is responsible for the functions of (i) Establishing plans of development, investment and funding, (ii) Managing the operation of national public network for P&T service, (iii) Conduction of the survey, research, design and construction, (iv) Industrial production and procurement of equipment/materials, (v) R &D and Training activities.

VNPT is composed of institutional organization: Board of Management which is a supreme organization of VNPT to make a final decision for VNPT, Board of Directors which is responsible for deciding management policies and very important person's assignments, C.E.O (Chief Executive Officer and President of VNPT), Headquarters Functional Divisions and four (4) subsidiaries (financially independent subsidiary, financially dependent subsidiary, administrative organization and joint-venture companies).

Under VNPT, there are business operating management companies such as Vietnam Telecom International Company (VTI), Vietnam Telecom National Company (VTN), Vietnam Data Communication Company (VDC), Vietnam Mobile Telecom Services Company (VMS), Vietnam Telecom Services Company (GPC), etc.

In addition, as a provincial P&T operation enterprise, there are 4 major city P&Ts (Ha Noi, Ho Chi Minh, Da Nang, Hai Phong) and 57 province P&Ts together with about

2,800 P&T offices throughout the country.

All P&T employees of VNPT account for about 80,000 persons, of which about 40,000 are engaged in telecommunications.

(3) VIETEL

After a competitive policy for telecommunications services was introduced by the Vietnam Government, VIETEL, which is under the control of Ministry of Defense, obtained a license to enter the telecommunications market. The licensed business scope covers mobile telephone, local telephone (WLL), paging, Internet, postal services and the joint-venture business with foreign investors. There are about 150 staffs.

(4) SAIGON POSTEL

SAIGON POSTEL is established a corporation which consists of 12 State-owned companies under Ho Chi Minh Committee, Ministry of Tourism, VNPT, other state organizations. SAIGON POSTEL runs a business on posts and telecommunications services, manufacturing/construction and trading of the related equipment and materials.

The scope of business for SAIGON POSTEL is almost the same as VIETEL. There are about 170 staffs.

3.4 Financial Performance of Telecommunications Operators

Since VNPT can be considered as an overall umbrella organization with some telecommunications subsidiaries, such as VTI, VTN, VDS, and VMS, and it is as a whole almost monopoly operator in Vietnam, the results of the analyses for the VNPT's revenue and expenses can be applied to the business plans for the whole telecommunications operators in Vietnam to be examined.

3.4.1 Financial trends of VNPT

Number of telephone subscribers and revenue and profit of VNPT have increased rapidly between 1993 and 1997. At the same time, profit percentage to revenue has kept rather high level, between 32.8% to 48.2%. The rates of such increases, however, have tendency to be reduced.

In terms of telephone revenue structure, the sum of revenues from international calls and international settlement against the total telecommunications revenues were 50.8 percent and 47.6 percent in the years of 1996 and 1997 respectively. 20.5 percent of the total telephone revenues in 1996 and 20.1 percent in 1997 was derived from the net accounting balance from international traffic. Therefore, the international revenues can be currently

considered as the main source of revenue for the VNPT.

However, it is still potentially dangerous to rely on the international traffic as a source of revenue and domestic revenues need to be enhanced.

In addition, it is also necessary to take into account that determining the average revenue per line in Vietnam is not straightforward because of the method of accounting and the difficulty in establishing what the number of subscriber lines was in the specific time period. Furthermore, some shared revenues and expenses are not included in their financial summaries.

3.4.2 Business Cooperation Contracts

While manufacturing joint ventures are allowed in Vietnam, foreign telecommunications firms wishing to invest in fixed or mobile communications networks are limited to Business Cooperation Contract (BCC). These contracts offer limited management rights in return for shared revenues but no equity. This BCC scheme was introduced by the Government to introduce foreign capital for infrastructure construction without increase of foreign debt. Basically, the Vietnamese operators conduct operation of the telecommunications network.

3.5 Tariff Structure

The General Department of Posts and Telecommunications (DGPT) has issued a list of rates for telephone calls and leasing international telecommunications channels. The announced rates are in accordance with Decision No. 358 in 1999.

In addition to this, DGPT issued a new local telephone tariff for foreign organizations, individuals and joint ventures with foreign organization operating in Vietnam on June, 22 with Decision No. 427 in 1999. The effective date is from July 1, 1999.

In terms of domestic tariff, the rate of long distance call had not been revised since May 2, 1993.

CHAPTER 4 CURRENT STATUS OF FUNDAMENTAL TECHNICAL PLAN

This Chapter outlines and reviews the existing situations of fundamental telephone network plan and technical standards adapted in Vietnam for planning the future development of telephone network and for introduction of new services and technology. The issues to be solved are pointed out and some improvement are recommended.

4.1 Network Configuration

The telephone network hierarchy consists of four levels as shown in Figure 4.1-1.

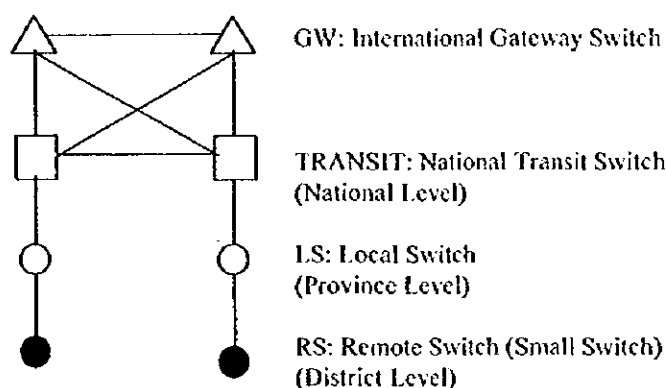


Figure 4.1-1 Network Hierarchy

There are three International Gateway Switching Centers and National Transit Switching Centers in Ha Noi, Ho Chi Minh and Da Nang. And each province has at least one Local Switching Center, which are connected to remote exchanges and small type exchanges depending on the size of exchanges.

4.2 Numbering Plan

ITU-T Recommendation provide the number structure and functionality which detailed the components of the numbering structure and digit analysis required to successfully route the call. National numbering plan in Vietnam follows this Recommendation.

“00” is used for International prefix.

“0” is used for National (Trunk) prefix.

At present, a numbering structure for fixed telephone service in Vietnam is as follow;
Trunk Prefix (0)+ Area Code (1,2 or 3Digits)+ Subscriber Number (7 or 6digits)

0 + 4 + XXX+XXXX (Hanoi)

0 + 31 + XXX+XXX (Hai Phong)

0 + 350 + XXX+XXX (Nam Dinh)

"1XY" codes are used for special service.

Under the competitive environment, independent regulatory authority for numbering administration should be established somewhere in DGPT.

4.3 Signaling System

In Vietnam two types of signaling system are adapted between digital exchanges:

- (a) R-2 Signaling System and
- (b) No.7 Signaling System National Version for National Network

with the latest relevant ITU-T Recommendations as approved by ITU-T in March 1993.

The ITU-T will further develop recommendations dealing with ITU-T No.7 signaling. Sufficient flexibility shall exist within the exchange to permit the implementation of the updates to the ITU-T No.7 signaling system and its service without disruption to the exchange or the need for costly hardware modification. The exchange shall also be capable of interworking with existing exchanges using R2 signaling system.

Signaling System No.7 Vietnam Version was introduced recently between Local Exchange and Transit Exchange in Ha Noi, Ho Chi Minh and Da Nang Cities.

4.4 Routing Plan

Between subscribers or between exchanges, there are usually several routing through transit / tandem exchanges. Routing is a mean to select economically and logically the most advantageous route. Alternative Routing and Far-to-Near Rotation are applied for routing based on homing plan in Vietnam telephone network.

4.5 Charging System Plan

International and national automatic telephone service is charged based on distance, call duration and time. For local calls, calls are charged by minute. The charging method is pulse metering or Automatic Message Accounting (AMA).

VNPT specified that facility shall be provided in the exchange to record details of every call offered to the exchange and to transfer this data via data link to remote center. It shall also be possible to transfer this data onto cartridges, magnetic tapes, hard disk, high-density floppy disk or optical disks.

4.6 Network Synchronization Plan

The objective of Network synchronization is to keep the rate of controlled slips stipulated in ITU-T recommendation G.822. Slip rate represents the performance of network

synchronization. The end-to-end performance for telephone and non-telephone service on a 64kb/s digital connection in an ISDN is recommended Table 4.6-1.

The current network synchronization on VTN SDH network already has adopted master-slave method.

Table 4.6-1 Controlled Slip Rate on a 64kb/s

Category	Mean slip rate	Proportion time
(a)	≤ 5 slips in 24 hours	>98.9%
(b)	≤ 5 slips in 24 hours and ≤ 30slips in 1 hour	<1.0%
(c)	> 30 slips in 1 hour	<1.0%

4.7 Error Performance Objective

ITU-T recommendation for Error Bit performance digital connections below the primary rate of the digital hierarchy states each direction of a $n \times 64$ kbit/s circuit-switched connection.(G.822)

VNPT should complies the target in Table 4.7-1.

Table 4.7-1 Error Performance Objectives for International ISDN Connections

Performance classification ratio	Objective (Notes 1, 2)
Severely Errored Second Ratio (%SES)	< 0.002
Errored Second Ratio (%ES)	< 0.08
NOTES	
1 The ratios are calculated over the available time. The observation time has not been specified since the period may depend upon the application. A period of the order of any one month is suggested as a reference.	

4.8 SDH Network Availability

ITU-T recommends the target of availability at the primary rate as follows.

(1) Hypothetical reference circuit (2,500km)

The objective for the availability of a 2500km Hypothetical reference circuit in one direction should be greater than 99.6% for a one year duration. (G.602)

(2) Design objective

The design objective for the availability of translating equipment for a 2,500km should be greater than 99.9% measured for a period of one year for one direction of transmission. (Reference from G.602)

VNPT complies with the target described above.

4.9 Transmission Loss (LR)

The loudness rating is defined by the amount of loss inserted in a reference system. Practical telephone connections are composed of several parts connected together. At present, "OLR", "SLR", "RLR" and "CLR" ratings are recommended by ITU-T G.111 and

121.

The LR value for International connection (G.111) and National System (G.121) is shown in Table 4.9-1. VNPT would comply the target described in Table 4.9-1.

