3.4 Non-Telephone Service

3.4.1 Telegraph Service

Historical data of the telegraph service in Uganda is also shown in DATA BOOK. The telegraph is delivered only to P.O. Boxes at the moment.

3.4.2 Telex Service

A digital exchange system with a capacity of 720 circuits located in Kampala have provides both domestic and international telex services. Recently new digital telex exchange has installed in order to expand telex exchange capacity.
The number of telex subscribers was 780 as of 1986, and 90% of them are located in Kampala city while the remaining subscribers are in Jinja and other ten towns. As of December 1993 the number of total telex subscriber is 553. The downward trend of services is due to the growth of facsimile services and poor local network.

3.4.3 Data Communication Service

The Uganda Posts and Telecommunications Corporation (UPTC) does not operate any Data Network. UPTC is currently offering two (2) types of data services, namely the circuit switched data service and the leased circuit data service. Data service is classified as one of the new services that UPTC is introducing. The annual growth rate started off at 12% but is expected to stabilize at 6%. Where the local network is good, the service is performing well. There are no immediate plans to introduce a dedicated public data network. UPTC has just started the planning process.

3.4.4 Mobile Communication Service

UPTC intends to introduce this service among customers in the main towns of Kampala, Jinja and Entebbe. Agreement has been signed with an international companies to build a network for mobile cellular communication service. Potential customers include:

- SITA and Airlines
- Banks
- Ministry of Information
- Parastatal Corporations
- Commercial and Industrial Transporters
- Foreign Embassies.

Paging service is also under preparation. The service has been planned to start in the year 1994 by another private company.

3.4.5 Leased Circuits

Leased circuits for data communications is discussed in 3.3.3 above. The summary of Leased Circuit on national trunk network is shown in Table 3-4-1.

Table 3-4-1 Leased Circuits on National Trunk Network

No.	Circuit Link	No. of Cct.	Client Category
1	Kampala - Entebbe	5	Government
2	Kampala - Entebbe	2	Airline
3	Kampala - Jinja	1	Bank
4	Kampala - Mbale	2	Radio
5	Kampala - Nairobi	2	Meteorology
6	Entebbe - Nairobi	1	Civil Aviation
7	Entebbe - Dar es Salaam	1	Civil Aviation
8	Kampala - Mbarara	2	Bank
9	Kampala - Kabale	1	Radio
10	Kampala - Mityana	1	Radio
11	Kampala - Gulu	1	Radio
	Total	19	

3.5 International Telecommunications Services

3.5.1 Telephone Service

There is one digital telephone exchange which was originally the national switching exchange but later upgraded into an international switching exchange. It has some limitations as an international exchange. It is planned to replace it with an autonomous international exchange if funds are available.

3.5.2 Non-Telephone Service

The key non-telephone services are still the Telex and Telegrams but data traffic is steadily on the increase. The public is getting to appreciate the value of data, facsimile, electronic mail, etc. The future is very bright.

3.6 Telecommunications Network by UPTC

3.6.1 Outline of Network

As of Sept. 1993, 98 telephone exchanges are working for 22,114 subscribers while the total capacity is 64,632 lines. These status are shown in Table 3-6-1.

Table 3-6-1 Existing Exchange System (As of Sept. 1993)

Type of Exchange	Number of Exchanges	Capacity (L)	Connected Lines (DELs)	Exchange Occupancy (DELs/L)
Digital	10 (5)	35,700 (8,700)	14,531 (2,101)	40.7 % (24.1 %)
Cross Bar	16	21,600	4,947	22.9
SxS, Rurax	2	900	266	29.6
Sub Total	28 (5)	58,200	19,744	33.9
Manual	70	6,432	2,370	36.8
Total	98 (5)	64,632	22,114	34.2

Note: Number in parentyheses ( ) means the number for Remote Switching Units.
The above figures exclude "Not Restored" exchanges.

Type of Exchange	Number of Exchanges	Capacity (L)	Connected Lines (DELs)	Exchange Occupancy (DELs/L)
Digital Exchange				
E10B	7	28,700	12,457	43.4%
HDX10	2	4,000	1,438	40.0
FETEX150	1	3,000	636	21.2
XB Exchange				
C400	4	12,200	2,627	21.5
C23	12	9,400	2,320	24.7

In 1978, 124 telephone exchanges were in service but most of the manual exchanges were damaged by the civil wars in 1979 and 1987. And 51 exchanges are still not in use.

Public telephone call boxes are available in major towns, especially head quarters and other medium size towns throughout the country. In remote areas Radio calls of HF Radio Call System have been installed, especially in Northern Uganda.

International communications network links Uganda with several countries, such as UK, USA, France, Italy, Germany, Switzerland, Holland and Belgium, directly through E10B digital switch and Mpoma satellite station. UPTC also has direct links via the PANAFTEL network to Kenya, Ethiopia, Tanzania, Rwanda and Zambia.

3.6.2 Switching System

At present the principal exchanges are served by digital exchanges, such as CIT Alcatel E10B, Hitachi HDX10 and Fujitsu FETEX 150. Some crossbar exchanges (C400, C23 and C22) are also still in use.

The smaller exchanges are all manual, which were commissioned between 1970 and 1975 and still have very few connected lines compared to their maximum capacity (mainly due to lack of distribution plant, materials and instruments), and as mentioned in 3.6.1, the actually operating lines are extremely few, and about half of all manual exchanges remain not in use.

Two trunk switching units are installed in Kampala, one being E10B-TSU (digital) and the other C5 (crossbar).

According to records available, about 89% of all subscribers are connected to automatic telephone exchanges. About 1.3 % of the subscribers are served by a step by step switching equipment which has been in operation for more than thirty years.

Four crossbar C400 exchanges having the capacity of 12,200 lines in total were commissioned between 1972 and 1977. Twelve crossbar C23 exchanges accommodating about 2,320 subscribers have been in operation for some fifteen years, and some manual exchanges commissioned in 1970-1975 have a surplus capacity to connect additional lines.

Statistical data shows that the telephone service is very poor and its service level is deteriorating from day to day. The main causes of this situation are:

- Malfunction of the equipment and network damaged during the civil wars.
- Insufficient maintenance of plant due to lack of spares.
- Very poor condition of equipment due to dust and poor environmental conditions.

The location of existing switching exchanges and an automatic switching network are shown in Figure 3-6-1 and 3-6-2 respectively. Basic statistics of existing switching exchange as of September 1993 are shown in DATA BOOK.

The existing network structure of the Uganda telephone network is composed of seven Area Switching Centers (ASC). The network structure is neither a pure star network nor a pure mesh network.
Table 3-6-2 presents the inventory of telephone exchanges in seven switching areas.

Table 3-6-2 Inventory of Telephone Exchanges in ASC area

Area Switching Center	Capacity	Connected Lines
Kampala	42,780	14,786
Jinja	4,280	1,667
Mbale	4,100	1,561
Gulu	1,170	587
Masaka	2,572	662
Fort Portal	2,600	1,077
Mbarara	7,130	1,774
Total	64,632	22,114

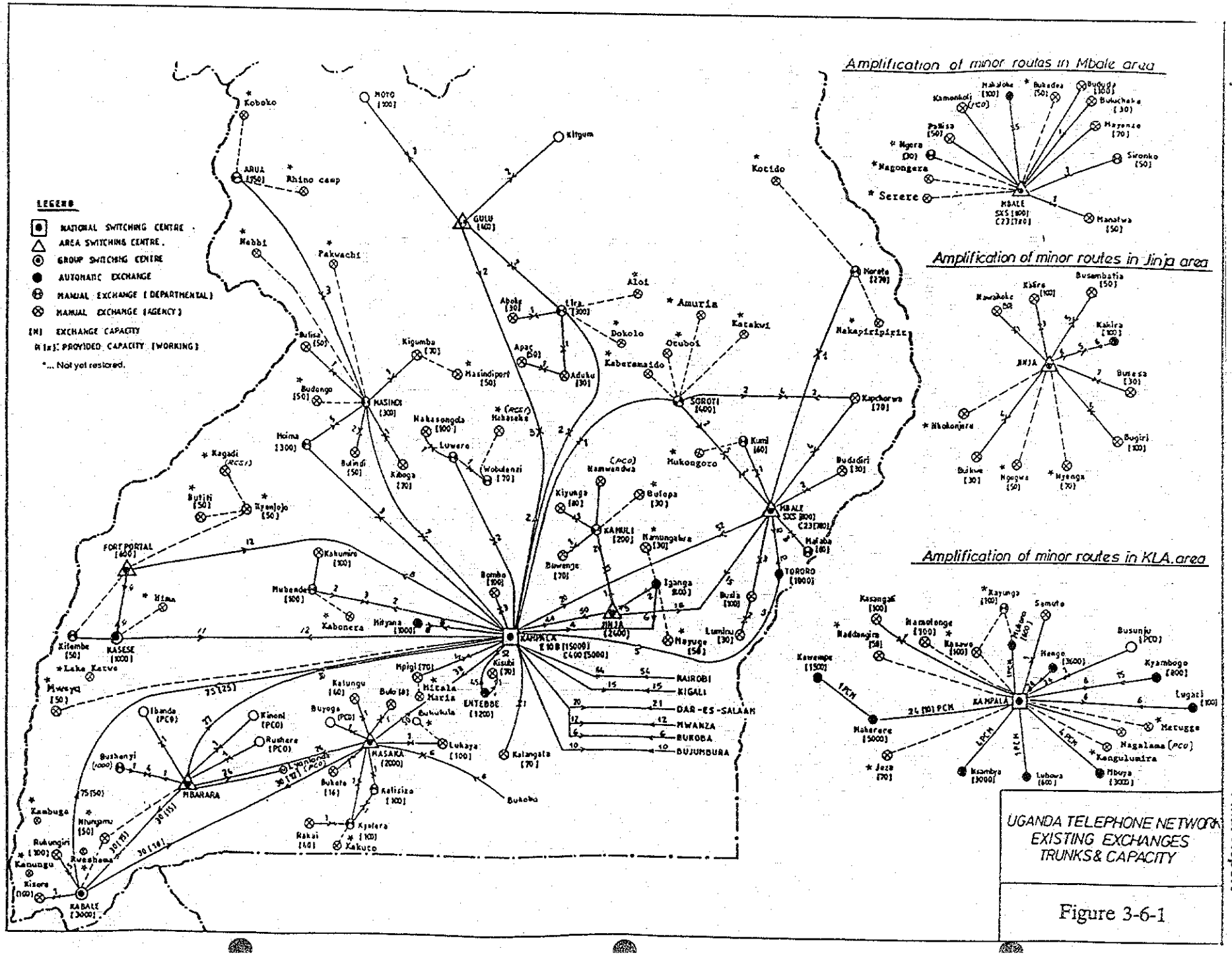

LEGEND
NATIONAL SWITCHING CENTRE
AREA SWITCHING CENTRE
GROUP SWITCHING CENTRE
AUTOMATIC EXCHANGE
MANUAL EXCHANGE (DEPARTMENTAL)
MANUAL EXCHANGE (AGENCY)
(N) EXCHANGE CAPACITY
N(a): PROVIDED CAPACITY (WORKING)
*... Not yet restored.
Amplification of minor routes in Mbale area
Amplification of minor routes in Jinja area
Amplification of minor routes in KLA.area
KAMPALA
MBALE
JINJA
MASAKA
MBARARA
FORT PORTAL
KASESE
KABALE
GULU
SOROTI
TORORO
KAMULI
LIRA
MASINDI
HOIMA
NAIROBI
KIGALI
DAR-ES-SALAAM
MWANZA
BUROBA
BUJUMBURA
ENTEBBE
UGANDA TELEPHONE NETWORK
EXISTING EXCHANGES
TRUNKS & CAPACITY

Figure 3-6-1

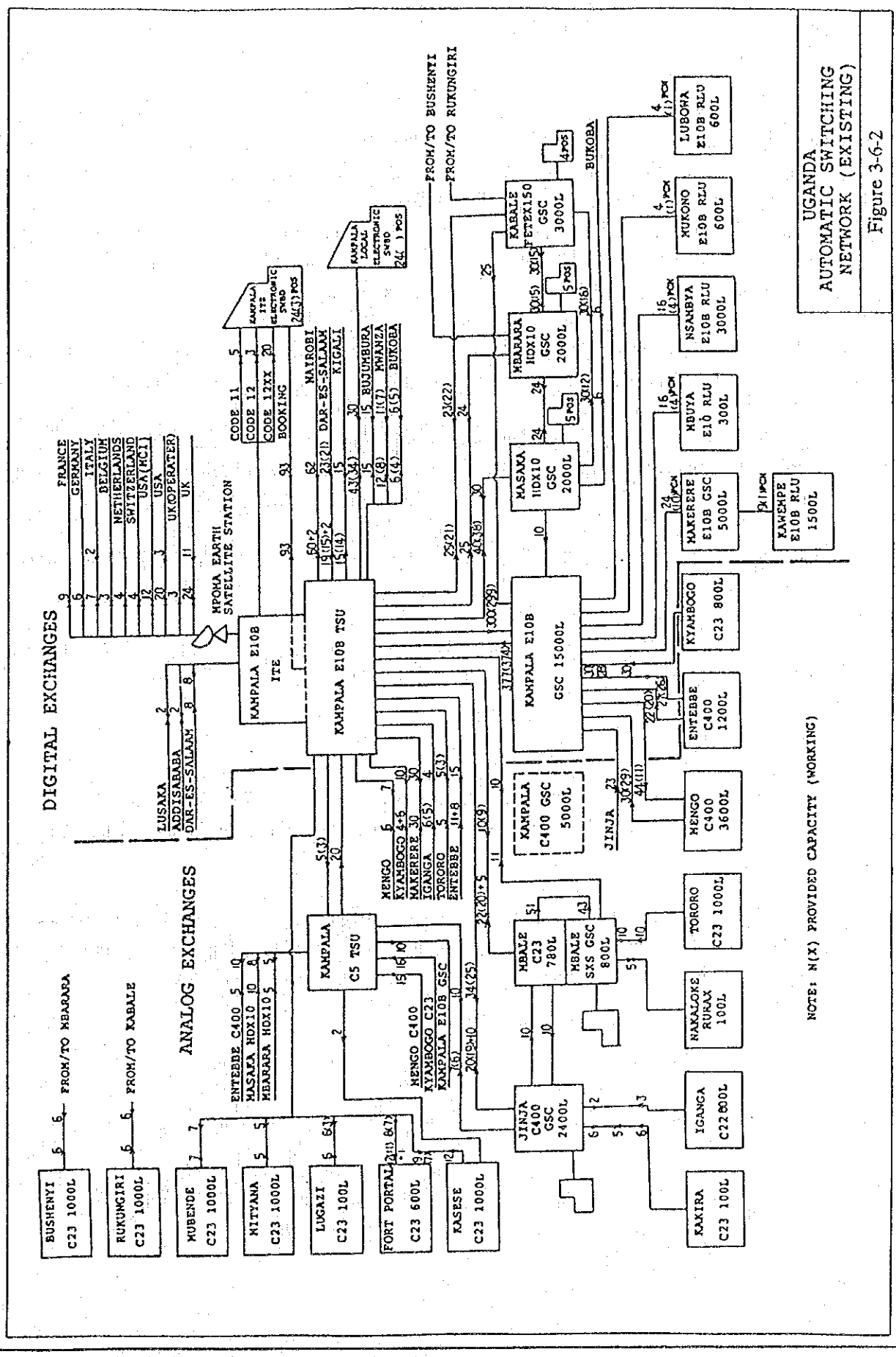

UGANDA
AUTOMATIC SWITCHING
NETWORK (EXISTING)
DIGITAL EXCHANGES
ANALOG EXCHANGES
FROM/TO BUSHENYI
FROM/TO RUKUNGIRI
FROM/TO MBARARA
FROM/TO KABALE
BUKOBA
NOTE: N(X) PROVIDED CAPACITY (WORKING)

Figure 3-6-2

3.6.3 Transmission System

A new digital microwave system to link Mbarara and Kabale was introduced recently as a part of KBO project. It is linked with the Kampala-Masaka-Mbarara analog microwave route and carries domestic and international traffic to Tanzania, Burundi and Rwanda. The Kampala-Jinja-Nairobi microwave link also carries domestic and international traffic to Kenya and Tanzania. These links are parts of the Pan African Telecommunications (PANAFTEL) network and also form national backbone links. The Kampala-Entebbe link is another microwave link.

UHF/VHF links and overhead lines with carrier equipment cover the rest of the country. Many of these lines were rehabilitated between 1987 and 1991.

Overhead lines are still playing an important role in national telecommunications. Problems involved are antique equipments and difficulty in maintenance. Replacement of these overhead lines with radio systems is under planning.

International services are provided through a standard A INTELSAT earth station commissioned in 1981.

The existing trunk systems by radio are shown in Table 3-6-3, Table 3-6-4 and in Figure 3-6-3. Existing overhead lines are shown in Figure 3-6-4.

3.6.4 Local Cable Network

The local line facilities mostly constructed in the period between 1950-1970 and damaged during the civil war are very poor in quality and restricting the use of exchanges.

Paper insulated cables are still used in suburban areas. The local cable networks should be upgraded by replacing these cables with new cables. The existing cable pairs on MDF are shown on the Existing Exchange List in DATA BOOK.

