CHAPTER 2 DEMAND FORECAST

2.1 Demand Forecasting Methods

It is generally known that telephone demands are influenced by national economic indices represented by the Gross Domestic Product (GDP) or GNP. In particular, with regard to a national long-term demand forecast, the method, based on the correlation between demand density and the level of GDP per capita using world-wide data, is demonstrated by ITU's recommendation.

On the other hand, the forecasting method by logistic models also often provides reasonable solutions when it is difficult to apply for the relationship between density and GDP per capita.

Considerable surveys and studies on the country concerned must be conducted when deciding to apply the above methods.

2.2 Macroscopic Demand Forecast

(1) Application to Syrian telecommunications forecast

In the Master Plan, the relationship between GDP/Capita and telephone density has been selected to forecast, the method employed being a long-term forecast method. However, in the Action Plan, the logistic model forecast, as a short-medium range method, has been applied to forecasting demands restricted to the period of the Eighth National Five-Year Plan (1996-2000) only, taking into account expected strong growth in demand. The forecasted demand is approximately twice as many as Master Plan's demand.

The forecasted result is given in Table 2.2-1.

Table 2.2-1 Demand Forecast

YEAR	1996	1997	1998	1999	2000	2002	2005
POPULATION (000)	14,780	15,274	15,784	16,311	16,856	18,001	19,865
DEMAND FORECAST (000)	3,074	3,274	3,475	3,677	3,876	4,256	4,806
DEMAND DENSITY/100 Inhabitants	20.80	21.44	22.02	22.54	22.99	23.69	24.19

2.3 Microscopic Demand Forecast

The local unit demand in each exchange area is forecasted by using the number of existing subscribers and waiting list because it is not easy to obtain stable statistical data for small geographical areas.

Table 2.3-1 shows the calculated result of demand forecasts for each province.

Table 2.3-1 Demand Forecast in each provinces (Unit : thousand persons)

PROVINCE/Year	1996	1997	1998	1999	2000	2002	2005
Damascus City	630.0	671.0	712.2	753.6	794.4	874.1	976.5
Damascus Rural	370.2	394.3	418.5	442.8	466.8	513.7	545.5
Aleppo	585.4	623.4	661.7	700.2	738.1	812.1	911.4
(City)	(460.2)	(490.0)	(520.1)	(550.4)	(580.2)	(638.4)	(716.4)
(Rural)	(125.2)	(133.4)	(141.6)	(149.8)	(157.9)	(173.7)	(195.0)
Homs	304.9	324.8	344.7	364.8	384.5	423.1	470.2
Hama	224.3	238.9	253.5	268.3	282.8	311.2	347.5
Lattakia	213.9	227.9	241.8	255.9	269.8	296.8	336.6
Daraa	108.7	115.7	122.8	130.0	137.0	150.8	174.5
Sweda	68.2	72.7	77.1	81.6	86.0	94.7	107.8
Tartous	143.5	152.9	162.3	171.7	181.0	199.1	227.2
Idleb	130.0	138.5	147.0	155.5	163.9	180.4	222.0
Der Al Zor	98.8	105.3	111.7	118.2	124.6	137.1	157.5
Al Hasaka	116.8	124.4	132.1	139.7	147.3	162.1	198.1
Quennetra	11.8	12.5	13.3	14.1	14.8	16.3	20.0
Rakkah	67.4	71.7	76.1	80.6	84.9	93.4	111.4
<TOTAL>	3074.0	3274.0	3475.0	3677.0	3876.0	4265.0	4806.0

CHAPTER 3 DEMAND FULFILLMENT PLAN AND TRAFFIC FORECAST

3.1 Demand Fulfillment Plan

This plan regards the annual construction ability to be approximately 300 thousand lines under STE's present ability of finances and construction.
Figure 3.1-1 shows the estimated result of the mid-term scope of the demand fulfillment plan based on the above-mentioned assumption.