Table 4.9-1 LR Value as Cited in G.111 and G.121

	SLR	CLR	RLR	OLR
Traffic weighted mean values				
Long term	7 - 9	0 - 0.5*	1 - 3	8 - 12
Short term	7 - 15	0 - 0.5	1 - 6	8 - 21
Maximum value for an average-sized country	16.5		13	
Minimum value	+2			

4.10 Quality Standard (Grade of Service)

In the development plan of Posts and Telecommunications Sector in 1996 - 2000, DGPT is entrusted with the responsibility in carrying out the plan for managing standard and quality to make up national standard system suited with the international standards (ITU). Staff members of DGPT agree to promulgate standard and quality systems in 3 fields: equipment, networks and service quality in the whole country.

4.10.1 Standard for Connection Loss

In Recommendations E.500 series that specify the traffic measurement method, the CCITT has defined the mean of the 30 highest working days during 12-month period of the mean busy-hour traffic of a circuit group as normal load, and the mean of the 5 highest for days during 12-month as high load. The loss probability for international system is defined as follows. (Recommendation E.520)

- Loss probability per link at normal load : 0.01 or less
- Loss probability per link at high load : 0.07 or less

4.11 Inter-network Connection

4.11.1 Inter-networks Connection of Existing Network

In Vietnam there are several telecommunications network besides VNPT Public Service Telephone Network (PSTN); i.e. cellular telephone networks and paging networks. Most of them are interconnected with VNPT telephone network through Transit Exchange / MSU (Main Switch Unit) and others are connected by normal subscriber lines.

4.11.2 Inter-networks Connection with Other Operators

Since new telecommunications operators such as VIETEL and Saigon Postel will commence the telecommunication service in the competitive telecommunications field, an interconnection interface is necessary. For this purpose, DGPT has to standardize the following system;

- (1) Technical standards for interface conditions such as signaling system, numbering plan for Carrier Identification Code,
- (2) Tariff system,
- (3) Type of interconnections, and responsibility of each operator, and
- (4) Interconnection method (Point of Interconnection).

CHAPTER 5 CURRENT STATUS OF TELECOMMUNICATIONS FACILITIES

5.1 Switching Facilities

In Vietnam many different types of equipment with different manufacturing are working. All types of switching facilities in Vietnam are summarized in the following tables:

(1) National Transit Switch

Table 5.1-1 National Transit Switch in 1998

No	Province	Name of Equipment	Channel Capacity	
			Incoming	Outgoing
1	Hà Nội	AXE-10	6,636	6,801
2	Hà Nội	TDX-10	2,966	2,744
3	Đà Nẵng	AXE-10	4,056	4,080
4	Hồ Chí Minh	AXE-10	8,575	8,686
5	Hồ Chí Minh	TDX-10	4,840	4,680
<i>Grand Total</i>		<i>5 units</i>	<i>27,073</i>	<i>26,991</i>

(2) Local Tandem Switch

Table 5.1-2 Local Tandem Switch in 1998

No	Province	Location	Name of Equipment	Channel Capacity	
				Incoming	Outgoing
1	Hồ Chí Minh	Hải Bào Trung	EWSD	10,221	9,556
2	Hồ Chí Minh	Hải Bào Trung	1000-E10	4,133	4,139
<i>Grand Total</i>			<i>2 units</i>	<i>14,354</i>	<i>13,695</i>

(3) Local Switch

Table 5.1-3 Local Switch in 1998

Number of LS	Capacity					
	Host + Remote		Host		Remote	
	Total	Utilized	Total	Utilized	Total	Utilized
<i>81 units</i>	<i>2,049,887</i>	<i>1,545,247</i>	<i>657,728</i>	<i>567,013</i>	<i>1,392,159</i>	<i>978,234</i>

5.2 Transmission Facilities

Transmission Network consists of two (2) hierarchical level, one is the Inter-Province Network which carries the traffic among all provinces and the other is called Intra-Province Network which transports all traffic within a Province.

(1) Inter-Province Network

The network region is sectioned at Hà Tĩnh and Nha Trang, especially Inter-provincial network between HNI and HCM is so-called Backbone Network.

Figure 5.2-1 shows the current Inter-Province Network.

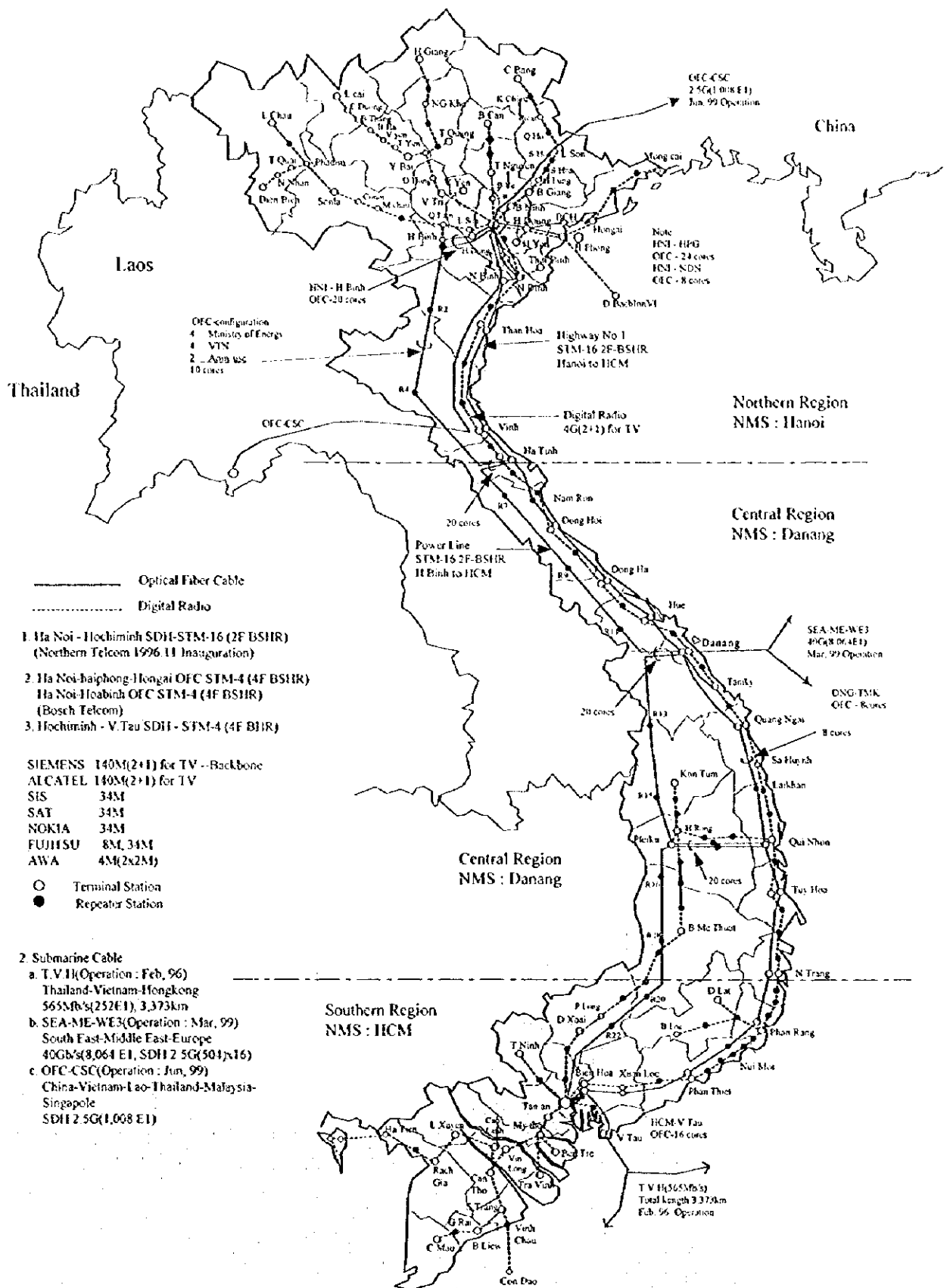


Figure 5.2-1 Current Inter-Province Network

(a) Backbone Network.

Backbone Network consists of SDH OFC and Radio transmission system. The SDH OFC transmission system was installed in 1996, however the capacity will be 100% occupied by end of this year (1999).

(b) Other region

In northern area and also southern area, Radio transmission system is working as the major transmission system.

(2) Intra-Province Network

The Network are mainly composed of radio transmission system, which is approximately 88% of the Intra-Province Network and cable system keeps only 12% at present.

5.3 Access Network

5.3.1 Outside Plant

The existing outside plant networks consist of metallic cable networks and optical access networks.

(1) Metallic Cable Network and Duct System

(a) Design Status

Table 5.3.1 Outside Plant Design Status

Items	Current Status	Remarks
Maximum transmission loss	7 dB	special case : 10 dB
Maximum cable loop resistance	1,000 Ω	special case : 1,300 Ω
Provisioning periods for Planning	not defined clearly	
Rate of primary pairs and line units	1.4	
Occupancy rate of DP design	80%	

(b) Upgrading Existing OSP Facilities

The upgrading activities of the OSP facilities are being carried out in order enhancing the network service qualities.

- Relocation of aerial cables to underground
- Renewal of conventional facilities of DPs and drop wires

(c) Duct System

Current duct system in Vietnam has number of problems in the technical specifications and the construction procedure.

(i) Specification

The appropriate manhole specifications, the economical manhole spacing and the installation standards are required to review.

(ii) Construction

In metropolitan areas, seriously delayed digging permission and the restricted working hours are bottlenecks in the civil works. The effective procedure to reduce the digging is required.

(2) Optical Access Networks

As an Optical Access Network (OAN) in Vietnam, several optical transmission systems (so-called DLC) are put into service in Ho Chi Minh City and Ha Noi.

5.3.2 Radio Subscriber Systems

The radio subscriber systems are utilized as shown in Table 5.3.2-1 for the following purposes in Vietnam:

- (1) Trial of Radio Subscriber Systems
- (2) Supplementary Utilization in Urban Areas
- (3) Utilization in Rural/Remote Areas

Table 5.3.2-1 Utilization Conditions of Radio Subscriber Systems

System	Utilized Areas	No. of Telephone Lines
DRMASS	Ha Noi, Ho Chi Minh, Tien Gian, Ben Tre	Total: 3,724 lines
GMII-2000	Tan Binh, Binh Chanh, Pham The Hien	Total : 11,245 lines
IRT-2000	Quang Ninh, Tay Ninh, Binh Duong, Binh Phuoc	Total: 1,514 lines
T400	Ho Chi Minh (6 cell sites)	Total: 4,700 lines

5.3.3 VSAT System

VSAT systems are applied not only to telecommunications in rural/remote areas, but also to data communications for leased line.