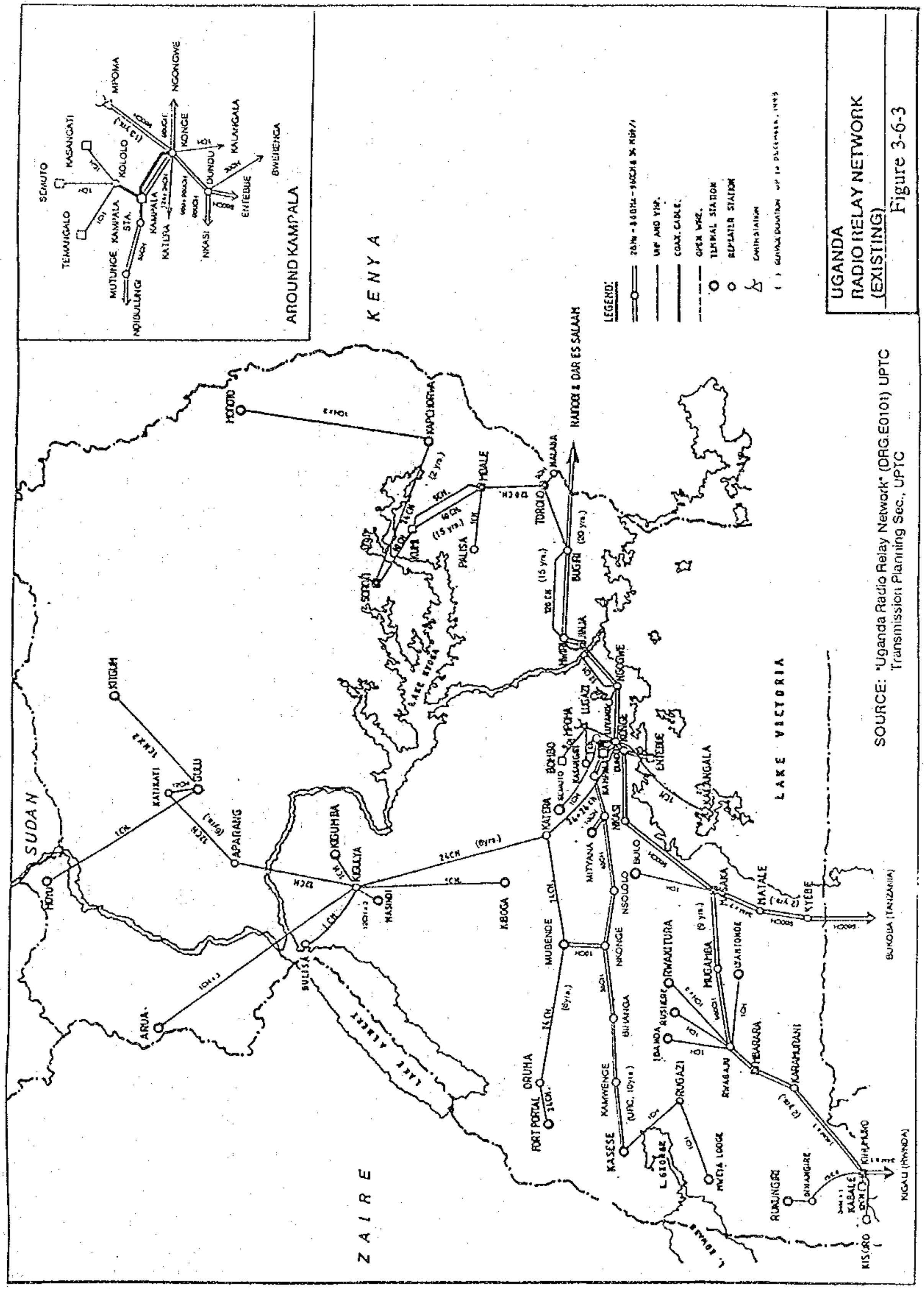
Table 3-6-3 National Trunk System by Radio (1/2)

No.	Sys.	Link	Detail Route [(***)... repeator station]	A/D	Freq. Band	Capacity Sys.	Capacity Equip.	Redun-dancy	Manufac.	Committed Year	Length (km)	Remarks
1	Micro	Kampala-Mpoma	Kampala-(Konge)-Mpoma	A	6 G/L Hz	960	240	1+1	NEC	1980		
2	UHF	Mpoma-Bombo	Mpoma-Bombo	A	400 MHz	12	5	None	NEC	1987		
3	VHF	Kampala-Kalangala	Kampala-(Konge)-Kalangala	A	164 MHz	1	1	None	NEC	1986		Kampala-(Konge) by other system
4	VHF	Kampala-Kasangati	Kampala-(Kololo)-Kasangati	A	164 MHz	1	1	None	NEC	1987		Kampala-(Kololo) by Coaxial cable
5	VHF	Kampala-Temangalo	Kampala-(Kololo)-Temangalo	A	164 MHz	1	1	None	NEC	1989		Kampala-(Kololo) by Coaxial cable
6	VHF	Kampala-Semuto	Kampala-(Kololo)-Semuto	A	164 MHz	1	1	None	NEC	1987		Kampala-(Kololo) by Coaxial cable
7	UHF	Kampala-Bwerenga	Kampala-(Konge)-(Dundu)-Bwerenga	D		30	4	None	AWA	1993		Kampala-(Konge) by other system For RCS Transmission
8	Micro	Kampala-Jinja-Nairobi	Kampala-(Konge)-(Ngongwe)-Jinja -(Mwiri)-(Bugiri)-to Nairobi	A	2 GHz	960	504	1+1	Fujitsu	1973	92.4 to JJA	Kampala-(Konge) by Coaxial cable
9	UHF	Jinja-Mbale	Jinja-(Mwiri)-(Bugiri)-(Tororo)-(Bushangi) -Mbale	A	800 MHz	120	108	None	NEC	1977	156.1	
10	UHF	Mbale-Kumi	Mbale-(Kumi)-Kumi Town	A	400 MHz	5	5	None	NEC	1986		
11	UHF	Mbale-Soroti	Mbale-(Kumi)-Soroti	A	400 MHz	60	48	None	NEC	1978	97.5	
12	UHF	Tororo-Malaba	Tororo-Malaba	A	400 MHz	5	5	None	NEC	1986		
13	UHF	Soroti-Kapchorwa	Soroti-Kapchorwa	A	400 MHz	24	24	1+1	NEC	1991		
14	UHF	Jinja-Lugazi	Jinja-(Ngongwe)-(Luyanzi)-Lugazi	A	400 MHz	12	12	None	NEC	1988		
15	VHF	Mbale-Paliisa	Mbale-Paliisa	A	164 MHz	1	1	None	Motorola	1978	64.0	
16	VHF	Kapchorwa-Moroto	Kapchorwa-Moroto	A	164 MHz	1x2	1x2	None	Motorola	1978.92	180.8	
17	Micro	Kampala-Entebbe	Kampala-(Konge)-(Dundu)-Entebbe	A	2 GHz	960	180	1+1	Telettra	1982/83	49.6	2+1 sys between Kampala and Konge with KLA-MBA link
18	Micro	Kampala-Masaka-Mbarara	Kampala-(Konge)-(Dundu)-(Nkasi)-Masaka -(Mugamba)-(Rwagaaju)-Mbarara	A	2 GHz	960	672	1+1	Telettra	1983/84	273.3	2+1 sys between Kampala and Konge with KLA-EBB link
19	Micro	Mbarara-Kabale-Kigali	Mbarara-(Karamurani)-(Kihumiro)	D	6 G/U Hz	140M	34Mx2	1+1	Siemens	1992		T-MUX at Mbarara
			(Kihumiro)-Kabale	D	2 GHz	34M	34Mx1	1+1				
			(Kihumiro)-to Kigali	D	2 GHz	34M	34Mx1	1+1				
20	Micro	Masaka-Bukoba	Masaka-(Matale)	D	2 GHz	34Mx2	34Mx2	1+1	Siemens	1992		T-MUX at Matale
			(Matale)-(Kyebe)-to Bukoba	A	6 G/U Hz	960	960	1+1				
21	UHF	Kabale-Rukungiri	Kabale-(Kihumiro)-(Bihangire)-Rukungiri	A	400 MHz	12	5	None	NEC	1989		
22	UHF	Kabale-Kisoro	Kabale-(Kihumiro)-(Rwaburimbe)-Kisoro	A	400 MHz	12	5	None	NEC	1989		
23	UHF	Mbarara-Rwagaaju	Mbarara-Rwagaaju	A	400 MHz	12	6	None	NEC	1991		
24	VHF	Rwagaaju-Rushere	Rwagaaju-Rushere	A	164 MHz	1	1	None		1989		
25	VHF	Rwagaaju-Ibanda	Rwagaaju-Ibanda	A	164 MHz	1	1	None		1989		
26	VHF	Rwagaaju-Rwakitura	Rwagaaju-Rwakitura	A	164 MHz	1x3	1x3	None		1991		
27	VHF	Masaka-Bulo	Masaka-Bulo	A	164 MHz	1	1	None	Telectron	1990		

Table 3-6-4 National Trunk System by Radio (2/2)

No.	Sys.	Link	Detail Route [(***)... repeator station]	A/D	Freq. Band	Capacity Sys.	Capacity Equip.	Redun-dancy	Manufac.	Committed Year	Length (km)	Remarks
28	Micro	Kampala-Mityana -Mubende-Kasese	Kampala-(Kampala Sta.)-(Mutundwe) -(Ndibulungi)-(Nsororo)-(Nkonge)-(Bihanga) -(Kamwenge)-(Kasese Sta.)-Kasese	A	2 GHz	55	35	None	Alcatel	1986/87/92	148.8	URC (Uganda Railways Corporation)'s property UPTC rents some lines from URC.
			(Ndibulungi)-Mityana	A	2 GHz		10	None				
			(Nkonge)-Mubende	A	2 GHz		10	None				
29	UHF	Kampala-Fort Portal	Kampala-(Konge)-(Katera)-(Mubende) -(Oruha)-Fort Portal	A	400 MHz	24	12	None	NEC	1988	269.2	
			(Mubende)-Mubende P.O.	A	400 MHz		3	None				
30	UHF	Kampala-Masindi-Gulu	Kampala-(Konge)-(Katera)-(Kigulya) -(Aparang)-(Katikati)-Gulu	A	400 MHz	24	12	1+1	NEC	1987	190.8	
			(Kigulya)-Masindi	A	400 MHz		9	None				
31	VHF	Mubende-Kabamba	Mubende-Kabamba	A	164 MHz	1	1	None	Motorola	1989	40.0	
32	VHF	Kasese-Mweya	Kasese-Mweya	A	164 MHz	1	1	None		1990		
33	VHF	Masindi-Kiboga	Masindi-Kiboga	A	164 MHz	1	1	None	Motprola	1988		
34	VHF	Masindi-Buliisa	Masindi-Buliisa	A	164 MHz	1	1	None	Motorola	1976	68.0	
35	VHF	Masindi-Arua	Masindi-Arua	A	164 MHz	1x3	1x3	None	Motorola	1983, 91	205.7	
36	VHF	Gulu-Moyo	Gulu-Moyo	A	164 MHz	1	1	None	Motorola	1978		

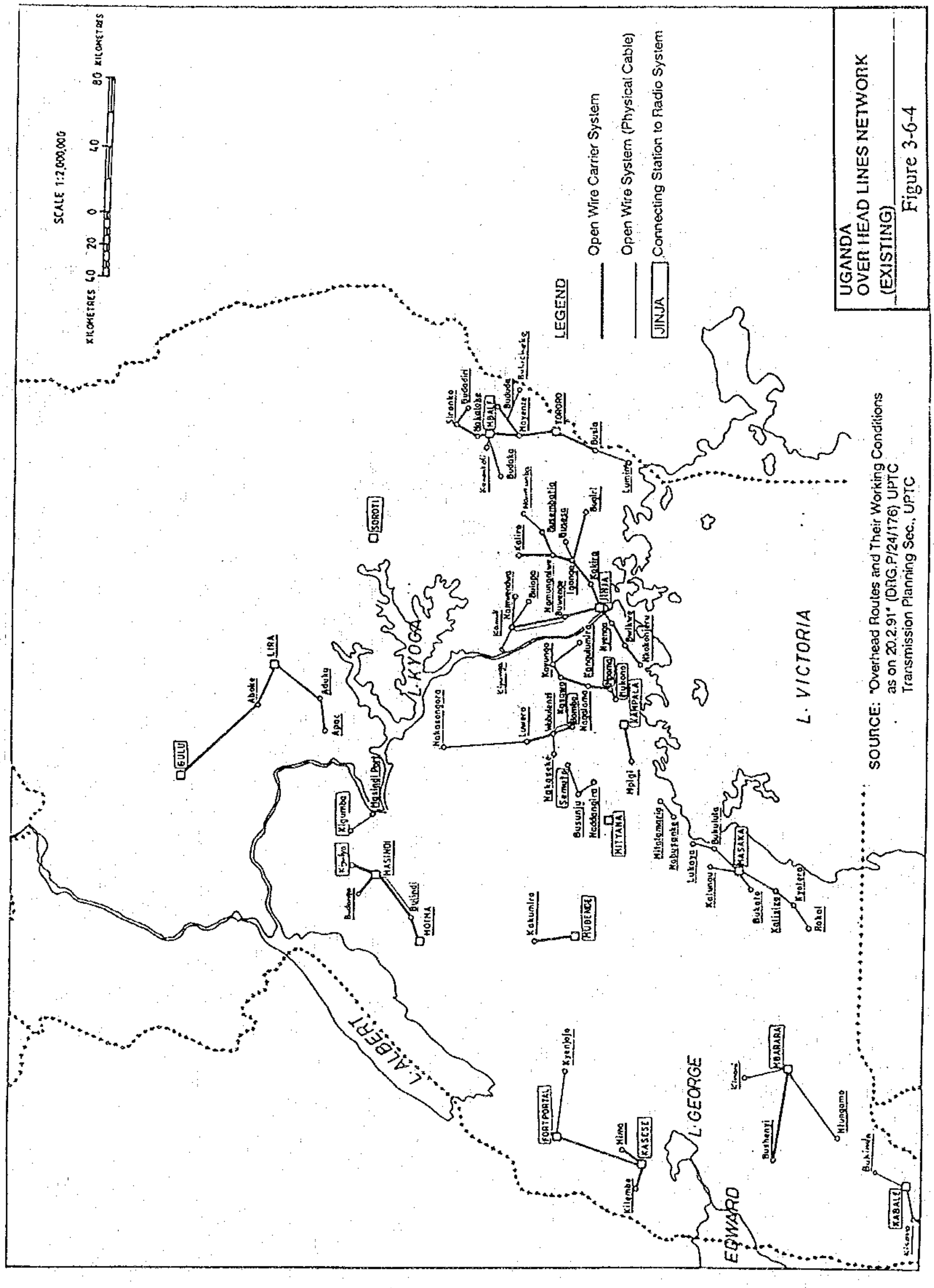
(TRUNKSYS.WK3)



UGANDA RADIO RELAY NETWORK (EXISTING)

Figure 3-6-3

SOURCE: "Uganda Radio Relay Network" (DRG.E0101) UPTC Transmission Planning Sec., UPTC


UGANDA
OVER HEAD LINES NETWORK
(EXISTING)
Figure 3-6-4
LEGEND
Open Wire Carrier System
Open Wire System (Physical Cable)
JINJA Connecting Station to Radio System
SCALE 1:2,000,000
KILOMETRES 40 20 0 40 80 KILOMETRES
SOURCE: "Overhead Routes and Their Working Conditions
as on 20.2.91" (DRG.P/24/176) UPTC
Transmission Planning Sec., UPTC
L. VICTORIA
L. KYOGA
L. ALBERT
L. GEORGE
EDWARD
GULU
LIRA
SOROTI
TORORO
MBALE
JINJA
KAMPALA
MASAKA
HOIMA
MASINDI
KITTANA
MUBENDE
FORTPORTAL
KASESE
MBARARA
KABALE

3.6.5 Rural Telecommunications

The exchanges in rural areas, which are mostly manual and partially analog, are linked to their respective transit exchanges with either manual or semi-automatic circuits. But these exchanges operate more often than not only during fixed office hours.

The rural exchanges are connected to their respective transit centers by open wire lines employing subscriber carriers system or small capacity radio links. The problem encountered in many regions is the unavailability of commercial power. In some areas it is not provided at all and in other areas available only during limited hours.

A radio call system is one of solutions to "no telephone service" problem of isolated areas but the quality of this service is poor: lack of security, too much noise, and simplex operation.

The List of Radio Call Stations is shown in DATA BOOK.

3.6.6 International Network

UPTC provides all the external telecommunication services which, in addition to those provided by the national network, include satellite TV transmission. Presently there exists two terrestrial routes. One microwave system links Uganda to Kenya, Tanzania, Zambia, Ethiopia and forms part of the Panaftel network. The other links Uganda to Rwanda, Burundi and Tanzania under Kagera Basin Organization Telecommunication links. Kagera link also connects Uganda to Tanzania through Masaka and Bukoba. One satellite route links Uganda to the rest of the world via a standard 'A' earth station beaming to the INTELSAT V-A over the Atlantic region.

The number of circuits is shown in Table 3-6-5.

Table 3-6-5 The Number of the Circuits on Direct International Routes

AS OF MAY 93

Country	Telephony			Telegraphy	Leased LINES	TOTAL	REMARKS
	INCOMING	OUTGOING	BOTHWAY				
U.K. (LONDON)	11		24	1	1	37	
USA (NYK ,AT&T)	3		20	1		24	
USA (MCI)			12			12	
GERMANY(FFT)			6	1		7	
ITALY	2		7	1		10	
FRANCE			9	1		10	
BELGIUM			3			3	
NETHERLANDS(AMS)			4			4	
SWITZERLAND(ZURICH)			4			4	
ETHIOPIA			2			2	PANAFTEL
ZAMBIA			2			2	PANAFTEL
TANZANIA	3	3				6	PANAFTEL
TOTAL	19	3	93	5	1	121	

3.7 On-Going Projects by UPTC

To rehabilitate the existing network, UPTC is executing the following major projects at present.

3.7.1 Nine-Town (Ten-Town) Project

This project comprises of 3 (three) components, i.e., switching, transmission and cable network.

(1) Switching Systems

a) Scope of Work
To supply and install digital switches for nine towns namely; Mbale (3,000 subs.) as Host, Soroti (900 subs.), Kapchorwa (450 subs.), Malaba (450 subs.), Busia (450 subs.), Luwero (900 subs.), Wobulenzi (600 subs.), Masindi (1,000 subs.) and Hoima (1,000 subs.).

b) Implementation Schedule
December, 1993 - September, 1995.

c) Finance Source
The Exim Bank of Korea (US $7.5 million).

(2) Transmission Links

a) Scope of Work
Supply and installation of 8 Mbps radio links to connect all the nine-exchanges and the existing Tororo exchange as follows:

- Mbale-Kumi-Kapchorwa, Mbale-Kumi-Soroti, Mbale-(Bushangi rep.)-Tororo, Tororo-Malaba and Tororo-Busia in the eastern area.
- Luwero-Luwube-Wobulenzi in the central area.
- Masindi-(Kigulya rep.)-(Bujumbula rep.)-Hoima in the northern area.

b) Implementation Schedule
January, 1994 - September, 1995.

c) Finance Source
UPTC's own budget.

3.7.2 Digital Multiple Access Radio System (DMARS) (Rural telecommunication system)

a) Scope of Work
To supply and install DMARS equipments in the Fort Portal/Bundibugyo and Mityana/Mubende areas.

b) Implementation Schedule
Tender evaluation is now in progress.

c) Finance Source
The World Bank (IDA-2 Program).

3.7.3 Rehabilitation of Mpoma Earth Station

a) Scope of Work
To refurbish the existing old antenna.

b) Implementation Schedule
September - December, 1994.

c) Finance Source
The World Bank (IDA-2 Program).

3.7.4 Digitalization of Mpoma Earth Station (IDR/D CME System)

a) Scope of Work
To upgrade the existing earth station for IDR/D-Polarization, in addition to the provision of national reference clock.

b) Implementation Schedule
September - December, 1994.

c) Finance Source
Loan by INTELSAT.

3.7.5 Replacement of Exchanges (Jinja, Entebbe, some in Kampala) and Microwave Link (Kampala- Mbale and Kenya)

a) Scope of Work
Replacement of old analog switches with digital switches at Jinja (3,000 LU), Entebbe (2,000 LU), and Mengo (2,000 LU) and Kyambogo (2,000 LU) in Kampala. Also a 34 Mbps, 9 hops high capacity microwave system link between Kampala and Mbale with a spur to Samia repeater station in Kenya will be implemented.

b) Implementation Schedule
The detailed design work has been completed. The project will be implemented, as soon as possible depend on availability of funding.

c) Finance Source.
Not yet available.

3.7.6 Northern Uganda Reconstruction Program (NURP)

a) Scope of Work
- To supply and install a 3,000 line (subscribers + trunks) digital telephone exchange at Gulu with power supply and air conditioning.
- Provision of about 18,000 pair km of local cable network at Gulu to connect subscribers to the new exchange.
- To supply 5,000 push button telephones and 50 payphones to work with the new digital exchange.
- Supply and installation of a 34 Mbps capacity 8 hops digital microwave system at Kampala-Gulu with drop insert station at Luwube and Kigulya, and regenerative repeaters at Kololo, Nakitoma, Lere and Minakulu.
- Supply of 6 vehicles for operations maintenance of the new systems.
- Consultancy services to assist in project management and initial maintenance of the system and on the job training of technical personnel.

b) Implementation Schedule
November, 1994 - August, 1996.

c) Finance Source
The World Bank (US$ 11.9 million).

3.7.7 New Computerized Billing System

a) Scope of Work
Supply and installation of a mini computer billing system in Kampala, including hardware design, delivery and installation of operating system, etc. Training of UPTC personnel.

b) Implementation Schedule
Under evaluation of tender proposals.

c) Finance Source
The World Bank.

3.8 Non-public Telecommunications Services

Non-public Telecommunications Services are categorized into two groups: In-government and Private. Most of these services are carried out by radio communications. Assignment of radio frequencies is done by NFRB (the National Frequency Registration Board) according to the Radio Regulations issued by ITU. NFRB is a board under the direct control of the Minister of Works, Transport and Communications. The minister plays a role as chairman and UPTC as secretary. Other members are those from army, police, civil aviation sectors and so on. The board controls radio frequency allocation and permits the issue of license for applications of radio equipments and their frequencies.

