

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

SYRIAN TELECOMMUNICATIONS ESTABLISHMENT (STE)  
THE SYRIAN ARAB REPUBLIC


THE STUDY  
ON  
NATIONAL TELECOMMUNICATIONS NETWORK  
EXPANSION PLAN  
IN  
THE SYRIAN ARAB REPUBLIC

FINAL REPORT

SUMMARY

AUGUST, 1996

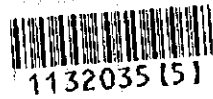
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## PREFACE

In response to a request from the Government of Syrian Arab Republic, the Government of Japan decided to conduct a study on National Telecommunications Network Expansion Plan and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Syria a study team headed by Mr. Makoto Tanaka, NTT International Corporation, and composed of staff members of NTT International Cooperation and NTT Data Institute of Management Consulting, 4 times between March, 1995 and July, 1996.

The team held discussions with the officials concerned of the Government of Syria, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

I wish to express my sincere appreciation to the officials concerned of the Government of Syrian Arab Republic for their close cooperation extended to the team.

August, 1996



Kimio Fujita  
President

Japan International Cooperation Agency





August 1996

Mr. Kimio FUJITA  
President  
Japan International Cooperation Agency

### Letter of Transmittal

We are pleased to submit to you the Final Report on the Study on National Telecommunications Network Expansion Plan in the Syrian Arab Republic.

This study was conducted by NTT International Corporation in association with NTT Data Institute of Management Consulting under the contract with JICA, during the period of March 1995 to August 1996.

In conducting the study, we have formulated a Master Plan for the development of telecommunications network up to the year 2010 which mainly intend to meet the demand for telephone lines, to create a communications network that is both secure and reliable, to introduce new communication technologies and services and to increase the efficiency of operational and administrative functions by computerizing them.

After formulating the Master Plan, we have executed a feasibility study on the identified projects extracted from the Master Plan.

And with regard to each project during the first five-year period (1996-2000) which corresponds to the period of the Eighth National Five-Year Plan, we have prepared the Action Plan which includes "review of the facilities plan and costs" along the lines of demand perception of Syrian side and we have also prepared the Detailed Plan about projects to be fulfilled urgently.


Main reports on the study consist of three volumes. The Volume 1 as the Master Plan describes "Services provision strategy", "Demand forecast", "Fundamental technical plan", "Long-term facilities plan", "Operations and maintenance", "Computerization", "Cost estimate", "Tariff plan", "Project evaluation", "Recommendation" and others. The Feasibility Study results on the identified projects, mainly focusing on Damascus city, extracted from the Master Plan are described in the Volume 2.

The Volume 3 as the Action Plan includes "Review of the telecommunications part of the Eighth National Five-Year Plan", "Developing the Plan further in detail", "Examination of the feasibility of its implementation" and "Detailed Plan".

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, and other Authorities concerned of the Government of Japan. We would also like to express our gratitude to the officials concerned of the Syrian Telecommunications Establishment, other related agencies of the Syrian Arab Republic, the JICA Syria office, and the Embassy of Japan in Syria for their cooperation and assistance throughout our study.

Finally, we hope that this report will contribute to further development of telecommunications field in the Syrian Arab Republic.

Very truly yours,



Hideaki KAMITSUMA  
President and CEO  
NTT International Corporation



**NATIONAL TELECOMMUNICATIONS NETWORK EXPANSION PLAN  
IN THE SYRIAN ARAB REPUBLIC  
(VOLUME 1: MASTER PLAN)**

Study period: Mar. 1995 to Aug. 1996

Counterpart: Syrian Telecommunications Establishment

**1. Background**

In 1993 there were about 550,000 main telephone lines, which means the penetration rate was 4.11 per 100 inhabitants. This figure is far below the average 10.4 in the Middle Eastern countries, and this low density of telephones is one of the obstacles to economic and social developments in Syria. As many as 1.94 million applicants were still without telephone lines at the end of 1995 according to STE's data. The most important task is to eliminate the waiting lists.

**2. Objectives**

The Master Plan for the National Telecommunications Network Expansion Plan (target year : 2010) is intended not only to meet the demand for telephone lines but also to create a telecommunications network that is both secure and reliable, to introduce new kinds of communications technology and services, and to increase the efficiency of STE's operational and administrative functions by computerizing them. Thus, the Master Plan aims at contributing to social and economic developments throughout Syria.

**3. Outline of the Plan**

**3.1 Concept**

Present facilities are not sufficient to create a telecommunications infrastructure that will provide the capacity and variety of systems needed to meet tomorrow's social and economic needs. The Master Plan therefore sets the following targets:

(1) Increase network capacity to meet the demands of all applicants by the year 2000 and keep up with the growing demands thereafter.

(2) Introduce mobile telephone and paging service, and expand Syria's ISDN and PSDN, and introduce a data network exploiting B-ISDN, FR and ATM technology.

(3) Computerize the STE's operational and administrative functions.

Taking into account the status of the existing systems, the relative importance of each of the existing and new systems, the relative importance of each area, and the economic growth that will be driven by the new telecommunications environment, it has been decided that these targets should be reached in three five-year plans.

### 3.2 Contents of the facilities plan

Table 1 Telecommunications facilities plan for each five-year plan

	The 8th five year plan (1996-2000)	The 9th five year plan(2001-2005)	The 10th five year plan (2006- 2010)
1. Telephone Network (Line units)	855,339	376,300	146,600
2. Mobile Services (Subs.)			
Mobile Telephone	71,822	76,752	62,616
Paging services	17,278	46,084	37,530
3. Data Com. Services (Lines)	675	1,535	* -555
4. Network Management (Centers)	3	1	-
5. TMN (Systems)	-	1	1
6. Computer System (Terminals)	564	12	756

Note: \* Because narrow-band lines transfer to broad-band lines.

### 4. Project Cost

The average annual investment cost for the proposed plan is about 73 million US. dollars. Because this is less than the estimated annual profit of STE (about 100 million US. dollars) during the plan's implementation, this is deemed "feasible investment size" as a long-term plan unless that profit changes from now on.

Table 2 Investment cost for each five-year plan (Unit: millions of US dollars)

	The 8th five year plan (1996-2000)	The 9th five year plan(2001-2005)	The 10th five year plan (2006- 2010)	Total
1. Telephone Network	583.3	178.6	121.4	883.3
2. Mobile Services	64.8	72.0	14.0	150.8
3. Data comm. Services	2.2	3.1	3.6	8.9
4. Network Management	3.0	10.0	-	13.0
5. TMN	-	15.0	5.0	20.0
6. Computer System	7.6	0.9	14.1	22.6
Total	660.9	279.6	158.1	1,098.6

Exchange rate (1995): 1US \$=42 Syrian Pounds

**NATIONAL TELECOMMUNICATIONS NETWORK EXPANSION PLAN  
IN THE SYRIAN ARAB REPUBLIC  
(VOLUME 2: FEASIBILITY STUDY)**

Study period: Feb. 1996 to Aug. 1996

Counterpart: Syrian Telecommunications Establishment

**1. Background**

The Master Plan which targets the year 2010 was prepared at the Phase 1 stage in order to improve the current telecommunications states and to establish a long-term telecommunications infrastructure expansion plan in Syria. Since it is important to execute projects in regular order according to the plan, projects to be fulfilled urgently is selected and their feasibility study is conducted at the Phase 2 stage.

**2. Objectives**

To evaluate the feasibility of each project during the first five-year period (1996-2000) in the Master Plan, a feasibility study on the identified projects such as telephone network, mobile telephone and computerization extracted from the Plan is conducted mainly focusing on Damascus city.

**3. Outline of the Plan**

**3.1 Concept**

The following systems are selected from the viewpoints of the urgent need to fulfill demand for telephones, introduce new services quickly, and improve customer service and management.

The target systems and areas are as follows:

- Telephone network expansion : Fulfillment of the demand in all Damascus city
- Mobile telephone system : Introduction to two big cities, Damascus and Aleppo
- Packet switched data network : Expansion of the existing and introduction of new system
- Computer system : Expansion of the existing and introduction of new system

The target year for each system in this Project is 2000, except for the Mobile telephone system which is targeted for 1998.

### 3.2 Contents of the plan

Table 1 Contents of the Plan

System	Area/Locations	Plan	Target year
1. Telephone Network	All Damascus city		2000
(1) Switching		Approx. 208 thousand units	
(2) Subscriber Network		Approx. 264 thousand pairs	
(3) Transmission		68 systems (Optical)	
2. Mobile Telephone	Damascus and Aleppo	Approx. 52 thousand subs.	1998
3. PSDN	Five big cities	380 lines	2000
4. Computer system	Five big cities, STE H.Q.	1 center, 25 telephone-center, 339 terms.	2000

### 4. Project Cost

The overall investment cost amounts to US \$ 110 million in foreign currency and this amount is almost the same as that invested in the project started in 1992.

It is estimated that it is feasible investment amount under the condition that the same financing program as that is available in the future.

Table 2 Investment cost

System	Foreign currency (MIL US \$)	Local currency (MIL S.P)
1. Telephone Network	62.5	1,328.8
2. Mobile Telephone	29.7	124.6
3. PSDN	1.7	6.6
4. Computer system	5.6	25.5
5. Contingency	9.9	148.6
Total	109.4	1,634.1

Exchange rate (1995): 1 US \$=42 Syrian Pounds

### 5 Project Evaluation

The projects in the plan are deemed "practicable" from both the technical and financial points of view and also deemed "indispensable" in providing the infrastructure for social and economic activities in Damascus and other cities surveyed.

#### 5.1 Financial Evaluation

According to the financial evaluation, this project has an FIRR of 16.1 percent for 10 years project evaluation period and 20.5 percent for 20 years.

## **5. Project Evaluation**

This plan is deemed "practicable" from both the technical and financial points of view and also deemed "indispensable" in providing the infrastructure for social and economic activities.

### **5.1 Financial Evaluation**

According to financial analysis based on a cost-versus-profit analysis, the projects have an FIRR of 14.29 percent. In this analysis capital expenditure and operation & maintenance cost in each year are used as costs, and the profit in each year is a result of the capital expenditure. When the FIRR calculation includes the benefits of computerization, the projects have an FIRR of 16.21 percent.

### **5.2 Review of the STE's Eighth Five-Year Plan**

The Action Plan was prepared in order to review the Eighth National Five-Year Plan, which forecasts a greater demand than the Master Plan does. As a result of this review, it has been determined that the feasibility of implementing the Five-Year Plan can be enhanced by undertaking the following policies:

- a. Periodical review of the demand and the facilities plans
- b. Financing programs and prioritization of the projects.
- c. Measures for dealing with the double number of new installations.
- d. Strengthening of Project Management

## **6. Recommendation**

- (1) Review of organization and business management
- (2) Authorization of the General Director
- (3) Creation of cost consciousness
- (4) Enhancement of incentives for employees
- (5) Review and enhancement of outside plant works
- (6) Arrangement of design and installation volumes on an annual basis
- (7) Reservation of the radio frequency band for new mobile services





## 5.2 Economic Evaluation

As a result of a sample survey, it is estimated that consumer surplus for business users is approximately 30 percent of total telephone charges and for residential users is approximately 50 percent.

## 6. Recommendation

- (1) Strengthening the forecasting section and assigning technically-trained staff to the forecasting section
- (2) Facility records are indispensable.
- (3) Improvement of project management



**NATIONAL TELECOMMUNICATIONS NETWORK EXPANSION PLAN  
IN THE SYRIAN ARAB REPUBLIC  
(VOLUME 3: ACTION PLAN)**

Study period: Jan. 1996 to Aug. 1996

Counterpart: Syrian Telecommunications Establishment

**1. Background**

In order to review the telecommunications part of the Eighth National Five-Year Plan, prepared by STE, in the course of the study for the Master Plan, it was proved to be essential to develop that part, which only concentrates on the accumulated number of waiting applicants and the number of exchange line units, further in detail (i.e. to forecast demand, to make facilities plan, and to estimate costs). Therefore, it was necessary to prepare the Action Plan as an action plan for the five years in order to increase the feasibility of its implementation.

**2. Objectives**

The objectives are to prepare an action plan for STE until the year 2000 in accordance with the STE's Eighth National Five-Year Plan and also to prepare a detailed plan which targets telephone network expansion in Damascus, introduction of mobile telephone system to Damascus and Aleppo, and introduction of packet switched data network and computer systems to five big cities as projects to be fulfilled urgently.

**3. Part 1 "The Eighth National Five-Year Plan"**

**3.1 Outline of the Plan**

The Plan set a goal to provisioning of transmission, exchange and subscriber network facilities and computerization in order to meet the demand of the more than 2 million waiting applicants by the year 2000.

**3.2 Contents of the Plan and its cost**

Table 1 Contents of plan and its cost (Unit: Millions of US Dollars)

Facilities/System	Contents of the Plan	Cost
Transmission	Approx. 260 systems	108.4
Exchange	Approx. 1,750 thousand subscriber lines etc.	292.0
Subscriber Network	Approx. 5 million cable pairs	505.7
Computer system	1 center, 48 Telephone-centers, 722 terminals	9.1
Total		915.2

Exchange rate (1995) : 1 US \$= 42 Syrian Pounds

### 3.3 Evaluation

The number of forecasted demand in the STE's National Five-Year Plan, which is calculated simply by adding the number of waiting lists to the number of applicants in future, is approximately twice that forecasted in the Master Plan, of which method is based on the correlation between demand density and the level of GDP per capita, taking account of national economic growth, recommended by ITU. Therefore, in order to realize projects in the Action Plan successfully, it is considered to be premises that future economic growth is strong to create the demand forecasted by STE. When the projects in the Action Plan are put into practice, it is essential to review the demand and the facilities plans periodically.

## 4. Part 2. "Detailed Plan"

### 4.1 Outline of the Plan

The target systems are selected mainly focusing on telephone network expansion plans in Damascus city in accordance with "Part 1. The Eighth National Five-Year Plan".