Table 5.3.3-1 Facilities Conditions of VSAT System

Type of Equipment	Utilization Conditions	Remarks
Satellite	ASIASAT II (C band, longitude 100.5° E)	
Transponder	about 5 MHz	
Hub Station	Ho Chi Minh City	
VSAT Station	24 earth stations nationwide 2.4 m antenna in diameter Voice and Data (64 kbps)	Total: 39 channels

5.4 Mobile Communications Systems

5.4.1 Cellular Mobile Systems

The cellular mobile systems are utilized in Vietnam as shown in Table 5.4.1-1.

Table 5.4.1-1 Facilities Conditions of Cellular Mobile Telephone Systems

Item	MobiFone System	VinaPhone System	CallLink System
Mobile Service Switching	AXE-103 (ERICSSON) x 4 Ha Noi: 45,000 l.u. Ho Chi Minh: 2 Units 115,000 l.u. Da Nang: 5,000 l.u.	EWSD (SIEMENS) x 3 Ha Noi: 30,000 l.u. Ho Chi Minh: 35,000 l.u. Da Nang: 10,000 l.u.	N.A.
Base Station Controller	Total : 10 Ha Noi: 7 Ho Chi Minh: 2 Da Nang: 1	Total : 13 Ha Noi: 4 Ho Chi Minh: 5 Da Nang: 2	N.A.
Base Station	Total : 182 Ha Noi: 67 Ho Chi Minh: 92 Da Nang: 23	Total : 214 Ha Noi: 87 Ho Chi Minh: 94 Da Nang: 33	N.A.

5.4.2 Maritime Mobile Systems

The stations and facilities for maritime mobile system are deployed in five (5) internationally registered stations, eight (8) major stations and other stations in Vietnam.

5.4.3 Paging Systems

All paging systems in Vietnam utilize POGSAG systems. The facilities conditions of Vietnam Paging Center are shown in Table 5.4.3-1.

**Table 5.4.3-1 System Parameters and Utilization Conditions of Paging System
(Vietnam Paging Center Co.)**

Item	Specification	Remarks
Type of System	POCSAG	
Radio Frequency	280 MHz band	
Transmitter Power	300 W	
No. of Base Stations	Total: 24 (Ha Noi: 10, HCM: 9, Da Nang: 5)	

5.5 Non-Voice Communications Systems

5.5.1 Packet Network

The packet switches are deployed in Ha Noi, Da Nang and Ho Chi Minh in Vietnam.

5.5.2 Internet

Internet Access Provider (IAP) is limited to VDC in Vietnam, so the access facilities of Internet are provided by VDC. Access servers for Internet by VDC are installed in Ha Noi and Ho Chi Minh, and Internet backbones are connected to the U.S.A, Hong Kong and Australia from Ha Noi and Ho Chi Minh.

**CHAPTER 6 CURRENT STATUS OF
INTERNATIONAL TELECOMMUNICATIONS**

6.1 Telecommunications Network System

The international telecommunication network has been intensively developed and increasingly extended. International telephone traffic has increased from 82.9 million minutes in 1993 to 390 million minutes in 1998 (Refer to Table 6.1-1).

Table 6.1-1 International Telephone Traffic

	1991	1992	1993	1994	1995	1996	1997	1998
Out Going (M.M)	2.7	14.3	19.9	32.8	44.5	52.4	53.5	53.0
In Coming(M.M)	11.3	27.2	63	111.2	163	220.6	290.5	337
Total (M.M)	12.7	41.5	82.9	144	207.5	273	344	390

At present, VTI has three gateway exchanges (International Telecom Center), five earth stations via INTELSAT and one earth station via INTERSPUTNIK and two cable landing stations via T-V-H and SEA-ME-WE3 optical submarine cables. The Networks are capable to link nearly 30 countries with 5,013 direct telephone circuits and transit to more than 200 countries as of end of 1998 (Refer to Table 6.1-2).

Table 6.1-2 No. of International Direct Telephone Circuits

	1992	1993	1994	1995	1996	1997	1998
No. of Circuits	659	950	1,647	2,972	4,285	4,836	5,013

Since December 1995, the T-V-H (Thailand-Vietnam-Hong Kong) fiber optical submarine cable with total length of 3,373 Km and capacity of 565 Mbps (equivalent to 7,560 standard telephone channels in each direction) has been put into service.

New cable landing station linked to the Southeast Asia, Middle East and the European countries (SEA-ME-WE3) was built at the beach site in Da Nang and the cable was landed on October 1st, 1998.

Vietnam International Network up to 2000 is shown in Figure 6.1-1.

Vietnam Telecom International (VTI) was founded on March 31, 1990. VTI is a 100% owned subsidiary company of Vietnam Posts and Telecommunications (VNPT) and was founded to build, manage, and operate the Vietnam International telecommunications network and to provide the following international telecommunications services:

- International Direct Dialing services, Facsimile and Telex
- Home Country Direct (HCD)
- International Private Leased Circuits (IPLC) and Telehousing
- International Television Transmission

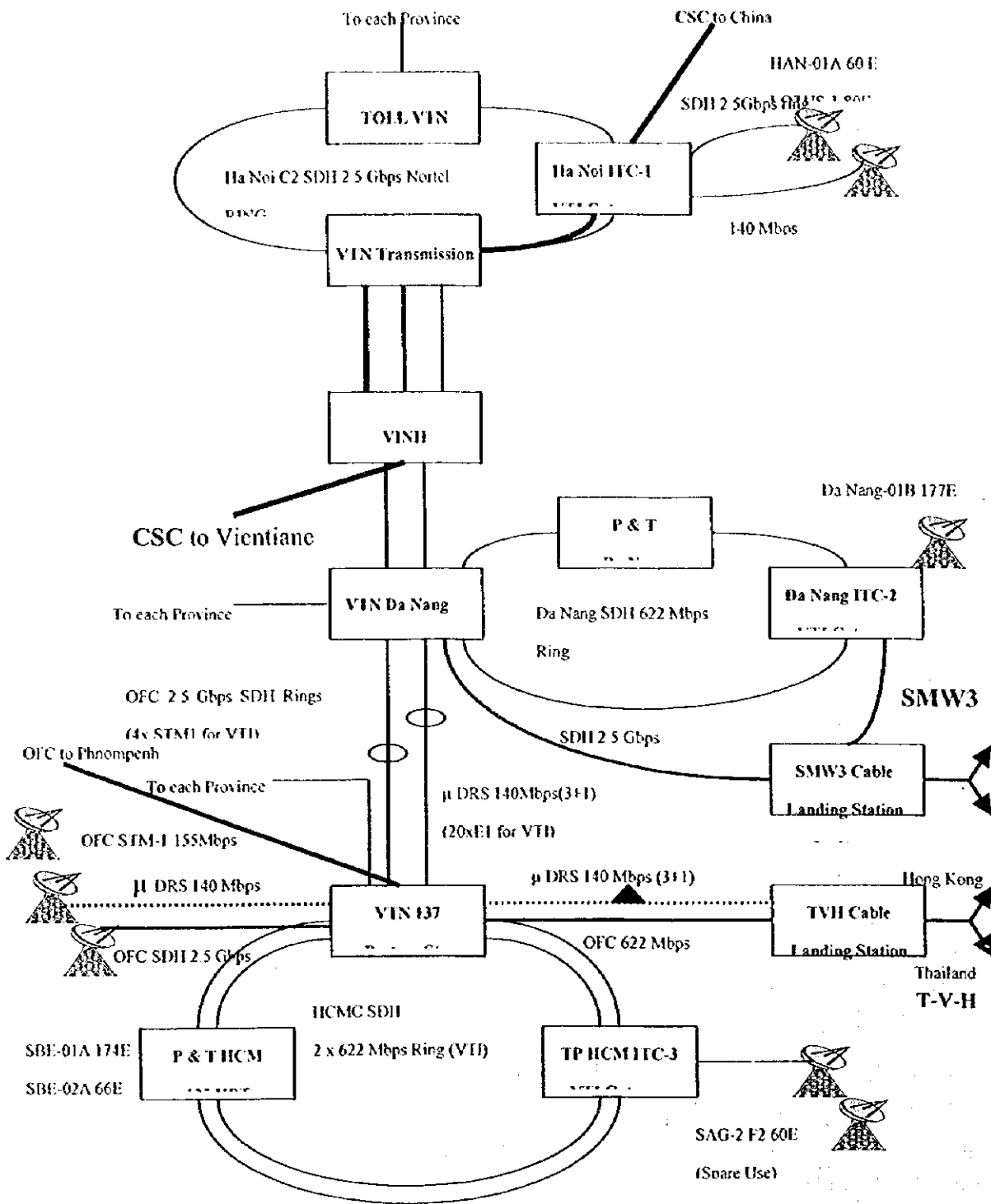


Fig. 6.1-1 Vietnam International Network Planning up to 2000

- Very Small Aperture Terminal (VSAT)
- INMARSAT Services
- Teleconferencing, Videoconferencing, ISDN and IN Services
- Internet International Gateway Services

The diversification of the International Telephone calls to and from Vietnam has been shown in the following Table 6.1-3.

From this table it shows almost international telephone traffic in Vietnam is now carried by two ITC's (Ho Chi Minh and Ha Noi). Under the current traffic situation it seems the third ITC gateway function is not required.

Table 6.1-3 Traffic Distribution of ITC (as of end of 1997)

	ITC-1(Ha Noi)	ITC-2(Ho Chi Minh)	ITC-3(Da Nang)
Total Minutes Ratio	25 %	71 %	4 %
O/G Minutes Ratio	32 %	67 %	1 %
I/C Minutes Ratio	24 %	72 %	5 %
IN :OUT Minutes Ratio	80:20	85:15	95:5
International Circuit Accommodation Ratio	33 % (1,632)	60 % (2,913)	7 % (330)
International :Domestic Traffic Ratio	3:97	5:95	5:95

6.2 Operation and Maintenance

6.2.1 International Network Management Center

Currently, each 1st level VTI maintenance center (e.g. ITC) is capable to operate and maintain its individual network facilities but unable to manage the whole international telecommunication network. In the event of one of the three ITC centers failing, the other two ITC centers shall act as a backup by the command of the international network manager.

In order to carry out the function of the centralized network management, it is necessary to build the integrated International Network Management Center.