3.8.1 In-government Telecommunications

There are some closed telecommunications networks for in-government use. Organizations who have such networks are as follows:

- URC (Uganda Railways Corporation)
- UEB (Uganda Electricity Board)
- UTV (Uganda Television)
- RU (Radio Uganda)
- UPF (Uganda Police Force)
- NRA (National Resistance Army)
- some ministries

and so on.

3.8.2 Private Telecommunications

Radio License have been issued to over 2,000 radio users. These are classified as Table 3-8-1 below. Users are private companies (e.g., travel agencies), NGO (e.g., UN) and so on.

Table 3-8-1 The Number of Radio Licenses as of December, 1993

Classification	No. of Licenses
HF	947
VHF	813
UHF	2
CB	242
Cordless Telephone	24
TV Receive Only	14
Amateur	6
FM Broadcaster	2
TV Broadcaster	6
Total	2,056

CHAPTER 4

DEMAND FORECAST

CHAPTER 4 DEMAND FORECAST

4.1 General Concepts of Demand Forecast

4.1.1 Demand Forecast Procedures

The main purpose of demand forecast in this study is to estimate the growth in telephone and non-telephone subscriber demand and to provide the basis for economic and technical study of the master plan for development of the telecommunications network in Uganda up to the year 2009/2010. The forecasting base year is set at 1993 (1992/1993), and successive forecasts are made at 2000 (1999/2000), 2005 (2004/2005) and 2010 (2009/2010).

National telephone service demand was forecasted by both microscopic (Bottom - up) and macroscopic (Top - Down) approaches in this study and was estimated in accordance with the following procedures:

(1) Collection of data and information concerning telecommunications and socio-economic activities;

(2) Selection of sample rural areas for demand survey;

(3) Execution of demand survey in selected areas;

(4) Review of the expressed sample demand collected by demand survey;

(5) Review of existing demand (Subscribers + Waiters) at each exchange presented by UPTC;

(6) Microscopic demand forecast based on the data obtained by demand survey (hereinafter referred to as "microscopic model");

(7) Macroscopic demand forecast based on the data in "Yearbook of Common Carrier Telecommunication Statistics" published by ITU in 1993 and in "World Development Report" published by the World Bank in 1992 (hereinafter referred to as "ITU regression model");

(8) Macroscopic demand forecast by using average demand growth rate in similar countries (hereinafter referred to as "Similar countries model");

(9) Macroscopic demand forecast based on the data obtained by microscopic model (hereinafter referred to as "Uganda regression model");

(10) Comparison of the demand forecast results of macroscopic models;

(11) Distribution of demand to counties in each district;

(12) Distribution of demand to exchange areas in each county;

Figure 4-1-1 presents the flow chart of telephone demand forecasting process.

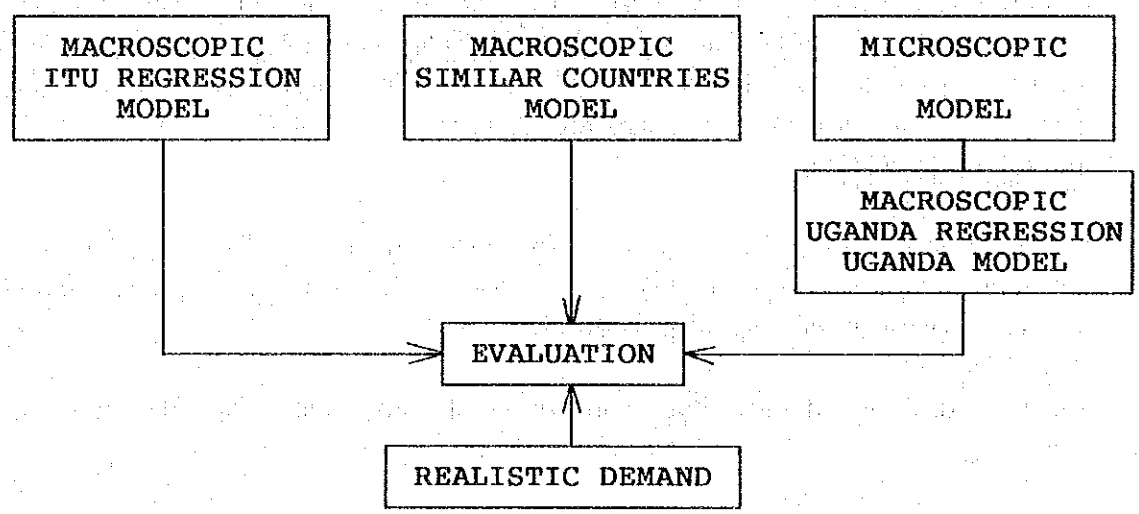


Figure 4-1-1 Demand Forecasting Flow

National non-telephone and new services, i.e., Telegraph, Telex, Data communication and Mobile communication service, are forecasted in this study, and forward projection of demand for these services, the regression model was used.

4.1.2 Demand Survey in Sample Rural Areas

(1) Selection of Sample Areas

a) Categorization of Districts

The Republic of Uganda consists of 4 Regions and 39 Districts. In order to carry out nationwide demand forecast, these districts were classified into 6 categories (except for some urban districts), based on their characteristics related to telephone density, population density, geographic conditions, economic activities and civil war damages. Characteristics of each category are listed in Table 4-1-1.

Table 4-1-1 Characteristics of 6 Categorized Groups

\Categories Item\	A1	A2	B	C	D	E
Telephone Density	Average	Average	Low	Low	Low	Average
Population Density	High	High	Low	Low	High	Low
Geographic Condition	Hilly	Hilly	Plain/Hilly	Mountain	Mountain	Plain/Hilly
Economic Activity	Small Agriculture	Small Agriculture	Small Agriculture	Livestock	Agriculture/ Tourism	Small Agriculture
Civil War Damage	R	NR	NR	NR	R	R

Note: R... Rehabilitated, NR... Not rehabilitated

b) Sample Areas Selected

6 sample areas subject to demand survey were selected in such a manner that each represents respective category. Priority in telecommunications development and regional balance are also taken into consideration in the selection. Selected districts are listed in Table 4-1-2.

Table 4-1-2 Selected Districts for Demand Survey

Region	District	Category
Central	Mpigi	A1
Eastern	Soroti	A2
Northern	Arua	B
Northern	Moroto	C
Western	Rukungiri	D
Western	Kabarole	E

For categories B and D, Arua and Rukungiri districts were selected instead of Gulu and Mbarara districts proposed in the Inception Report, for the following reasons:

- The network expansion plan for Gulu district has already been designed by UPTC under the World Bank Project and a supplemental study is not required for Gulu areas.

- The telecommunications development priority in Rukungiri district is higher than that of Mbarara district in category-D.

The categorization of each district and sample areas for demand survey are shown in Table 4-1-3.

Table 4-1-3 The Categorization of Each District and Sample Areas

Name of Region	No.	Name of District	Tel. Density Sep'93(%)	Land Density (/sq.km)	Geograph. Conditions	=== Major Economic Activity ===					Telecom. Damaged by Wars	Telecom. Develop. Priority	Remarks	Category	Sample Area for Survey
						Agriculture		Indusry	Tourism	Other					
						small	large								
Central	1	Kalangala	0.06	39	Islands	Yes	-	-	Yes	Yes	-	High		Special	
	2	Kampala	1.70	4,108	Urban	Yes	-	Yes	Yes	Yes	-	-	incl.Entebbe	Special	
	3	Kiboga	0.03	43		Yes	-	-	-	-	-	-		A1	
	4	Luwero	0.03	55		Yes	-	-	-	-	-	-		A1	
	5	Masaka	0.07	160		Yes	-	-	-	Yes	-	-		A1	
	6	Mpigi	0.01	214		Yes	-	-	Yes	Yes	-	High		A1	Selected
	7	Mubende	0.05	83		Yes	-	-	-	-	-	-		A1	
	8	Mukono	0.02	189		Yes	Sugar	-	Yes	-	-	-	incl.Islands	A1	
	9	Rakai	0.02	104		Yes	-	-	-	Yes	-	High	Border town	A1	
Eastern	10	Iganga	0.03	206		Yes	-	-	-	-	-	-	incl.Islands	A1	
	11	Jinja	0.42	449	Urban	Yes	Tea	Yes	Yes	Yes	-	High		Special	
	12	Kamuli	0.01	153		Yes	-	-	-	-	-	-		A1	
	13	Kapchorwa	0.03	71	Mount	Yes	-	-	-	-	-	-		E	
	14	Kumi	0.02	101		Yes	-	-	-	-	Yes	-		A2	
	15	Mbale	0.10	298	Urban	Yes	-	Yes	-	Yes	-	-		Special	
	16	Pallisa	0.00	240		Yes	-	-	-	-	-	High		A1	
	17	Soroti	0.04	53		Yes	-	-	-	-	Yes	High		A2	Selected
	18	Tororo	0.07	250		Yes	-	Yes	-	Yes	-	-	Border town	A1	
Northern	19	Apac	0.01	81	Plain	Yes	-	-	-	-	-	-		B	
	20	Arua	0.01	88		Yes	-	-	-	Yes	Yes	High	Border town	B	Selected
	21	Gulu	0.07	31	Plain	Yes	-	-	-	-	Yes	-		B	
	22	Kitgum	0.01	23		Yes	-	-	-	Yes	Yes	-	Border town	B	
	23	Kotido	0.00	16	Mount	Yes	(livestock)	-	Yes	-	Yes	High		C	
	24	Lira	0.02	86		Yes	-	-	-	-	Yes	-		B	
	25	Moroto	0.05	13	Mount	Yes	(livestock)	-	Yes	-	Yes	High		C	Selected
	26	Moyo	0.03	40		Yes	-	-	-	Yes	Yes	-	Border town	B	
	27	Nebbi	0.00	120		Yes	-	-	-	Yes	-	High	Border town	B	
Western	28	Bundibugyo	0.00	58	Mount	Yes	-	-	Yes	Yes	-	High	Border town	D	
	29	Bushenyi	0.02	153	Mount	Yes	-	-	Yes	Yes	-	High		D	
	30	Hoima	0.08	66		Yes	-	-	Yes	-	-	-		E	
	31	Kabale	0.15	259	Mount	Yes	-	-	Yes	Yes	-	-	Border town	D	
	32	Kabarole	0.06	97		Yes	Tea	-	-	-	-	High		E	Selected
	33	Kasese	0.07	133	Mount	Yes	-	Yes	Yes	Yes	-	-	Border town	D	+
	34	Kibaale	0.00	50		Yes	-	-	-	-	-	High		E	(Kagadi)
	35	Kisoro	0.03	316	Mount	Yes	-	-	Yes	Yes	-	-	Border town	D	
	36	Masindi	0.08	32	Plain	Yes	Tobac.Sugar	-	Yes	-	-	-		E	
	37	Mbarara	0.11	87	Mount	Yes	-	-	Yes	-	-	-		D	
	38	Ntungamo	0.00	168	Mount	Yes	-	-	-	-	-	-		D	
	39	Rukungiri	0.02	159	Mount	Yes	-	-	Yes	Yes	-	High	Border town	D	Selected

c) Field Survey Team and Schedule

The field survey team comprised of three sub-teams (Team-1, Team-2 and Team-3). The field survey team members and the survey schedule are given in SUPPORTING DOCUMENTS (Field Survey Reports).
Sample areas are shown in Figure 4-1-2.

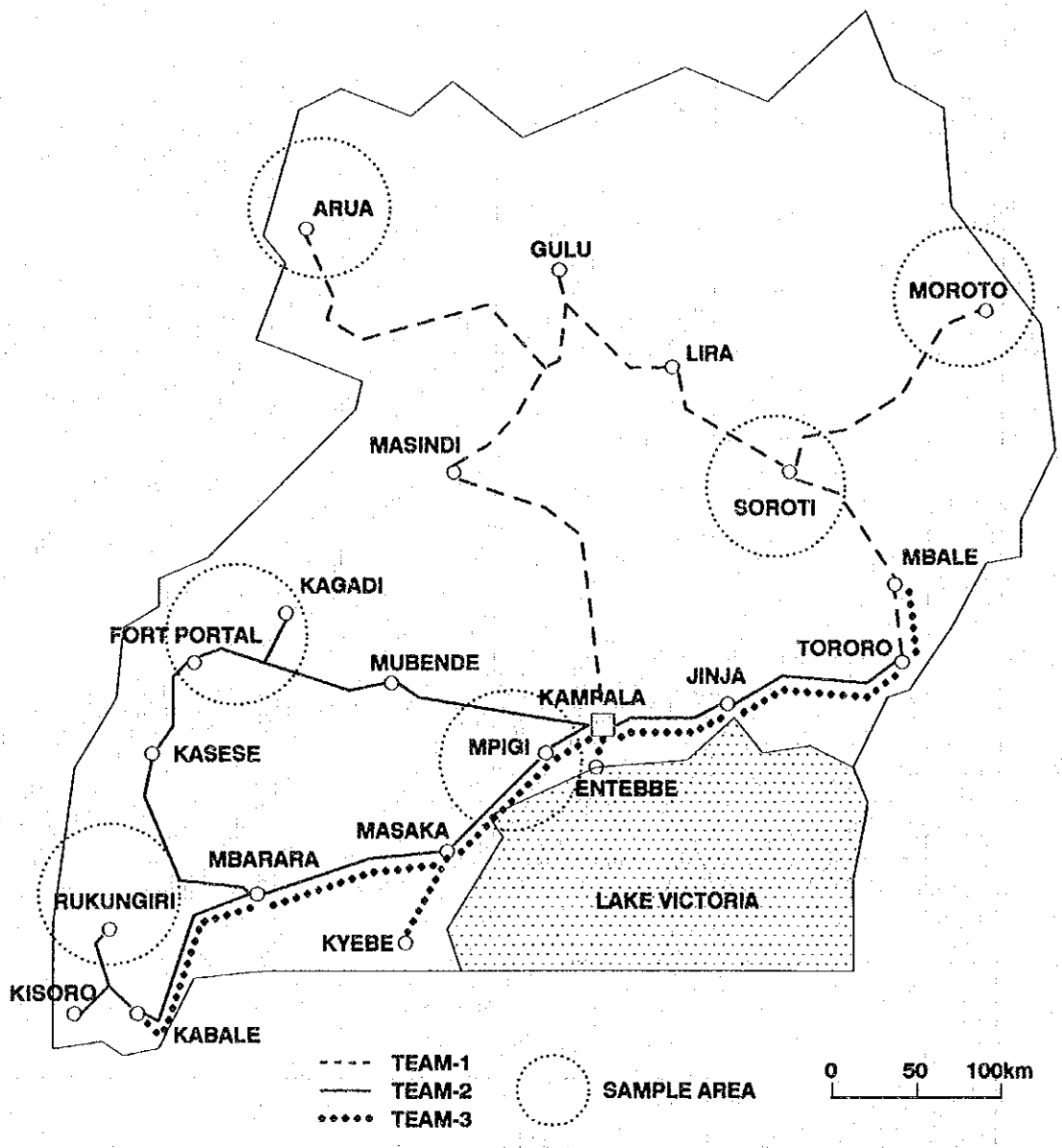


Figure 4-1-2 Field Survey Areas

(2) Sample Areas of Demand Field Survey

The demand survey was carried out in the sample districts by distributing questionnaires to District Administrations and County Administrations. Sample forms of questionnaires to District and County Administrations are shown in DATA BOOK (Field Survey Data in Rural Areas).

Table 4-1-4 District Administrations Interviewed for Questionnaire

No.	District Administrations in	Category
1	Mpigi	A1
2	Soroti	A2
3	Arua	B
4,5	Moroto, Kitido	C
6,7	Rukungiri, Kisoro	D
8	Kabarole	E

Note : In addition to 6 sample areas, Kitido (Category-C) and Kisoro (Category-D) were also surveyed to obtain additional reference data.

Table 4-1-5 County Administrations Interviewed for Questionnaire

No.	District	County Administrations in	Category
1	Mpigi	Butambala	A1
2	Mpigi	Mawokota	A1
3	Soroti	Kabelamaido	A2
4	Soroti	Serere	A2
5	Soroti	Usuk	A2
6	Arua	Koboko	B
7	Arua	Madi-Okollo	B
8	Moroto	Bokora	C
9	Moroto	Kadam (Chekwi)	C
10	Rukungiri	Kinkizi	D
11	Kabarole	Mwenge	E
12	Kabarole	Burahya	E
13	Kibale	Buyaga	D

The detailed data obtained through the demand survey are given in DATA BOOK (Field Survey Data in Rural Areas).

The microscopic demand forecast was made, mainly based on the data obtained from questionnaires to County Administrations, and those obtained from District Administrations were used as reference data.

4.1.3 Socio-Economic Growth

To forecast telephone demand, socio-economic growth in Uganda, in terms of population, GDP, GDP/capita and GRDP, was estimated for each forecast year, based on the study results of Chapter 2. The average growth ratio of GDP was estimated at 5.6% per annum as a modest case figure, and 7.27%, as an optimistic case figure.

(1) Population and GDP Projection
(ITU Regression Model)

GDPs in both modest and optimistic cases estimated by the constant price at 1990/1991 were used for macroscopic demand forecast projection (ITU regression model). The population, GDP and GDP/capita for each forecasted year are shown in Table 4-1-6.

Table 4-1-6 Population and GDP Projection (for ITU regression model)

Year	1992/1993	1999/2000	2004/2005	2009/2010
Population (thousands)	17,516	20,802	23,476	26,380
Constant price at 1990 /1991				
GDP (MIL. US$)				
(Avr. 5.6 %)	3,141	4,524	5,963	7,928
(Avr. 7.27%)	3,141	4,862	7,051	10,361
GDP/CAP.(US$)				
(Avr. 5.6 %)	179	217	254	301
(Avr. 7.27%)	179	245	315	411

(2) GRDP Projection
(Uganda Regression Model)

GRDPs of all districts based on the constant price at 1992/1993 were estimated for macroscopic demand forecast (Uganda regression model). GRDP projection for each forecasted year is shown in Table 4-1-7.

Table 4-1-7 GRDP Projection

Unit: Million US$

NO.	District / Year	1992/1993	1994/1995	1999/2000	2004/2005	2009/2010
	Central Region					
1	Kalangala	3	3	4	6	8
2	Kampala	1,024	1,135	1,489	1,997	2,710
3	Kiboga	15	17	22	29	40
4	Luwero	49	54	71	96	130
5	Masaka	92	102	134	179	244
6	Mpigi	111	123	161	217	294
7	Mubende	54	60	79	105	143
8	Mukono	192	213	279	374	508
9	Rakai	41	45	60	80	109
	Eastern Region					
10	Iganga	94	104	135	175	230
11	Jinja	132	146	189	246	323
12	Kamuli	50	55	72	93	122
13	Kapchorwa	13	14	19	24	32
14	Kumi	23	25	33	43	56
15	Mbale	80	89	115	149	195
16	Pallisa	39	43	56	73	95
17	Soroti	42	47	60	78	103
18	Tororo	61	68	87	114	149
	Northern Region					
19	Apac	47	52	67	85	109
20	Arua	70	77	99	127	163
21	Gulu	34	36	48	62	79
22	Kitgum	36	40	51	65	84
23	Kotido	19	21	27	34	44
24	Lira	52	57	74	94	121
25	Moroto	17	19	24	31	40
26	Moyo	17	19	24	31	40
27	Nebbi	32	35	45	58	74
	Western Region					
28	Bundibugyo	12	13	17	22	28
29	Bushenyi	63	70	89	115	148
30	Hoima	20	22	28	36	47
31	Kabale	42	46	60	77	98
32	Kabarole	79	87	112	144	185
33	Kasese	39	43	55	71	91
34	Kibale	23	25	33	42	54
35	Kisoro	19	21	27	35	45
36	Masindi	27	30	38	49	63
37	Mbarara	86	95	122	157	202
38	Ntungamo	41	45	58	75	96
39	Rukungiri	31	34	44	56	73

(Constant price at 1992/1993)

The detailed socio-economic data are given in DATA BOOK (Socio-economic Data of Uganda).