### 4.2 Contents of the Plan

Table 2 Contents of the Plan

System	Area/Locations	Plan	Target year
1. Telephone Network (1) Switching (2) Subscriber Network (3) Transmission	All Damascus city	Approx. 288 thousand units Approx. 580 thousand pairs 84 systems (Optical)	2000
2. Mobile Telephone	Damascus and Aleppo	Approx. 52 thousand subs.	1998
3. PSDN	Five big cities	380 lines	2000
4. Computer system	Five big cities, STE H.Q.	1 center, 35 telephone -centers, 539 terminals.	2000

#### 4.3 Project Cost

Table 3 Investment cost

System	Foreign currency (MIL. US\$)	Local currency (MIL.S.P)
1. Telephone Network	106.5	2,764.9
2. Mobile Telephone	29.7	124.6
3. Packet Switched Data Network	1.7	6.6
4. Computer system	7.1	33.7
5. Contingency	14.5	293.0
Total	159.5	3222.8

Exchange rate (1995): 1 US\$=42 Syrian Pounds

#### 4.4 Financial Evaluation

According to the financial evaluation, this project has an FIRR of 12.4 percent for 10 years project evaluation period and 17.6 percent for 20 years.



Unless otherwise stated, the following  
exchange rate prevailing in 1995 has  
been used: USD 1.00 = S.P 42.00

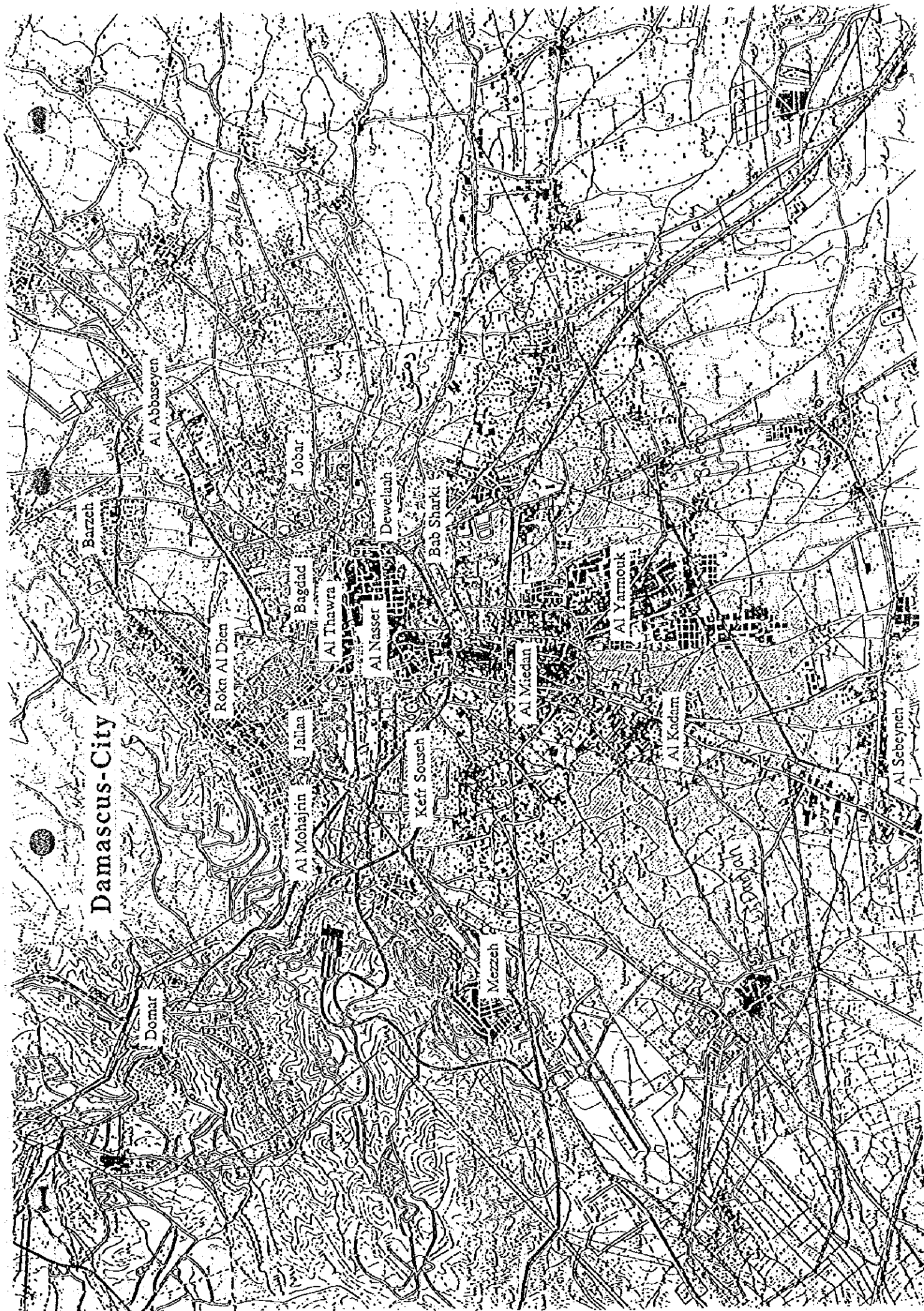




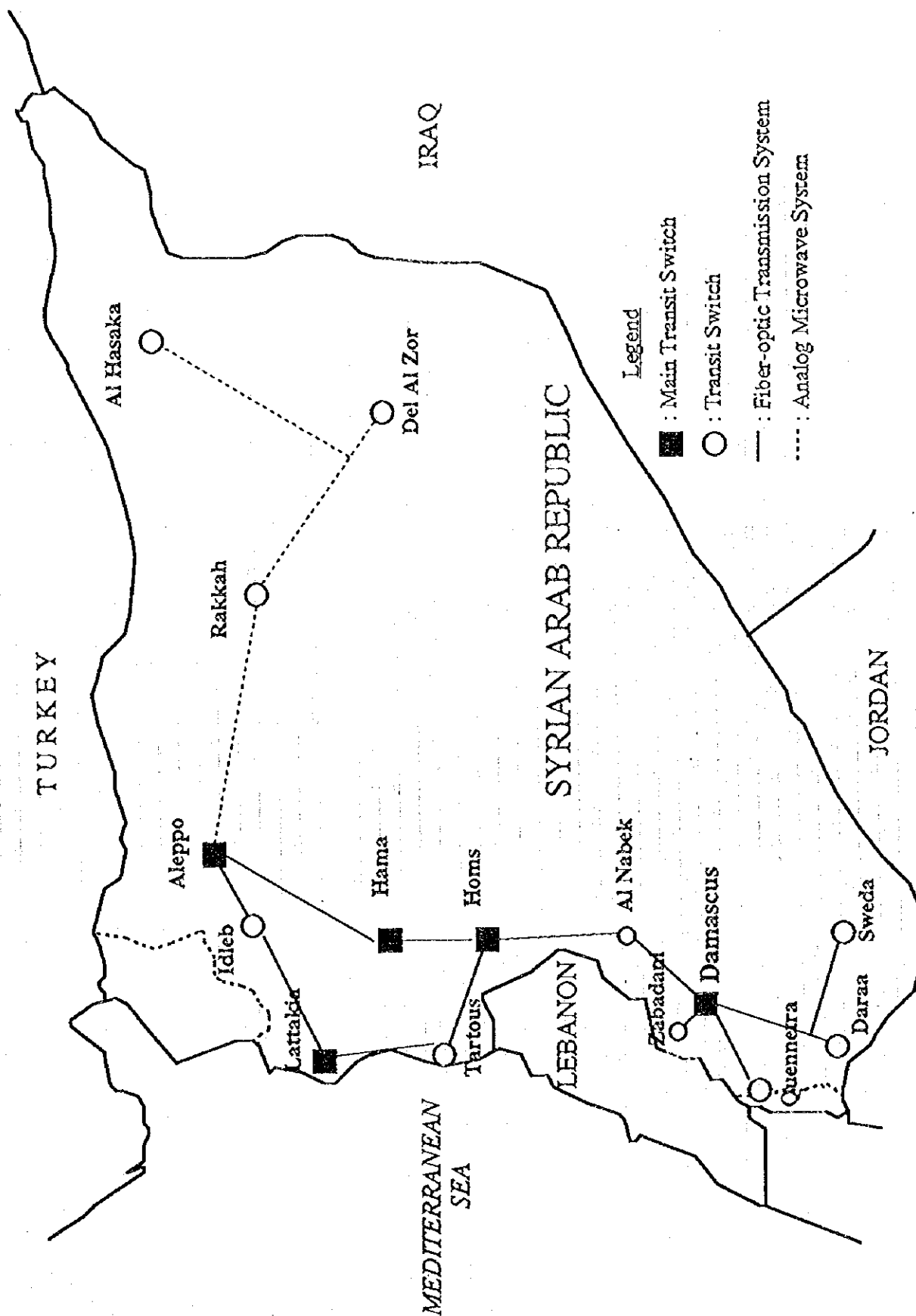




# Damascus-City







Route Map of STE National (Backbone) Telecommunication Network



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## Abbreviation

APX	: (Name of Product/ Device)
ATM	: Asynchronous Transfer Mode
B-ISDN	: Broadband-ISDN
B.S	: Base Station
BSC	: Base Station Controller
BTS	: Base Transceiver Station
CCC	: Cross Connection Cabinet
CCS	: Common Channel Signalling System
CENTREX	: Centralized Extension System for Business Customers
dB	: deciBel
ECOM	: (Name of Product/ Device)
EMD	: Edelmetall Motor Drehwähler Switch of Siemens
erl	: erlang
EWSD	: Elektronische Wähle System Digital (Digital Electronic Switching System) of Siemens
FEP	: Front End Processor
FIRR	: Financial Internal Rate of Return
FR	: Frame Relay
GDP	: Gross Domestic Product
GSM	: Global System for Mobile Communication
H.Q.	: Headquarters
IN	: Intelligent Network
INTS	: International Transit Switch
ISDN	: Integrated Services Digital Network
ITU	: International Telecommunication Union
ITU-T	: International Telecommunication Union - Telecommunication Standardization Sector
JICA	: Japan International Cooperation Agency
LE	: Local Exchange
MBS	: Managed Bandwidth Service
MDF	: Main Distribution Frame
MIS	: Management Information System
MSC	: Mobile Service Switching Center
NGN	: New Generation Network
NMC	: Network Management Center

nx64	: n multiplied by 64
OJT	: On the Job Training
OMC	: Operation and Maintenance Center
PABX	: Private Automatic Branch Exchange
PSDN	: Packet Switched Data Network
PSTN	: Public Switched Telephone Network
QOS	: Quality of Service
RU	: Remote Unit
SDH	: Synchronous Digital Hierarchy
SP	: Syrian Pound
STD	: Subscriber Trunk Dialing
STE	: Syrian Telecommunications Establishment
STM	: Synchronous Transport Module
STM-1	: Synchronous Transport Module - 1
STM-4	: Synchronous Transport Module - 4
TMN	: Telecommunications Management Network
VPN	: Virtual Private Network
WLL	: Wireless Local Loop
XMUX	: (Name of product/ device)



**VOLUME 1**

**MASTER PLAN**



## CHAPTER 1 INTRODUCTION

Japan International Cooperation Agency (hereinafter referred to as "JICA"), which is the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, dispatched the JICA study team (hereinafter referred to as "the Team") in March, 1995 to formulate a master plan for the development of the telecommunications network in the Syrian Arab Republic up to the year 2010 in the Phase 1 and to conduct a feasibility study for the identified project(s) based on the master plan in the Phase 2.

In the course of the study for the Master Plan, it was necessary to draw up an Action Plan, specifically limited to the Eighth Five-Year period (1996 to 2000), in order to develop in detail, analyze and review the telecommunications part of the Eighth National Five-Year Plan, as prepared by the Government of Syria, and to improve its realization.

The main report has been divided into "VOLUME 1," the Master Plan, "VOLUME 2," the Feasibility Study, and "VOLUME 3," the Action Plan.

### 1.1 Background of the Study

In 1993 there were about 550,000 main telephone lines, which means the penetration rate was 4.11 per 100 inhabitants. This figure is far below the average 10.4 in the Middle Eastern countries, and this low density of telephones is one of the obstacles to economic and social developments in Syria. As many as 1.94 million applicants were still without telephone lines at the end of 1995 according to STE's data. The most important task is to eliminate the waiting lists.

Under these circumstances, the Government of Syria has decided to implement a comprehensive long term communications development programs including introduction of computerized systems and of an efficient management structure and requested the Government of Japan to conduct a study for planning national telecommunication network expansion in the Syrian Arab Republic.

### 1.2 Objectives of the Study

The objectives of the study are to formulate a master plan for the development of the telecommunications network in the whole territory of the Syrian Arab Republic up to the year 2010 and to conduct a feasibility study for the identified project(s) based on the Master Plan.

## CHAPTER 2 PRESENT STATE OF TELECOMMUNICATIONS IN SYRIA

### 2.1 Socioeconomic Conditions

#### (1) Population

The population of Syria is estimated about 13,844 thousand people as of 1994's midyear. The population annual growth is about 3.4% in 1994.

#### (2) Economic Trends

Syria's real growth in GDP in 1993 was 3.16%. Its economic base is diversified between agriculture, industry and an expanding energy (oil) sector.

### 2.2 Telecommunications Sector

#### (1) STE Organization

The STE is the sole responsible and authorized body to provide international and domestic telecommunications services in Syria. The STE is one of the government agencies under the control of Ministry of Communications.

#### (2) STE's Financial Situation

Revenues and profits in 1994 are 6,493 and 3,756 (million Syrian Pounds) respectively including estimated sums.

#### (3) Service Level of STE

Table 2.2-1 Service Level of STE

	1990	1992	1993	1994
Telephone Main Subscribers	496,360	513,000	550,000	688,500
Automatic Subscribers	376,646	401,000	435,000	610,000
Manual & Semi Automatic Subscribers	119,714	112,000	115,000	78,500
Capacity Of Main Telephone Exchanges	516,000	531,000	738,500	1,205,000
Capacity Of Automatic Exchanges	389,000	416,000	613,000	1,116,000
Capacity Of Manual & Semi Automatic Exchanges	127,000	115,000	125,000	89,000
Local Call (million calls)	845	895	1,000	1,100
National Call (million minutes)	108	111	115	155
International Call (million minutes)	21	22	34	35
Telex Subscribers	3,401	3,650	3,725	3,765
Telex Letters (million minutes)	2,375	2,893	2,681	2,525
Workers in STE	13,796	14,072	15,670	16,655

## **2.3 Tariff System**

- (1) Installation Fee:** 4000 SP.(subscription in 1980)
- (2) Subscription Fee:** Residential : 400 SP, Business: 800 SP.
- (3) Local Calls**  
175 free local calls per quarter without any limitation of time  
Calls in excess of 175: 0.6 SP per local call (EWSD: per 6 minutes)
- (4) National Calls**  
7 different national zones, off-peak discount : 50% between 22:00 and 7:00
- (5) International Calls**  
7 different international zones, off-peak discount : 50%

## **2.4 Telecommunications Services**

- (1) Telephone Services**
  - a. Basic Telephone Service**

As of the end of 1994, the number of main telephone lines in service was approximately 688,500. Of the total main lines 588,500, or 85.5 %, are connected to automatic telephone exchanges.