6.2.2 Modernization of Network Maintenance

It is important that maintenance technology keeps pace with telecommunication network advances, particularly since the larger and more complex the facilities become, the more seriously they are affected when trouble arises. Needless to say, every effort must be made to secure communications systems against failure. Furthermore, key technical skills must be continuously upgraded to ensure rapid, effective response to exchange system failures.

CHAPTER 7 DEMAND FORECAST

7.1 Overview of the Information Services Market

(1) Convergence of Telecommunication, Media and IT Sectors in the Global Market

- (a) The telecommunications, media and IT (Information Technology) sectors are converging into a single information services market; e.g., computing over the telecommunications network, voice communication over the Internet Protocol (IP Telephony/ VoIP).

The legacy telecommunications service, i.e., POTS over PSTN (Public Switched Telephone Network) per se is converging into an information service on a single information infrastructure such as the Internet.

- (b) A fundamental “paradigm shift” is taking place away from conventional modes of operation, commerce and interaction. The phenomenon is most fully represented by the immeasurable and wholly unanticipated growth of the Internet as a new communication medium, even a new society.

(2) Current Status of Telecommunication Services Market in Vietnam

- (a) POTS demand is still large and dominant though the convergence of information services markets may take place sooner or later.
- (b) The Teledensity has grown considerably at the higher rate than expected.
- (c) The CMTS (Cellular Mobile Telephone Service) market is emerging rapidly not only in major cities but also in the provincial capitals thanks to the recent reduction of handset prices and expansion/ extension of the coverage areas.
- (d) The market of the Internet service may also emerge in parallel to the emerging market of CMTS, which is still subject to uncertainty.

7.2 Method of Approach

(1) POTS (Plain Old Telephone Service)

- (a) A simulation of POTS forecast was carried out in order to grasp the bird-eye view of overall forecasting processes under the environments of scarce records at the early stage of the Study.
- (b) The Affordability Parity (AP) has been defined and introduced in the course of the simulation to avoid an “underestimate” of POTS demand; APs for the respective provinces/cities have been found increasing over the time.
- (c) It has been found out that “intra-province disparity” of Teledensity prevails.
- (d) Three scenarios in terms of GDP growth rates for the main and alternative forecasts have been assumed.

(2) CMTS (Cellular Mobile Telephone Service)

- (a) The mother population of potential CMTS users has been assumed to be the business users of POTS.
- (b) MOBIX (Mobile Index) related to Teledensity and Business User Ratio of POTS has been defined and introduced to derive the Mobile Penetration.

(3) Internet

- (a) The forecast of the Internet users is still subject to uncertainty due to the immaturity of the Internet services market in Vietnam.
- (b) Three qualitative cases, i.e., Pessimistic, Moderate and Optimistic are considered.

7.3 Market Forecast

(1) POTS Teledensity (Main, Scenario 3 @ 10.0%, National Level)

Year	1997	2000	2005	2010	2020
Teledensity	1.86	3.01	5.25	8.29	17.62

(2) CMTS Users (ditto)

Year	1999	2000	2005	2010	2020
CMTS Users	295,200	341,000	1,109,400	2,785,600	4,717,100

(3) Internet Users (Optimistic: doubled in 2 years)

Year	1999	2000	2005	2010	2020
Internet Users	42,100	59,600	311,600	1,077,600	2,128,800

CHAPTER 8 TRAFFIC FORECAST

This chapter contains the traffic forecast of the target year 2000, 2005 and 2010, in each province as an integrated network.

8.1 Methodology

Due to the difficulty of collecting historical data, the gravity model was used to forecast traffic matrix volume. This model calculates the traffic volume between two exchanges by using "community factor" based on distance.

8.2 Estimation of Calling Rate

In this study, future calling rate was estimated based on the following Vietnam traffic feature.

- (a) High calling rate, because of high percentage of business users
- (b) High percentage of local calling because of the current tariff system (i.e. local call charges within 300 or 450 minutes per month are included in the subscription charge).
- (c) Sharp decrease of calling time per subscriber

Calling rate will continue to decrease for 10 years in accordance with the increase of residential telephone subscribers. The estimated calling rates used for the traffic forecast in this study are shown in Table 8.2-1.

Table 8.2-1 Calling Rate

CR	2000	2005	2010
HNI	0.087	0.077	0.068
HCM	0.094	0.082	0.072
Other	0.085	0.075	0.068
Country(Average)	0.088	0.077	0.069

Unit: Erlang

8.3 Traffic Distribution Ratio

The ratio of intra-provincial traffic is high and the ratio of a local telephone call will increase in the future. Past trend of traffic flow was used for the future. The average traffic distribution ratios in years of 2000, 2005 and 2010 are shown in the Table 8.3-1 and the traffic matrix of target year of 2010 is illustrated in the Figure 8.3-1.

Table 8.3-1 Traffic Distribution Ratio

	2000	2005	2010
Intra-province	82.1 %	82.8 %	83.3 %

Inter-province	15.4 %	14.9 %	14.5 %
International	2.5 %	2.3 %	2.2 %

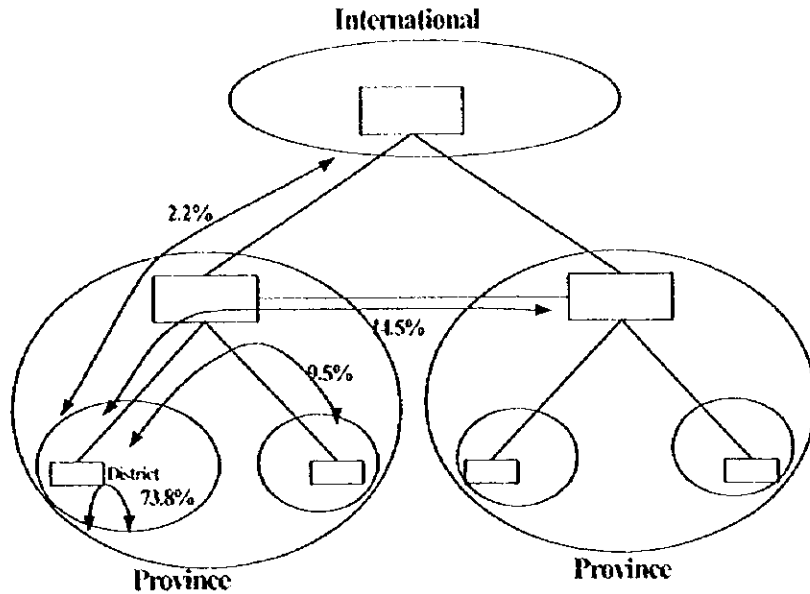


Figure 8.3-1 Traffic Distribution Ratio at 2010

8.4 Traffic Matrix of Target Year

Traffic between provinces was estimated for each phase based on the number of estimated subscribers and calling rate for toll calls. Traffic matrices between provinces calculated for 2000, 2005 and 2010 are shown in Appendix in Volume III.

8.5 International Telephone Traffic Forecast

8.5.1 Forecast of Total Chargeable Minutes (Outgoing+Incoming) of International Telephone

The fundamental growth rate of international telephone traffic has been obtained by fitting the following exponential curve to the above historical data through the method of least squares:

$$\log_{10} \text{TPMTOT} = -247.82 + 0.12537 * \text{YEAR} \quad (R^2 = 0.989)^*$$

Where: TPMTOT= Total Telephone Minutes (M)

YEAR= four digits of Christian era

* Multiple correlation coefficient denoted by R

As to the super-imposing growth rates by the GDP per capita, enhancement in domestic network and additional increase in subscribers, the estimated figures based upon various

kinds of studies are shown below together with basic and total growth rates.

Table 8.5.1-1 Growth Rates

Year	Basic Growth (%)	Factor on GDP per capita Growth (%)	Factor on Domestic network Growth (%)	Factor on Subscribers Growth (%)	Total Growth (%)
Existing (1997)	33.4	1.5	0.2	3.3	38.4
2000	20.0	1.0	0.2	1.1	22.3
2005	15.0	0.8	0.2	0.5	16.5
2010	12.5	0.7	0.2	0.3	13.7

The forecast of IDD calls (Outgoing + Incoming) for 1998 through 2010 has been estimated based on the data obtained from VNPT. The curve fitting by means of the method of least squares applied to the total telephone minutes in relation to the GDP per capita are given on the above Figure 6.3.1-1 and the following formula has been used:

$$\text{Log } Y = 1.8729 X - 2.1973$$

Where: Y = Total Telephone Minutes (M)

$$X = \log_{10} \text{GDP per capita (US \$)}$$

In this master plan, the international telephone traffic for the period up to the year 2020 has been forecasted by the following Gompertz curve formula:

$$\text{TPMTOT} = 118,418 * (0.0063)^{0.971035 \wedge t}$$

Where: TPMTOT = Total Telephone Minutes (M)

$$t = 1 (2003), 2(2004), 3(2005) \text{-----}$$

The forecasted demand for international telephone traffic calculated by the above is shown in Table 8.5.1-2.

Table 8.5.1-2 International Telephone Traffic Forecast Vietnam-World (Outgoing+Incoming)

Year	GDP per capita(US \$)	O/G Telephone Minutes (M)	Total Telephone Minutes (M)
1998	362	67	393
1999	398	81	470
2000	438	97	562
2005	643	208	1,155
2010	902	405	2,177
2015	1,206	719	2,499
2020	1,556	1,192	2,980

8.5.2 Forecast for Number of International Circuits

It is recommended to use the following formula to estimate mean offered busy-hour traffic (in Erlang) from the Micro-forecasts (in annual paid-minutes).

$$E = (A * M * D * H) / (60 * \eta)$$

Where E: the estimated mean traffic in Erlangs offered in the busy-hour

A: the total annual paid minutes (Micro-Forecasts)

M: Busy month to year ratio (e.g. M=month/year: 9.58%)

D: Weekday to busy month ratio (e.g. D=day/month: 4.38%)

H: Busy hour to weekday ratio (e.g. H=hour/day: 8.88%)

η : the efficiency factor, i.e. Paid minutes to circuits holding time ratio
(e.g. η =paid/hold: 0.889)

After calculation of the offered busy-hour traffic (in Erlang), the number of required circuits can be obtained by using the Erlang B Formula substituting the adequate loss probability.

The required number of circuits was calculated from these Erlang values by using a loss probability of 1 % in accordance with the ITU-T Recommendations E520.