4.2 National Telephone Services Demand

4.2.1 Microscopic Demand Forecast

(1) Process of Microscopic Demand Forecast

Microscopic demand forecast is made, based on the data obtained from the field survey carried out in 13 counties. The study results can be used to estimate the total demand in the whole county at present. Figure 4-2-1 presents the flow chart of microscopic demand forecasting method.

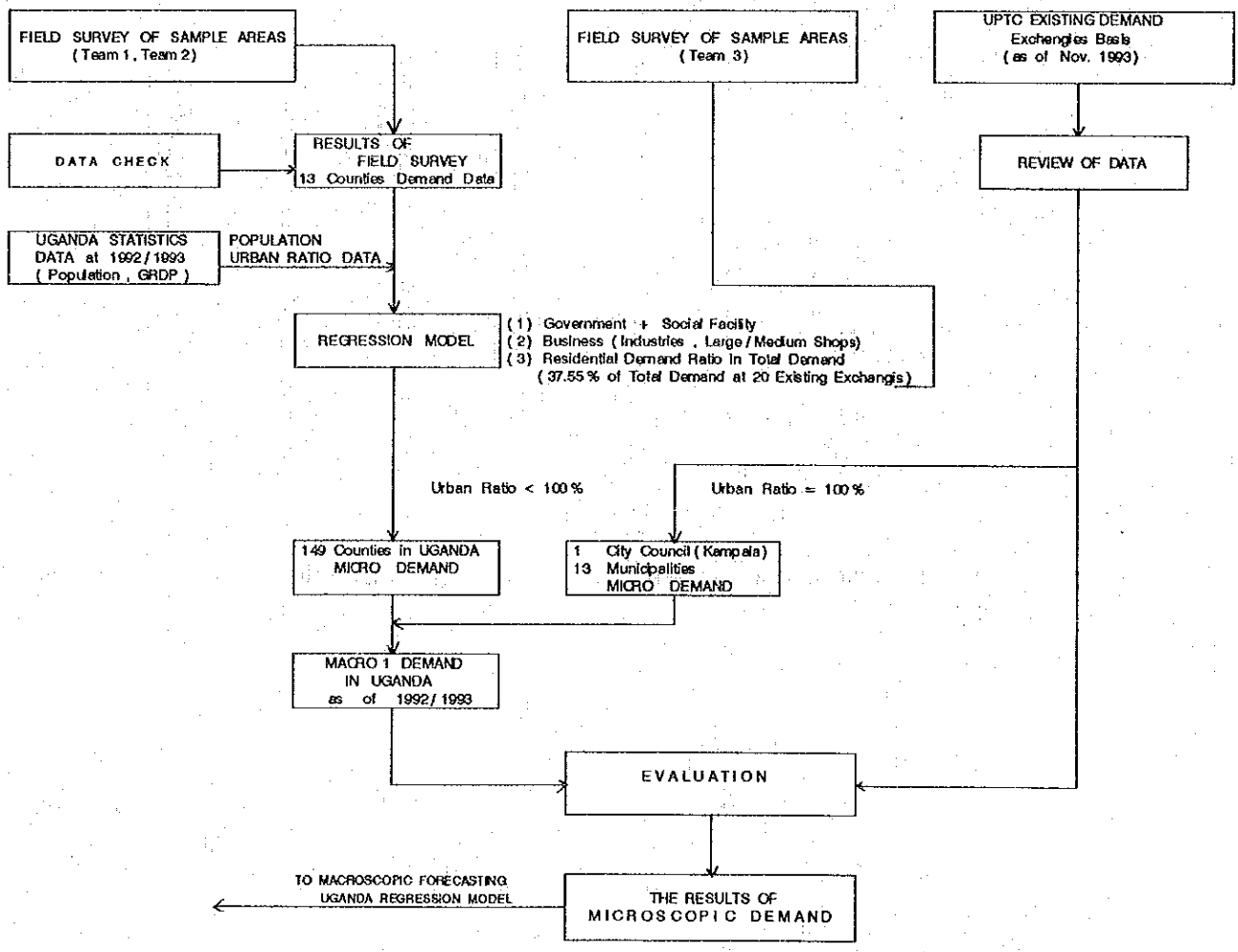


FIGURE 4 – 2 – 1 MICROSCOPIC DEMAND FORECASTING METHOD

(2) Potential Telephone Demand in sample rural areas

The potential telephone demand in sample rural areas can be classified into 3 groups as follows:

Demand Group 1 : Government and Social Facility Use

Government Offices	:	Government offices excluding social facilities
Social Facilities	:	Post offices, Police stations, hospitals, Hotels, Schools, Banks etc.

Demand Group 2 : Business Use

Industries	:	Large scale industries
Companies	:	Large scale Companies
Shops	:	Large and Medium scale shops

Demand Group 3 : Residential Use

Residence	:	Important residences like residence for chiefs of government offices and social facilities

(3) Demand Forecast in Sample Areas

Based on the results of the field survey in 13 counties in sample areas, the telephone demand in each demand group is forecasted as shown in Table 4-2-1.

Further details are given in DATA BOOK (Field Survey Data in Rural Areas).

Table 4-2-1 The Result of Demand Field Survey

Table 4-2-1 The Results of Demand Field Survey

No.	District	County	Category	Population	Urban %	Demand				
						Gov. use	Soci. use	Business	Resident	Total
1	Mpigi	Butambara	A1	77811	2.08	34	45	32	67	178
2		Mawokota	A1	165335	6.94	33	56	112	121	322
3	Soroti	Kaberamaido	A2	42110	4.52	25	23	28	46	122
4		Serere	A2	63809	0	34	18	225	167	444
5		Usuk	A2	79053	4.64	47	26	46	72	191
6	Arua	Koboko	B	65493	7.21	23	27	55	63	168
7		Madi-Okolo	B	74307	0	29	25	31	51	136
8	Moroto	Bokora	C	39592	0	12	30	10	31	83
9		kadam (Chekwi)	C	42699	3.64	2	21	18	25	66
10	Rukungiri	Kinkizi	D	191241	0.78	8	35	40	50	133
11	Kabarole	Mwenge	E	139868	1.81	10	43	33	52	138
12		Burahya	E	168844	1.95	16	88	51	93	248
13	Kibale	Buyaga	E	145541	0	7	58	39	63	167

(4) Characteristics of Telephone Demand

Through the analysis of the field survey results, the following characteristics were observed for each group:

a) For Group 1, the demand density is related to the population size as shown in Figure 4-2-2.

b) For Group 2, the demand density is related to the urbanization ratio as shown in Figure 4-2-3.

c) For Group 3, the potential demand volume could not be figured out through the field survey. Hence, the demand was estimated by adopting the existing average residential ratio to the total subscriber lines for the government and business use at the existing 20 exchanges investigated in the field survey (Team-3).

Note :

- Demand Density = Telephone Demand (number of potential subscribers) / 100 inhabitants

- Urbanization ratio = Population in an urban area / population in a county (By the 1991 Population and Housing Census)

- According to Statistics Department in Uganda, the areas having population of more than 2,000 persons are classified as the urban area (trading center).

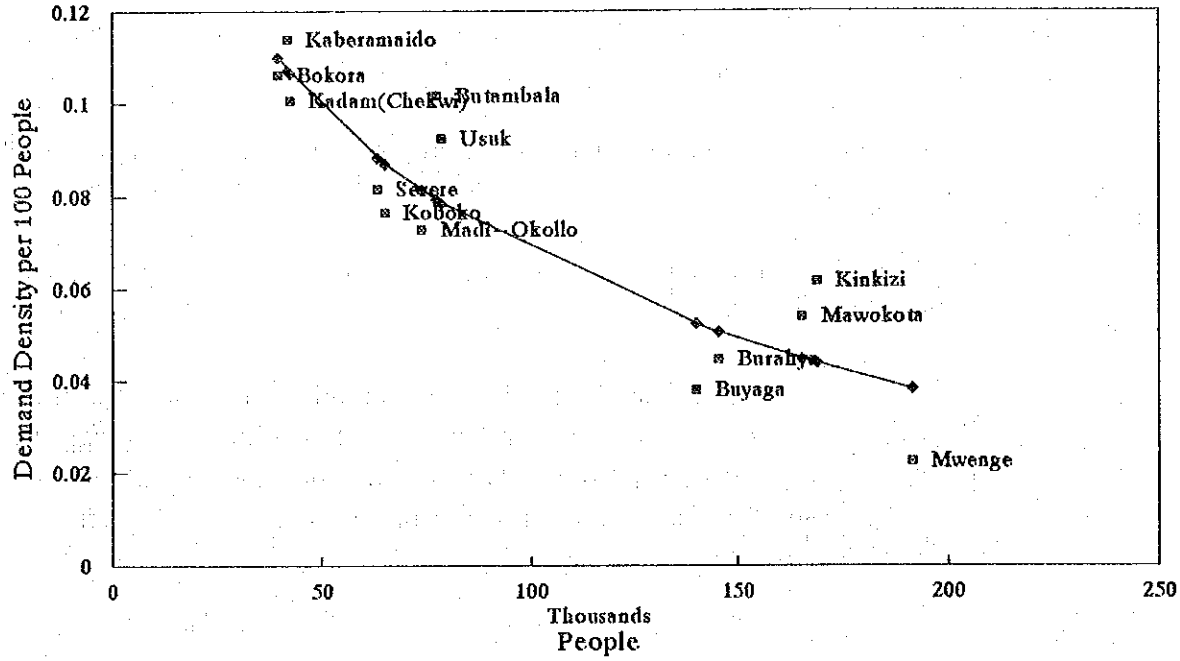


Figure 4-2-2 Characteristics of Group-1 Demand Density

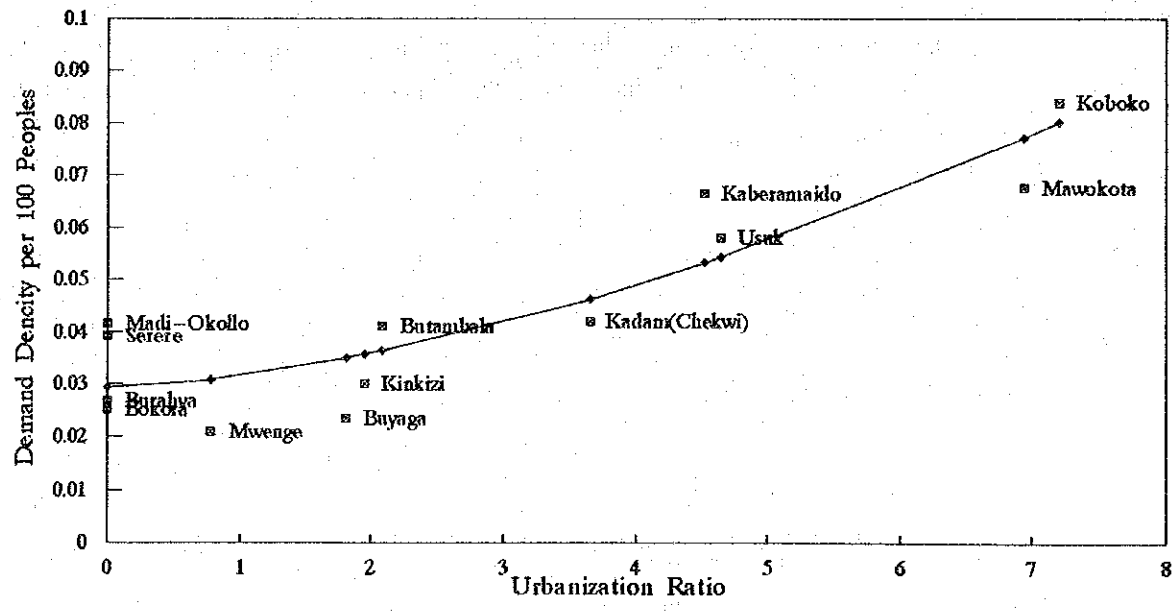


Figure 4-2-3 Characteristics of Group-2 Demand Density

(5) Demand Forecast on County basis

For microscopic demand forecast, some models were developed by a regression analysis as shown below.

Group 1 :

(Gov. + Soci. Demand / 100 POP.) = 0.592107 - 0.04556 x Ln(Population)

(R squared = 0.807)

Ln : Natural logarithmic operator

Group 2 :

(Business Demand / 100 POP.) = 0.29482 + 0.002108 x (Urbanization ratio)$^{1.61}$

(R squared = 0.817)

Group 3 :

(Residential Demand) = ((Gov. + Soci. Dem.) + Bussi. Dem.) x 0.601159 (*)

(*) : This average ratio was obtained by the following formula, based on the data of the existing 20 (twenty) exchanges.

$$\text{Radio} = \frac{\text{Residential subscriber lines}}{\text{Gov. + Soci. + Bussi. subscriber lines}}$$

The data of the existing 20 (twenty) exchanges are given in DATA BOOK (Field Survey Data in Rural Areas).

Gov. + Soci. Demand : Government offices and social facilities telephone demand

Business Demand : Large industries, Large companies and Large and medium shops telephone demand

Residential Demand : Residential telephone demand

POP. : Population

The present demand in each county in Uganda was estimated by the above regression models and formula. However, for the demand in one Kampala City Council and thirteen (13) Municipalities of which urbanization ratio reaches 100%, the demand estimated by Network & Development Section of UPTC was adopted in this study.

The estimated total demand in Uganda may reach **73,337 telephone lines** at the end of 1993.

The results of microscopic demand forecast are shown in Table 4-2-2 through Table 4-2-5.

Table 4-2-2 (1/4)

Table 4-2-2 The Result of Microscoic Demand Forecast (1/4, Central Region)

Region	District	County	Number of Sub-County	Population			Urban Ratio (%)	GRDP (Mil. US$)	E.Cs	Waiters	E.Cs +WAT.	Demand Density	Category	Estimated DEMAND	Demand Ratio
				Urban	Rural	Total									
Central	Kalangala	Bujumba	2	1,446	8,211	9,657	14.97							57	0.08%
		Kyamuswa	4	0	7,542	7,542	0.00							26	0.04%
		(TOTAL)	6	1,446	15,753	17,199	8.41	3	11	20	31	0.064	Special	83	0.12%
	Kampala	Kampala C.C.	7	813,437	0	813,437	100.00		14,093	4,851	18,944			* 22,000	30.00%
		(TOTAL)	7	813,437	0	813,437	100.00	1,024	14,093	4,851	18,944	1,733	Special	22,000	30.00%
	Kiboga	Kiboga	5	5,544	143,232	148,776	3.73							230	0.31%
		(TOTAL)	5	5,544	143,232	148,776	3.73	15	50	30	80	0.034	A1	230	0.31%
	Luwero	Butuli	5	6,697	98,888	105,585	6.34							230	0.31%
		Katikamu	8	28,439	126,310	154,749	18.38							758	1.03%
		Nakaseke	6	1,206	97,347	98,553	1.22							159	0.22%
		Wabusana (Bamunanika)	5	2,038	111,532	113,570	1.79							176	0.24%
		(TOTAL)	24	38,380	434,077	472,457	8.12	49	139	147	286	0.029	A1	1,323	1.80%
	Masaka	Bukomansimbi	4	0	132,956	132,956	0.00							179	0.24%
		Bukoto	8	14,218	370,873	385,091	3.69							326	0.44%
		Kalungu	4	11,165	148,559	159,724	6.99							317	0.43%
		Lwemiyaga	2	1,076	21,121	22,197	4.85							68	0.09%
		Masaka municipality	3	52,095	0	52,095	100.00		557	355	912			* 2,150	2.93%
		Mawogola	3	2,550	126,584	129,134	1.97							190	0.26%
		(TOTAL)	24	81,104	800,093	881,197	9.20	92	578	413	991	0.066	A1	3,230	4.39%
	Mpigi	Entebbe municipality	2	44,928	0	44,928	100.00		1,048	85	1,133			* 2,210	3.01%
		Busiro	8	33,436	234,919	268,355	12.46							750	1.02%
		Butambala	5	1,617	76,194	77,811	2.08							144	0.20%
		Gomba	4	2,709	122,893	125,602	2.16							189	0.26%
		Kyadondo	6	49,909	228,191	278,100	17.95							1,205	1.64%
		Mawokota	8	11,470	153,865	165,335	6.94							322	0.44%
		(TOTAL)	33	144,068	816,063	960,131	15.01	111	1,186	221	1,407	0.124	A1	4,820	6.57%
	Mubende	Busujju	4	0	69,273	69,273	0.00							126	0.17%
		Buwekula	7	9,772	128,281	138,053	7.08							291	0.40%
		Kassanda	4	1,232	152,210	153,442	0.80							194	0.26%
		Mityana	5	25,265	140,285	165,570	15.27							647	0.88%
		(TOTAL)	20	36,290	490,048	526,338	6.89	54	269	194	463	0.051	A1	1,258	1.71%
	Mukono	Bbaale	4	2,138	87,528	89,666	2.38							159	0.22%
		Buikwe	8	59,832	203,361	263,193	22.73							1,581	2.16%
		Buvuma islands	4	0	19,418	19,418	0.00							53	0.07%
		Mukono	7	7,781	183,114	190,895	4.08							* 491	0.67%
		Nakifuma	6	11,181	133,529	144,710	7.73							317	0.43%
		Ntenjeru	5	22,802	135,666	158,468	14.39							584	0.80%
		(TOTAL)	34	103,733	762,617	866,350	11.97	193	408	182	590	0.047	A1	3,185	4.35%
	Rakai	Kabula	5	5,799	49,989	55,788	10.40							192	0.26%
		Kakuuto	5	0	71,801	71,801	0.00							129	0.18%
		Kooki	6	577	136,070	136,647	0.42							184	0.25%
		Kyotera	6	9,245	127,435	136,680	6.76							281	0.38%
		(TOTAL)	22	15,622	387,294	402,916	3.88	41	76	162	238	0.019	A1	786	1.07%
Sub-Total		34 Counties / 175 Sub-Counties		1,239,624	3,849,177	5,088,801	24.36	1,582	16,810	6,220	23,030	0.330		36,915	50.32%

: Sample Areas of The Field Survey
COUNTY = COUNTY + MUNICIPALITY + CITY COUNCIL
SUB-COUNTY = SUB-COUNTY + MUNICIPALITY + TRADING CENTER + URBAN TOWN
* : Estimated Demand by Network & Development Section of UPTC

Table 4-2-3 (2/4)

Table 4-2-3 The Result of Microscoic Demand Forecast (2/4, Eastern Region)