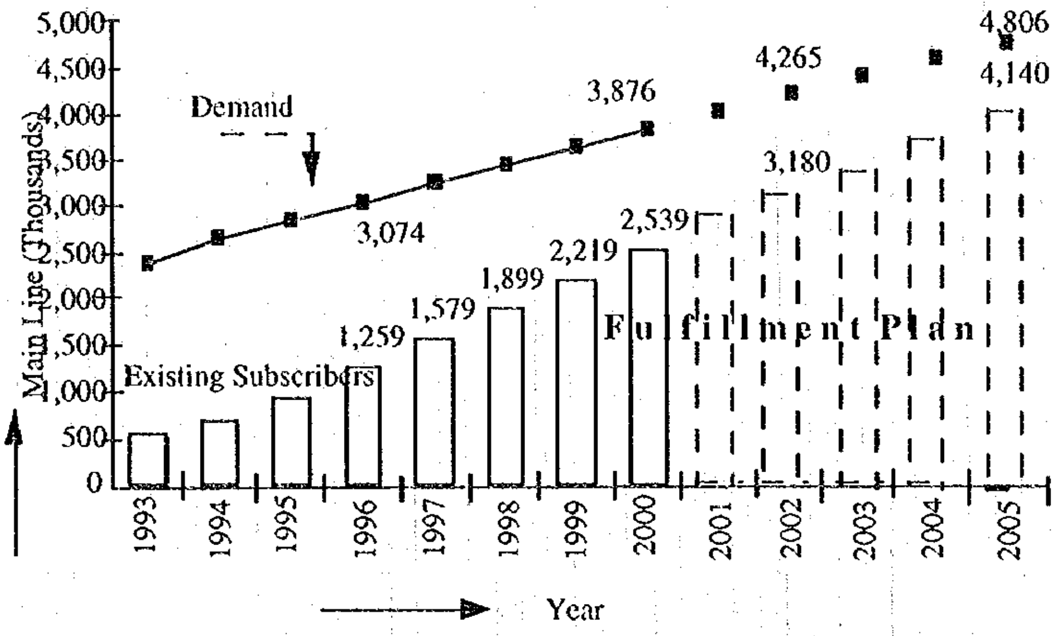

Figure 3.1-1 Mid-Term Scope of the Demand Fulfillment Plan

3.2 Traffic Forecast

(1) Methods used in the Traffic Forecast Approach

- Determination of Calling Rates

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

Category	Total calling rate
Business	0.13 Erl.

Residential 0.08 Erl.

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

The traffic volume for exchange units and specified trunk circuit routes varies according to originating calling rate and the distribution ratio between business and residential subscribers. The calling rates and distribution ratio should be determined by each area and exchange center because of difference of social-geographical conditions. Taking into the above conditions, traffic volume distribution by route are calculated.

(2) The Calculating the Traffic Matrix

The traffic matrix is prepared according to the volume of originating traffic. Traffic volume is normally calculated using the gravity model, which assumes an unequal affinity rate between telephone centers, and is affected by the distance between telephone centers. Matrix in the Study, however, was calculated on the assumption that the affinity rate among exchange centers is equal and is not affected by the distance between exchanges except for the Damascus local network area, Aleppo City and between transit exchanges. That is because actual traffic data and sufficient information about location on the map is not obtained concerning every exchange area.

CHAPTER 4 FACILITIES PLAN

In order to satisfy the demand fulfillment plan, every kind of systems in each facility has been studied and the most suitable and economical facilities have been selected. As a result of the study,a comprehensive overview for the Eighth National Five-Year Plan is shown below.

4.1 Transmission

The shortage of transmission facilities on long-line networks, junction networks, long local sections, and so forth. has been evaluated. Plans for the years 1996-2000 can be summarized as follows:

a. Aleppo-Hama-Moms-Lattakia: one SDH STM-4 Ring on existing fiber optic cables
b. Aleppo-Hama-Moms-Tartous-Lattakia: one SDH STM-4 Ring on existing fiber optic cables
c. Damascus -Homs: 5GHz microwave systems and two SDH STM-4 on existing fiber optic cable.
d. Several loops for junction network in Damascus and Aleppo.

4.2 Exchange

Sizes for local exchanges and long-distance exchanges are examined.Table 4.2-1 gives the comprehensive facilities plan.

Table 4.2-1 The comprehensive facilities plan for exchanges (Line Units)

	1996	1997	1998	1999	2000
Regular Network Expansion	123,300	243,300	430,900	411,000	323,900
Replacement of EMD	10,000	82,000	0	61,000	68,000
Total Subscriber Line Units	133,300	325,300	430,900	472,000	391,900
Total Trunk Line Units	6,160	7,560	6,360	7,340	9,330

4.3 Subscriber network

An average distribution factor* of 1.5 is recommended when to decide the number of primary and secondary cable pairs. Table 4.3-1 gives the overview of the required numbers of primary and secondary cable pairs.