Table 8.5.2-1 Required Number of International Circuits for Telephone between Vietnam and the World according to the estimated traffic forecasting data

Year	ITC-1(Ha Noi)	ITC-2(Ho Chi Minh)	ITC-3(Da Nang)	Total
1997	849(1,632)	1,925(2,913)	144(330)	2,918(4,875)
1998	965 (1,666)	2,143(2,897)	162(450)	3,270(5,013)
1999	1,147	2,615	191	3,953
2000	1,365	3,120	225	4,710
2005	2,760	6,361	440	9,560
2010	5,157	11,936	807	17,900

Note: a parenthesized figure () shows the number of actual telephone circuits.

CHAPTER 9 FORMATION OF DEVELOPMENT INDICATOR

9.1 Basic Concept of Master Plan

The Government has been strongly emphasizing the needs for adequate, efficient and reliable infrastructures in the national development policy. Telecommunications policy has been established by the DGPT in keeping with the Economic Policy Statement of the Government of Vietnam to achieve universal service covering the whole country including all villages.

This master plan covers long-term development plan for the telecommunications networks up to 2010 in whole Vietnam. The planning period up to 2010 is divided into several milestones as target year i.e. a 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).

9.2 Target Level of Telephone and Cellular Mobile Density

DGPT intends to achieve that the telephone and cellular mobile services are to be made available on demand nationwide. In consequence, all the planning components consisting of supply plan, network plan, facility plan, manpower plan, etc. are prepared based on the above condition. Telephone and Cellular Mobile density are a vital index, which are shown in Table 9.2-1.

Table 9.2-1 Targets of Telephone and Cellular Mobile Density up to 2010

	Existing 1998	Phase A 2000	Phase B 2005	Phase C 2010
Telephone Density per 100 people	2.33	3.01	5.25	8.29
Total main lines (X1000)	1,792	2,398	4529	7,660
Cellular Mobile Density per 100 people	0.30	0.44	1.12	1.74
Total Mobile Terminal (X1000)	234	347	968	1,607

9.3 Target Level of the Development in Rural and Remote Areas

To reduce a gap of telephone services between urban and rural/remote area, the introduction of telephone services in rural/remote areas shall be carried out by the year 2010. It is estimated that the telephone services have not yet provided in about 3,000 communes at the end of 1997. To provide telephone services in these communes, the following targets for access networks is established (Table 9.3-1).

Table 9.3-1 Target Number of Communes to be Served

	Phase A 2000	Phase B 2005	Phase C 2010	Total
Metallic Cable	200	500	500	1,200
VSAT	50	125	125	300
Radio Subs System	300	600	600	1,500
Total	550	1,225	1,225	3,000

Application criteria for access network system in rural and remote areas are proposed considering the demand and geographical distribution.

9.4 Development Indicator of Access Network

9.4.1 Metallic Access Network

The conventional metallic access network in Vietnam has been constructed widely and will be still mainly expanded with the growth of the POTS demand.

(1) Subscriber Cable Network

The metallic cable network consists of primary and secondary cable sections that shall be cross-connected in one cabinet.

For the subscriber cable expansion/maintenance activities in Vietnam, the following design policies are recommended;

- (a) Maximum transmission loss for subscriber cable; 7 dB
- (b) Maximum cable loop resistance ; 1,000 Ω
- (c) Provisioning periods for Planning

The recommended provisioning periods for primary cable, secondary cable and duct system are 5-year, 10-year and 15-year, respectively.

(2) N-ISDN (BRI) on Metallic Cable Network

The current metallic cable networks can provide a new digital access service of N-ISDN basic rate. As compared with POTS, the transmission frequency bands of N-ISDN (BRI) are wider. Therefore, the electrical characteristics of crosstalk noise, impulsive noise and non-linear variation shall be well studied before the service commencement.

(3) xDSL on Metallic Cable Network

In upgrading the access network to be broadband-capable, re-use of existing infrastructure is one way to make the best use of existing assets.

Digital Subscriber Line (xDSL) on metallic cable will cover the future demand of high-speed service for the time being as a temporary step toward the optical access network establishment.

Since the frequency band in transmission of xDSL is expanded to Mega-Hertz order,

the applicable condition of the current metallic cable network is steady more than N-ISDN (BRI) technical considerations.

9.4.2 Optical Access Network

(1) Optical Access Network Overview

In the future in Vietnam, the new service categories will be expanded from narrow-band services to the broadband services in parallel with the POTS growth.

(2) OAN Roll-out Steps

The OAN in Vietnam will be evolved as shown in Table 9.4.2-1.

Table 9.4.2-1 OAN Evolution in Vietnam

Year	Optical Access Network Evolution	Associated Services
1998 to 2000	For the coming years, mainly the conventional metallic networks will be still expanded and numbers of optical fiber systems will be introduced in the forms of FTTB and/or FTTCab in Ha Noi and Ho Chi Minh City, but not aggressive.	<ul style="list-style-type: none"> - POTS - Dedicated data line - Introduction of ISDN, xDSL - <i>FTTB/FTTCab</i> - <i>Study of FTTC</i>
2001 to 2010	Until year 2010, still the metallic network will increase, while FTTB and FTTCab will be expanded in the leading cities and the industrial districts. FTTC will be introduced and strategically increases and at the same time FTTH will be required.	<ul style="list-style-type: none"> - POTS, ISDN - Mid-band Service - <i>FTTB and FTTCab (hybrid fiber-metal)</i> - <i>FTTC and FTTH</i>
2010 to 2020	The deteriorated metallic networks will be replaced with the OAN. The demand will increase still in POTS and mid to broad-band services that will be accommodated in the forms of FTTC and FTTH.	<ul style="list-style-type: none"> - POTS, ISDN - Mid-band Service - Broad-band Service - <i>FTTB, FTTC and FTTH</i>
Beyond 2020	When the nation will be well advanced, a goal of all fiber networks will be set as a final target. In the forms of FTTx, all the predicted services will be able to be provided for the customers anywhere.	<ul style="list-style-type: none"> - POTS - Mid-band Service - Broad-band Service - <i>Target of all-fiber network</i>

9.4.3 Radio Subscriber System

(1) General

In general, these systems can be classified into the following types:

- (a) Cellular based system (WLL)
- (b) TDMA (Time Division Multiple Access) system

The comparison between cellular based system and TDMA system is summarized in Table 9.4.3-1.

Table 9.4.3-1 Comparison between Cellular Based System and TDMA System

Item	Cellular based System	TDMA System	Remarks
	Based on Cellular Mobile or Cordless Telephone Systems	Using TDMA technology	
Radio Frequency Band	800/900 MHz bands 1800/1900 MHz bands	1.4/1.5/2.4/3.5 GHz bands (generally)	
Coverage Area	Small (Smaller than approx. 15 km in radius)	Large (Smaller than approx. 30 km in radius)	
System Capacity	Large (Several tens of thousands lines)	Small (Approximately thousand lines)	
Capacity / Subscriber	1 line / subscriber (generally)	Plural lines / subscriber	
Repeater Function	Not included	Included	

(2) Future Trend of Systems

(a) Cellular based system (WLL)

These types of systems will be developed in parallel with the development of the cellular mobile system. (refer to Section 9.5) Therefore, the transmission speed will be expanded to correspond to the multimedia services.

In addition, the cost of the system is expected to be reduced in order to compete with the cable system.

(c) TDMA System

This type of systems may co-exist with the cellular based systems due to its effectiveness in low demand areas. Besides, the system may be developed to correspond to higher data communications such as multimedia services.

9.4.4 VSAT System

(1) General

The VSAT system is technically suitable to apply in isolated areas, but the cost for earth stations and leased charge of transponders is critical point to decide the introduction. In addition, low/medium earth orbit (LEO/MEO) systems may be utilized not only for mobile services, but also for fixed services, therefore, the VSAT system should be utilized considering the system features comparing with these systems.

(2) Future Trend

The trend of the VSAT system is to reduce its cost and to expand its transmission capacity by modifying its system parameters such as access scheme and modulation scheme. The VSAT system will be co-exist due to its peculiar features with the other satellite communications systems such as LEO/MEO systems.

9.5 Development Indicator of Mobile Communications

9.5.1 Cellular Mobile Telephone Network

(1) General

There are many types of cellular mobile telephone systems in the world, i.e., GSM, PDC, digital AMPS, CDMA systems, etc. To expand and improve the cellular mobile telephone network, the introduction of the following systems should be considered.

- (a) PCS, PHIS and PCN
- (b) IMT-2000
- (c) GMPCS
- (d) MMAC

(2) Development Scenario of Cellular Mobile Telephone Network in Vietnam

The development scenario of cellular mobile telephone network is established as follows:

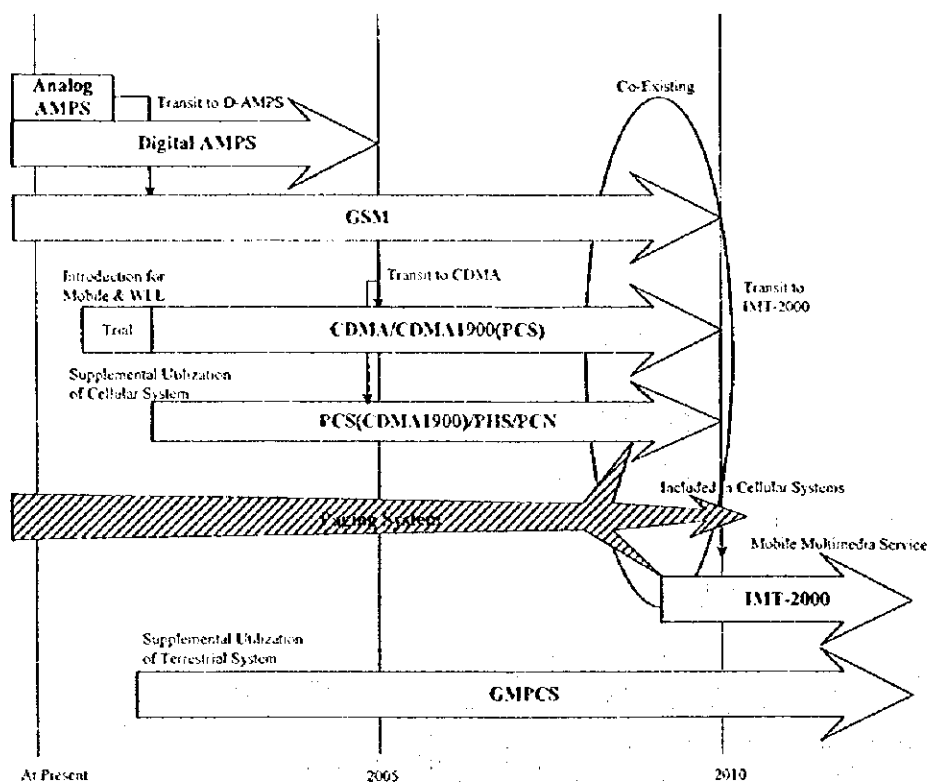


Figure 9.5.1-3 Cellular Mobile Systems to be applied

- (a) Analog AMPS will be replaced/absorbed by D-AMPS or the other cellular

systems such as GSM and CDMA.