Region	District	County	Number of Sub-County	Population Urban	Population Rural	Population Total	Urban Ratio (%)	GRDP (Mil. US$)	E.Cs	Waiters	E.Cs +WAT.	Demand Density	Category	Estimated DEMAND	Demand Ratio
Eastern	Iganga	Bugweri	4	4,060	84,579	88,639	4.58							185	0.25%
		Bukooli	9	9,987	241,435	251,422	3.97							310	0.42%
		Bunya	6	6,640	221,187	227,827	2.91							265	0.36%
		Buwiki	5	0	130,142	130,142	0.00							177	0.24%
		Kigulu	8	25,543	138,080	138,623	18.10							796	1.09%
		Luuka	7	0	137,010	137,010	0.00							181	0.25%
		(TOTAL)	39	46,230	947,433	955,663	4.85	94	307	249	556	0.031	A1	1,914	2.61%
	Jinja	Buhemba	3	11,324	91,646	102,970	11.00							363	0.49%
		Jinja Municipality	3	68,468	0	68,468	100.00		1,305	292	1,597			* 3,015	4.11%
		Kagoma	4	5,196	127,497	132,693	3.92							224	0.31%
		(TOTAL)	10	84,988	219,143	304,131	27.94	132	1,359	352	1,710	0.447	Special	3,602	4.91%
	Kamuli	Budiope	5	0	137,395	137,395	0.00							192	0.25%
		Bugabula	8	6,824	156,809	163,433	4.18							259	0.35%
		Bulamogi	5	1,856	108,588	110,444	1.68							173	0.24%
		Buzaaya	6	0	98,506	98,506	0.00							154	0.21%
		(TOTAL)	24	8,680	501,098	509,778	1.70	51	74	86	162	0.015	A1	767	1.05%
	Kapchorwa	Kongasis	4	0	32,246	32,246	0.00							77	0.10%
		Kwoon	3	0	39,233	39,233	0.00							89	0.12%
		Tingey	4	4,837	46,294	51,131	9.46							183	0.25%
		(TOTAL)	11	4,837	117,773	122,610	3.95	13	35	13	49	0.023	E	348	0.47%
	Kumi	Bukedea	5	0	79,083	79,083	0.00							136	0.19%
		Kumi	7	12,344	94,851	107,195	11.52							392	0.53%
		Ngora	4	0	62,399	62,399	0.00							116	0.16%
		(TOTAL)	16	12,344	236,333	248,677	4.96	23	45	30	75	0.018	A2	646	0.88%
	Mbale	Bubulo	7	0	167,586	167,586	0.00							205	0.28%
		Budadiri	5	3,841	151,897	155,206	2.15							* 356	0.49%
		Butembuli	5	0	67,845	67,845	0.00							125	0.17%
		Bungokho	7	3,290	193,116	196,406	1.67							224	0.31%
		Manjiya	5	0	83,228	83,228	0.00							* 239	0.33%
		Mbale Municipality	3	54,720	0	54,720	100.00		685	70	755			* 1,308	1.76%
		(TOTAL)	32	83,351	663,622	746,973	5.48	80	755	171	926	0.101	Special	2,459	3.35%
	Pallisa	Budaka	4	0	105,428	105,428	0.00							160	0.22%
		Butaleja	4	0	66,769	66,769	0.00							123	0.17%
		Kibuku	4	0	95,834	95,834	0.00							152	0.21%
		Pallisa	7	3,075	104,858	107,731	2.85							193	0.25%
		(TOTAL)	19	3,075	372,887	375,762	0.82	39	17	22	39	0.005	A1	818	0.85%
	Soroti	Amuria	5	0	47,705	47,705	0.00							100	0.14%
		Kaberamaido	4	1,903	40,207	42,110	4.52							110	0.15%
		Kalaki	4	0	43,553	43,553	0.00							94	0.13%
		Kapelebyong	3	0	25,159	25,159	0.00							64	0.09%
		Kasilo	3	0	31,153	31,153	0.00							75	0.10%
		Serere	4	0	53,609	53,609	0.00							120	0.16%
		Soroti	7	0	78,593	78,593	0.00							134	0.18%
		Soroti Municipality	3	43,044	0	43,044	100.00		207	120	327			* 536	0.82%
		Usuk	6	3,670	75,383	79,053	4.64							173	0.24%
		(TOTAL)	39	48,616	403,583	452,179	10.75	42	207	120	327	0.046	A2	1,468	2.01%
	Tororo	Bunyole	5	1,839	110,240	112,079	1.64							174	0.24%
		Kisoro (West Bunderma)	6	0	167,036	167,036								197	0.27%
		Samia-Bugwe	10	29,383	142,496	171,879	17.10							923	1.26%
		Tororo	4	7,519	97,049	104,568	7.19							260	0.35%
		Tororo Municipality	2	28,139	0	28,139	100.00		331	70	401			* 1,063	1.46%
		(TOTAL)	29	66,880	516,821	583,701	11.45	61	425	140	566	0.073	A1	2,637	3.60%
Sub-Total		43 Counties /	221 Sub-Counties	336,001	3,998,473	4,337,474	7.82	535	3,225	1,185	4,410	0.074		14,459	19.74%

: Sample Areas of The Field Survey
* : Estimated Demand by Network & Development Section of UPTC

Table 4-2-4 (3/4)

Table 4-2-4 The Result of Microscoic Demand Forecast (3/4, Northern Region)

Region	District	County	Number of Sub-County	Population			Urban Ratio (%)	GRDP (Mil. US$)	E.Cs	Waiters	E.Cs +WAT.	Demand Density	Category	Estimated DEMAND	Demand Ratio
				Urban	Rural	Total									
Northern	Apac	Kole	5	0	121,094	121,094	0.00							171	0.23%
		Kwania	4	0	88,814	88,814	0.00							146	0.20%
		Maruzi	5	6,076	75,513	81,589	7.45							223	0.30%
		Oyam	7	0	186,016	186,016	0.00							205	0.26%
		(TOTAL)	26	6,076	471,437	477,513	1.27	47	26	26	52	0.005	B	745	1.01%
	Arua	Aringa	5	0	104,846	104,846	0.00							159	0.22%
		Arua Municipality	2	23,342	0	23,342	100.00		96	27	123			* 690	0.94%
		Ayivu	4	0	116,488	116,488	0.00							168	0.23%
		Koboko	3	4,723	60,770	65,493	7.21							186	0.25%
		Madi-Okollo	5	0	74,307	74,307	0.00							132	0.18%
		Maracha	5	0	113,043	113,043	0.00							166	0.23%
		Terego	5	0	104,406	104,406	0.00							159	0.22%
		Vurra	4	0	68,313	68,313	0.00							125	0.17%
		(TOTAL)	39	28,065	642,173	670,238	4.19	70	96	27	123	0.014	B	1,785	2.44%
	Gulu	Aswa	5	0	77,758	77,758	0.00							135	0.18%
		Gulu Municipality	4	40,236	0	40,236	100.00		250	75	325			* 898	1.22%
		Kilak	4	0	93,182	93,182	0.00							150	0.20%
		Nwoya	4	0	39,868	39,868	0.00							89	0.12%
		Omoro	5	0	104,516	104,516	0.00							159	0.22%
		(TOTAL)	22	40,236	315,324	355,560	11.32	34	250	75	325	0.070	B	1,431	1.94%
	Kitgum	Agago	5	2,468	103,287	105,755	2.33							175	0.24%
		Aruu	5	0	85,035	85,035	0.00							142	0.19%
		Chua	6	13,635	96,215	109,850	12.41							432	0.59%
		Lamwo	5	0	74,626	74,626	0.00							132	0.18%
		(TOTAL)	21	16,103	359,163	375,266	4.29	36	55	35	90	0.015	B	881	1.20%
	Kotido	Dodoth	10	5,419	90,436	95,855	5.65							213	0.29%
		Jie	5	4,774	55,320	60,094	7.94							184	0.25%
		Labwor	3	0	49,980	49,980	0.00							103	0.14%
		(TOTAL)	18	10,193	195,736	205,929	4.95	19	0	25	25	0.000	C	500	0.68%
	Lira	Dokolo	5	0	89,280	89,280	0.00							146	0.20%
		Erute	6	0	172,203	172,203	0.00							199	0.27%
		Kioga	4	0	71,939	71,939	0.00							129	0.18%
		Lira Municipality	4	28,964	0	28,964	100.00		117	150	267			* 449	0.61%
		Moroto	5	0	116,284	116,284	0.00							169	0.23%
		Otuke	4	0	45,657	45,657	0.00							97	0.13%
		(TOTAL)	28	28,964	497,363	526,327	5.50	52	119	170	289	0.023	B	1,189	1.62%
	Moroto	Bokora	6	0	39,592	39,592	0.00							88	0.12%
		Kadam (Chekwii)	4	1,554	41,145	42,699	3.64							106	0.14%
		Matheniko	3	0	51,094	51,094	0.00							104	0.14%
		Moroto Municipality	2	11,049	0	11,049	100.00		98	45	143			* 250	0.34%
		Pian	3	0	26,902	26,902	0.00							68	0.09%
		Upe	3	1,035	10,875	11,910	8.69							53	0.07%
		(TOTAL)	21	13,638	169,608	183,246	7.44	17	98	45	143	0.053	C	669	0.90%
	Moyo	East Moyo	6	2,215	98,922	101,137	2.19							169	0.23%
		Obongi	3	0	23,664	23,664	0.00							62	0.08%
		West Moyo	4	7,017	52,718	59,735	11.75							248	0.34%
		(TOTAL)	13	9,232	175,304	184,536	5.00	17	51	30	81	0.028	B	479	0.65%
	Nebbi	Jonam	4	5,429	67,866	73,295	7.41							205	0.28%
		Okoro	6	12,405	125,558	137,963	8.99							377	0.51%
		Padyere	7	7,322	114,328	121,650	6.02							258	0.35%
		(TOTAL)	17	25,155	307,753	332,908	7.56	32	0	25	25	0.000	B	840	1.14%
Sub-Total		42 Counties / 205 Sub-Counties		177,561	3,133,862	3,311,523	5.36	324	695	458	1,153	0.021		8,519	11.58%

: Sample Areas of The Field Survey
* : Estimated Demand by Network & Development Section of UPTC

Table 4-2-5 (4/4)

Table 4-2-5 The Result of Microscoic Demand Forecast (4/4, Western Region)

Region	District	County	Number of Sub-County	Population			Urban Ratio (%)	GRDP (Mil. US$)	E.Cs	Walters	E.Cs + WAT.	Demand Density	Category	Estimated Demand	
				Urban	Rural	Total								DEMAND	Ratio
Western	Sundibugyo	Bwamba	6	7,192	89,792	96,984	7.42							252	0.34%
		Ntoroko	2	2,490	22,993	25,483	9.77							106	0.14%
		(TOTAL)	8	9,682	112,785	122,467	7.91	12	0	25	25	0.000	D	358	0.46%
	Bushenyi	Buhweju	4	0	58,345	58,345	0.00							114	0.16%
		Bunyaruguru	4	0	79,176	79,176	0.00							137	0.19%
		Igara	8	14,914	154,218	169,132	8.82							429	0.58%
		Ruhinda	6	0	141,047	141,047	0.00							184	0.25%
		Sheema	6	0	160,755	160,755	0.00							194	0.26%
		(TOTAL)	28	14,914	593,541	608,455	2.45	62	98	189	287	0.016	D	1,058	1.44%
	Holma	Bugahya	7	4,850	124,921	129,771	3.74							748	1.02%
		Buhaguzi	5	0	78,096	78,096	0.00							135	0.18%
		(TOTAL)	12	4,850	203,017	207,867	2.33	20	169	21	190	0.081	E	883	1.20%
	Kabale	Kabale Municipality	3	30,727	0	30,727	100.00		659	87	746			* 2,010	2.74%
		Ndorwa	7	0	160,984	160,984	0.00							194	0.26%
		Rubanda	5	0	155,190	155,190	0.00							191	0.26%
		Rukiga	4	0	91,439	91,439	0.00							148	0.20%
		(TOTAL)	19	30,727	407,613	438,340	7.01	42	659	87	746	0.150	D	2,543	3.46%
	Kabarole	Bunyangabu	4	1,459	133,290	134,749	1.08							185	0.25%
		Burahya	7	0	145,541	145,541	0.00							186	0.25%
		Fort Portal Municipality	3	34,449	0	34,449	100.00		446	109	555			* 975	1.33%
		Kibale	3	1,417	124,260	125,677	1.13							180	0.25%
		Kitagwenda	3	0	66,186	66,186	0.00							143	0.19%
		Kyaka	5	0	66,764	66,764	0.00							123	0.17%
		Mwenge	7	1,499	189,742	191,241	0.78							211	0.29%
		(TOTAL)	32	38,825	745,782	784,607	4.95	79	446	151	597	0.057	E	2,003	2.73%
	Kasese	Bukonjo	10	11,124	165,741	176,865	6.29							337	0.46%
		Busongora	9	30,787	153,343	184,130	16.72							951	1.30%
		(TOTAL)	19	41,911	319,084	360,995	11.61	39	255	190	445	0.071	D	1,288	1.76%
	Kibale	Bugangaizi	5	0	48,909	48,909	0.00							102	0.14%
		Buyaga	6	2,530	137,338	139,868	1.81							196	0.27%
		Buyanja	3	0	42,635	42,635	0.00							93	0.13%
		(TOTAL)	14	2,530	228,882	231,412	1.09	23	11	55	66	0.005	E	391	0.54%
	Kisoro	Bufumbira	7	7,864	188,268	196,132	4.01							279	0.38%
		(TOTAL)	7	7,864	188,268	196,132	4.01	19	68	40	108	0.035	D	279	0.38%
	Masindi	Mujenje	2	0	46,284	46,284	0.00							98	0.13%
		Bulisa	2	0	50,124	50,124	0.00							103	0.14%
		Buruli	6	12,715	77,248	89,963	14.13							421	0.57%
		Kibanda	4	2,364	85,263	87,627	2.70							161	0.22%
		(TOTAL)	14	15,079	258,919	273,998	5.50	27	232	135	367	0.085	E	783	1.06%
	Mbarara	Bukanga	3	0	83,152	83,152	0.00							140	0.19%
		Ibanda	5	3,125	152,398	155,523	2.01							209	0.26%
		Isingiro	4	0	154,673	154,673	0.00							191	0.26%
		Kashari	6	0	128,264	128,264	0.00							176	0.24%
		Kazo	4	0	67,900	67,900	0.00							125	0.17%
		Mbarara Municipality	3	43,108	0	43,108	100.00		894	80	974			* 1,463	1.99%
		Nyabushozi	5	0	80,182	80,182	0.00							138	0.19%
		Rwampara	6	0	126,410	126,410	0.00							175	0.24%
		(TOTAL)	36	46,233	792,979	839,212	5.51	86	897	178	1075	0.107	D	2,617	3.56%
	Ntungamo	Kajara	4	0	87,114	87,114	0.00							144	0.20%
		Rushenyi	4	0	78,070	78,070	0.00							135	0.18%
		Ruhaama	4	2,743	135,937	138,680	1.98							197	0.27%
		(TOTAL)	12	2,743	301,121	303,864	1.98	31	17	12	29	0.006	D	476	0.65%
	Rukungiri	Kinkizi	7	3,291	165,553	168,844	1.95							216	0.29%
		Rubabo	4	0	107,260	107,260	0.00							161	0.22%
		Rujunbura	7	10,352	124,107	134,459	7.70							386	0.53%
		(TOTAL)	18	13,642	396,921	410,563	3.32	41	84	30	114	0.020	D	766	1.04%
Sub-Total		44 Counties / 229 Sub-Counties		228,999	4,548,913	4,777,912	4.79	481	2,936	1,113	4,049	0.061		13,444	18.33%
Grand ToTal		163 Counties / 820 Sub-Counties		1,985,285	15,530,425	17,515,710	11.33	2,921	23,666	8,976	32,642	0.135		73,337	

: Sample Areas of The Field Survey
* : Estimated Demand by Network & Development Section of UPTC

4.2.2 Macroscopic Demand Forecast

(1) Process of Macroscopic Demand Forecast

Three models were used for macroscopic demand forecast. Figure 4-2-4 presents a flow chart of macroscopic demand forecast method.

(2) ITU Regression Model

For macroscopic demand forecast (ITU regression model), a forecast model was developed by the regression analysis. The analysis was made in correlation between the expressed demand density and GDP per capita using statistical data (at 1990) of 60 (sixty) countries over the world.
The data to obtain the regression model are shown in Table 4-2-6.

The data used to develop the model for macroscopic demand forecast consist of existing main lines and waiting applicants registered. Accordingly, the estimated demand does not include potential demand.

As a result of the analysis, the following regression model was obtained:

$$Ln((ML + WA)/POP \times 100) = -6.110 + 1.042 \times Ln(GDP/POP)$$

(R squared = 0.849)

where,

Ln	:	natural logarithmic operator
ML	:	the number of main lines at 1990
WA	:	the number of waiting applicants at 1990
POP	:	population at 1990
GDP	:	GDP at 1990