- b. Public Payphone Services**

The total number of Public Call Cabinets, including coin payphones, card payphones and telephone instruments for operator assisted calls, is about 2500.

- (2) Packet Switched Data Network**

A small scale packet switched network, supplied by Gandalf of Canada, was installed in Syria during 93/94. The network consists of 3 packet switched nodes, two co- located in Damascus and one in Aleppo.

- (3) Leased Line Services**

A small number of analog leased lines are provided to government bodies and to other organizations such as companies involved in the Oil industry. The total number is of the order of 200.

## **CHAPTER 3 SERVICES PROVISION STRATEGY**

### **3.1 Basic Considerations on Services Provision Strategy for Syria**

The services provision strategy is based on the demand forecasts. In addition to the demand forecast, the efficiency and the qualitative analysis for telecommunications services should be also considered.

In general, modern systems/services require modern management and marketing techniques, without which, the investment may be partly or even fully wasted. Therefore it is at least as important to properly plan for developing the commercial skills needed to successfully market modern telecommunications services as it is to develop the technical skills to operate the networks that these services run on.

### **3.2 Plain Ordinary Telephone Service(POTS)**

As a first step, it is recommended that STE select a small number, maximum three, of supplementary services for POTS. The services suggested are : Call Waiting, Call Hold and Three Party Conference.

### **3.3 Mobile Services**

From the point of view of basic mobile telephone service provision, evolution to new mobile services, interworking with the digital fixed network infrastructure, international interconnectivity and roaming with neighboring countries and the rest of the World, GSM is strategically the right choice for the Syrian Public Land Mobile Network.

As for the paging services, radio technologies progress now provide various kinds of services such as numeric or alphanumeric display, wide area paging services and value-added services different from the conventional paging services by only tone signals. STE has a plan introduce it.

### **3.4 ISDN Services**

It is recommended that some expansions of the ISDN line unit capacity should be made during the Eight National Five-Year Plan. A maximum of 1% ISDN line units of the total number of line units seems to be sufficient for next 3 to 4 years but most likely the number will be less than that. However it is important that ISDN can be offered on a broader basis in the business areas, i.e. that ISDN is available for the majority of business customers.

### 3.5 Data Communication and Wide Area Networking Services

It is recommended that Packet Switched Data Network (PSDN) should form the core infrastructure upon which data communications will be supported in Syria until at least year 2005.

In addition to existing leased line services, STE should extend its leased line services to cover the whole range of digital leased line services (subrates, 64 Kbit/s, nx64 kbit/s and 2 Mbit/s leased lines). For providing these digital leased lines, specific arrangements have to be worked out. It has already been pointed out that there is a trend for higher bandwidth. Also new services (e.g. FR for LAN interconnections) gain importance in data communication.

### 3.6 Intelligent Network Supported Services

It is recommended that the following services should be the focus of study by the IN planning group :

- Freephone Service
- Universal Number
- IN supported access to Voicemail (fixed and mobile network)
- Televoting
- VPN (as an alternative to leased lines for private voice networks)
- CENTREX ( as an alternative to a PABX)

### 3.7 Public Payphone and Telecenter Services

It is recommended that STE should continue to expand its public payphone services. A suggested target penetration of public payphones is 1 per thousand of population, by 2010, from the current penetration level which is approximately 0.2 per thousand.

It is also recommended that STE should develop its public call office services to cover a range of communications services.

### 3.8 Value Added Services

Value Added Services are defined as services that are provided by third party service providers in co-operation with STE. Specifically, it is recommended that STE encourage the development of electronic mail services based on the establishment of an INTERNET or X400 node for Syria.

### 3.9 Long Term Services Provision Strategy

The long term services provision strategy should be focused on four principal areas :

- (1) Improving the Quality of Service as a priority objective
- (2) The provision and expansion of Mobile Services
- (3) The provision and expansion of the Packet Switched Data Network services including new services and technologies
- (4) The development of Intelligent Network supported services

The approximate time scale for service development in Syria is shown in Figure 3.9-1.

Services Provision	Year	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Improve QOS towards intl. standards																	
Provision of GSM																	
Provision of Service Paging																	
Provision of PSDN service																	
Provision of M1020/M1040 leased lines																	
Provision of nx64 kbit/s leased lines																	
Provision of 2 Mbit/s leased lines																	
Provision of "New Generation" Pilot																	
Provision of "New Generation" services																	
Provision of ISDN Pilot																	
Provision of ISDN service																	
Provision of IN Pilot service																	
Provision of IN supported services																	

Figure 3.9-1 Approximate Time Scale for Services Development in Syria



## CHAPTER 4 DEMAND FORECAST

### 4.1 Telephone Service

#### (1) ITU Regression Model

The following regression model is obtained by analysis of latest available data on 68 countries reported in World Telecommunication Development Report 1994 (ITU).

$$Y = 1.5467X - 4.1864 \dots [1] \quad \text{where: } Y = \log y, \quad y : \text{Main Line Density} \\ X = \log x, \quad x : \text{GDP per capita (in US dollar)}$$

This study uses a slightly modified regression model to take account of the fact that the current telephone density in Syria is gradually high compared with GDP.

$$\text{The modified regression model : } Y = 1.5467X - 3.9787 \dots [2]$$

#### (2) Population Forecast

This study assumes population growth rate of 3.34%, in line with the average for the past 30 years.

#### (3) Economic Growth Forecast

This study uses the UN-rate adopted by some organizations of United Nations including ITU, which is 1US\$ = 26.6 SP. Concerning the growth rate of GDP, this study adopts 5.4%, the average growth rate of the last thirty years, because the rate of economic growth fluctuates considerably for the last several years.

#### (4) Result of Demand Forecast

The GDP per capita is applied to the modified equation [2] of regression model to calculate national telephone density in Syria. Then, this density is multiplied by the forecasted population to get national demand.

However, the result derived by the above-mentioned method is corrected to take account of this countries' existing subscribers and waiting applicants list. That is to say that the demand for the long-term is calculated from GDP and the demand for the short-term is estimated in consideration of the available present data.

Table 4.1-1 Demand Forecast

YEAR	GDP (M. US\$)	Population (M. persons)	GDP/capita (US\$)	Density Forecast on GDP/C.	Existing Subscribers (thousand)	Waiting List <corrected> (thousand)	Demand on GDP/C. (thousand)	Demand <corrected> (thousand)
1993	14,982	13.39	1,119	[4.11]	550	1,089		1,639
1994	15,791	13.84	1,141	[4.95]	685			1,679
1995	16,643	14.30	1,164	5.80			829	1,721
2000	21,649	16.86	1,284	6.75			1,138	1,853
2005	28,161	19.87	1,417	7.86			1,561	1,994
2010	36,631	23.41	1,565	9.17			2,146	2,146

#### 4.2 Mobile Telephone Service

Forecast has been carried out using two methodological top-down approach, which are a correlation of cellular development in the world and a comparison of neighboring counties of Syria. And also substitution with the fixed telephone is considered because of the big waiting applicants.

Table 4.2-1 Base Scenario of Mobile Subscriber Growth in Syria According to Network Rollout

Year	Population in Covered Areas	Potential Penetration in Covered Areas	Top-Down Forecast	Substitutors	Total Number of Subscribers in Each Area	Grand Total of Subscribers
1998	7,167,305	0.248	17,775	32,225	50,000	50,000
1999	7,406,693	0.306	22,664	37,000	59,664	59,664
2000	7,645,077	0.377	28,822	43,000	71,822	71,822
2005	9,020,593	1.073	96,791	43,000	139,791	148,574
	3,081,663	0.285	8,783	0	8,783	
2010	10,631,080	1.305	138,736	43,000	181,736	211,190
	3,631,845	0.811	29,454	0	29,454	

(Note: The upper figures for years after 2005 indicate data of the western region; lower figures are data for the eastern region.)

#### 4.3 Paging Service

At present there are no paging services in Syria. Therefore, the demand forecast of the paging service was performed based on top-down approach referring to the data obtained by analyzing the paging service penetration ratio of foreign countries.

Table 4.3-1 Scenario of number of subscribers in Syria and penetration in covered areas

Year	Population in Covered Areas	Potential Penetration in Covered Areas	Top-Down Forecast	Total Number of Subscribers in Each Area	Grand Total of Subscribers
1998	7,167,305	0.149	10,000	10,679	10,000
1999	7,406,693	0.183	13,554	13,554	13,554
2000	7,645,077	0.226	17,278	17,278	17,278
2005	9,020,593	0.644	58,093	58,093	63,362
	3,081,663	0.171	5,270	5,270	
2010	10,631,080	0.783	83,241	83,241	100,892
	3,631,845	0.486	17,651	17,651	

(Note: The upper figures for year after 2005 indicate data for the western region; lower figures are data for the eastern region.)

#### 4.4 ISDN

A maximum of 1% ISDN line units of the total number of line units seems to be sufficient for the next 3 to 4 years but most likely the number will be less than that.

#### 4.5 Leased Lines

It is forecasted that demand for leased lines will grow at an average rate of 20% per year up to the year 2000 and continuously decreasing to 10% per year thereafter.

Table 4.5-1 Leased Lines

	1995	2000	2005	2010
64 kbit/s circuits	220*	500	900	1200

#### 4.6 Facsimile

The demand is forecasted based on a relation between main telephone lines and facsimile connections in Germany, using the ratio of GDP per capital between Germany and Syria. 10,851 subscribers are estimated in the year 2010.

## CHAPTER 5 DEMAND FULFILLMENT PLAN AND TRAFFIC FORECAST

### 5.1 Demand Fulfillment Plan

The telephone facilities plan should meet the requirements for the forecasted demand. However, it is difficult to clear the current backlog and to catch up with the rate of demand before the year 2000. The demand fulfillment plan is established to set up how to catch up with the demand by the year 2000.

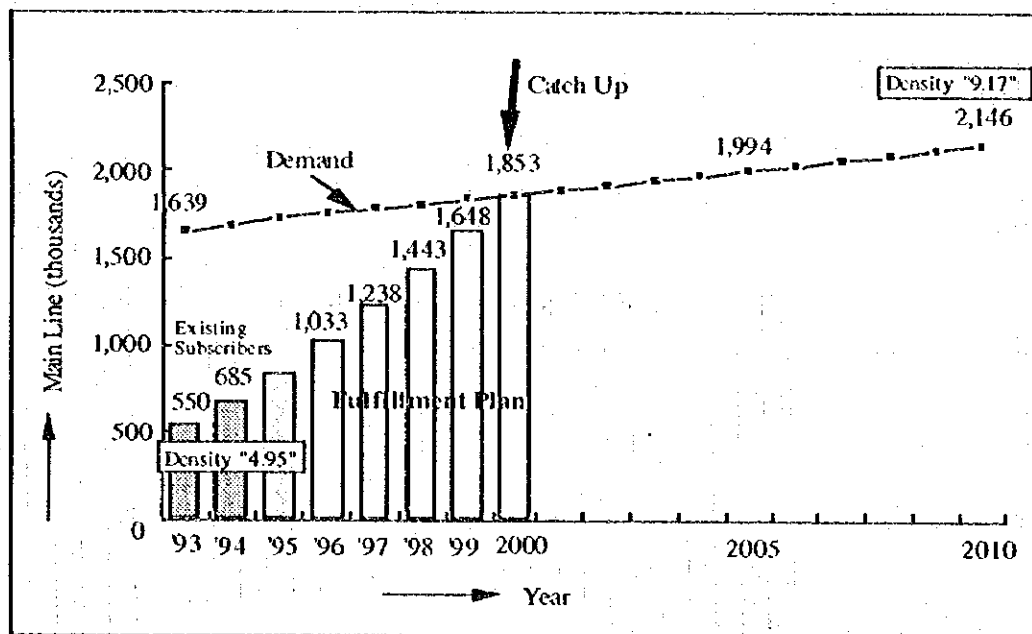


Figure 5.1-1 The Demand Fulfillment Plan for the Year 2000

### 5.2 Traffic Forecast

#### (1) Calling Rates and Distribution Ratio between Business and Residential Subscribers

The traffic volume per subscriber applicable to this study is estimated based on the present values for design in STE as follows:

Category	Total calling rate
Business	0.12 Erl.
Residential	0.07 Erl.

Table 5.2-1 The Distribution Ratio between Business and Residential Subscribers and Originating Calling Rates by Each Area

AREA	Business	Residential	Originating Calling Rate
Damascus city	30 %	70 %	0.043 erl./sub.
Damascus rural	20 %	80 %	0.040 erl./sub.
Aleppo city	30 %	70 %	0.043 erl./sub.
Aleppo rural	20 %	80 %	0.040 erl./sub.
Homs	20 %	80 %	0.040 erl./sub.
Hama	20 %	80 %	0.040 erl./sub.
Lattakia	20 %	80 %	0.040 erl./sub.
Daraa	10 %	90 %	0.038 erl./sub.
Sweda	10 %	90 %	0.038 erl./sub.
Tartous	20 %	80 %	0.040 erl./sub.
Idleb	10 %	90 %	0.038 erl./sub.
Der Alzor	10 %	90 %	0.038 erl./sub.
Alhasaka	10 %	90 %	0.038 erl./sub.
Quennetra	5 %	95 %	0.036 erl./sub.
Rakkah	10 %	90 %	0.038 erl./sub.

(2) Traffic Distribution Ratio by Route

Table 5.2-2 The Distribution Ratio of Originating Traffic by Route in Each Area

AREA	INTRA-OFFICE	LOCAL	NATIONAL	INTERNATIONAL
Damascus and Aleppo city	16.0 %	75.0 %	8.0 %	1.0 %
Other cities	40.0 %	51.3 %	8.0 %	0.7 %
Rural Area	30.0 %	61.5 %	8.0 %	0.5 %

(3) Traffic Matrix

The traffic matrix is prepared according to the volume of originating traffic from each exchange centers, using the gravity model and applying the Kruithof Algorithm.