- (b) GSM may be utilized for the time being by the introduction of IMT-2000 due to its popularity in the world, but the major position in the cellular mobile service may be replaced by CDMA.
- (c) CDMA may be introduced as trial in specific areas, and based on the result of the trial CDMA is expected to play a major role in cellular mobile service before the introduction of IMT-2000. At present, VIETTEL and Saigon Postel have plans to introduce CDMA systems in the future.
- (d) PCS/PHS/PCN systems may be utilized in specific areas, especially in urban areas as supplemental systems to the cellular mobile systems due to their technical and economical reasons.
- (e) Cellular mobile systems have a function of paging/short message service, therefore, cellular mobile service may assimilate paging service if the fee of cellular mobile services is reduced as same as that of paging service.

9.5.2 Paging Network

(1) General

The paging system shall be expanded considering the following potential systems:

- (a) New Pager with Multi-function
- (b) Paging System using GMPCS
- (c) Paging Function using PCS/PHS/PCN

(2) Target of Paging Network in Vietnam

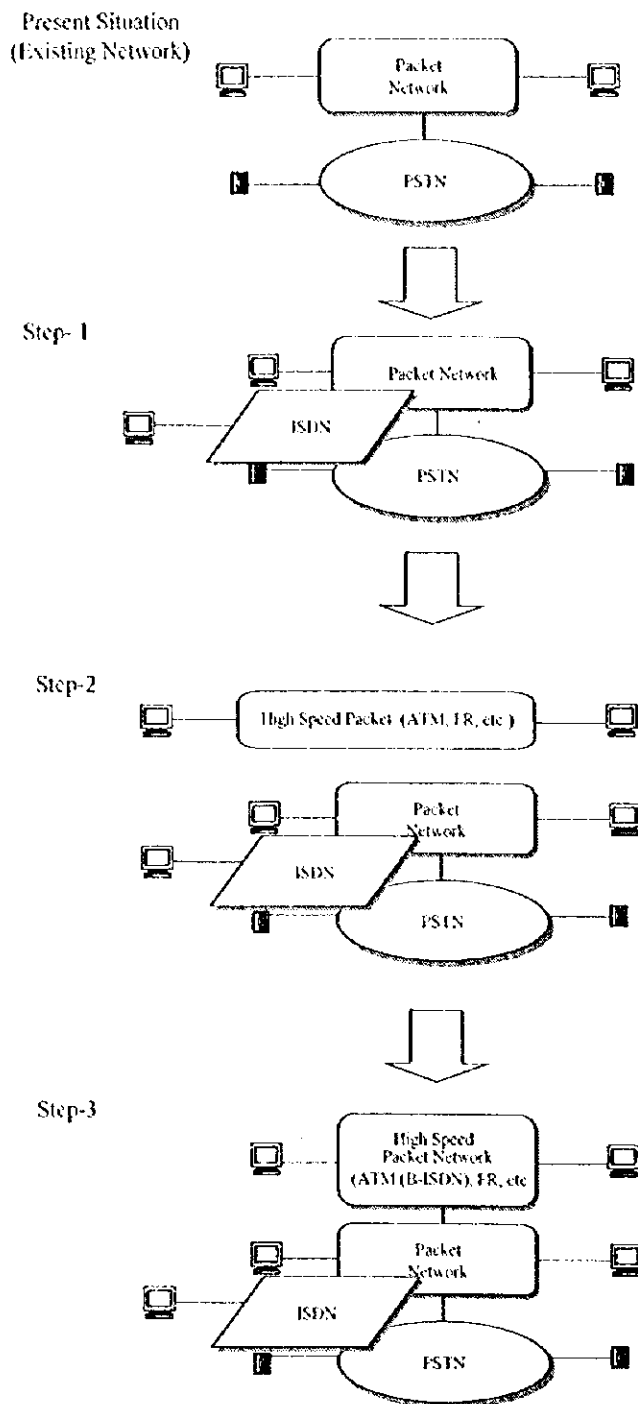
The target of paging service is established considering the above tendency and the forecasted demand as follows:

- (a) Improvement of service in quality
- (b) Re-consideration of tariff
- (c) Assimilation with cellular mobile service

9.6 Development Indicator of Non-Voice Communications

9.6.1 Scenario of New Service Introduction

It is tentatively considered that the introduction of new services for data communications should be carried out based on the following scenario by transition from the existing networks/services:



Step-1
N-ISDN (mainly Basic Rate Interface) services will be introduced corresponding to the demand of higher data transmission speed through PSDN. Also, the new data communications systems such as Frame Relay and ATM will be investigated.

Step-2
Primary Rate Interface of N-ISDN will be expanded, and ATM and/or FR technology will be introduced. ATM/FR service will be applied to the special users, which number would be expected to be small. In this stage, ATM/FR will be applied as bearer service.

Step-3
Broad-band ISDN (B-ISDN) will be introduced together with ATM/FR. ATM/FR service will be provided as switch bearer service.

Figure 9.6.1-1 Scenario of New Service Introduction

9.6.2 Overall Qualitative Prediction

Based on the overall introduction plan mentioned above, the trend of data communications in Vietnam can be predicted as follows:

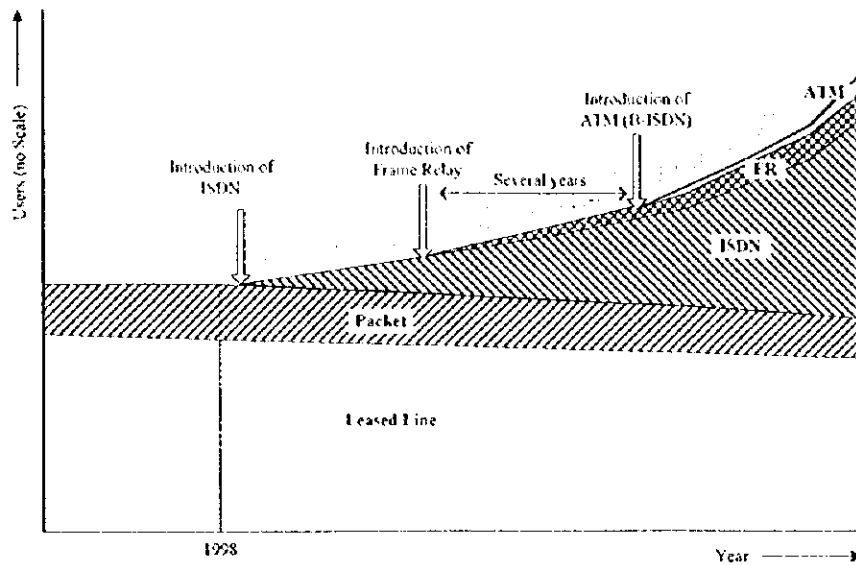


Figure 9.6.2-1 Trend of Data Communications in Vietnam

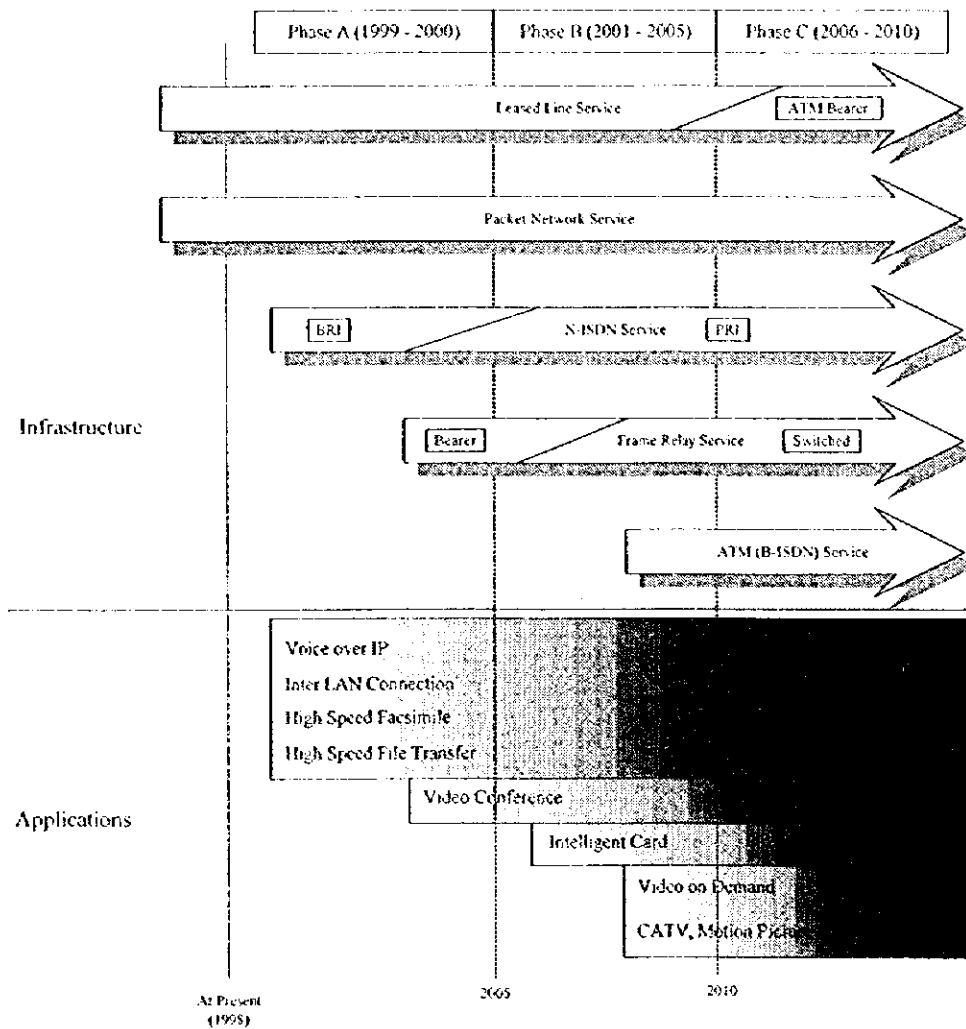


Figure 9.6.2-2 Introduction of Non-Voice Communications Services

The major new services and applications other than the existing services will be introduced in Vietnam as follows:

(a) Voice over IP

VoIP, which is expanded outside of the Internet, stands for technologies and services which realize conversation service by putting packetized voice signal through networks with IP interface in general. However, VoIP still has the several technical issues to be overcome.