Figure 4-2-4 Flow Chart of Macroscopic Demand Forecast Method

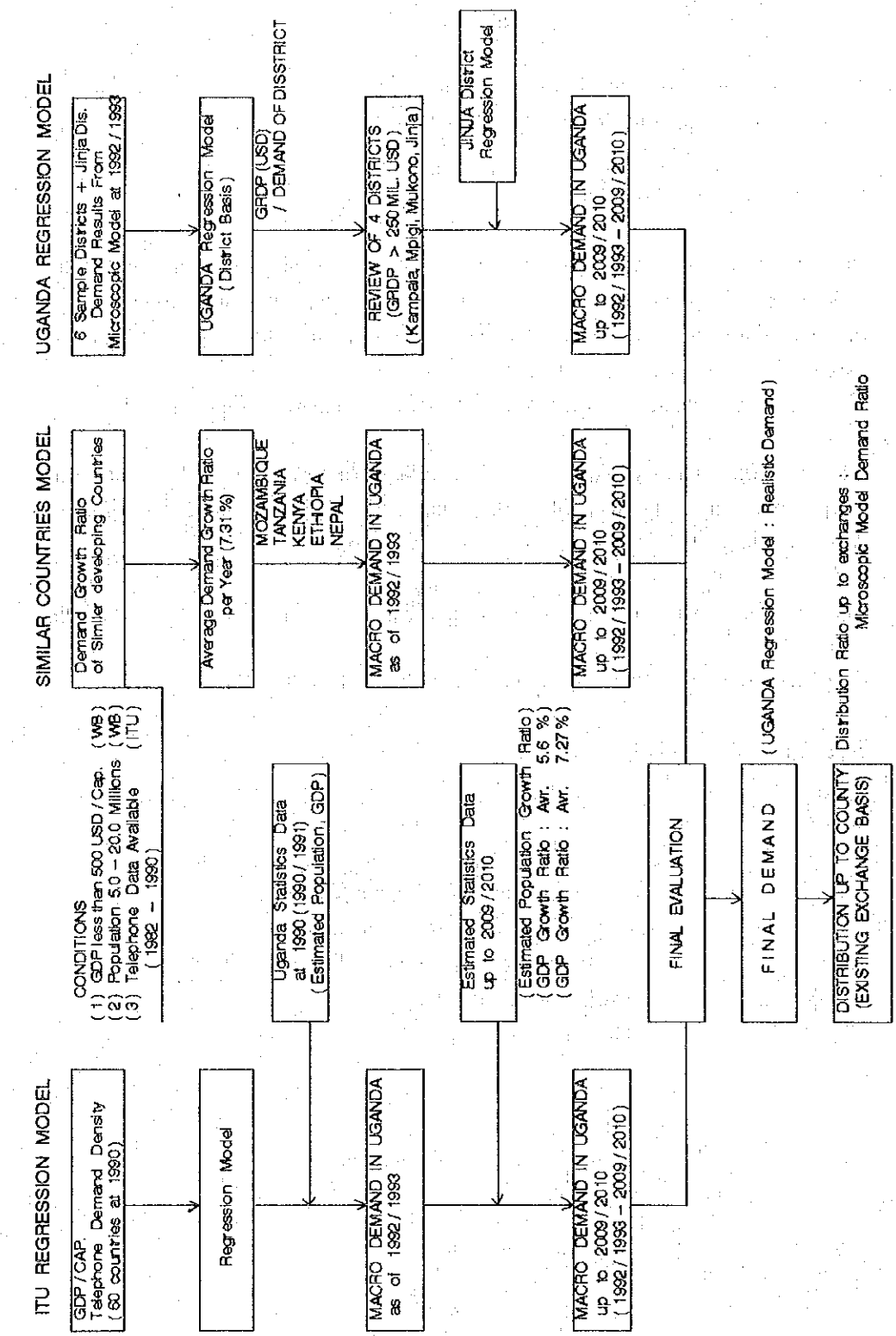


Figure 4 – 2 – 4 Flow Chart of Macroscopic Demand Forecast Method

Table 4-2-6 Telephone Service in Various Countries

Country	Population (millions) mid-1990	GDP (millions) (US$)	GDP/Capita (US$)	Main Line (10x3)	Waiting (10x3)	Demand (ML+WL) (100 Pop.)	Supply Main Lines (100 Pop.)	Remarks
Algeria	25.1	42,150	1,679	794.311	668.101	5.83	3.16	
Argentina	32.3	93,260	2,887	3,519.664	1,500.000	15.54	10.90	
Australia	17.1	296,300	17,327	7,786.889	4,000.000	68.93	45.54	
Bangladesh	106.7	22,880	214	241.824	113.656	0.33	0.23	
Belgium	10.0	192,390	19,239	3,912.600	18.365	39.31	39.13	
Brazil	150.4	414,060	2,753	9,409.230	428.337	6.54	6.26	
Cameroon *	11.7	11,130	951	40.000	7.000	0.40	0.34	Estimated data
Canada	26.5	570,150	21,515	15,290.000	0.000	57.70	57.70	
Chile	13.2	27,790	2,105	860.075	310.267	8.87	6.52	
China	1,133.7	364,900	322	6,850.300	688.800	0.66	0.60	
Colombia	32.3	41,120	1,273	2,414.726	457.904	8.89	7.48	
Cote D'Ivore	11.9	7,610	639	64.177	9.000	0.61	0.54	
Czech & Slovak	15.7	44,450	2,831	2,334.489	505.946	18.09	14.87	
Ecuador	10.3	10,880	1,056	490.508	151.200	6.23	4.76	
Egypt	52.1	33,210	637	1,717.498	1,173.641	5.55	3.30	
Ethiopia	51.2	5,490	107	130.689	116.458	0.48	0.26	
France	56.4	1,190,780	21,113	28,084.922	4,578.571	57.91	49.80	
Germany(FR+DR)	79.5	1,488,210	18,720	31,886.000	825.000	41.15	40.11	
Ghana	14.9	6,270	421	44.243	11.900	0.38	0.30	
Greece	10.1	57,900	5,733	3,948.654	1,091.223	49.90	39.10	
Hungary	10.6	32,920	3,106	996.000	658.000	15.60	9.40	
India	849.5	254,540	300	4,588.832	1,716.800	0.74	0.54	
Indonesia	178.2	107,290	602	1,043.919	388.915	0.80	0.59	
Iran	55.8	116,040	2,080	2,254.944	471.314	4.89	4.04	
Italy	57.7	1,090,750	18,904	22,350.000	65.000	38.85	38.73	
Japan	123.5	2,942,890	23,829	54,132.000	0.000	43.83	43.83	
Kenya	24.2	7,540	312	183.240	82.263	1.10	0.76	
Korea(Rep.of)	42.8	236,400	5,523	13,510.000	0.665	31.57	31.57	
Madagascar	11.7	2,750	235	31.543	3.000	0.30	0.27	
Malawi	8.5	1,660	195	26.170	11.016	0.44	0.31	
Malaysia	17.9	42,400	2,369	1,585.744	81.780	9.32	8.86	
Mexico	86.2	237,750	2,758	5,189.802	600.965	6.72	6.02	
Morocco	25.1	25,220	1,005	402.597	193.013	2.37	1.60	
Mozambique	15.7	1,320	84	47.439	32.872	0.51	0.30	
Nepal	18.9	2,890	153	57.320	72.434	0.69	0.30	
Netherlands	14.9	279,150	18,735	6,940.000	20.000	46.71	46.58	
Nigeria *	115.5	34,760	301	250.000	300.000	0.48	0.22	Estimated data
Pakistan	112.4	35,500	316	843.346	730.263	1.40	0.75	
Peru	21.7	36,550	1,684	564.504	376.396	4.34	2.60	
Philippines	61.5	43,860	713	610.126	567.325	1.91	0.99	
Poland	38.2	63,590	1,665	3,293.000	2,400.000	14.90	8.62	
Portugal	10.4	56,820	5,463	2,379.265	222.404	25.02	22.88	
Romania	23.2	34,730	1,497	2,406.294	980.407	14.60	10.37	
Rwanda	7.1	2,130	300	10.301	2.193	0.18	0.15	
Saudi Arabia	14.9	80,890	5,429	1,384.096	133.042	10.18	9.29	
South Africa	35.9	90,720	2,527	3,254.246	115.232	9.39	9.06	
Spain	39.0	491,240	12,596	12,600.000	379.900	33.28	32.31	
Sri Lanka	17.0	7,250	426	121.388	47.872	1.00	0.71	
Syria	12.4	14,730	1,188	496.360	1,528.651	16.33	4.00	
Tanzania	24.5	2,060	84	73.011	76.539	0.61	0.30	
Thailand	55.8	80,170	1,437	1,324.522	992.496	4.15	2.37	
Turkey	56.1	96,500	1,720	6,893.267	1,418.574	14.82	12.29	
Uganda	16.3	2,820	173	27.886	15.675	0.27	0.17	
United Kingdom	57.4	975,150	16,989	25,400.000	0.000	44.25	44.25	
United States	250.0	5,392,200	21,569	127,200.000	0.000	50.88	50.88	
Venezuela	19.7	48,270	2,450	1,494.776	585.085	10.56	7.59	
Yugoslavia	23.8	82,310	3,458	3,842.000	600.000	18.66	16.14	
Zaire *	37.3	7,540	202	29.500	10.000	0.11	0.08	Estimated data
Zambia	8.1	3,120	385	65.057	52.546	1.45	0.80	
Zimbabwe	9.8	5,310	542	125.747	72.820	2.03	1.28	

Source : World Development Report 1992 , established by World Bank (Population and GDP at 1990)
: Year of Common Carrier Telecommunication Statistics 20th edition , established by ITU
(Main lines and Waiting lines for main lines at 1990)

Figure 4-2-5 shows the demand regression curve expressing a correlation between telephone demand density and GDP/capita and the supply regression curve expressing a correlation between telephone supply density and GDP/capita. It can be said that the regression curve shows the international average of "the demand density" in commensurate with the economic level of the country concerned. This regression formula is applied to the estimation of the future demand in Uganda.

Table 4-2-7 shows the demand forecast in the case of modest GDP growth rate (5.6%) and that of optimistic GDP growth rate (7.27%).

Table 4-2-7 The Result of Demand Forecast (ITU regression model)

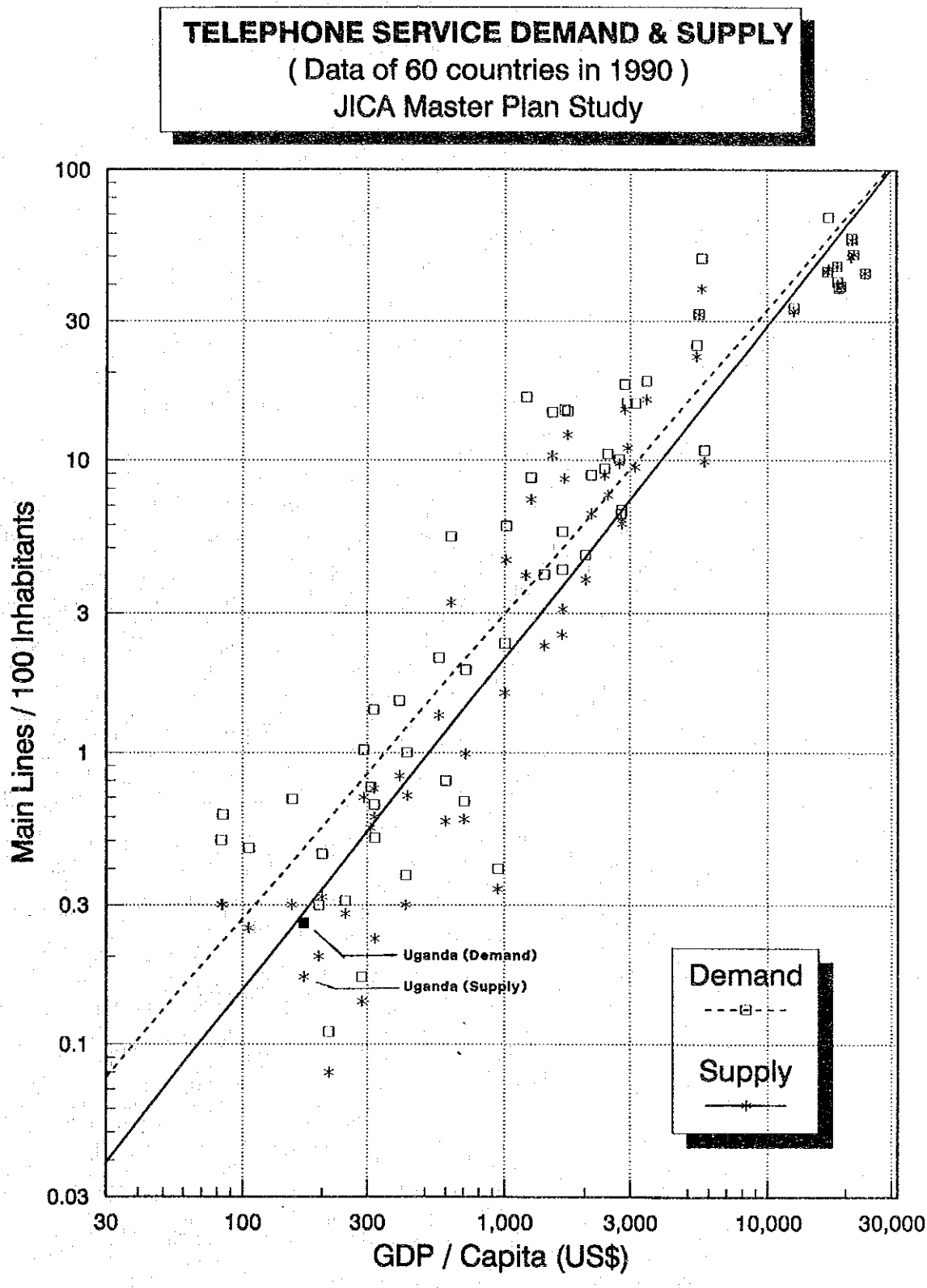
ITEM \ YEAR	1993/1994	1999/2000	2004/2005	2009/2010
Population (Mil.)	17.51	20.80	23.48	26.38
Case 1 : GDP 5.6%				
GDP / CAP. (US$)	179	217	254	301
Demand / 100 POP.	0.50	0.61	0.71	0.85
Demand	86,721	125,951	167,080	223,727
Case 2 : GDP 7.27%				
GDP / CAP. (US$)	179	245	315	411
Demand / 100 POP.	0.50	0.69	0.89	1.18
Demand	86,721	142,848	209,160	310,174

(GDP : 1990/1991 Constant Price (US$))

(2) Similar Countries Model

To know the average demand growth rate per year, five countries were selected as the similar countries to Uganda by the following three factors:

- GDP less than 500 US$ / Capita
  (World Bank Report, at 1990)
- Population 5.0 - 20.0 Millions
  (World Bank Report, at 1990)
- Telephone Data Available
  (ITU Year Book, 1982 - 1990)



Source:
Yearbook of Common Carrier by ITU in 1993
World Development Report by World Bank in 1992

Figure 4-2-5 ITU Regression Curve (60 Countries)

Table 4-2-8 shows the statistical data of telephone demand in the following similar countries:

Mozambique	(1985 - 1990 Data)
Tanzania	(1986 - 1990 Data)
Kenya	(1982 - 1990 Data)
Ethiopia	(1985 - 1989 Data)
Nepal	(1984 - 1989 Data)

Table 4-2-8 Telephone Services in Similar Countries

TELEPHONE SERVICE IN MOZAMBIQUE

YEAR	Population	GDP (Metical) (Millions)	GDP (Metical) (Cons. Mil.)	GDP (US$) (Cons. Mil.)	GDP/CAP (Cons. US$)	Main Lines	Waiters	Demand	Annual Dem. Growth	Exchange Rate
1985	13,990,000	147,000	395,566	989	71	38,332	26,427	64,759		40.400
1986	14,360,000	167,000	400,566	1,001	70	39,840	28,395	68,235	5.09%	40.000
1987	14,550,000	426,000	423,300	1,058	73	40,174	29,214	69,388	1.66%	400.000
1988	15,130,000	659,000	447,588	1,119	74	40,786	29,311	70,097	1.01%	632.400
1989	15,490,000	--	472,042	1,180	76	41,278	32,576	73,854	5.09%	820.030
1990	15,940,000	--	480,790	1,202	75	47,439	32,872	80,311	8.04%	1,035.600
Growth Ratio of GDP (1985 -- 1990)			4.0%	Average Growth Ratio of Demand / Year (1985 -- 1990)					4.18%	

TELEPHONE SERVICE IN TANZANIA

YEAR	Population	GDP (TShs) (Millions)	GDP (TShs) (Cons. Mil.)	GDP (US$) (Cons. Mil.)	GDP/CAP (Cons. US$)	Main Lines	Waiters	Demand	Annual Dem. Growth	Exchange Rate
1986	22,450,000	131,300	183,908	2,679	119	54,460	66,716	121,176		51.978
1987	24,000,000	198,100	193,082	2,813	117	58,600	64,600	123,400	1.80%	68.651
1988	23,200,000	271,700	203,075	2,958	128	66,056	75,960	142,016	13.11%	100.400
1989	23,170,000	351,200	210,562	3,067	132	68,155	74,206	142,361	0.24%	145.000
1990	24,490,000	401,600	218,219	3,179	130	73,011	76,539	149,550	4.81%	196.600
Growth Ratio of GDP (1986 -- 1990)			4.4%	Average Growth Ratio of Demand / Year (1986 -- 1990)					4.99%	

TELEPHONE SERVICE IN KENYA

YEAR	Population	GDP (Shilling) (Millions)	GDP (Shilling) (Cons. Mil.)	GDP (US$) (Cons. Mil.)	GDP/CAP (Cons. US$)	Main Lines	Waiters	Demand	Annual Dem. Growth	Exchange Rate
1982	18,040,000	59,010	107,423	6,510	361	88,100	72,000	160,100		12.725
1983	18,770,000	66,330	108,997	6,606	352	95,700	79,000	174,700	8.36%	13.796
1984	19,540,000	75,950	110,845	6,718	344	106,100	73,900	180,000	2.94%	15.781
1985	20,330,000	85,620	115,640	7,008	345	116,400	64,500	182,900	1.59%	16.284
1986	21,150,000	101,500	123,880	7,508	355	129,500	48,500	178,000	-2.75%	16.012
1987	22,030,000	114,100	131,170	7,950	361	145,270	54,587	199,857	10.94%	16.500
1988	22,660,000	130,100	139,239	8,439	372	157,356	63,892	221,248	9.67%	18.599
1989	23,200,000	146,600	145,682	8,829	381	168,683	75,284	243,967	9.31%	21.601
1990	26,000,000	146,600	151,902	9,206	354	183,240	82,263	265,503	8.11%	23.300
Growth Ratio of GDP (1982 -- 1990)			4.4%	Average Growth Ratio of Demand / Year (1982 -- 1990)					6.02%	

TELEPHONE SERVICE IN ETHIOPIA

YEAR	Population	GDP (Birr) (Millions)	GDP (Birr) (Cons. Mil.)	GDP (US$) (Cons. Mil.)	GDP/CAP (Cons. US$)	Main Lines	Waiters	Demand	Annual Dem. Growth	Exchange Rate
1985	43,350,000	9,881	9,785	4,727	109	100,694	50,310	151,004		2.070
1986	44,930,000	10,800	10,422	5,035	112	104,660	68,220	173,080	12.75%	2.070
1987	47,300,000	--	11,399	5,507	116	108,029	78,606	186,635	7.26%	2.070
1988	47,300,000	--	11,623	5,615	119	112,602	87,807	200,409	6.87%	2.070
1989	49,310,000	8,939	11,808	5,705	116	124,203	101,896	226,099	11.36%	2.070
Growth Ratio of GDP (1985 -- 1989)			4.8%	Average Growth Ratio of Demand / Year (1985 -- 1989)					9.56%	

TELEPHONE SERVICE IN NEPAL

YEAR	Population	GDP (Rupee) (Millions)	GDP (Rupee) (Cons. Mil.)	GDP (US$) (Cons. Mil.)	GDP/CAP (Cons. US$)	Main Lines	Waiters	Demand	Annual Dem. Growth	Exchange Rate
1984	16,680,000	39,160	22,262	1,012	61	18,592	33,622	52,214		18.300
1985	16,700,000	44,420	23,530	1,074	64	20,691	40,330	61,021	14.43%	17.700
1986	17,130,000	50,430	24,645	1,120	65	25,548	40,833	66,380	8.07%	22.000
1987	17,560,000	46,830	25,617	1,164	66	30,404	41,335	71,739	7.47%	22.000
1988	17,990,000	67,840	27,475	1,249	69	37,931	49,316	87,246	17.77%	25.200
1989	18,440,000	71,250	28,536	1,297	70	45,457	57,296	102,753	15.09%	27.700
Growth Ratio of GDP (1984 -- 1989)			5.09%	Average Growth Ratio of Demand / Year (1					14.60%	12.57%

GDP : Constant Price at 1987 (NEPAL : Constant Price at 1975)

The average demand growth rate of 7.31% per year was obtained from the data of the similar countries. The demand growth rate per year in each country is shown in Table 4-2-9.

Table 4-2-9 Demand Growth Rate / Year in Similar Countries

NO.	Country Name	Year	Growth Ratio of Demand
1	MOZAMBIQUE	1985/86	5.09%
2		1986/87	1.66%
3		1987/88	1.01%
4		1988/89	5.09%
5		1989/90	8.04%
6	TANZANIA	1986/87	1.80%
7		1987/88	13.11%
8		1988/89	0.24%
9		1989/90	4.81%
10	KENYA	1982/83	8.36%
11		1983/84	2.94%
12		1984/85	1.59%
13		1985/86	-2.75%
14		1986/87	10.94%
15		1987/88	9.67%
16		1988/89	9.31%
17		1989/90	8.11%
18	ETHIOPIA	1985/86	12.75%
19		1986/87	7.26%
20		1987/88	6.87%
21		1988/89	11.36%
22	NEPAL	1984/85	14.43%
23		1985/86	8.07%
24		1986/87	7.47%
25		1987/88	17.77%
26		1988/89	15.09%
Average Growth Rate of Demand/Year (5 Countries)			7.31%

If the same annual growth rate (7.31%) is applied to Uganda, the telephone demand up to the year 2009/2010 will be as shown in Table 4-2-10. For the demand in 1992/1993 (basic year for the model), the result of ITU regression model in 1992/1993 (Estimated Demand Volume : 86,721) was adopted for simple comparison of both macroscopic forecasted results.

Table 4-2-10 The Result of Demand Forecast
(Similar countries model)

ITEM \ YEAR	1992/1993	1999/2000	2004/2005	2009/2010
Population (Mil.)	17.51	20.80	23.48	26.38
Demand / 100 POP.	0.50	0.68	0.86	1.09
Demand	86,721	142,104	202,212	287,745

(3) Uganda Regression Model

Uganda regression model was made based on correlation between the GRDP in million US$ in 1992/1993 and the total demand of seven (7) sample districts. The total demand of these districts was obtained by the microscopic model mentioned in Chapter 4.2.1. The basic data of these districts to develop the regression model are shown in Table 4-2-11.