## CHAPTER 6 FUNDAMENTAL TECHNICAL PLANS

### 6.1 Numbering Plan

It is recommended that numbering plan in Syria complies with the following items.

- (1) Structure of numbering  
Country Code + Area Code + Trunk Code + Subscriber Code  
963 XX XX(X) XXXX
- (2) Prefix code  
00 : International  
0X : National  
09 : New services (090 : Cellular, 091 to 099 : other new service such as Paging)

### 6.2 Transmission Plan

The transmission plan is based on the following objectives.

- (1) To comply with trends in transmission technology development.
- (2) To incorporate Syria's existing transmission systems.
- (3) To meet the demand level estimated in chapter 4 of the report.
- (4) To increase network security and flexibility.
- (5) To introduce SDH systems.

### 6.3 Security and Availability

It is recommended that the following items should be the focus of security and availability.

- (1) Loop (Ring) Transmission Network
- (2) Availability Performance in accordance with ITU-T Recommendation G602.
- (3) Two STDs at each Transit Center
- (4) Two Master Clocks with Stand-by
- (5) Maximum Size of a Local Exchange

### 6.4 Traffic Loss and Transmission Loss Allocation Plan

Loss probability in circuit groups is allocated on the basis of ITU-T Recommendation E.520.

The allocation of maximum transmission loss is 8dB for the subscriber line and 7dB for the network loss. The subscriber loop resistance does not exceed 1500 ohm.

### 6.5 Switching Plan

The switching plan is based on the following objectives:

- (1) To provide (PSTN) switching capacity in accordance with the demand
- (2) To replace older exchanges
- (3) To replace manual line units with automatic exchanges
- (4) To introduce a mobile system
- (5) To introduce an Intelligent Network infrastructure
- (6) To expand ISDN deployment carefully in accordance with the experience in the pilot
- (7) To introduce a network management system
- (8) To introduce B-ISDN by deployment of ATM switches

#### 6.6 Signalling Plan

For the implementation of ISDN, ITU-T's No.7 CCS (Common Channel Signalling System) is essential. The CCS can also be adopted on the various networks as it provides economical and reliable transmission of signalling information. There are two kinds of No.7 CCS network configurations with regard to the allocation of the communication:

Associated mode and Quasi-associated mode

#### 6.7 Charging Plan

New establishment of digital exchanges, replacement from EMD exchanges to new digital exchanges and expansion of existing digital exchanges are planned. Accordingly, an AMA (Automatic Message Accounting) system should be used for international and long distance calls, and an electronic meter system should be used for local calls.

#### 6.8 Synchronization Plan

In near future Aleppo INTS will have a sub-master clock as stand-by of the master-clock in Damascus INTS and in case of master-clock failure, the sub-master clock should distribute clock to all the Syrian digital network.

#### 6.9 Transmission Network

SDH ring configuration with 2Mbps cross connection function is proposed as physical network configuration for important parts of Syrian networks in order to gain better network security and easier operation and maintenance.

#### 6.10 Long Distance Telephone Network

The present long distance network is 4 level structure including the local level. Optimization of the long distance network structure was studied from viewpoints of total length of the circuits,

network development, effective operation and maintenance, and network stability. As a result, two levels of transit switching hierarchy is preferable for the Syria's digital STD network.

#### 6.11 Local Networks

Local network structures have to be imposed in the optimization process with the aim:

- to ease future network planning for expansion,
- to avoid major restructuring in the traffic routing in future,
- to avoid circular routing,
- to enable a prediction of the network behavior in case of failure and overload.

For the choice of the appropriate local network structures, the following three different types of local networks should be considered.

- A single exchange local network consists of only one local exchange.
- A small multi-exchange local network consists of a minimum of two local exchanges and may contain as much as up to ten local exchanges.
- A large multi-exchange local network consists of more than ten local exchanges.

#### 6.12 Subscriber Networks

Considering some kinds of elements, cost, duration to implement and so on, the subscriber network should be introduced as follows.

- the existing network (Metallic Cable Network) should remain as it is now. An early replacement is economically not feasible. An exception may be, if bottlenecks in duct availability surface. In such exceptional cases, the replacement of an existing CCC by a RU and the replacement of primary cables by optical fiber cable may be considered in order to avoid or to postpone duct expansion.
- New projects, especially in suburban and rural areas, should be executed by means of introducing a Hybrid Subscriber Network.
- In rural areas, the WLL technology shall be applied, if the costs for the construction of a Metallic Cable Network or a Hybrid Subscriber Network exceed the costs for the WLL installation.

#### 6.13 Intelligent Network

An intelligent Network infrastructure should be deployed in STE's PSTN/ISDN starting during the Eighth Five Year Plan. The Strategy should aim at reaching full network covering already in the early stage of the deployment, so that IN services can be marketed throughout the country.



## CHAPTER 7 LONG TERM FACILITY PLAN

### 7.1 Transmission

Shortage of transmission facilities have been checked. For areas where shortages are anticipated, new facilities are planned. The following are summaries of transmission plans.

- (1) The Eighth National Five-Year Plan (1996-2000)
  - a. Aleppo-Tabqua-Rakka-Deir Elzor-Hassakeh-Kamichily  
New 606km FO (fiber-optic) cable SDH STM-4 (1+1) system
  - b. Damascus-Homes  
5GHz micro (2+1) system and two SDH STM-1 systems on an existing FO cable
  - c. Damascus SDH Loop 1-3 with one STM-4 Ring for each loop on existing FO cables and others.
- (2) The Ninth National Five-Year Plan (2001-2005)
  - a. Dier Elzor-Mayadin-Alshakera-Abukumal  
New 151km FO (Fiber-Optic) cable SDH STM-1 (1+1) system
  - b. Damascus Loop 4, 5 with one SDH STM-1 Ring for each loop in existing FO cables
  - c. Sections on Manual switches 34Mbit/s micro (24+24) systems and others
- (3) The Tenth National Five-Year Plan (2006-2010)
  - a. Homs-Tadmor new 150km FO (Fiber-Optic) cable SDH STM-1 (1+1) system
  - b. Homs STD-Homs E STM-1 (1+1) system on existing FO cables
  - c. Lattakia STD-Lattakia D STM-1 (1+1) system on existing FO cables and others

### 7.2 Switching for the PSTN

A comprehensive overview for the next 3 five year plans are shown in the following table.

Table 7.2-1 Comprehensive Overview for the Next 3 Five Year Plans

	2000	2005	2010
Regular network expansion (Line Units)	574,339	158,300	146,600
Replacement of the out-dated exchanges	281,000	218,000	-
Subscriber Line Units to be procured	855,339	376,300	146,600
Trunk Line Units to be procured	8,500	1,530	3,180

### 7.3 Subscriber Network

A summary of the additional numbers of primary cable pairs and secondary cable pairs respectively to be installed in five-year steps is shown in the following table.

Table 7.3-1 Summary of the Additional Numbers of Primary/Secondary Cable Pairs

Year	2000	2005	2010
Primary Cable Pairs	1,066,930	224,940	242,800
Secondary Cable Pairs	1,385,900	292,270	315,720

### 7.4 Mobile Services

The total infrastructure requirements for the GSM network to meet the demand for mobile telephone service has been calculated.

Table 7.4-1 The Total Infrastructure Requirements for the GSM

Ref.NO.	GSM Infrastructure to be provided in the five year periods: Description	2000 Quantity	2005 Quantity	2010 Quantity
1	Base Transceiver Station(BTS)	92	87	0
2	BTS Expansion	0	54	35
3	Number of BTS Sites	92	87	0
4	Base Station Controller(BSC)	10	10	0
5	Mobile Switching Center(MSC)	1	1	0
6	MSC Expansion	0	1	2
7	OMC/NMC and Billing System	1	0	0
8	Microwave(BTS-BSC)	92	87	0
9	2Mbits/sec	191	220	26
10	Sites Infrastructure	98	93	0

The total infrastructure requirements for the Paging Services network to meet the demand for the Paging Services have been calculated.

Table 7.4-2 The Total Infrastructure Requirements for the Paging

Ref.No.	Paging Infrastructure to be provided in the five year periods: Description	2000 Quantity	2005 Quantity	2010 Quantity
1	Base Station	40	66	0
2	Base Station Expansion	0	11	11
3	Number of B.S Sites	20	35	0
4	Paging Processor	1	0	0
5	Paging Processor Expansion	0	1	1
6	OMC/NMC and Billing System	1	0	0
7	Transmission Lines(B.S-Paging Processor)	80	278	212
8	2Mbits/sec(PSTN-Paging Processor)	11	5	2
9	Sites Infrastructure	21	35	0

## 7.5 Packet Switched Data Network (PSDN)

Combining the capacity requirements from the "public" packet service and STE's internal data communications, the total projected capacity requirements of the PSDN are shown in the following table.

Table 7.5-1 The Total Projected Capacity Requirements of the PSDN

Access Type	1995	2000	2005	2010
Dedicated Accesses	90	270	250	80
Dial-Up Accesses	15	350*	1,700*	700*

\*) D-channel (and possibly B-channel) access included

Forecast figures, that are shown in the following table, are at this point very vague but they are necessary for medium term strategies.

Table 7.5-2 Forecast for Frame Relay and ATM (Native Interface)

	1995	2000	2005	2010
n*64 kbit/s up to 2 Mbit/s	-	50	200	-
ATM, >= 2 Mbit/s	-	5	60	200

## 7.6 Network Management

The following facility plan gives an overview on the amount of Transmission Facilities Management Centers and the Traffic Management Centers.

Table 7.6-1 Facility Plan for Network Management

Year	2000	2005	2010
Transmission Management Center	3	-	-
Traffic Management Center	-	1	-

## **CHAPTER 8      OPERATIONS AND MAINTENANCE**

### **8.1      Switching**

#### **(1)      Comments on the Organization of Operation and Maintenance**

STE's operations and maintenance organization is ruled by the dominating Government policy to create job opportunities to the extent possible, and thus, presently not changeable.

However, as soon as the Government policy changes, STE should revise their operations and maintenance organization and should start to exploit the existing operations and maintenance infrastructure.

### **8.2      Transmission**

The following are steps to improve STE's operation and maintenance:

- Discard Obsolete transmission systems as soon as possible, and gradually increase unmanned stations for night time, and even for day time operation in some cases. Maintain 24-hour maintenance on an on-call basis.  
Carry out monitoring activities at central stations, first at night, and then round the clock. Provide and test 2Mbit/s paths remotely from central stations.
- Functions of the STE contact points for receiving customer complaints must be strengthen in line with increase of leased circuits. Some telephone operators have customer centers.
- Who controls fault clearing operations up until the fault is actually cleared, and who carries out tests for each circuit, for each path and for each transmission system must be clearly defined.

### **8.3      Subscriber Network**

#### **(1)      Operation**

It is, as a first step, recommended to prepare technical standards and technical guidelines for aerial cable, drop wire and in-house installation.

#### **(2)      Maintenance and Maintenance Organization for Subscriber Lines**

For faults which require a rather long repair time, temporary provisional repair should be considered to bring the customer back to service as early as possible.

Linemen for the actual physical fault clearing in the respective service area of an exchange or Remote Unit should be stationed at every Main Distribution Frame (MDF) site during normal working hours.

The work orders including the initial test results and the subscriber data needed for the line men should be generated by the complaint service operation system (triggered by the operator in the complaint center) and transferred directly to the respective sites.

#### 8.4 Network Management

The Network Management function is primarily concerned with the real-time behavior of the PSTN under abnormal conditions.

#### 8.5 Telecommunications Management Network (TMN)

(1) The overall targets of TMN are to speed up telecommunications service provision to the customers, and to make all actions which are necessary to operate, sustain and administrate telecommunications more efficiently and cost effectively.

The objective of Network Management is to ensure that as many calls as possible are successfully completed by maximizing the use of all available network resources under all abnormal network conditions.

##### (2) TMN Concept and Architecture

For the purpose of basic understanding, a TMN can be imagined as a very large Operation System (OS). It has access to all telecommunications equipment in a network. Automatic monitoring and controlling of the telecommunications equipment via these accesses is based on indications and notifications received from the equipment. Triggering of actions by human intervention via the Work Stations (WS) is also an inherent feature of this system.

## **CHAPTER 9 STE MANAGEMENT**

### **9.1 Current STE Management**

The major STE management issue is trimming the waiting list that is 2.0 million at the end of 1995.

### **9.2 Organization**

Regarding the STE's organization, the obstacles for the effective management of the STE are as follows

- The functions of Headquarters are too distributed. Functions overlap between Directorates.
- Many decisions regarding managerial issues are vested in the Director General. To make the STE organization more effective and flexible, it is necessary to summarize the headquarters functions and to distribute the duties of the Director General among several top-management positions (example, Vice Director Generals).

### **9.3 Finance and Accounting**

To maintain a healthy future financial status it is necessary for the STE to increase its self-financing ratio in the next telecommunications-investment program and to raise profits. To expand profits, it is indispensable to introduce a cost-control system.

### **9.4 Training**

Comparing the required work force for 2000 with present STE personnel, many workers who graduated from institutes, Telecommunication schools, and Secondary school will be needed.

Computer-system training is mainly focused on operation of personal computers, but system engineers are needed to design the STE's computer systems.

Management training for top- and middle-management (especially for directors and managers in the headquarters) is needed for managerial improvement.

### **9.5 Computer systems**

Directorates in the STE headquarters and provinces take much time to get the information regarding the revenue, the new subscription and the collection of charges, and it causes the delay of management decision makings. To strengthening the management decision makings, the installation of management support system is very important.

## 9.6 STE's Management Plan

The most important managerial issue is reduction of the waiting list. To achieve success, additional educated technical staff (especially graduates from institutes, telecommunication schools, and secondary schools) are required. From 1996 to 1998 the STE must therefore hire technical staff as well as strengthen the training of existing technical staff.

It is necessary for the STE to establish a project team for network expansion from 1996 to 2000 in addition to the STE's organizational changes.

After the satisfaction for waiting list, the improvement of work productivity and customer service will be required for STE's management.