The introduction of VoIP technology could benefit the integration of voice and data systems, so the VoIP service will be also introduced in the near future in Vietnam as corporate network.

VoIP is one of the key technologies for new value added services. However, use of the Internet for VoIP is not practical in general because of its quality problems, especially, in the case where network quality is not so good. Considering the above conditions it is better to expand VoIP service after the improvement of PSTN and introduction of ISDN network.

(b) High-speed Facsimile and File Transfer

These applications may be available during Phase A by the introduction of N-ISDN (BRI).

(c) Inter-LAN Connection

These applications may be available during Phase A by the introduction of N-ISDN (PRI), and expanded during Phase B by using Frame Relay and ATM.

(d) Video Conference

Video conference can be available during the Phase A in specific areas by using high speed leased lines, and full-scale introduction may be carried out during Phase B by using Frame Relay and ATM.

(e) Video on Demand

Video-on-demand may be available during Phase B by the introduction of Frame Relay and ATM.

(f) Intelligent Card

A limited service of Intelligent card may be available during Phase B corresponding to the improvement of the communications infrastructures.

In addition to the above applications, the following application will be available by combination and utilization of the new infrastructures:

(g) Telemedicine

The services are expected to be introduced by the end of Phase A and will be expanded/improved during Phase B.

(h) Remote Education

These services will be possible by the end of Phase A as same as the Telemedicine.

(i) Disaster Management

These services also will be available by the introduction of high speed, high capacity networks and expansion of these networks by the end of Phase A.

(j) Electronic Commerce

Electronic commerce (EC) is a promising service by using non-voice communications, but this service requires fully developed digital network nationwide from the technical viewpoint. Considering the conditions in Vietnam, the fundamental network should be expanded and improved nation-wide prior to the introduction of EC service.

9.7 International Network Plan

9.7.1 International Telecommunications Development Indicator

(1) Main Use of Optical-fiber Submarine Cable

For international transmission lines, the optical-fiber submarine cable shall be used mainly in order to provide the customers with the most reliable and superior services by routing the international traffic on its submarine cable circuits instead of satellite circuits. Up to the year 2000 it is planned to increase the cable circuits occupancy ratio from 60 % to 80 %.

Da Nang earth station (DAN-1B) can be dismantled as a result of the activation of the SEA-ME-WE3.

(2) Distribution of the several services of circuits to the plural routes

In providing the international circuits it is necessary to take the connectivity with other destination, economization and the reliability into account. The international circuits are distributed to several transmission media (submarine cables and/or satellite, etc.) and to the switching centers. In this respect, the satellite circuits can be used to supplement the optical-fiber submarine cable network and be used to route the telephone calls by making diversity with the cable circuits to secure the high reliability network. For example, in case of large capacity of the communication destination, the international circuits are distributed to set up the ratio at 2:1 between the optical-fiber cable and the satellite.

(3) Expansion of direct telephone circuits

From the viewpoints of the national interests, the communications reliability and the circuit cost efficiency, it is desirable to establish the direct circuits when there is a traffic in excess of approximately 60,000 minutes per year. The network planning with expansion of the direct circuit is more advantageous to when the rapid growth of traffic is expected.

9.7.2 Facilities Plan

The following investment plan to develop the network infrastructure in the international telecommunications services is necessary to make base for info-communication market during the early of 21st century.

Time Frame: from now to 2010

- (1) The start of the network operation of SEA-ME-WE3 optical submarine cable system
- (2) The start of the network operation of CSC optical fiber cable over the land
- (3) Expansion of the VSAT network to expand the business applications needs for the IPLC services and to upgrade the domestic satellite communication network in the rural and remote area
- (4) Development and deployment of GMPCS service
- (5) Expansion of the ISDN and IN services, and development and deployment of the international frame relay service and the international ATM service
- (6) Bringing the Global Maritime Distress Safety System (GMDSS) into operation for handling distress messages from international shipping and the start of the full-scale INMARSAT services
- (7) Development and deployment of the second-generation ATM based digital switching systems in succession to existent AXE-105 series switching systems.
- (8) To build the telecommunication systems for telemedicine and distant learning through digital telecommunication (VSAT network, ISDN and ATM)
- (9) Development and deployment of the integrated Network Management System toward realization of the TMN concepts
- (10) Development and deployment of a domestic submarine optical cable network along the coast to provide the both international and domestic telecommunication backbones.
- (11) To launch Vietnam's first telecommunication satellite (VINASAT) to use the satellite as a multi-purpose multimedia satellite

9.8 Orientation on Private Network Development

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
- 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.

CHAPTER 10 TELECOMMUNICATIONS NETWORK PLAN

10.1 Switching Network Plan

The Switching Network which consists of two simple hierarchical structures is recommended. At present, HNI, DNG and ICM are working as the National Transit Switch node. However, to cope with the increase of traffic, the number of National Transit Switch node should be extended from 3 to 7. The figure 10.1-1 shows the transition of network configuration.

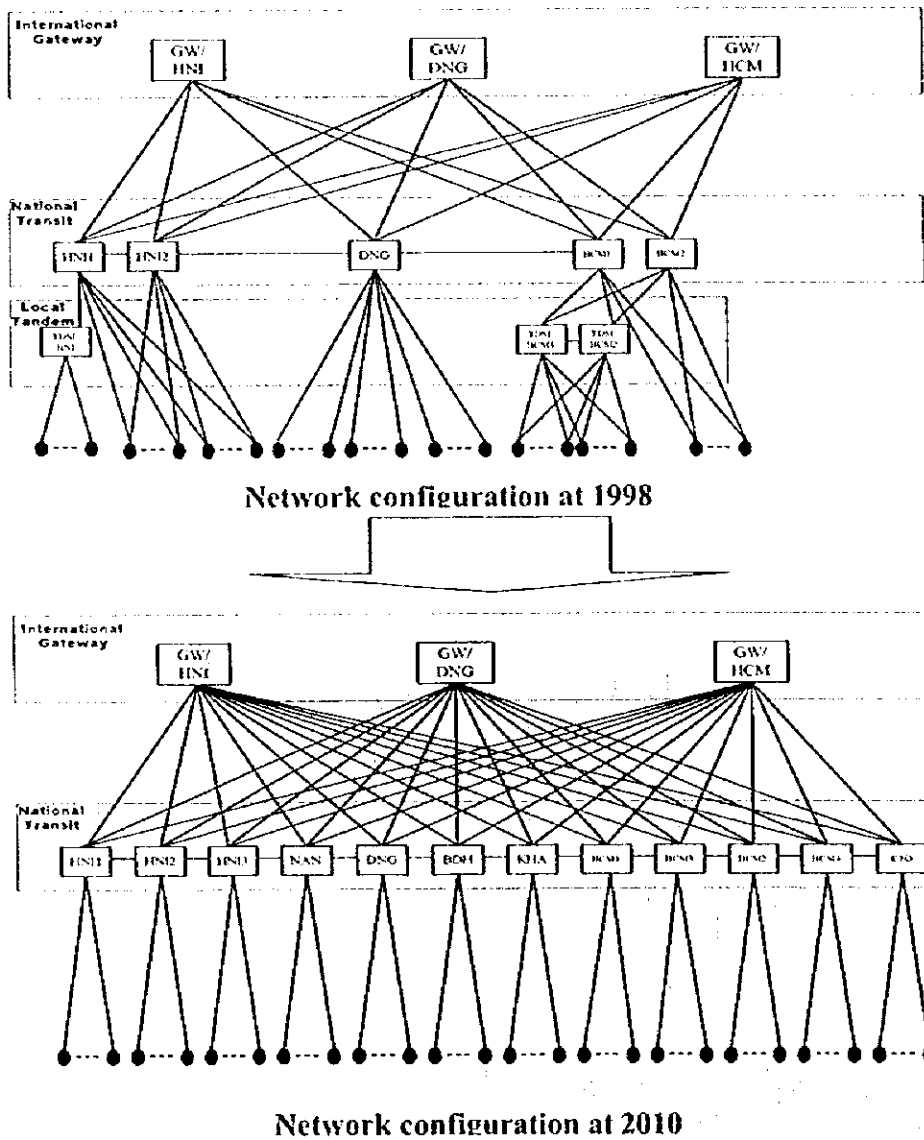


Figure 10.1-1 Transition of Network Configuration

10.2 Transmission Network Plan

Three (3) layer Network structure is recommended. Backbone loop is added to current network as a top layer of the current SDH network for efficient pass accommodation design. (see Figure 10.2-1)

(1) Top layer (Backbone Network)

The top layer pick up and transmit the traffic among Hanoi, Vinh, Da Nang, Q.Nhon, Na Trang and Ho Chi Minh.

(2) Mid layer (Regional Network)

The Mid layer spreads the SDH Network to the all capital city in province (61 cities).

(3) Bottom layer (P&T Network)

The Network pick ups the traffic within the P&T and delivers the traffic to mid layer.