Table 4-2-11 Telephone Demand & GRDP in Sample Districts

No.	District	Category	GRDP Mil.US$	Demand
1	Mpigi	A1	111	4,820
2	Soroti	A2	42	1,468
3	Arua	B	70	1,785
4	Moroto	C	17	669
5	Kabarole	D	79	2,003
6	Rukungiri	E	41	765
7	Jinja	Special	132	3,602

(At 1992/1993)

a) Regression Model analysis

As a result of the analysis, the following regression model was obtained:

(Total Demand in the District) = -192.819 + 33.45881 x (GRDP)

(R squared = 0.805)

The demand in seven (7) sample districts and regression curve are shown in Figure 4-2-6.

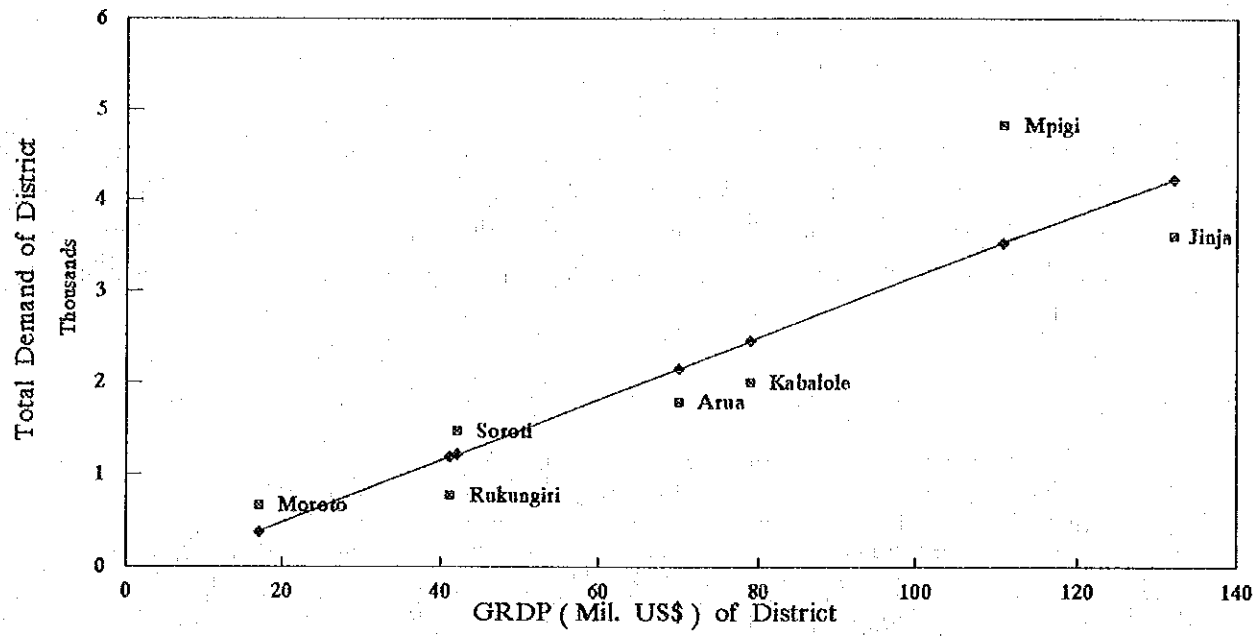


Figure 4-2-6 Regression Curve for Sample Districts
(correlation between telephone demand and GRDP in each district)

b) Review of Estimated Demand

The future demand of each district in Uganda was estimated by the above regression model.

However, GRDP of seven (7) sample districts ranges between US$ 17 million and US$ 132 million. Therefore, for four (4) districts (Kampala, Mpigi, Mukono and Jinja) of which GRDPs were estimated to be more than US$ 250 million during the forecast year, the results obtained by the Uganda Regression Model were reviewed, through the comparison with the demand forecast results made under the OUTSIDE PLANT REHABILITATION PROJECT in 1988. Table 4-2-12 presents the comparison of these data.

Table 4-2-12 Comparison of Demand Forecasts for 4 Districts

District	Uganda Regression Model	REHABILITATION PROJECT
Kampala	78,424	70,630
Mpigi	10,936	4,290 (Entebbe Exc.)
Mukono	13,765	1,370 (Mukono Exc.)
Jinja	9,976	12,000 (Jinja Exc.)

Exc. : Exchange

Demands in three districts, i.e., Kampala, Mpigi and Mukono, by Uganda Regression Model, are larger than those by REHABILITATION PROJECT and, therefore, considered reasonable. However, demand in Jinja by Uganda Regression Model is less than the one forecasted by REHABILITATION PROJECT and, therefore, adjusted by adopting the following regression model:

(Total Demand in The District) = -3949.360 + 57.207 x (GRDP)

c) Results of Demand Forecast

Table 4-2-13 shows the results of demand forecast obtained by Uganda regression model.

Table 4-2-13 Results of Demand Forecast (Uganda regression model)

ITEM \ YEAR	1992/1993	1999/2000	2004/2005	2009/2010
Population (Mil.)	17.51	20.80	23.48	26.38
Demand / 100 POP.	0.42	0.57	0.70	0.86
Demand	73,337	117,753	163,869	226,841

The total demand in the nation in the year 2009/2010 may reach **226,841 Telephone Lines.**

Figure 4-2-7 shows the results of macroscopic demand forecast.

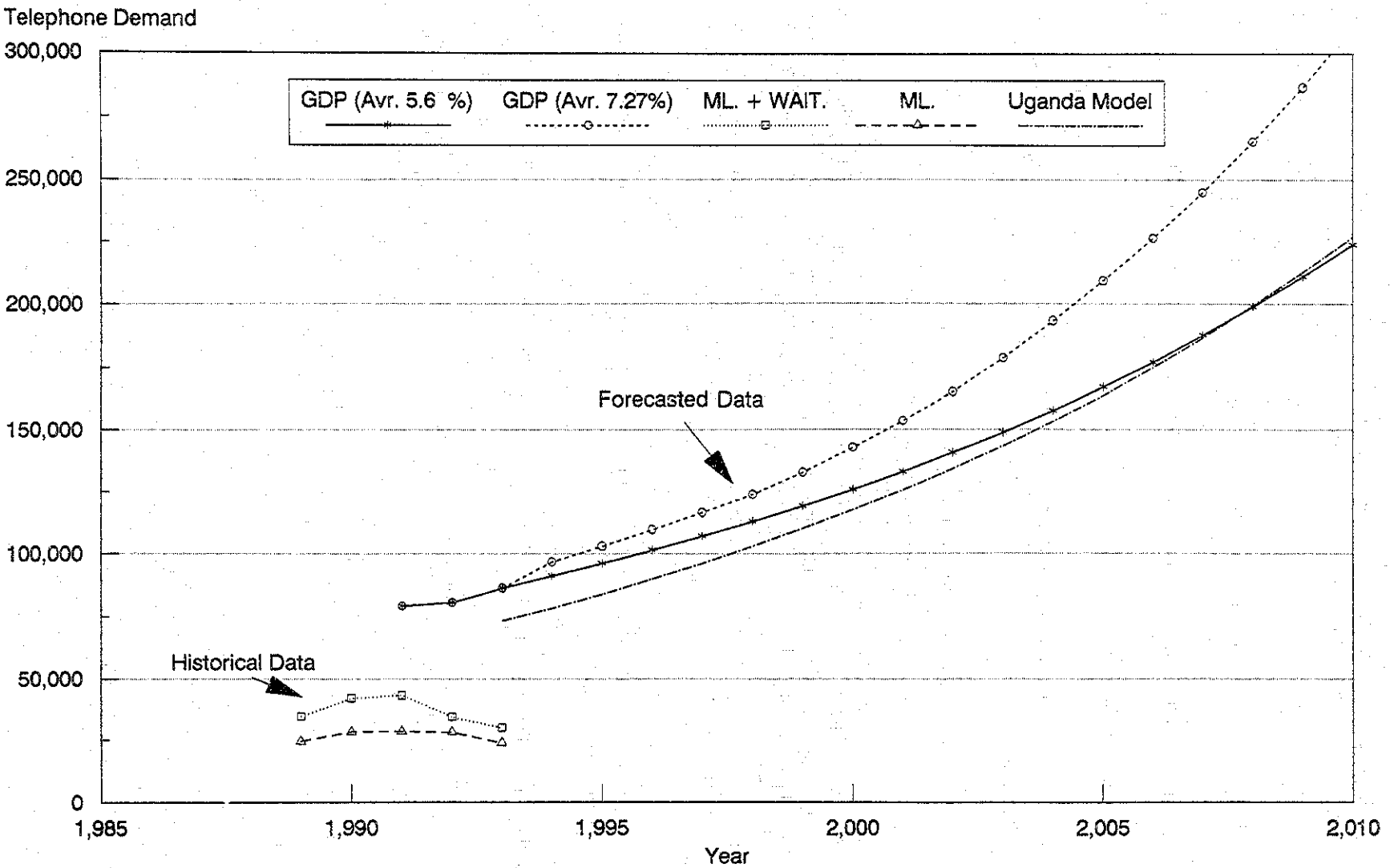


Fig. 4-2-7 The Result of the Macroscopic Demand Models
(ITU Regression Model and Uganda Regression Model)

Note: The historical Data is only for the existing service areas while the forecasted demand data is for the whole nation.

4.2.3 Evaluation of Results of Demand Forecast

The results of telephone demand forecast obtained by microscopic and macroscopic methods are summarized in Table 4-2-14.

Table 4-2-14 Summary of Forecasted Telephone Demand

Main Method	Model	1992/1993	1999/2000	2004/2005	2009/2010
Macroscopic	ITU(5.6%) Similar Uganda	86,721 86,721 73,337	125,951 142,104 117,753	167,080 202,212 163,869	223,727 287,745 226,841
Microscopic		73,337	-------	-------	-------
E.C.s. + Waiters	By UPTC	32,642	-------	-------	-------

Generally, the forecasted demand based on the microscopic method presents more realistic results compared to the forecast obtained by other methods, and represents regional features.
However, the microscopic method cannot forecast the future demand, while the macroscopic method can forecast the telephone demand for both at present and in the future, though the latter can output only the total demand in the whole nation.

In this study, therefore, the result of Uganda regression model is considered to be the realistic demand, because this model is relating to the result of the microscopic model for 1992/1993. That is, the macroscopic and microscopic models are to be applied in this study as follows:

a) For demand in each district,
   - **Macroscopic model (Uganda regression model)** was used.

b) For demand in county,
   - The demand distribution ratio obtained by **Microscopic model** was used.

Figure 4-2-8 shows the classification of counties by telephone demand at 2009/2010. Table 4-2-15 through Table 4-2-18 show the demand in each existing exchange area up to 2009/2010.

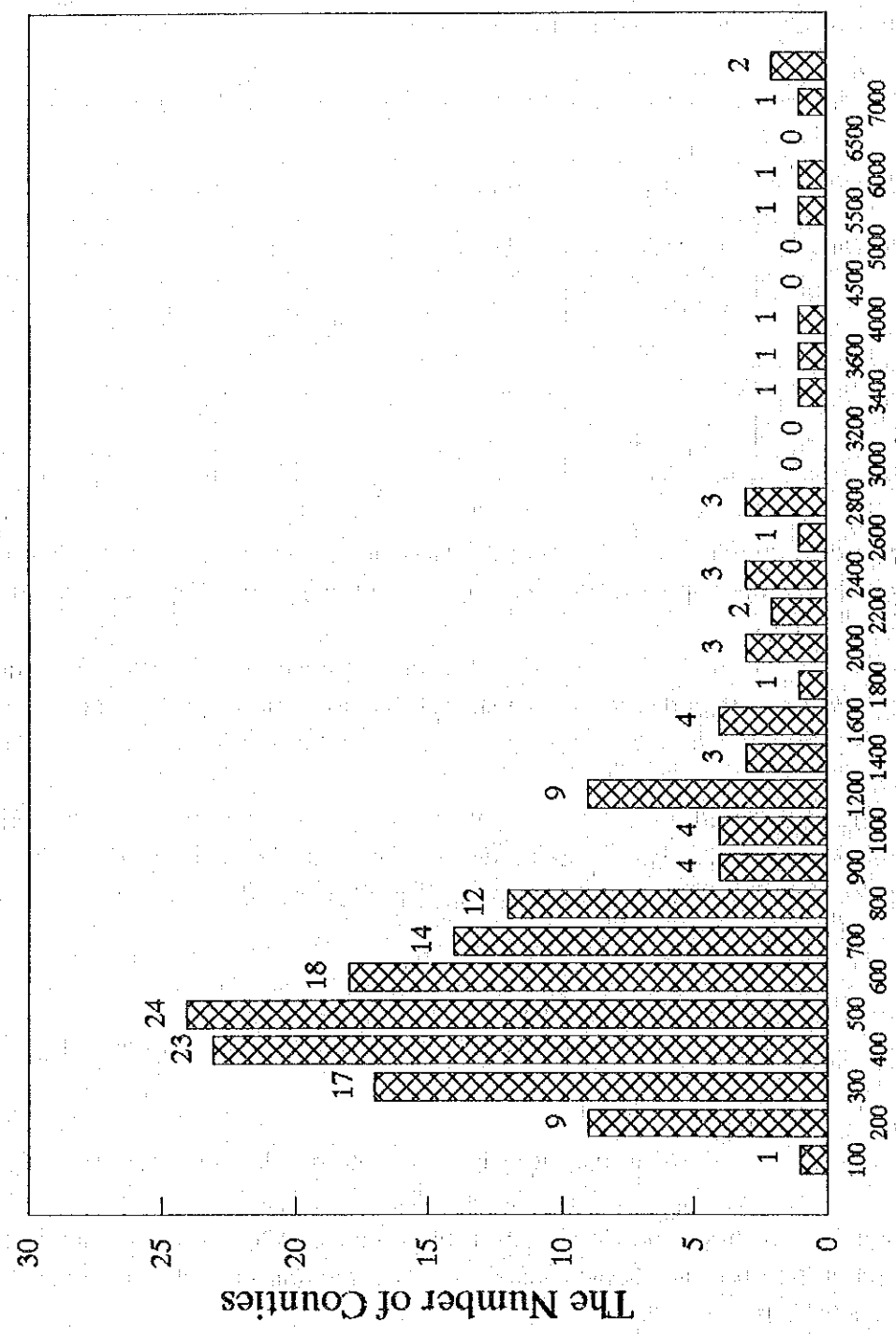


Fig 4-2-8 Classification of Counties by Telephone Demand at 2009/2010

Table 4-2-15

Table 4-2-15 The Result of Demand Forecast up to 2009/2010 (1/4, Central Region)

NO	Region	District	County	Exchange Name (Not – Working)	EC.s	Waters	EC.s Waters	Population			Urban Ratio (%)		1992 / 1993 Demand	1994 / 1995 Demand	1999 / 2000 Demand	2004 / 2005 Demand	2009 / 2010 Demand
								Urban	Rural	Total							
1	Central	Kalangala	Bujumba	Kalangala	11	20	31	1,446	8,211	9,657	14.97		57	62	89	122	170
2			Kyamuswa					0	7,542	7,542	0.00		26	29	40	56	78
			(TOTAL)		11	20	31	1,446	15,753	17,199	8.41		83	94	129	178	248
3		Kampala	Kampala CC.	Kampala Central	10,298	4,321	14,619						10,877	12,482	18,234	26,481	38,059
				Makerere	970	92	962						2,642	3,089	4,513	6,553	9,419
				Kawempe (RLU)	268	112	380						1,459	1,705	2,491	3,618	5,200
				Mengo (XB)	411	70	481						2,750	3,215	4,697	8,821	9,600
				Nsambya (RLU)	1,095	150	1,215						1,346	1,574	2,299	3,339	4,800
				Lubowa (RLU)	117	45	162						477	558	815	1,184	1,702
				Kyambogo (XB)	215	20	235						1,293	1,500	2,191	3,181	4,572
				Mbuya (RLU)	849	41	890						1,368	1,600	2,337	3,394	4,878
			(TOTAL)		14,093	4,851	18,944	813,437	0	813,437	100.00	*	22,000	25,721	37,573	54,566	78,424
4		Kiboga	Kiboga	Kiboga	50	30	80	5,544	143,232	148,776	3.73		230	285	456	707	1,057
			(TOTAL)		50	30	80	5,544	143,232	148,776	3.73		230	285	456	707	1,057
5		Luwero	Buruli	Nakasongola	33	30	63	8,697	96,888	105,585	8.24		230	261	360	501	699
6			Katikamu	Bombo	22	35	57						481	523	720	1,003	1,401
				Luwero	42	26	68						142	161	222	309	431
				Wobulenzi	29	13	42						155	176	243	338	473
				(Sub – Total)	93	74	187	28,439	126,310	154,749	18.38		756	860	1,185	1,651	2,306
7			Nakaseke	Ssemuto	9	15	23						65	74	102	142	199
				Nakaseke	5	28	33						94	106	146	204	285
				(Sub – Total)	13	43	56	1,206	97,347	98,553	1.22		156	180	249	346	483
8			Wabusana (Bamunanika)					2,038	111,532	113,570	1.79		178	200	275	383	535
			(TOTAL)		139	147	286	39,390	434,077	472,457	8.12		1,323	1,501	2,069	2,881	4,023
9		Masaka	Bukomansimbi	Byoga (FCO)	1	20	21	0	132,856	132,856	0.00		179	199	257	341	460
10			Bukoto	Bukoto	4	7	11	14,218	370,873	385,091	3.69		326	360	467	621	838
11			Kalungu	Lukaya	15	17	32						146	161	209	278	374
				Kalungu	1	14	15						171	189	246	327	440
				(Sub – Total)	16	31	47	11,165	148,559	159,724	6.99		317	350	454	604	814
12			Lwemiyaga					1,078	21,121	22,197	4.85		88	75	97	130	175
13			Masaka municipality	Masaka	557	355	912	52,095	0	52,095	100.00	*	2,150	2,372	3,081	4,096	5,524
14			Mawogola					2,550	126,584	129,134	1.97		190	210	272	362	488
			(TOTAL)		578	413	991	81,104	800,093	881,197	9.20		3,290	3,564	4,629	6,156	8,299
15		Mpigi	Entebbe municipality	Entebbe	1,048	85	1,133	44,928	0	44,928	100.00	*	2,210	2,395	2,994	3,828	5,014
16			Busiro	(Naddangira)				33,436	234,919	268,355	12.46		750	813	1,013	1,299	1,702
17			Butambala					1,617	76,194	77,811	2.08		144	156	194	249	327
18			Gombe					2,709	122,893	125,602	2.16		189	205	255	327	429
19			Kyadondo	Kasangati	91	15	96						732	793	986	1,268	1,661
				Namulonge	5	40	45						90	97	109	139	182
				(Matugga)									393	425	530	680	891
				(Sub – Total)	96	55	141	49,909	228,191	278,100	17.95		1,205	1,306	1,627	2,088	2,734
20			Mawokota	Mpigi	52	81	133						265	288	358	460	602
				(Kitera Maria)									57	61	76	98	128
				(Sub – Total)	52	81	133	11,470	153,995	165,395	6.96		322	349	435	558	731
			(TOTAL)		1,196	221	1,407	144,068	816,093	960,131	15.01		4,820	5,223	6,509	8,350	10,936
21		Mubende	Busuju					0	69,273	69,273	0.00		126	149	206	296	424
22			Buwekula	Mubende	88	59	147	9,772	128,281	138,053	7.08		291	336	481	688	979
23			Kasanda					1,232	152,210	153,442	0.80		194	224	321	459	653
24			Mityana	Mityana	180	95	275						583	651	931	1,332	1,895
				Busunju	1	40	41						84	97	139	199	283
				(Sub – Total)	181	135	316	25,295	140,365	165,570	15.27		647	748	1,068	1,530	2,178
			(TOTAL)		269	194	463	36,299	490,048	526,338	6.89		1,258	1,454	2,079	2,975	4,234
25		Mukono	Buikwe					2,139	87,528	89,668	2.38		159	194	305	464	887
26			Bukwe	Lugazi	75	57	132						707	862	1,355	2,062	3,055
				Bukwe	4	12	16						382	466	732	1,114	1,651
				Ngogwe	0	17	17						182	221	348	530	785
				Nkokonjeru	4	30	34						288	351	552	839	1,244
				Nyenga	19	21	40						405	493	775	1,180	1,749
				(Sub – Total)	102	137	236	59,832	203,381	263,193	22.73		1,881	1,927	3,030	4,612	6,833
27			Buvuma islands					0	19,418	19,418	0.00		53	65	102	155	229
28			Mukono	Mukono (RSU)	222	10	232						365	468	736	1,122	1,663
				(Seeta)									106	129	204	310	459
				(Sub – Total)	222	10	232	7,781	183,114	190,895	4.08	*	491	599	943	1,432	2,122
29			Nakifuma	Kasawo	12	20	32						156	190	299	454	672
				(Nagalama)									161	197	309	471	698
				(Sub – Total)	12	20	32	11,181	133,529	144,710	7.73		317	386	608	925	1,370
30			Ntanjeru	Kayunga	72	15	87						375	457	719	1,094	1,620
				(Kangulumira)									209	255	401	610	904
				(Sub – Total)	72	15	87	22,802	135,666	158,468	14.39		564	713	1,119	1,704	2,524
			(TOTAL)		409	192	590	103,733	762,617	866,350	11.97		3,185	3,880	6,105	9,291	13,765
31		Rakai	Kabula	Lyantonde	0	95	95	5,799	49,909	55,708	10.40		192	226	344	511	744
32			Kakuuto	(Kakuuto)				0	71,801	71,801	0.00		129	153	231	343	500
33			Kooki	Rakai	4	15	19	577	138,070	138,647	0.42		184	219	330	489	713
34			Kyotera	Kyotera	39	30	69						129	154	232	344	501
				Kalisizo	33	32	65						152	180	272	403	588
				(Sub – Total)	72	62	134	9,245	127,405	136,650	6.76		281	334	504	747	1,089
			(TOTAL)		76	182	298	15,822	387,294	402,816	3.88		786	935	1,410	2,090	3,045