Table 4.3-1 The required number of cable pairs

Number of primary cable pairs	2,051,400
Number of secondary cable pairs	3,077,100
Total	5,128,500

* Distribution factor 1 : Ratio between primary pairs terminated at the MDF and required line units for primary pairs.

Distribution factor 2 : Ratio between primary and secondary cable pairs for secondary pairs.

4.4 Computerization

It is proposed to introduce three computer systems in order to improve STE's management. They are "Billing-center System", "Telephone-center System" and "Management Information System".

Billing-center system which is to be introduced in Aleppo is the same as the existing in Damascus, and that is planned to cover northern cities.

Telephone-center System aims at streamline of whole works and services in the telephone center and is to be installed at 48 telephone centers.

Management Information System is installed to analyze and let the STE's management know many important pieces of information from the above-mentioned two systems.

CHAPTER 5 COST ESTIMATION

5.1 Transmission

The STE's contract prices are adopted to estimate transmission costs (except for cost in a few systems).

5.2 Exchange

STE's contract prices are also employed to estimate exchange costs and the total cost is calculated after per line (unit costs) for different types of exchanges are deduced.

5.3 Subscriber Network

The average costs for physical subscriber network are estimated based on STE's information.

5.4 Computerization

Costs for computerization is calculated under the condition of procurement in Syria, use and customization of packaged software etc.

5.5 Cost estimation summary

The total investment cost for the Eighth National Five-Year Plan is listed in Table 5.5-1.

Table 5.5-1 Total Cost Estimation Summary for the Eighth National Five-Year Plan

(Unit: Millions of US Dollars)

Facilities / Systems	Estimated Cost
Transmission System	108.4
Switching System	292.0
Subscriber Network	505.7
Computerization	9.1
Total	915.2

CHAPTER 6 FINANCIAL ANALYSIS

The projects during the Eighth National Five-Year Plan were evaluated using the following methods:

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

6.1 Premises and Assumptions

The basic premises and assumptions are as follows:

(1) The projects' revenues was calculated under the assumption that revenues would continue until 2010 because the lifetime of most facilities is about 10 years.

(2) The effects of inflation were not considered.

(3) Revenues and Costs Estimation
The present tariff rate (1995) was used to estimate the revenues in the projects.

(4) Revenue per year is estimated by forecasting the number of mainline, the revenue per main line, traffic distribution, and depreciation of facilities.

(5) Investment costs are shown in 5.5 cost estimation summary of CHAPTER 5.

(6) Operation and Maintenance Costs
Operation and maintenance costs include personnel costs, administration costs, repair costs and so on.
Table 6.1-1 gives operation and maintenance costs in 1994.

Table 6.1-1 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

(7) Working Capital

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

(8) Taxes

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

6.2 The Result of Financial Analysis

As the result of financial analysis, the financial internal rate of return for the projects during the Eighth National Five-Year Plan is estimated at 10.46 percent.

PART 2 DETAILED PLAN

A-10

CHAPTER 1 INTRODUCTION

1.1 Introduction

This Report describes the findings and results of the work in Syria on the Detailed Plan of the selected projects, which was carried out from February to August, 1996, based on the Eighth National Five-Year Plan as Part 1 in this Volume 3, which was formulated from December, 1995 to March, 1996 prior to this study.

1.2 Objectives of the Study

The objective is to study in detail the target projects based on the Action Plan.

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 Detailed Plan are selected based on the Action 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 Detailed Plan 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 Action 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	2002	2005
Demand Total	630.0	671.0	712.2	753.6	794.4	874.1	976.5

(2) Fulfillment Plan

The fulfillment plan in the Study area is prepared based on the Fulfillment Plan formulated in the Action Plan, taking into account of the latest existing subscribers and STE's Eighth National Five-Year Plan.