	1995	2000	2005	2010
Management Target		Demand satisfaction for waiting list	Improvement of work productivity	Improvement of customer service
Organization	Project team Organizational change	Secondary Organizational change		
Training/hiring	Hiring New training system			

Figure 9.6-1 STE Management Plan from 1996 to 2010

## CHAPTER 10 COMPUTERIZATION

### 10.1 Trends of Computerization in Telecommunication Companies

- (1) Step-1: To enhance efficiency of telecommunication service and manage correctly information of subscribers, plants, network, billing and so on.
- (2) Step-2: To enhance customer satisfaction level, to gain more profit and to be more competitive.

### 10.2 Policy of Computerization in STE

Policy of computerization in STE should be developed based on the trends described in Figure 10.2-1.

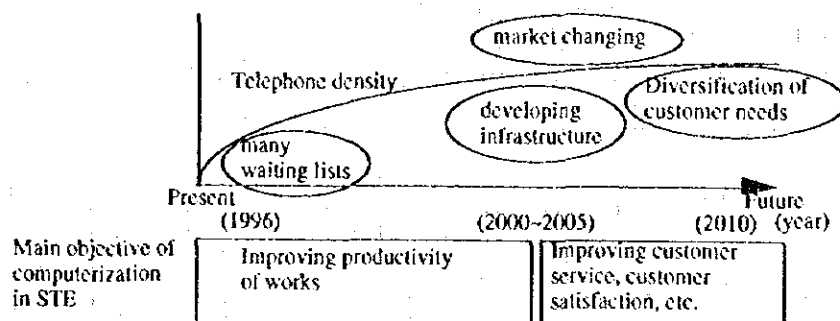


Figure 10.2-1 Policy of Computerization in STE

### 10.3 Background of Systematization

Table 10.3-1 Background of Systematization

Item	Content
Environmental change surrounding STE	Increase of subscribers according to network-expansion plan targeting demand satisfaction for waiting list
Background of systematization	Improving work efficiency for telephone subscription and usage
Objectives of systematization	To cope with above tasks using limited human resources



## 10.4 Computer System Configuration

### (1) Hardware Configuration

#### a. Telephone-center System

This System is to be introduced in thirty-five telephone centers and their terminals are connected by a LAN and a file server. Moreover, the file servers are connected to a billing center by public network (X.25).

#### b. Billing-center System

As the processing type, distributed type is recommended for the following reason.

- Damage caused by system shutdown or other trouble is less in case of distributed type than in case of concentrated type.
- Most of packaged software for billing application have the limit of the processing capacity and it may be difficult to expand it.
- 1996-2000: South (Damascus, already implemented in 1995 by Bull) and North (Aleppo)
- 2001-2010: South (Damascus), North (Aleppo), Middle, Coast, and East

#### c. Management Information System

Client terminals are installed in headquarters and each province connected by public network (X.25) so that directors can utilize them.

### (2) Software Configuration

#### a. General

Necessary computer software includes an OS (operating system), network software, database software, and an application program.

#### b. Overview of Application Software of Telephone-center and Billing-center System

The application software is comprised of the following subsystems.

- Service-order subsystem
- Subscribers-line-management subsystem
- Bill-collection subsystem
- Bill-calculation and issuance subsystem

c. Management Information System (MIS)

MIS gathers customer information and billing information from telephone-center system and billing-center system and accumulates them as its database.

## 10.5 Implementation Plan

### (1) Plan for System Implementation

#### a. The Plan during the Eighth Five-Year Plan (1996-2000)

Considering the expected number of subscribers, another new billing-center system should be implemented in Aleppo for one of the distributed areas in the country within 1996. After that, billing processing is done by two billing centers according to provinces as follows.

Table 10.5-1 Billing Centers and Divided Area for Each Center (1996-2000)

Billing center	Province
Damascus	Damascus (City), Damascus (Rural), Quennetra, Darra, Sweda
Aleppo	Aleppo, Homs, Hama, Idleb, Der Alzor, Alhasala, Rakkah, Lattakia, Tartous

The installation for telephone centers in Damascus Rural, Quennetra, Darra, Sweda and Aleppo should be done in 1997, and that in Idleb, Tartous, Lattakia, Homs, Hama, Alhasaka, Der Alzor and Rakka in 1998.

As regards the management information system (MIS), because it is relatively small-scale and its application is not so complicated, it should be implemented 1997.

#### b. The Plan during the Ninth Five-Year Plan (2001-2005)

Billing centers should be increased and finally STE will have 3 more billing centers, and billing process of STE is distributed into 5 by areas; North, Coast, Middle, East, and South.

Table 10.5-2 Billing Centers and Divided Area for Each Center (2001-2005)

Billing center	Province
South (Damascus)	Damascus (City), Damascus (Rural), Quennetra, Darra, Sweda
North (Aleppo)	Aleppo, Idleb
Middle	Homs, Hama
Coast/ East	Lattakia, Tartous /Der Alzor, Alhasaka, Rakkah

c. The plan for during the Tenth Five-Year Plan (2005-2010)

By the year of 2005, a series of initial implementation of computer system will be completed and service operation in STE will be greatly improved. Considering the life-cycle of computerized system, however, the systems implemented before 2000 would be necessary to be replaced.

Concrete plan for initial implementation and replacement is shown in Table 10.5-3.

Table 10.5-3 Plan for Initial Implementation and Replacement

System	Center	Year of initial implementation	Year of Replacement
Telephone-center system	Damascus(City)	1995*	1997
	Damascus(Rural), Aleppo, Darra, Sweda, Quennetra	1997	1997
	Homs, Hama, Idleb, Latakia, Tartous, Alhasaka, Der alzor, Rakka	1998	1998
Billing-center system	Damascus (South)	1995*	2006
	Aleppo (North)	1996	2006
	Middle	2001	-
	Coast	2003	-
	East	2005	-
Management information system	Headquarters in Damascus	1997	2007

Note \*: Implemented by Bull before the Eighth Five Year Plan

(2) Staffing Plan

To operate the implemented system more effectively, professional staff is needed for the three systems.

According to the implementation plan mentioned above, the necessary number of staff members per year is indicated as follows.

Table 10.5-4 Number of Staff Members for the Computer System

Needed personnel	Year	Number of staff members		
		2000	2005	2010
Maintenance person		9	9	13
Operator		3	12	15
System engineer (for billing center)		2	8	10
System engineer (for MIS)		1	1	1
Total		15	30	39

## CHAPTER 11 COST ESTIMATION

### 11.1 Transmission

Table 11.1-1 Transmission Costs for 5-Year Plans (US\$)

	2000	2005	2010
Long Distance Networks	21,700,000	-	-
Junction Networks	6,000,000	5,100,000	5,600,000
Long Distance Local Sections	1,100,000	3,100,000	3,400,000
Local Sections	2,600,000	4,400,000	2,200,000
Sections on Manual Switches	8,800,000	8,800,000	-
TOTAL	40,200,000	21,400,000	11,200,000

### 11.2 Switching and Intelligent Network

Table 11.2-1 Switching Costs for 5-Year Plans (US\$)

	2000	2005	2010
Regular Local Exchange Expansion	111,996,105	30,868,500	28,587,000
Replacement of the out-dated exchanges	61,820,000	47,960,000	-
Intelligent Network Infrastructure	12,000,000	3,000,000	-
Long Distance Exchange Expansion	1,827,500	328,950	683,700
TOTAL SWITCHING INVESTMENT	187,643,605	82,157,450	29,270,700

### 11.3 Subscriber Network

Table 11.3-1 Subscriber Network Costs for 5-Year Plans (US\$)

Year	2000	2005	2010
Primary Pairs	142,328,462	30,006,996	32,389,520
Secondary Pairs	213,151,420	44,951,126	48,557,736
Total	355,479,882	74,958,122	80,947,256

## 11.4 Mobile Services

Table 11.4-1 GSM Costs for 5-Year Plans (US\$)

GSM Infrastructure to be provided in the five year periods: Components	Investments by Year:		
	2000	2005	2010
Base Transceiver Station(BTS)	18,400,000	31,440,000	9,100,000
Base Station Controller(BSC)	4,000,000	4,000,000	0
Mobile Switching Center(MSC)	3,500,000	4,500,000	2,000,000
OMC/NMC and Billing System	2,000,000	0	0
Microwave(BTS-BSC)	7,360,000	6,960,000	0
2Mbps/sec(BSC-MSC)	2,200,000	2,450,000	1,050,000
Sites Infrastructure	5,450,000	5,200,000	0
Design & installation Cost	4,291,000	5,455,000	1,215,000
Miscellaneous Set-Up Cost	6,000,000	0	0
Total Cost	53,201,000	60,005,000	13,365,000

Table 11.4-2 Paging Costs for 5-Year Plans (US\$)

Paging Infrastructure to be provided in the five year periods: Components	Investment by Year:		
	2000	2005	2010
Base Station	5,200,000	9,020,000	440,000
Paging Processor	2,000,000	100,000	100,000
OMC/NMC and Billing System	2,000,000	0	0
Sites Infrastructure	1,350,000	1,750,000	0
Design & Installation Cost	1,055,000	1,087,000	54,000
Total Cost	11,605,000	11,957,000	594,000

## 11.5 Packet Switched Data Network (PSDN)

Table 11.5-1 PSDN Costs for 5-Year Plans (US\$)

	2000	2005	2010
PSDN	515,000	265,000	50,000
PSDN-ISDN Interworking	300,000	300,000	50,000
New Generation Networks	1,400,000	2,500,000	3,500,000
Total	2,215,000	3,065,000	3,600,000

## 11.6 Network Management and Telecommunications Management Network

Table 11.6-1 Network Management and Telecommunications Management Network

Costs for 5-Year Plans			(US \$)
Year	2000	2005	2010
Network Management	3,000,000	10,000,000	
Cost for TMN	-	15,000,000	5,000,000
Total	3,000,000	25,000,000	5,000,000

## 11.7 Computerization

Table 11.7-1 Total Cost for the Computerization for 5-year Plans (US\$)

System	1996-2000	2001-2005	2006-2010	Total
Telephone-center	6,811,042	0	8,698,147	15,509,189
Billing-center	455,584	883,027	5,084,721	6,423,332
MIS	304,203	0	304,203	608,406
Total	7,570,829	883,027	14,087,071	22,540,927

## 11.8 Summary

Table 11.8-1 Total Cost Estimation Summary for 5-Year Plans (US\$ million)

Facility / System	1996 - 2000	2001 - 2005	2006 - 2010	Total
Switching System	187.6	82.2	29.3	299.1
Subscriber Network	355.5	75.0	80.9	511.4
Transmission System	40.2	21.4	11.2	72.8
Mobile Services	64.8	72.0	14.0	150.8
Data Communication Services	2.2	3.1	3.6	8.9
Network Management and TMN	3.0	25.0	5.0	33.0
Computerization	7.6	0.9	14.1	22.6
TOTAL	660.9	279.6	158.1	1098.6

## CHAPTER 12 PROJECT EVALUATION

The projects were evaluated using the following methods:

- Estimation of capital expenditure and operating expenditures (cash outflow)
- Estimation of operating revenue (cash inflow)
- Creation of cash flow table and calculation of financial internal rate of return (FIRR).

### 12.1 Premises and Assumptions

The basic premises and assumptions are as follows:

- (1) The duration of revenues is settled as 10 years after the end of investments.
- (2) The salvage value of the equipment that has reached the end of its service life is considered nil.
- (3) The effects of inflation were not considered.
- (4) Revenues and Costs Estimation  
The present tariff rate (1995) was used to estimate the revenues in the projects.
- (5) Revenue per year is estimated by forecasting the number of mainline, the revenue per main line, traffic distribution, and depreciation of facilities.
- (6) Investment costs are shown in 11.9 cost estimation summary of Chapter 11.
- (7) Operation and Maintenance Costs  
Operation and maintenance costs include personnel costs, administration costs, repair costs and so on.  
Table 12.1-1 gives operation and maintenance costs in 1994.

Table 12.1-1 Operation and Maintenance Costs in 1994

(Unit: US\$)

Payment to International Operator	Personnel	Utilities	Others	Total
22,330,000	27,050,000	3,190,000	13,070,000	65,640,000

#### (8) Working Capital

This capital includes current deposits as cash on hand, and accounts receivable as funds necessary until call charges are collected.

(9) Taxes

The STE Pays about 58.5% of annual profits to the Government as a tax obligation.

12.2 The Result of Financial Analysis

As a result of financial analysis, the tentative financial internal rate of return for the projects is estimated at 14.29 percent. In case that the project includes the benefit of the Computerized System, the tentative internal rate of return will be 16.21 percent.



## CHAPTER 13     **TARIFF PLAN**

### 13.1     Structure of the New Tariff

The following general remarks and assumptions should be made:

- all PSTN-tariffs are regulated by the Telecommunications Minister of Syria,
- the tariff level and structure which will be developed in the course of this study are based on an estimated traffic flow derived from the existing traffic flow of STE,
- cost figures are adapted from the calculated costs of the proposed new network,
- the study covers especially the telephone tariff adjustments for the next years 1996 and 1997,
- telegraph and telex are obsolete techniques of communication. Therefore, these services are not analyzed in this study,
- All calculations have been made on the basis of US Dollars.

### 13.2     Analysis of Present Tariff System

The existing tariff structure has the following disadvantages:

- access and annual rent charges do not cover access cost,
- access costs are subsidized by international charges,
- No direct incentive for the operator to connect new subscribers to its network,
- attraction of customers with very low usage leading to no rationalization of demand.

To overcome these weaknesses a cost-based tariff structure will be developed.

### 13.3     Summary of the Results

The implementation of the Ramsey tariffs will increase slightly the consumer surplus in Syria by 2.1%. Importance should be laid to the self-financing character of these tariffs for the modernization and necessary expansion of the Syrian telephone network. These tariffs are an appropriate means for setting free all market forces of demand and supply in the Syrian telecommunication sector. The application of the recommended tariffs will support STE's ambitious expansion policy for the next years.