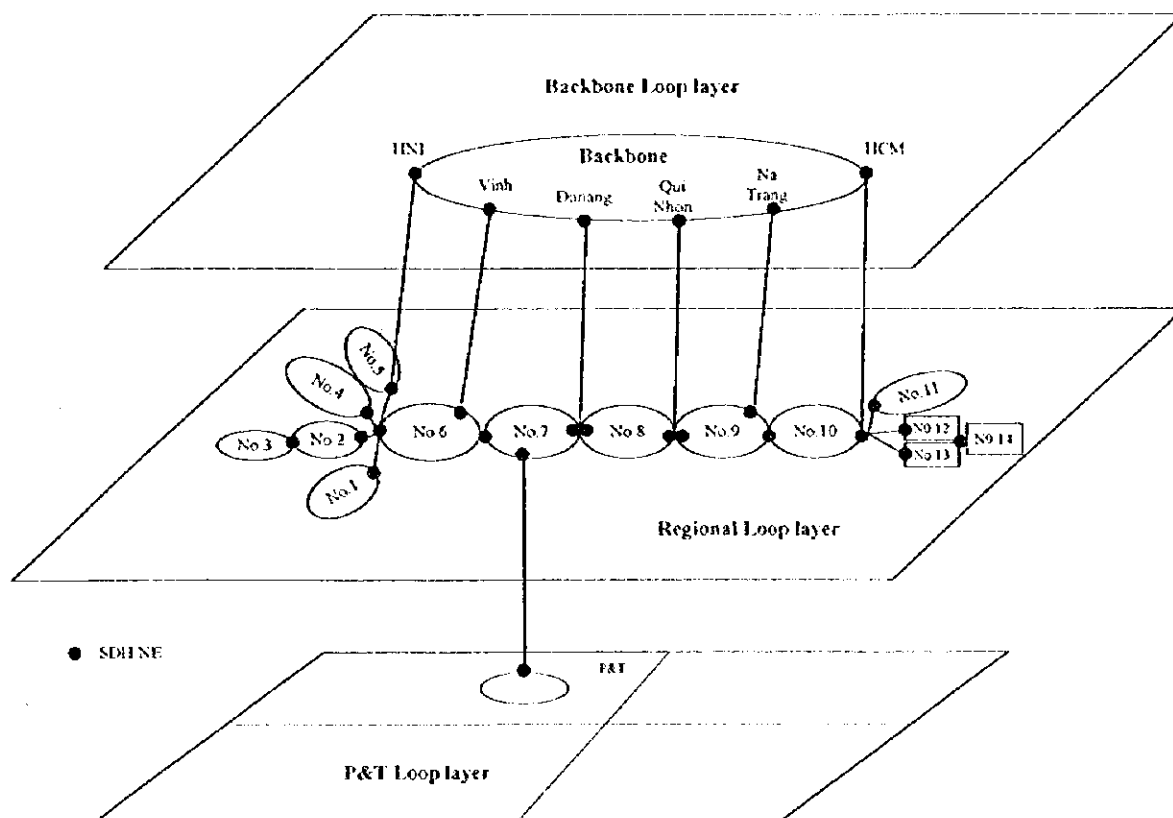


Figure 10.2-1 Multi-Layer Network

10.3 Access Network Plan

10.3.1 Access Network to be applied

The access network/system shall be selected and determined in a service area with due

consideration of the cost comparison, operation/maintenance circumstances, strategic aspects, geographical conditions and so on.

- (1) Conventional Metallic Access Network
- (2) Optical Access Network
- (3) Radio Subscriber System
- (4) VSAT System

10.3.2 Classification of Objective Areas to be covered

The distribution of both types of teledensities, i.e., main line / 100 inhabitants and main lines / km², is summarized in Table 10.3.2-1.

Table 10.3.2-1 Teledensity

Main Lines / 100 inhabitants			Main Lines / km ²		
Teledensity	No. of Districts	%	Teledensity	No. of Districts	%
0-1 (less than 1)	328	67.2	0 - 1 (less than 1)	155	30.9
1-5	104	21.3	1 - 10	243	48.2
5-10	45	9.2	10 - 50	38	7.5
10-15	7	1.4	50 - 100	25	5.0
15-20	4	0.8	100 - 500	27	5.4
Total	488	-	500 - 1,000	3	0.6
			1,000 - 2,000	3	0.6
			2,000 - 3,000	3	0.6
			3,000 - 4,000	0	0.0
			4,000 - 5,000	2	0.4
			5,000 - 6,000	1	0.2
			6,000 - 7,000	1	0.2
			7,000 - 8,000	1	0.2
			Total	502	-

Considering the feature of telephone services, the objective areas covered by access network can be classified into several categories as shown in Table 10.3.2-2.

Table 10.3.2-2 Classification of Objective Areas for Access Network

Category	Typical Area/Location
Metropolitan Area	Metropolitan areas with high teledensity (central areas of Ha Noi, Ho Chi Minh). Telephone services are provided throughout province, and the main lines/100 inhabitants and main lines/km ² are very high in these areas. Teledensities are about 10 main lines/100 inhabitants and 1,000 main lines/km ² or more.
Big City	Big cities with high teledensity such as Provincial capitals. Telephone services are provided throughout city, and the main lines/100 inhabitants and main lines/km ² are high. Teledensities are about 5 main lines/100 inhabitants and 50 main lines/km ² or more. About 10 % of districts can be classified into this category.
Country Area	Country areas with medium teledensity located in plain areas. Telephone services are provided within city or town, but the penetration ratio is not so high. Teledensities are around 1 main line/100 inhabitants and 10 main lines/km ² or less. Nearly 10 % of districts are this category.
Remote and Rural Area	Mountainous and/or isolated areas with very low teledensity (less than 1 main line/100 inhabitants and 1 main line/km ²) or non-telephone such as isolated island and mountainous bordering areas. About 80 % of districts belong to remote and rural area.

10.3.3 Justification of Access Network Application

(1) Justification by Area

The application of the access networks to POTS is justified considering the objective areas and the features of each access network as shown in Table 10.3.3-1.

Table 10.3.3-1 Justification of Access Network Application by Area

	Metallic	OAN	TDMA	WLL	VSAT	Remarks
Metropolitan Areas	⊙	⊙	△	⊙	×	
Big Cities	⊙	⊙	○	○	×	
Country Area	⊙	○	○	○	△	
Remote and Rural Areas	△	△	⊙	△	⊙	

Note: ⊙: Most suitable, ○: Suitable, △: Fair, ×: Not Suitable

(2) Justification by Service

The access network can also be justified from the viewpoint of service to be provided.

Table 10.3.3-2 Justification of Access Network Application by Service

		Metallic	OAN	TDMA	WLL	VSAT
Telephone	POTS	⊙	⊙	⊙	⊙	⊙
Data	up to 64 kbps	⊙	○	⊙	⊙	⊙
Communications	64 kbps – 2 Mbps	○	⊙	○	△	○
	More than 2 Mbps	△	⊙	×	×	△

Note: ⊙: Most suitable, ○: Suitable, △: Fair, ×: Not Suitable

10.3.4 Access Network Plan

The access network shall be applied based on the above considerations area by area and service by service.

(1) Metallic Access Network Plan

The metallic access network is generally applied as a fundamental access network to the POTS in the areas of "Metropolitan Areas", "Big City" and "Country Area".

Also this network can be applied to the data communications by using new access network technologies such as N-ISDN basic rate access and xDSL. These technologies enable to provide digital access services on the current metallic lines. In particular, the xDSL can provide broad band services and it may be utilized for the time being, until transition to OAN.

(2) Optical Access Network Plan

Considering economical and strategic aspects of the OAN deployment, it is to be applied in specific areas. The OAN utilizing DLC and PON systems is applied to the POTS in the areas of "Metropolitan Areas", "Big City" and "Country Area" and it can cover all the predictable broadband and high-speed multimedia services.

(3) Network Plan for Radio Subscriber System

(a) Cellular based System (WLL)

The WLL is generally applied to the areas of "Metropolitan Areas", "Big City" and "Country Area" to supplement the cable systems. In the case of application of the system, the frequency assignment should be carefully carried out considering the re-use pattern of the frequencies (radio channels). This network can be applied to the low speed data communications, so high-speed data communications require the other specific system.

(b) TDMA system

The TDMA system is generally applied to the areas of "Country Area" and "Remote and Rural Areas", where the cable construction is difficult from the economical and construction period's viewpoints. This network can be applied to the low/medium speed data communications by changing interfaces of the system. Also, the radio frequencies should be assigned to avoid interference between the existing microwave systems and the other radio subscriber systems. For this purpose, about 1,200 communes are a target to be covered by radio subscriber systems, and nearly ten thousands of telephone lines will be provided by the systems.

(4) Network Plan for VSAT System

The VSAT system is suitable to the isolated areas categorized "Remote and Rural

Areas". The network plan for VSAT system is carried out as follows:

(a) Network Configuration

The network applies mesh configuration.

(b) Number of Lines per VSAT Station

The number of lines should be limited to 2 - 3 lines or less per station.

(c) Number of VSAT Stations

About 300 VSAT stations will be installed nationwide.

(d) Space Segment to be used

The total number of telephone lines provided by VSAT system is approximately 750 lines based on the above consideration (300 VSATs x 2 -- 3 lines/VSAT). The possession of own satellite should be carefully considered from the overall viewpoints including utilization of satellite other than telecommunications such as broadcasting.

10.4 Mobile Communications Network Plan

10.4.1 Cellular Mobile Telephone Network Plan

(1) Expansion of existing Cellular Mobile Network

The analog system (AMPS) provided by Call Link in Ho Chi Minh City will be removed or replaced by the other system such as Digital AMPS (D-AMPS). To expand the systems and services, the following cellular mobile system is established:

(a) Mobile Switching Center

The capacities of mobile switches will be increased without an addition of mobile switching center.

(b) Base Station Controller

The capacities of the base station controllers (BSCs) will be expanded according to the increasing demand.

(c) Base Transceiver Station

Base transceiver stations (BTSS) and their approach links between BSCs and BTSSs will be added.

(2) Introduction of New Systems

(a) Introduction of CDMA

CDMA systems using 800 MHz bands will be introduced by VIETEL and Saigon Postel, and personal communications service (PCS, CDMA using 1900 MHz band) will be provided by AirTel.

(b) Introduction of PCS / PHIS/PCN

To supplement the cellular mobile services, PCS, PHIS and/or PCN which use the different frequency bands from the cellular mobile system, are very useful in specific areas such as urban areas.

(c) Introduction of GMPCS

GMPCS will be used only for supplemental service of the terrestrial cellular mobile services, and/or for fixed services in remote and rural areas due to its expensive tariff.

10.4.2 Paging System Network Plan

The improvement of the paging services is carried out mainly in quality. To improve the service quality the following items are considered:

(1) Expansion of Service Areas

Paging services cover 21 provinces/cities at present. Based on the forecasted demand, the service areas should be expanded.

(2) Increasing of Radio Channels

Corresponding to the increase of subscribers, the radio channels should be properly added.

(3) Expansion of Service

The service menu provided by paging service should be expanded, and necessary treatments for service provision should be carried out.

(4) Supplement by PCS / PHIS / PCN

To supplement the paging services in Vietnam, PCS, PHIS and/or PCN can be utilized. These systems will be introduced for the purpose of supplement of both the cellular mobile service, fixed telephone service and paging service.