Table 4.1-2 Fulfillment Plan in Damascus City

	1996	1997	1998	1999	2000	2002	2005
Fulfillment Plan	296,100	343,700	391,400	439,000	486,700	582,000	752,200

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 such as ISDN 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	248,000	40,000	57,000	231,000	584,000

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 STDs in Damascus City

STD	Damascus (city+rural)	Damascus (other area)	Other STD	MSC	INTS		Total
					Damascus	Aleppo	
Al Nasser	5,640	1,530	3,480	1,380	630	450	13,110
Al Thawra	5,640	1,530	3,480	1,380	630	450	13,110
Total	11,280	3,060	6,960	2,760	1,260	900	26,220

Note : Damascus other area : Zabadani, Al Nabek, Quenneira, 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 1, 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	752,200	1,128,300	547,100	584,950

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.

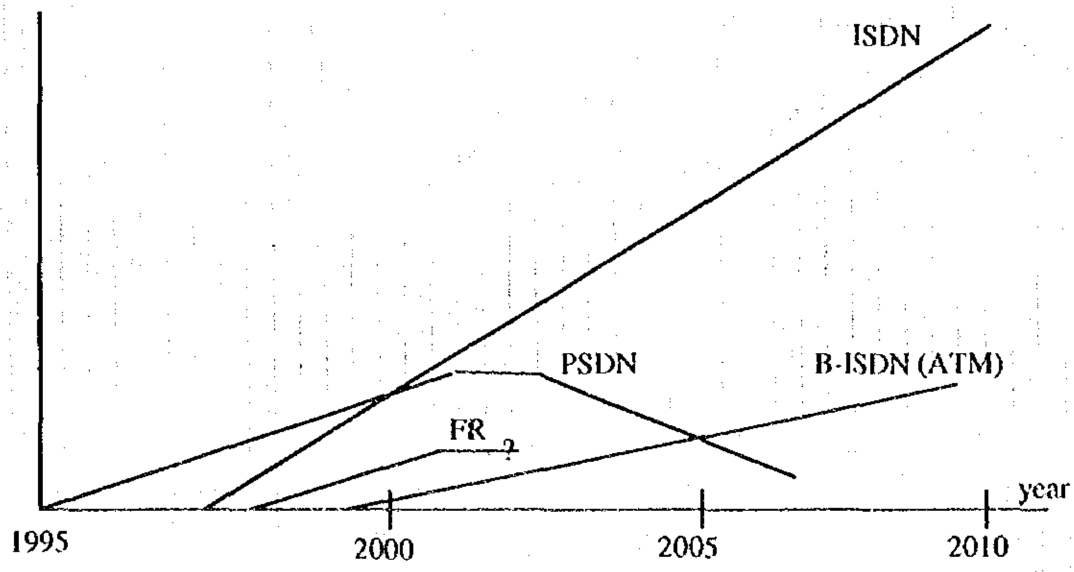

Figure 6.1-1 Possible Trend in Data Communication in Syria

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.

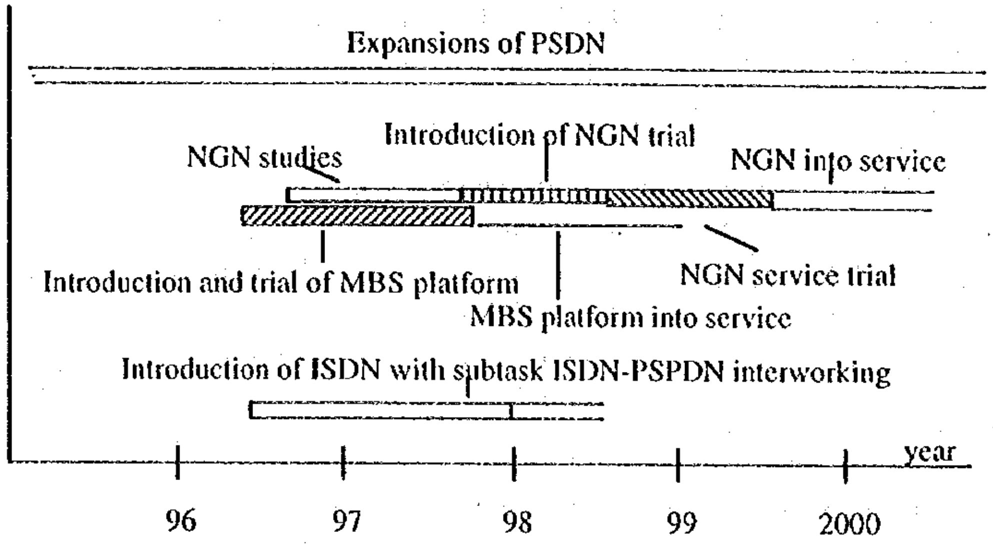

Figure 6.2-1 Projects and Tasks Schedule

(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 Action 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 1.5 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