- Main recommendations (Table 13.3-1)
- Current tariffs and Ramsey tariffs (Table 13.3-2)

**Table 13.3-1 Main Recommendations**

- The installation charges (residences) and the annual rent should be increased heavily.
- Instead of residential/ business pricing should be used only one customer tariff.
- A peak/ off peak tariff should be introduced for local calls.
- Importance should be laid to the increase of the local call tariff at peak time.
- Free local call units should be decreased from 350 to 30 quarterly.
- The existing seven long distance zones should be concentrated into three zones
- Peak call charges of long distance national calls should be increased substantially.
- Off-peak call charges of long distance national calls could be reduced slightly paying attention to social aspects.
- International calls off peak should be canceled (marginal costs are equal to peak calls)
- International call charges peak should be decreased slightly.
- International call charges off peak should be increased in order to cover the cost.
- Facsimile should be regarded as a part of the PSTN and not additionally charged.

Table 13.3-2 Current Tariffs and Ramsey Tariffs

	Current Tariffs US\$	Ramsey Charges US\$	Change in %
Installation (Normal Access)	95.24	122.51	29%
Installation (Priority Access)	1,785.71	122.51	- 93%
Annual Rent (Residential)	9.52	22.54	136%
Annual Rent (Business)	19.05	22.54	18%
Local peak/ min.	0.002381	0.006	152%
Local off peak/ min.	0.002381	0.0004	- 84%
Long Distance 1 peak/min. *	0.024	0.286	19%
Long Distance 1 off peak /min. *	0.012	0.0011	- 91%
Long Distance 2 peak /min. *	0.045	0.0551	22%
Long Distance 2 off peak /min. *	0.023	0.0020	- 91%
Long Distance 3 peak /min. *	0.089	0.1416	59%
Long Distance 3 off peak /min. *	0.045	0.0028	- 94%
International Zone 1/ Peak /min.	0.833	0.6444	- 23%
International Zone 1 /Off Peak /min.	0.417	0.6176	48%
International Zone 2/ Peak /min.	1.19	0.9521	- 20%
International Zone 2 /Off Peak /min.	0.595	0.918	54%
International Zone 3/ Peak /min.	1.548	1.0624	- 31%
International Zone 3 /Off Peak /min.	0.774	1.022	32%
International Zone 4/ Peak /min.	2.381	1.4765	-38%
International Zone 4 /Off Peak /min.	1.191	1.4190	19%
International Zone 5/ Peak /min.	2.738	1.6817	- 39%
International Zone 5 /Off Peak /min.	1.369	1.6245	19%
International Zone 6/ Peak	2.976	2.0678	- 31%
International Zone 6 /Off Peak /min.	1.488	2.0085	35%
International Zone 7/ Peak /min.	4.762	2.7189	- 43%
International Zone 7 /Off Peak /min.	2.381	2.6278	10%

\* (Current long distance tariffs zone 0 - 6 are compared on a traffic basis accordingly to the new subdivision of long distance zones 1 - 3)

Table 13.3-3 Summary of Results

Summary of Results	Ramsey Tariffs	Current Tariffs **
Total Revenues R' (in US\$)	266,860,435	255,089,291
Total Variable Cost Cv' (in US\$)	128,247,373	125,326,229
Non-Accountable Cost Assumption (in US\$)	47,413,062	45,763,062
<b>STE's Profit Target G (in US\$)</b>	<b>91,200,000</b>	84,000,000
New Consumer surplus CS (in US\$)	312,214,763	
Current Consumer surplus CSi (in US\$)	305,729,175	
Change in Consumer surplus	6,485,588	2.1%

\*\* (Revenues are not including connection fees for priority direct / second lines and facsimile services.)

## CHAPTER 14 REVIEW OF STE'S EIGHTH FIVE-YEAR PLAN

### 14.1 Comparison of the Master Plan with STE's Eighth Five-Year Plan

#### (1) Framework

The Master Plan	STE's Five-Year Plan
<ul style="list-style-type: none"> <li>•A long-term plan until the year 2010</li> <li>•Covers all telecommunications development plans ranging from basic telephone networks to new services, such as Mobile Telephone services, Packet Switched Data Network and ISDN.</li> <li>•The GDP per capita method, which takes into account both the past and actual records in Syria and the correlation between the telephone demand density and economic indices of various countries, was employed in making the demand forecast.</li> </ul>	<ul style="list-style-type: none"> <li>•This medium-term plan mainly focuses on basic telephone demand fulfillment which is calculated according to the demand of each telephone office, and on necessary facilities plans to fulfill this demand. (No long-term demand forecast was conducted.)</li> <li>•The number of new lines to be installed annually under this plan is more than twice that prescribed by the Master Plan.</li> <li>•The cost estimate is based on past contracts.</li> </ul>

#### (2) Goals

The Master Plan	STE's Five-Year Plan
<ul style="list-style-type: none"> <li>•To increase the number of subscribers to 1.85 million by the year (2000-2002). (including the replacements of manual telephone exchanges with automatic telephone exchanges in rural areas).</li> <li>•To increase the telephone density to 11 percent by the year (2000-2002).</li> <li>•It is estimated that it will cost approximately US \$ 660 million to carry out the eighth five-year plan (1996-2000).</li> </ul>	<ul style="list-style-type: none"> <li>•To meet the demand of the approximately 2 million waiting applicants accumulated as of 1995 and to accommodate the estimated 2.54 million subscribers in the year 2000.</li> <li>•To increase the telephone density by the year 2000 to approximately 14 percent, as a result of the completion of this plan.</li> <li>•The total investment cost for the Eighth National Five-Year Plan (1996 to 2000) is estimated at approximately US \$ 900 million.</li> </ul>

## 14.2 Review of the STE's Eighth Five-Year Plan and Preparation of the Action Plan.

### (1) Preparation of the Action Plan

Since STE's Eighth Five-Year Plan only concentrates on the accumulated number of waiting applicants and the number of exchange line units, it was necessary to develop this plan further (i.e. to forecast demand, to make facilities plans, to estimate costs and to evaluate its feasibility) with regard to its actual implementation.

Therefore, the Action Plan was drafted after the Master Plan was completed, in order to determine whether or not STE's Eighth Five-Year Plan is practical. It will also serve as a future reference plan for the Syrian side.

### (2) Review of STE's Eighth Five-Year Plan

As mentioned above, the Action Plan has been prepared to review the STE's Eighth Five-Year Plan. The results of the review are outlined below:

The demand forecast and the plan for its fulfillment in STE's Eighth Five-Year Plan, although based on various social, political and economic conditions in Syria, assumes a growth rate for telephone density that seems to be high when compared with the growth rates based on similar conditions in other countries.

However, in some countries there have been cases in which strong economic growth has contributed to sharp increases in growth rates. Therefore, if STE adheres to the following guidelines, it may be possible to realize the goals set forth in its plan.

- a. Periodical review of the demand and the facilities plans
- b. Financing programs and prioritization of the projects
- c. Measures for dealing with the double number of new installations
- d. Strengthening of Project Management

## CHAPTER 15 RECOMMENDATION

### 15.1 Recommendation

The Syrian telecommunications network would improve remarkably if the Master Plan is carried out in accordance with its scope and schedule. However, it is important that STE restructure and improve its business management, in order to successfully realize the Plan.

Therefore, the following seven recommendations are proposed.

#### (1) Review of Organization and Business Management

It is recommended that STE review in detail the management inventories of each Directorate and to discover where an overlapping of duties or responsibilities occurs and begin to restructure STE's organization and systems.

#### (2) Authorization of the General Director

For more quick decision-making and action, it is recommended that STE establish a few Vice General Directors who are responsible for authorization on behalf of the General Director and review and redefine the duties and authorization power of the General Director, the Vice General Director and the Directors.

#### (3) Creation of Cost Consciousness

The following measures are recommended to create cost consciousness.

STE's top executives should study the accounting systems of private companies, and should introduce management accounting system into STE, and if necessary, experts should be invited to make a work shop.

#### (4) Enhancement of Incentives for Employees

To retain its good engineers, STE should consider enhancing incentives, rather than raising the salaries. Two possible ways to create incentives are to establish new programs for study abroad and to introduce an awards system.

#### (5) Review and Enhancement of Outside Plant Works

In order to improve the quality of service and the reliability of the subscriber network facilities in Syria, it is recommended that the necessary measures should be adopted by various departments.

The recommended measures are:

- Review of the duties and responsibilities of all the departments concerned.
- Systematized work flow according to the review of work flow.
- Introduction of computer systems to improve routine work.
- Training key persons who can manage and control work in each department.
- Establishment of a Work Improvement Project to control the preparation of Task Manuals, Designing Standards, Installation and Construction Standards etc.

(6) Arrangement of Design and Installation Volumes on an Annual Basis

In order to implement the balanced expansion of a telecommunications network, which consists of switching, transmission, subscriber cables and other supporting systems, the following points should be considered:

- The Network Planning Department should make detailed implementation plans for network expansion, considering the length of time required for design and construction and also the actual work volume.
- Appropriate construction and installation cost estimates for each individual system, estimated cost allocations for all related departments and management of comprehensive project implementation.

(7) Reservation of the Radio Frequency Band for New Mobile Services

It is necessary that the frequency assignment of both the GSM system and the paging system should be discussed at the government level to avoid interference with other radio frequencies, and, if necessary, to change the frequencies of other systems in order to reserve the GSM frequency bands.





**VOLUME 2**

**FEASIBILITY STUDY**



## CHAPTER 1 INTRODUCTION

### 1.1 Introduction

The Master Plan which targets the year 2010 was prepared at the Phase 1 stage in order to improve the current telecommunications states and to establish a long-term telecommunications infrastructure expansion plan in Syria. Since it is important to execute projects in regular order according to the plan, projects to be fulfilled urgently is selected and their feasibility study is conducted at the Phase 2 stage.

This Report describes the findings and results of the work, which was carried out from February to August, 1996. The Master Plan is described as Volume 1 apart from this Volume 2.

### 1.2 Objectives of the Study

To evaluate the feasibility of each project during the first five-year period (1996-2000) in the Master Plan, a feasibility study on the identified projects such as telephone network, mobile telephone and computerization extracted from the Plan is conducted mainly focusing on Damascus city.

The target projects are as follows:

- (1) Expansion and improvement of the telephone network
- (2) Introduction of Mobile Telephone system
- (3) Introduction of Packet Switched Data Network system
- (4) Introduction of three (3) Computerized systems

- Telephone-center System
- Billing System
- Management Information System

## CHAPTER 2 SELECTION OF TARGET PROJECT

### 2.1 Policy of Selection

The target projects for the Feasibility Study were selected out of the next five-year plan(1996-2000) based on the Master Plan. The basic criteria for selection of telecommunications network development is as follows:

- To expand the telephone network in order to satisfy the big demand.
- To introduce new services with big and urgent demand.
- To replace/renew older facilities which are obstacles to service quality and O/M work.
- To secure stable network services.
- To improve productivity of daily work.
- To improve productivity of administration and management.

### 2.2 Project Selection

The outline of the target project selected for the Feasibility Study is shown in Table 2.2-1.

Table 2.2-1 Outline of Target Project

System	Areas/Location	Remarks
1. Telephone Network Systems (1) Switching (2) Transmission (3) Subscriber Network	All Damascus city (except for rural area)	Including replacement of EMD & expansion of STD. Target Year : 2000
2. Mobile Telephone system	Damascus & Aleppo including main roads	Main parts of western Syria. Target Year : 1998
3. Packet Switched Data Network	5 big cities	Target Year : 2000
4. Computer System (1) Billing System • Center	Aleppo	Target Year : 2000
• Telephone Center	5 big cities	
(2) Telephone Center System	5 big cities (except for Damascus)	
(3) Management Information System	5 big cites & STE's Headquarters	

## **CHAPTER 3      FUNDAMENTAL NETWORK PLAN**

### **3.1      Network Structure**

The telecommunications network structure in the study area is summarized as follows:

#### **(1)      International Network**

At present, there are two (2) INTSs (International Transit Switches) in Damascus and Aleppo. Each individual INTS has international destinations; however, small traffic destinations are set only from a certain INTS. Therefore, inter INTS circuits are established between both INTSs.

#### **(2)      Local Network and Long Distance Network**

There is a large multi-exchange local network in Damascus city, and the local network would be classified as an unstructured network from the viewpoint of exchange location plan and the existent route structure without the routing standards.

In considering the future local network in Damascus city, three (3) models (Zone tandem model, Multi-tandem model and Zone/Multi-tandem Combined model) were studied. As a result of the study, the Zone/Multi-tandem Combined model were selected for constituting the future optimum local network.

As regards long distance network, the existent network structure has the four-level hierarchy divided into five (5) parts in Syria. Digitalization of the telecommunication systems will promote the transition from the four (4) level hierarchy to the three (3) level hierarchy in order to simplify the network structure and to decrease the circuit operation expenditure.

### **3.2      Routing Plan**

The routing will be basically "far to near rotation method". The Damascus city and its rural area is divided into seven (7) blocks as tandem areas according to geographical aspects, the number of LEs and the transmission routes.

### **3.3      Numbering Plan**

The numbering plan in Damascus city will be set up with the following principles:

- (1) The area code is composed of two (2) digits.
- (2) The exchange (trunk) code is composed of three (3) digits.
- (3) The subscriber code is composed of four (4) digits.

Considering the above principles, the telephone numbering for the subscribers in Damascus city will be 011-XXX-XXXX.

### 3.4 Signaling Plan

The ITU CCS (Common Channel Signaling System) No.7 is applied to the signaling system between digital exchanges. The present associated mode for signaling link is employed until a quasi-associated mode is introduced in near future.

### 3.5 Charging Plan

The present charging systems are shown in Table 3.5-1.

Table 3.5-1 Present Charging System

Category	Charging System	Remarks
International Call	Automatic Message Accounting (AMA) System	
Long Distance Call	Automatic Message Accounting (AMA) System	
Local Call	Electronic Meter and Mechanical Meter System	

In this project, the charging systems to be introduced in this project will be AMA system for international/long distance calls and electronic meter system for local calls.

### 3.6 Synchronization Plan

A master-slave synchronization system will be employed in the Syrian digital network. In near future, Aleppo INTS will have a sub-master clock as stand-by of the master-clock in Damascus INTS, and in case of master-clock failure, the sub-master clock will distribute the clock to all of the Syrian digital network.

### 3.7 Technical Standards of Network

In order to establish an appropriate network, the design work should be performed so as to satisfy the target values defined for network quality based on the ITU Recommendation, E and G series.