Thirty 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 floor space of buildings required for this Project is estimated according to the expansion sizes of the systems, considering a future expansion within the final capacities of individual systems

8.1 Telephone Network

Table 8.1-1 Floor Space for Telephone Network (Unit : m^2)

	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	645	610	30	180	0	672	0	262	0	3,208	675	4,932

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^2)

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

8.3 Packet Switched Data Network (PSDN)

The extensions of the existing PSDN do not put any particular requirements on the building plan.

8.4 Computer System

The room modifications in Aleppo billing-center building are needed in order to install the billing-center system, and these rooms are computer room and data-entry room. In estimating the necessary space for Aleppo billing center, the space of Damascus billing center is referred.

Table 8.4-1 Floor Space for Computer System (Unit : m^2)

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	Number of staff members				
year	1996	1997	1998	1999	2000
Maintenance person	0	5	9	9	9
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	11	15	15	15

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.

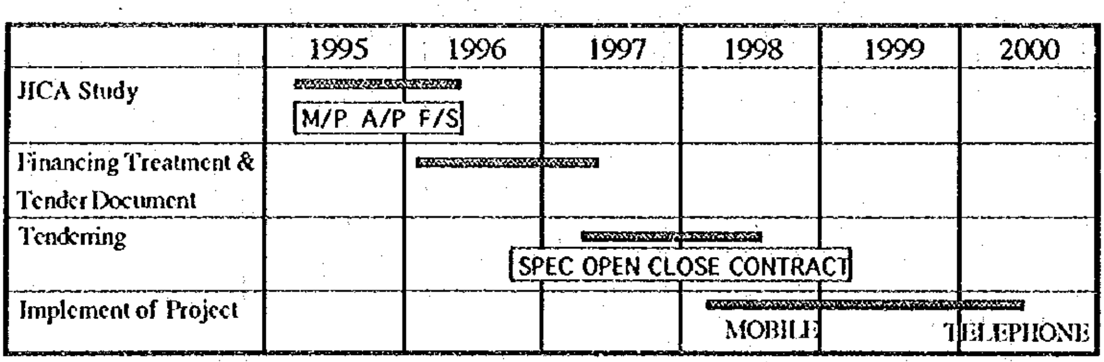

Figure 10.3-1 Comprehensive Schedule

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)
1. Telephone Network	**106,528,194**	**2,764,929,606**
(1) Switching	45,191,944	215,265,750
(2) Transmission	4,433,730	17,813,826
(3) Subscriber Network	56,902,520	2,531,850,030
2. Mobile Telephone System	**29,671,100**	**124,649,500**
3. Packet Switching System	**1,724,462**	**6,594,808**
4. Computer System	**7,129,280**	**33,723,122**
(1) Billing Center System	322,456	2,325,773
(2) Telephone Center	6,590,705	30,287,910
(3) Management Information System	216,119	1,109,439
5. Sub-Total (1 to 4)	**145,053,036**	**2,929,897,036**
6. Contingency(10% of Sub-Total)	**14,505,304**	**292,989,704**
7. Total	**159,558,340**	**3,222,886,740**

CHAPTER 12 PROJECT EVALUATION

12.1 Project Costs

Total project cost amounted in US 214,812,000 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 68%.

Total Project Costs (thousands US$)

	Total	1996	1997	1998	1999	2000
Foregin Portion	145,053	317	5,474	64,202	53,666	21,394
Local Portion	69,759	55	561	23,012	32,952	13,180
Equity	0	0	0	0	0	0
Total	214,812	372	6,035	87,214	86,618	34,574

12.2 Financial Evaluation

(1) Analysis of Cash Flow Statement

This project is calculated as 12.4% of FIRR for ten years project evaluation period, and 17.6% for twenty years project evaluation period. 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 7.5% for ten years project evaluation period, and 13.7% 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 29%.

(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 214,812,000 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 384,931,000 dollars, and the investment cost shares 56% of this amount. This means that this project can generate 1.8 times cash balance as large as the total investment amount.

By the year 2002, 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 3.2 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%.