## CHAPTER 4 TELEPHONE NETWORK EXPANSION PLAN

### 4.1 Demand Forecast

#### (1) Telephone Demand Forecast

In the Study, the telephone demand in Damascus city is forecasted by microscopic demand forecasting methods through a concrete site survey, referring the telephone demand forecasted by macroscopic demand forecasting methods in the Master Plan. The result of the demand forecast in the Study area is shown in Table 4.1-1.

Table 4.1-1 Telephone Demand in Damascus City (Unit : 1,000)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Demand	427.3	433.7	440.0	446.6	453.2	459.8	466.7	473.5	480.6	487.7

#### (2) Fulfillment Plan

The fulfillment plan is to be made to catch up with the demand of the year 2000. As a result, the fulfillment plan after the year 2000 can be set by the same figures as the forecasted telephone demand. The fulfillment plan until the year 2000 is shown below.

Table 4.1-2 Fulfillment Plan in Damascus City

	1996	1997	1998	1999	2000
Fulfillment Plan	289,200	330,200	371,200	412,200	453,200

### 4.2 Traffic Forecast and Circuit Calculation

#### (1) Traffic Forecast

The traffic of local calls and long distance calls including international and mobile telephone calls is calculated using the figures of the Fulfillment Plan in the year 2002.

The calling rates of subscribers classified into business and residential users are as follows:

- Business user : 0.065 erl. per subscriber
- Residential user : 0.040 erl. per subscriber

As for the traffic distribution, the ratio of call kinds are categorized in four (4) by exchange area. The traffic matrices are calculated based on the factors mentioned above and the gravity model. And the mobile telephone traffic is added to the matrices.

## (2) Circuit Calculation

The number of circuits between exchanges is calculated based on the traffic matrices, the proposed network structure and the routing plan. In this study, the connection loss probability per one (1) link is 0.01.

## 4.3 Switching System

The local exchange expansion plan is decided in consideration of the following conditions, and the expansion plan is shown in Table 4.3-1.

- The capacity of line units for each local exchange is calculated with the figure estimated in the year 2002, based on the fulfillment plan.
- Four (4) worn-out step-by-step exchanges (EMD) is replaced with new digital exchanges by 2000.
- The maximum number of line units for an exchange is 30,000 lines.
- New services are introduced to the newest digital exchanges.

Table 4.3-1 Local Exchange Expansion Plan in Damascus City

No of exchanges		Capacity	Expansion Plan (2000)				Total
(1995)	(2000)	(1995)	New	Expansion	Replacement	Sub-total	(2000)
18	24	353,000	192,000	16,000	57,000	151,000	504,000

As regards Long Distance Transit Exchange (STD) and International Exchange (INTS), one (1) new STD should be established in the Thawra building separated from the existing STD in Al Nasser building, considering the increase in telephone demand and network security. The total numbers of necessary circuits are shown in Table 4.3-2.

Table 4.3-2 Number of Circuits of STD in Damascus City

STD	Damascus (city+rural)	Damascus (other area)	Other STD	MSC	INTS		Total
					Damascus	Aleppo	
Al Nasser	4,530	1,080	2,790	1,380	450	300	10,530
Al Thawra	4,530	1,080	2,790	1,380	450	300	10,530
Total	9,060	2,160	5,580	2,760	900	600	21,060

Note : Damascus other area : Zabadani, Al Nabek, Quennetra, Daraa, Sweda  
Other STD : Aleppo, Hama, Homs, Lattakia

The power supply systems in the objective exchange offices are designed in consideration of the present commercial power conditions and the future plan of the telecommunications facilities to be introduced.



#### 4.4 Transmission System

The facilities provision plan is formulated taking the following conditions into account.

- Transmission network structure is simplified as far as possible
- The existing transmission system is optimized as much as possible.
- 50 % of circuits is secured even in case of one route failure.
- One (1) pair of fiber cores is spared for each transmission section.
- According to the worldwide trend on technology, SDH transmission system is introduced in the Study area.

The transmission ring (loop) structure is established in order to satisfy the circuit demand estimated in the year 2002 based on the Demand Fulfillment Plan.

SDH transmission rings, LOOP 2, LOOP 3, LOOP 5 and LOOP 9 are established for the section with a circuit shortage. Removed 140 Mb/s systems are transferred to sections related to the new telephone exchanges, Ibn Alamied, Al Abbaseyen and Al Sebeyneh.

#### 4.5 Outside Plant

The following subscriber network structures are considered and examined to select the most appropriate subscriber network to be planned in this study area. As a conclusion of considering all the conditions in the study area, the combination of the Rigid Cable Network and the Flexible Cable Network is selected.

- Cable Network Structure : Rigid Cable Network, Flexible Cable Network and Hybrid Cable Network
- Radio Network Structure : Wireless Local Loop Network

The total number of necessary primary cable pairs calculated based on the "Demand Fulfillment Plan" and the total number of primary cable pairs added in this project are shown in Table 4.5-1.

Table 4.5-1 Numbers of Primary Cable Pairs in Damascus City

No. of Service Area	Demand Fulfillment Value (Tx-5, 2005)	Necessary No. of Primary Pairs	No. of Existing Primary Pairs	No. of Added Primary Pairs
20	487,700	731,550	547,100	264,100

The new junction cable routes are planed on eight (8) sections in order to satisfy the terms required from the transmission system plan.

## CHAPTER 5 MOBILE TELEPHONE SYSTEM

### 5.1 Introduction

The mobile telephone service is presumed to start in the year 1998 and the system is to be designed to have enough capacity for the estimated demand in the year 2000.

### 5.2 Demand Forecast

The demand forecasted in the area to be covered by this system is shown in Table 5.2-1.

Table 5.2-1 Demand Forecast of Mobile Telephone

	1998	1999	2000
Total Demand	50,000	59,665	69,857

### 5.3 System Plan

The fundamental network aspects are as follows:

- The network has one (1) mobile service switching center (MSC) located at Al Thawra, which is connected to STDs at both Al Thawra and Al Nasser.
- A billing Center and an Operation and Maintenance Center (OMC) are located at Al Thawra.
- Radio link budget is based on 0.8 Watts Mobile Station (MS) nominal power with coverage probability of at least 90 % within each cell, and the indoor loss is not taken into consideration.

### 5.4 Billing Plan

The tariff structure is generally composed of the following items shown in Table 5.4-1, and its tariff is estimated using a result of having surveyed the tariff in neighboring countries.

Table 5.4-1 Tariff Plan (Unit : US\$)

	Tariff
Price of Mobile Terminal	1,000
Subscription Fee	500
Monthly Fee	25
Air-time Fee	0.05/min.
Special Features Charge	-

## CHAPTER 6 PACKET SWITCHED DATA NETWORK (PSDN)

### 6.1 Demand Forecast for Syria

The international trends can not be applied to Syria without taking into account the special situation in Syria concerning data communications. However international trends will help to better forecast the medium and long term demand. Demand forecast for Syria should be based mainly on

- STE's experience since the introduction of the PSDN (demand over the past 2 years),
- the forecasts of economy development,
- forecasts in the area of computer penetration (PCs, LANs, Workstations etc.) and
- forecasts of STE's internal demand (STE is probably the largest user of the service).

It is assumed that the trend in Syria will follow the trend which can be observed in developed countries. The anticipated trend in Syria is depicted in Figure 6.1-1.

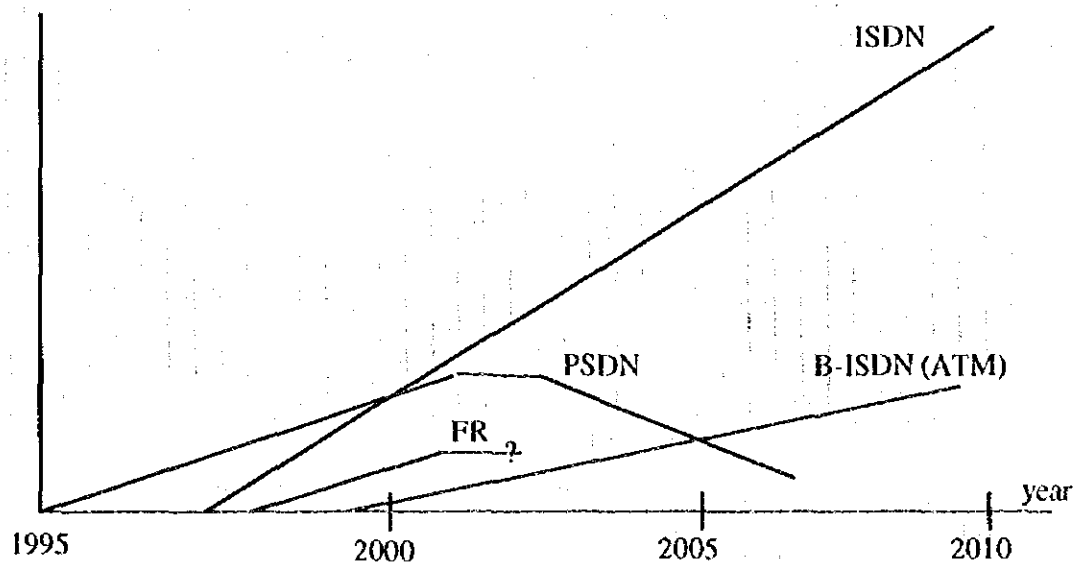


Figure 6.1-1: Possible Trend in Data Communication in Syria

### 6.2 Outline of Action Items

#### (1) Expansion Schedule

The expansion of the existing PSDN is an ongoing routine task and should be carried out within the existing responsible organizational unit. The other tasks involve several organizational units and hence it is preferable to carry out this work in project organization. A possible rough schedule of the action areas is depicted in figure 6.2-1.

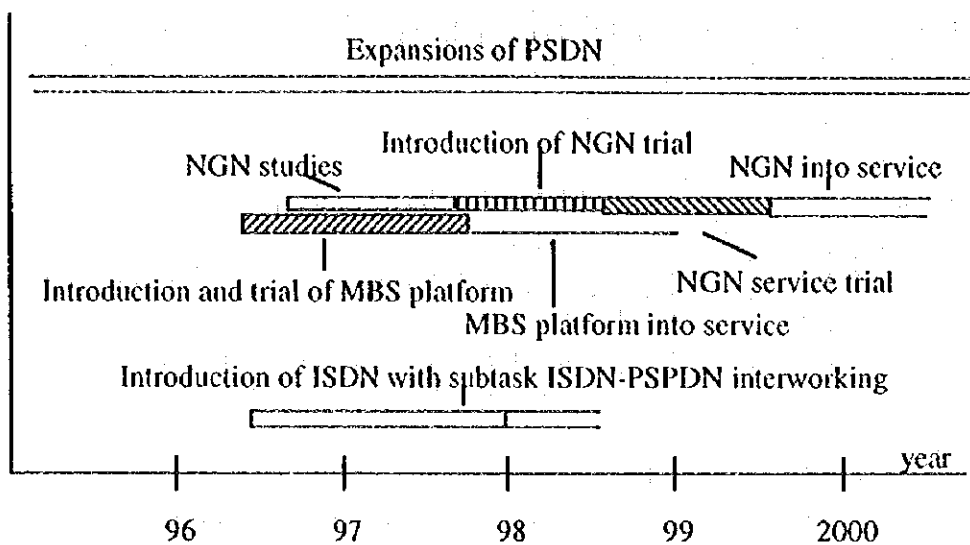


Figure 6.2-1 Projects and Tasks Schedule

(2) Expansion of Existing PSDN

- Expansion of the network is based on a permanent supervision and planning process to keep track with demand
- All expansions activities are triggered by this process, expansions should not be based on forecast
- A small test network should be installed (1 ECOM, 1 APX, 2 XMUX, all devices with limited port (FEP) numbers. The test network should be combined with the pool for spare parts.

(3) PSDN-ISDN Interworking

- ISDN project should be set up as soon as possible
- PSDN-ISDN interworking should be part of this project (sub-project)
- Sub-project should evaluate interworking cases, write a specification, evaluate tenders etc.
- Project should not only deal with technical issues but also with issues such as tariffs and marketing

(4) NGN and MBS Platform

- Definition of services to be supported by the platform(s)
- Development of a consistent concept
- Specification and tendering process
- Development of marketing and tariff concept
- Introduction of platform (for trial)
- Introduction of service

## **CHAPTER 7      COMPUTER SYSTEM**

### **7.1      Introduction**

Based on the Master Plan, the feasibility study was carried out on the three (3) computer systems; Billing-center System, Telephone-center System and Management Information System.

### **7.2      Billing-center System Plan**

A new Billing-center system is added to process telephone charges and issue the bills in order to cover the northern part of Syria, in which part the number of the subscribers is estimated at 1.05 million in 2000. It should be reminded that a new billing-center system has already been installed at Damascus for the southern part.

This system is to be installed in the new building at Aleppo and consists of two Servers and two Magnetic Units in the heart of the system, taking account of its reliability.

### **7.3      Telephone-center System Plan**

Twenty five telephone-centers which will have more than 10,000 subscribers from 1996 to 2000, are selected. The main functions of this system is to process "service order works", manage subscriber lines and collect bills. As for the system configuration, terminals including cash registers must mutually communicate and thus are connected by a LAN (Local Area Network) and a file server.

### **7.4      Management Information System (MIS)**

The information in the above-mentioned systems is useful for the directors in H.Q and provinces to make management decisions and this system is employed to let managers know the useful many pieces of information.

A server of the MIS is installed in H.Q. and it is connected to the above both systems to gather the customer and billing information. Client terminals are installed in H.Q. and each province connected by X.25 network.

## CHAPTER 8 BUILDING PLAN

The building floor space required for this Project was estimated based on the size of the new and expanded systems, taking account of future expansion within the final capacities of the systems

### 8.1 Telephone Network

Table 8.1-1 Floor Space for Telephone Network (Unit : m<sup>2</sup>)

	Switching System		Transmission System		Power Supply System		MDF Room		Common Space (New Building)		TOTAL	
	Mod.	New	Mod.	New	Mod.	New	Mod.	New	Mod.	New	Mod.	New
Required Space	545	560	30	180	0	672	0	176	0	2,936	575	4,524

### 8.2 Mobile Telephone System

The estimation of the space for the mobile telephone system is shown in the table below.

Table 8.2-1 Floor Space for Mobile Telephone System (Unit : m<sup>2</sup>)

	MSC, BSC	OMC	Billing Center	BTS	Transmission	Total
Required Space	108	144	144	365	320	1,081

### 8.3 Packet Switched Data Network (PSDN)

Expanding the existing PSDN does not place any particular requirements on the building plan.

### 8.4 Computer system

Modifications are needed in the Aleppo billing-center building in order to install the billing-center system, in particular to the computer room and data-entry room. To estimate the necessary space for the Aleppo billing center, the space used in the Damascus billing center was used for reference.

Table 8.4-1 Floor Space for Computer System (Unit : m<sup>2</sup>)

Office/Bldg.	Room type	Necessary space	Required space	
			Modification	New
Aleppo billing center	computer room	70	70	---
	Data-entry room	70	70	---

## CHAPTER 9 OPERATION AND MAINTENANCE

### 9.1 Policy of Operation and Maintenance

After the completion of the project, the Operation and Maintenance (O/M) of the telecommunications network is an important role of STE. Therefore, the O/M organization should be fully formulated in consideration of all the things, such as training of employees, enhancement of O/M facilities, appropriate stock of spare parts and tools.

### 9.2 Telephone Network

#### (1) Inside Plant

In principle, the O/M structure for the inside plant will be extended as the same structure as the present O/M system in consideration of the following items:

- Deployment of Staff
  - Additional staff is required for switching and power plants to be located in the new exchange offices, while no additional staff is required for SDH transmission system.
  - Inside plant is supervised and controlled by O/M staff all the day with three-shift.
- Spare parts and tools
  - Spare parts and tools for switching and power plants are provided the amount for the next five years at the initial stage.
  - As common spare parts, one unit per active unit in SDH loop (ring) is provided.
- Maintenance assistance
  - For switching system, an expert engineer is required to assist STE in resolving software/hardware problems for one year after completion of the Project.
- Training
  - Key persons who manage and control the O/M work is trained to acquire the network planning, systematic O/M procedures and so forth in a foreign country advanced on the telecommunications field.
  - For the personnel who are engaged in daily O/M work, a site-training is provided by suppliers and manufacturers

#### (2) Outside Plant

After the completion of the Project, it is significant for STE to operate and maintain the completed subscriber network in a good condition. In principle, the organization of the

present maintenance centers for the outside plant will be extended in consideration of the following items.

- **Development of Maintenance Center**
  - Four (4) maintenance centers are established for new exchange service areas.
- **Deployment of Staff**
  - Additional staff is required for Operation and Maintenance Center (OMC) to be located in the new exchange service areas.
- **Arrangement of Vehicles**
  - Some vehicles should be arranged for each OMC to perform the maintenance work efficiency. In addition, the allocation plan of vehicles should be formulated by STE, in consideration of the future states by the completion of this Project.
- **Arrangement of Measuring equipment and tools**
  - The measuring equipment and jointing/maintenance tools should be arranged for each maintenance center to achieve an easy and accurate maintenance work.
- **Training**
  - Key persons who manage and control the operation and maintenance work should be trained to acquire project implementation and systematic operation/maintenance procedures in foreign countries.
  - For line men who are engaged in daily operation and maintenance works, it is recommended that they should take part in On-the-Job-Training (OJT) as much as possible.

### 9.3 Mobile Telephone System

The organization for the mobile telephone network should be established solely for mobile telephone service independent of the organization of the PSTN.

Generally speaking, there should be the following sections in the operation and maintenance organization.

- (1) Administration section
- (2) Engineering section
- (3) Marketing/Sales section
- (4) Customer service and billing section
- (5) Operation and Maintenance section



The Operation and Maintenance Center (OMC) for the mobile telephone service should be established in Al Thawra telephone office and the branch telephone office at Aleppo for quick recovery from a failure at remote stations.

#### 9.4 Packet Switched Data Network

OMC should be operated in 1.5 shifts(e.g. from 8:00 to 19:00) but supervised 24 hours a day. In case of any serious events, the intervention of trained persons is required.

##### (1) PSDN

- a. Recommended PSDN-OMC staff:
  - 2 engineers, 4 technicians and 2 secretaries.
- b. Training for engineers and technicians:
  - 2 weeks (courses abroad and in Syria)

##### (2) ISDN-PSDN Interworking

The ISDN-PSDN interworking unit will not require extra staff. It is assumed that 3 persons have to be trained abroad. Duration of training will be 1 week.

##### (3) NGN/MBS

- a. Recommended NGN/MBS-OMC staff:
  - 2 engineers, 4 technicians and 2 secretaries.
- b. Training for engineers and technicians
  - 3 weeks (courses abroad)

#### 9.5 Computer System

To operate the implemented system, professional staff is required for the computer systems in telephone centers and billing centers. Required personnel for the computerized system are operators, maintenance personnel, and system engineers. Consequently, the necessary number of staff members per year is indicated as follows.

Table 9.5-1 Number of Staff Members for the Computer System

Needed personnel	year	Number of staff members				
		1996	1997	1998	1999	2000
Maintenance person		0	4	7	7	7
Operator		3	3	3	3	3
System engineer (for billing center)		2	2	2	2	2
System engineer (for MIS)		1	1	1	1	1
Total		6	10	13	13	13

## CHAPTER 10 IMPLEMENTATION PLAN

### 10.1 Policy of Implementation Plan

The objective of project implementation is that target projects are to be put into service as planned without any delays. In order to achieve this objective, it is important that the implementation plan is made from all over points of view.

### 10.2 Project Implementation

The demarcations of responsibilities for the Projects are shown in Figure 10.2-1.

Items	Equipment and materials	Installation	Supervision	Maintenance assistance
1. Telephone exchange	○	■	○	○
2. Transmission system	○	○	○	----
3. Power plant	○	■	○	----
4. Outside plant	○	* ○ / ■	■	----
5. Mobile telephone system	○	■	○	○
6. Packet switching system	○	* ○ / ■	○	----
7. Computer system	○	■	○	○
8. Land/Building	■	■	■	----

Note : ■ STE Part \* ○ / ■ Contractor & STE ○ Contractor Part

Figure 10.2-1 Responsibility of Project Works

### 10.3 Implementation Schedule

Taking into consideration the target year for the Project, the comprehensive schedule of the Project will be as shown in Figure 10.3-1.

	1995	1996	1997	1998	1999	2000
JICA Study	M/P A/P F/S					
Financing Treatment & Tender Document						
Tendering			SPEC OPEN CLOSE CONTRACT			
Implement of Project				MOBILE	TELEPHONE	

Figure 10.3-1 Comprehensive Schedule

## CHAPTER 11 COST ESTIMATION

### 11.1 Conditions for Estimation

The investment cost for this project is estimated based on the scopes of the facility provision plan and classified into foreign currency and local currency. The prices of equipment and wages may be changed according to the market situation, inflation and so on, however the cost is estimated, referring to the world market and the STE's actual costs.

The conditions for estimation are as follows:

- (1) Foreign currency is US\$.
- (2) Local currency is Syrian Pounds.
- (3) The costs for equipment and materials are based on C.I.F. (Cost, Insurance and Freight)
- (4) The exchange rate except for Import Tax is 42 Syrian Pounds per US\$.
- (5) The import tax for telecommunication equipment and materials in Syria is 30% average and its exchange rate is 23 Syrian Pounds per US\$ for cable, 11.25 Syrian Pounds per US\$ for other telecommunications equipment.

### 11.2 Cost Estimation for Each System

The cost components for each system are mainly considered as follows:

- Equipment and materials including spare parts
- Installation including supervision
- Building except for land(including also common space but negligible space for small requirements)
- Tools and measuring equipment
- Training including maintenance assistance(in foreign counties and / or in-land)

The currency of installation cost for each system is in accordance with the responsibility of project works.

### 11.3 Summary of Cost Estimation

The total cost for all facilities is estimated as shown in Table 11.3-1

Table 11.3-1 Total Cost

	Foreign Currency (US\$)	Local Currency (Syrian Pounds)
<b>1. Telephone Network</b>	<b>62,501,202</b>	<b>1,328,782,862</b>
(1) Switching	33,171,514	169,861,952
(2) Transmission	3,384,468	14,734,470
(3) Subscriber Network	25,945,220	1,144,186,440
<b>2. Mobile Telephone System</b>	<b>29,671,100</b>	<b>124,649,500</b>
<b>3. Packet Switching System</b>	<b>1,724,462</b>	<b>6,594,808</b>
<b>4. Computer System</b>	<b>5,575,400</b>	<b>25,517,987</b>
(1) Billing Center System	435,736	2,934,221
(2) Telephone Center	4,923,545	21,474,327
(3) Management Information System	216,119	1,109,439
<b>5. Sub-Total ( 1 to 4)</b>	<b>99,472,164</b>	<b>1,485,545,157</b>
<b>6. Contingency(10% of Sub-Total)</b>	<b>9,947,216</b>	<b>148,554,516</b>
<b>7. Total</b>	<b>109,419,380</b>	<b>1,634,099,673</b>

## CHAPTER 12 PROJECT EVALUATION

### 12.1 Project Costs

Total project cost amounted in US 134,842,000 dollars required to implement the project excluding contingency cost. The project cost will be disbursed during the period of 1996-2000 along with the implementation plan described in Chapter 11. It is assumed that the construction cost will spend more than 80% of total in the year 1998 and 1999. The ratio of foreign currency portion in total construction cost is 74%.

Total Project Costs		(thousands US\$)				
	Total	1996	1997	1998	1999	2000
Foreign Portion	99,472	430	4,623	50,172	31,658	12,589
Local Portion	35,370	69	454	12,651	15,855	6,341
Equity	0	0	0	0	0	0
Total	134,842	500	5,077	62,823	47,513	18,929

### 12.2 Financial Evaluation

#### (1) Analysis of Cash Flow Statement

This project is calculated as 16.1% of FIRR for ten years project evaluation period till the year 2008, and 20.5% for twenty years project evaluation period till the year 2018. The FIRR for the project is more than the currently prevailing interest rate for long-term lending in STE. Thus, this project is viable on the condition that STE will keep the same financial resources as that of currently deploying. The FIRR for basic telephone network project including fax, ISDN, new services, were calculated as 8.5% for ten years project evaluation period, and 14.6% for twenty years. The FIRR for mobile telephone network project were calculated as 32.7%, and 34.6% respectively.

#### (2) Analysis of Income Statement

It is seen that the net income turns into black as early as the full commencement year of the services. The operating ratios in total indicate 28% , and indicate that the sufficient profits are generated with the project.

#### (3) Analysis of Fund Flow Statement

The fund flow statement is prepared as an example of the following conditions. Total investment for the project amounts US 134,842,000 dollars of which the foreign currency portion will be financed by foreign soft loan (23 years maturity period with 5.2% p.a. interest with grace period of 10 years). The local currency portion is to be financed with the government (15 years maturity period with 9% p.a. interest with grace period of 5 years). The repayment method for both loans is to repay in equal amount during the remaining period after the grace period of principal repayment. The short-term loan should be procured when an cash balance become negative, is assumed to be 10% p.a. interest for this analysis.

The fund flow statement indicates that the total cash balance generated during the project period (1996 - 2018) is estimated about US 303,193,000 dollars, and the investment cost shares 44% of this amount. This means that this project can generate 2.2 times cash balance as large as the total investment amount, which is higher than currently achieved 18% of returns on fixed assets by STE.

By the year 2001, the cash balance turns surplus to cover the costs and keep its positive accounting position until the end of service life. Debt-service ratio shifting to 3.8 at the year end, indicates the stability of financial position of the project and well capability to repay the foreign loan. Therefore, the project provides a sound investment opportunity if the shortage of fund in the beginning of the project period will be covered by the smooth procurement of short-term loan with a good terms of procurement conditions, since the larger amount of loans make weaken its repayment capability.

### 12.3 Economic Evaluation

According to the questionnaire survey conducted by the Team in March 1996, seven samples of business users, and forty one residential users were obtained from Damascus city. Business users answered that the costs reduction were realized due to telephone usage. This is estimated by around 1.3 times as large as telephone charges. Residential users answered that if telephone service is not available, 27% of total frequencies (No. of users x frequencies of monthly call) will be substitute to the travel to call destination or use alternative means such as car transportation, sending messengers by spending 48% of total forty one user' telephone charges. These means that consumer surplus for business user is 30%, and for residential users is 48%.

## **CHAPTER 13      RECOMMENDATION**

### **13.1    Recommendation**

To help STE successfully implement, the following three recommendations have been prepared:

(1) Strengthening the forecasting section and assigning technically-trained staff to the forecasting section.

- It is important for the demand-forecasting section(s) to keep in close contact with the related staff of national administrative organizations, and to make consistent efforts to obtain the latest statistical data.
- With regard to the staff, certain employees should be technically re-trained to undertake these important tasks.

(2) Facilities records are indispensable.

- Facility records should be updated with each installation, including replacements and removals.
- STE should assign staff to be responsible for the maintenance of facilities records and should organize section(s) for that purpose.

(3) Improvement of Project Management

- STE organize a new project management department in its H.Q. to manage and supervise all ongoing projects in order to achieve "progress management".
- The project team should draw up a basic time table for all projects, including building constructions to circuits.





**VOLUME 3**

**ACTION PLAN**

## **PART 1 THE EIGHTH NATIONAL FIVE-YEAR PLAN**

## CHAPTER 1 INTRODUCTION

### 1.1 Introduction

In order to review the telecommunications part of the Eighth National Five-Year Plan, prepared by STE, in the course of the study for the Master Plan, it was proved to be essential to develop that part, which only concentrates on the accumulated number of waiting applicants and the number of exchange line units, further in detail (i.e. to forecast demand, to make facilities plan, and to estimate costs). Therefore, it was necessary to prepare the Action Plan as an action plan for the five years in order to increase the feasibility of its implementation.

Based on the above-mentioned objectives, the Action Plan was prepared.

The Master Plan is described in "Volume 1" of the Main Report and the Feasibility Study is described in "Volume 2".

### 1.2 Objectives of the Study

The objectives are to prepare an action plan for STE until the year 2000 in accordance with the STE's Eighth National Five-Year Plan and also to prepare a detailed plan which targets telephone network expansion in Damascus, introduction of mobile telephone system to Damascus and Aleppo, and introduction of packet switched data network and computer systems to five big cities as projects to be fulfilled urgently.