: ESTIMATED DEMAND BY NETWORK & DEVELOPMENT SECTION OF UPTC AND STUDY TEAM

Table 4-2-16

Table 4-2-16 The Result of Demand Forecast up to 2009/2010 (2/4, Eastern Region)

NO.	Region	District	County	Exchange Name (Not – Working)	E.C.s	Waiters	E.C.s Waiters	Population Urban	Population Rural	Population Total	Urban Ratio (%)	1992 / 1993 Demand	1994 / 1995 Demand	1999 / 2000 Demand	2004 / 2005 Demand	2009 / 2010 Demand
35	Eastern	Iganga	Bugweri	Busesa	15	28	43	4,060	84,579	88,639	4.58	185	218	317	448	624
36			Bukooli	Bugiri	46	40	86	9,987	241,435	251,422	3.97	310	365	531	751	1,045
37			Bunya	Mayuge	15	13	28	6,840	221,187	227,827	2.91	265	312	454	642	893
38			Busiki	Bysembatya	20	18	38	0	150,142	150,142	0.00	177	208	303	429	597
39			Kigulu	Iganga	207	120	327					735	866	1,258	1,781	2,478
				(Namangalwe)								61	72	104	148	206
				(Sub-Total)	207	120	327	25,543	133,080	158,623	16.10	796	937	1,363	1,928	2,684
40			Luuka	Kiyunga	4	30	34	0	137,010	137,010	0.00	161	213	310	439	610
			(TOTAL)		307	249	556	46,230	947,433	993,663	4.65	1,914	2,254	3,277	4,637	6,453
41		Jinja	Butembe	Kakira	44	34	78	11,324	91,646	102,970	11.00	363	445	693	1,022	1,461
42			Jinja Municipality	Jinja	1,305	292	1,597	68,468	0	68,468	100.00 *	3,015	3,696	5,754	8,488	12,137
43			Kagoma	Buwenge	9	26	35	5,196	127,497	132,693	3.92	224	275	427	631	902
			(TOTAL)		1,358	352	1,710	84,988	219,143	304,131	27.94	3,602	4,416	6,874	10,140	14,500
44		Kamuli	Budiope					0	137,395	137,395	0.00	182	225	354	526	755
45			Bugabula	Budiope	34	45	79					39	48	75	112	161
				Kamuli	4	11	15					203	251	395	587	843
				Namwendwa	1	7	8					16	20	31	46	66
				(Sub-Total)	39	63	102	6,824	156,609	163,433	4.18	256	319	502	745	1,070
46			Bulamogi	Kaliro	35	25	60	1,856	108,588	110,444	1.68	173	214	337	500	717
47			Buzaaya					0	98,506	98,506	0.00	154	190	300	445	639
			(TOTAL)		74	88	162	8,680	501,098	509,778	1.70	767	948	1,492	2,215	3,181
48		Kapchorwa	Kongasis					0	32,246	32,246	0.00	77	87	119	160	216
49			Kwoti					0	39,233	39,233	0.00	88	100	136	183	247
50			Tingoy	Kapchorwa	36	13	49	4,837	46,294	51,131	9.46	183	208	282	381	513
			(TOTAL)		36	13	49	4,837	117,773	122,610	3.95	348	395	536	725	976
51		Kumi	Bukedea	(Bukedea)				0	79,083	79,083	0.00	135	153	206	278	370
52			Kumi	Kumi	45	30	75	12,344	94,851	107,195	11.52	392	442	594	796	1,066
53			Ngora	(Ngora)				0	62,399	62,399	0.00	118	133	179	240	321
			(TOTAL)		45	30	75	12,344	236,333	248,677	4.96	646	729	979	1,312	1,757
54		Mbale	Bubulo	Myenze	20	25	45	0	187,566	187,566	0.00	205	229	302	396	527
55			Budadiri	Budadiri	13	10	23					179	200	263	348	460
				Sironko	13	10	23					179	200	263	348	460
				(Sub-Total)	26	20	46	3,341	151,867	155,208	2.15 *	358	400	527	695	920
56			Bulambuli					0	67,845	67,845	0.00	125	140	184	243	321
57			Bungokho	Nakaloke	5	21	26					154	172	227	300	397
				Manafwa	3	8	11					70	78	103	136	179
				(Sub-Total)	8	29	37	3,290	193,116	196,406	1.67	224	250	330	435	576
58			Manjiya	Bududa	11	15	26					137	154	202	267	353
				Bulucheke	5	12	17					102	114	149	197	261
				(Sub-Total)	16	27	43	0	83,226	83,226	0.00 *	239	267	352	464	614
59			Mbale Municipality	Mbale (2 Units)	685	70	755	56,720	0	56,720	100.00 *	1,306	1,462	1,925	2,541	3,363
			(TOTAL)		755	171	926	63,351	682,822	746,973	8.48	2,459	2,748	3,619	4,777	6,322
60		Pallisa	Budaka	Kamonkoli	1	7	8	0	105,428	105,428	0.00	160	197	306	453	648
61			Butaleo					0	66,769	66,769	0.00	123	151	235	348	498
62			Kibuku					0	95,834	95,834	0.00	152	187	291	430	615
63			Pallisa	Pallisa	16	15	31	3,075	104,656	107,731	2.85	183	225	350	518	741
			(TOTAL)		17	22	39	3,075	372,687	375,762	0.82	618	759	1,183	1,748	2,501
64		Soroti	Amuria	(Amuria)				0	47,705	47,705	0.00	100	110	141	183	236
65			Kaberamaido	(Kaberamaido)				1,903	40,207	42,110	4.52	110	121	156	201	262
66			Kalaki	(Otsuboi)				0	45,553	45,553	0.00	94	104	133	172	224
67			Kapelebyong					0	25,159	25,159	0.00	64	71	91	117	152
68			Kasilo					0	31,155	31,155	0.00	75	85	106	137	179
69			Serere	(Serere)				0	65,909	65,909	0.00	120	132	170	219	286
70			Soroti					0	76,593	76,593	0.00	134	148	190	245	319
71			Soroti Municipality	Soroti	207	120	327	43,044	0	43,044	100.00 *	596	660	846	1,094	1,424
72			Usuk	(Katakwi)				3,870	75,383	79,053	4.84	173	191	245	316	412
			(TOTAL)		207	120	327	48,816	403,563	452,179	10.75	1,466	1,620	2,077	2,665	3,496
73		Tororo	Bunyole					1,859	110,240	112,079	1.64	174	189	232	291	368
74			Kisoro (West Bundama)					0	167,036	167,036		197	214	263	329	417
75			Samia-Bugwe	Busia	62	30	92					666	722	890	1,113	1,411
				Lumino	3	15	18					257	278	343	429	543
				(Sub-Total)	65	45	110	29,383	142,496	171,879	17.10	923	1,000	1,232	1,541	1,954
76			Tororo	Malaba	30	25	55	7,519	97,049	104,568	7.19	260	282	347	434	550
77			Tororo Municipality	Tororo	331	70	401	28,139	0	28,139	100.00 *	1,083	1,174	1,446	1,809	2,293
			(TOTAL)		426	140	566	66,860	515,821	583,701	11.46	2,537	2,858	3,521	4,404	5,585

* : ESTIMATED DEMAND BY NETWORK & DEVELOPMENT SECTION OF UPTC AND STUDY TEAM

Table 4-2-17

Table 4-2-17 The Result of Demand Forecast up to 2009/2010 (3/4, Northern Region)

NO.	Region	District	County	Exchange Name (Not - Working)	E.C.s	Waiters	E.C.s Waiters	Population Urban	Population Rural	Population Total	Urban Ratio (%)	1992 / 1993 Demand	1994 / 1995 Demand	1999 / 2000 Demand	2004 / 2005 Demand	2009 / 2010 Demand
78	Northern	Apac	Kole				0		121,994	121,994	0.00	171	209	321	484	550
79			Kwania	Aduku	3	11	14		86,814	86,814	0.00	146	178	274	396	555
80			Maruzi	Apac	23	15	38	6,076	75,513	81,589	7.45	223	272	418	606	848
81			Oyam				0		186,016	186,016	0.00	250	305	385	557	779
			(TOTAL)		26	26	52	6,076	471,437	477,513	1.27	745	909	1,398	2,023	2,832
82		Arua	Aringa				0		104,846	104,846	0.00	159	181	246	329	436
83			Arua Municipality	Arua	96	27	123	23,342	0	23,342	100.00 *	690	785	1,066	1,426	1,891
84			Ayivu				0		116,488	116,488	0.00	168	191	259	347	461
85			Koboko	(Koboko)				4,723	60,770	65,493	7.21	186	212	287	384	510
86			Madi - Okollo	(Rhino Camp)					74,507	74,507	0.00	192	150	204	273	362
87			Maracha				0		113,043	113,043	0.00	166	189	256	343	455
88			Terego				0		104,406	104,406	0.00	159	181	246	329	436
89			Yumbe				0		69,313	69,313	0.00	125	142	193	258	343
			(TOTAL)		96	27	123	28,065	642,173	670,238	4.19	1,795	2,030	2,737	3,658	4,893
90		Gulu	Agago				0		77,758	77,758	0.00	135	145	190	222	277
91			Gulu Municipality	Gulu	250	75	325	40,236	0	40,236	100.00 *	696	973	1,194	1,478	1,846
92			Kilak				0		93,182	93,182	0.00	150	162	199	247	308
93			Nwoya				0		39,968	39,968	0.00	69	96	118	146	183
94			Omoro				0		104,516	104,516	0.00	159	172	211	262	327
			(TOTAL)		250	75	325	40,236	315,924	356,160	11.32	1,431	1,550	1,903	2,355	2,941
95		Kitgum	Agago				0		103,287	103,755	0.33	175	200	274	369	493
96			Aruu				0		85,035	85,035	0.00	142	162	223	300	400
97			Chua	Kitgum	55	35	90	13,935	96,215	109,850	12.41	432	494	677	912	1,216
98			Lamwo				0		74,626	74,626	0.00	132	151	207	279	372
			(TOTAL)		55	35	90	16,105	359,163	375,266	4.29	881	1,007	1,381	1,860	2,480
99		Koldo	Dodoth				0		95,838	95,838	0.00	213	241	325	433	573
100			Jie	(Kidio)	0	25	25	5,419	55,320	60,994	8.88	184	208	281	374	495
101			Labwor				0	4,774	49,980	54,980	8.68	103	117	157	210	277
			(TOTAL)		0	25	25	10,193	195,738	205,932	4.95	500	566	764	1,017	1,344
102		Lira	Dokolo	(Dokolo)			0		89,260	89,260	0.00	145	166	235	320	430
103			Erute	Aboke	2	20	22		172,203	172,203	0.00	199	229	326	436	585
104			Kioga				0		71,939	71,939	0.00	129	149	207	282	380
105			Lira Municipality	Lira	117	150	267	28,964	0	28,964	100.00 *	449	518	722	983	1,321
106			Moroto	(Aloi)			0		118,284	118,284	0.00	169	195	272	370	497
107			Otuke				0		45,557	45,557	0.00	97	112	156	212	285
			(TOTAL)		119	170	289	28,964	497,363	526,327	5.50	1,189	1,371	1,911	2,603	3,498
108		Moroto	Bokora				0		39,592	39,592	0.00	98	90	119	149	187
109			Kadam (Chekwii)				0	1,554	41,145	42,699	3.64	106	115	145	179	226
110			Matheniko	(Nakapiripirit)			0		51,094	51,094	0.00	104	113	141	176	221
111			Moroto Municipality	Moroto	98	45	143	11,049	0	11,049	100.00 *	250	272	338	423	532
112			Pian				0		26,902	26,902	0.00	68	74	92	115	145
113			Upe				0	1,035	10,875	11,910	8.69	53	58	72	90	113
			(TOTAL)		98	45	143	13,638	169,608	183,246	7.44	680	725	905	1,131	1,424
114		Moyo	East Moyo				0	2,215	99,822	101,137	2.19	160	190	252	332	435
115			Obongi				0		23,854	23,854	0.00	62	70	93	122	160
116			West Moyo	Moyo	51	30	81	7,017	52,718	59,735	11.75	248	279	370	487	639
			(TOTAL)		51	30	81	9,232	175,394	184,630	5.00	479	538	715	941	1,234
117		Nebbi	Jonam	(Pakwach)	0	25	25	5,429	67,866	73,295	7.41	205	232	314	417	552
118			Okoro				0	12,405	125,356	137,963	8.99	577	427	577	767	1,015
119			Padyere	(Nebbi)	0	25	25	7,322	114,328	121,650	6.02	256	292	395	525	694
			(TOTAL)		0	25	25	25,155	307,753	332,908	7.56	840	952	1,285	1,710	2,261

* : ESTIMATED DEMAND BY NETWORK & DEVELOPMENT SECTION OF UPTC AND STUDY TEAM

Table 4-2-18

Table 4-2-18 The Result of Demand Forecast up to 2009/2010 (4/4, Western Region)

NO.	Region	District	County	Exchange Name (Not – Working)	E.C.s	Waiters	E.C.s Waiters	Population Urban	Population Rural	Population Total	Urban Ratio (%)	1992 / 1993 Demand	1994 / 1995 Demand	1999 / 2000 Demand	2004 / 2005 Demand	2009 / 2010 Demand
120	Western	Bundibugyo	Bwamba		0	25	25	7,192	89,792	96,984	7.42	252	282	371	454	532
121			Nkoroko		0	25	25	2,490	22,995	25,485	9.77	106	119	156	204	266
			(TOTAL)		0	25	25	9,682	112,787	122,467	7.91	358	401	527	688	898
122		Bushenyi	Bushenyi				0	58,345	79,176	58,345	0.00	114	136	209	301	419
123			Bunyaruguru				0		79,176	79,176	0.00	157	156	252	361	504
124			Igara	Bushenyi	97	154	251	14,914	154,218	169,132	8.82	429	520	788	1,132	1,579
125			Ruhinda				0		141,047	141,047	0.00	184	223	338	485	677
126			Sheema	Kabwohe (PCO)	1	35	36		160,755	160,755	0.00	194	235	356	512	714
			(TOTAL)		98	189	287	14,914	508,453	523,341	2.45	1,058	1,269	1,943	2,791	3,893
127		Holma	Bugahya	Holma	169	21	190	4,850	124,921	129,771	3.74 *	746	908	966	1,214	1,510
128			Buhaguzi				0		78,096	78,096	0.00	135	146	178	219	273
			(TOTAL)		169	21	190	4,850	203,017	207,867	2.33	883	954	1,164	1,433	1,783
129		Kabale	Kabale Municipality	Kabale	659	87	746	30,727	0	30,727	100.00 *	2,010	2,129	2,475	2,923	3,504
130			Ndorwa				0		160,984	160,984	0.00	194	202	235	278	333
131			Rubanda				0		155,190	155,190	0.00	191	202	235	278	333
132			Rukiga				0		91,439	91,439	0.00	148	157	182	215	259
			(TOTAL)		659	87	746	30,727	407,613	438,340	7.01	2,543	2,693	3,133	3,698	4,433
133		Kabarole	Bunyangabu				0	1,459	133,290	134,749	1.08	185	211	289	396	513
134			Burnhya				0		145,541	145,541	0.00 *	186	212	289	396	516
135			Fort Portal Municipality	Fort Portal	446	109	555	34,449	0	34,449	100.00 *	975	1,112	1,515	2,083	2,705
136			Kibale				0	1,417	124,260	125,677	1.13	180	205	280	385	499
137			Kitagwenda	(Kyenjojo)	0	30	30		86,186	86,186	0.00	143	163	222	305	397
138			Kyaka				0		66,764	66,764	0.00	123	140	191	263	341
139			Mwenge	(Butiti)	0	12	12	1,499	189,742	191,241	0.78	211	241	328	440	585
			(TOTAL)		446	151	597	38,825	745,782	784,607	4.95	2,003	2,285	3,113	4,178	5,556
140		Kasese	Bukonjo		236	120	356	11,124	165,741	176,865	6.29	337	373	480	616	796
141			Busongora	Kasese	236	120	356					661	732	942	1,211	1,561
				Kilembe	19	25	44					95	106	136	175	225
				(Hilima)	0	15	15					70	78	100	129	166
				(LKatwe)	0	30	30					124	138	177	228	294
				(Sub – Total)	255	190	445	30,787	153,943	184,730	16.72	951	1,054	1,356	1,743	2,247
			(TOTAL)		255	190	445	41,911	319,684	360,595	11.81	1,288	1,427	1,835	2,361	3,043
142		Kibale	Bugahgazi	Kakumiro	11	30	41	0	49,009	49,009	0.00	102	123	186	267	372
143			Buyaga	Kagadi	0	25	25	2,530	137,336	139,866	1.81	196	237	358	515	715
144			Buyanja				0	0	42,635	42,635	0.00	83	113	170	244	339
			(TOTAL)		11	55	66	2,530	229,882	231,412	1.09	381	473	714	1,024	1,426
145		Kisoro	Bufumbira	Kisoro	68	40	108	7,864	188,268	196,132	4.01	279	347	548	802	1,134
			(TOTAL)		68	40	108	7,864	188,268	196,132	4.01	279	347	548	802	1,134
146		Masindi	Mujunje	Bulindi	9	5	14					65	73	96	128	166
				(Budongo)								33	37	49	64	84
				(Sub – Total)	9	5	14	0	46,284	46,284	0.00	98	110	145	191	250
147			Buliisa	Buliisa	5	25	30	0	50,124	50,124	0.00	153	116	153	201	263
148			Bunuli	Masindi	207	80	287	12,715	77,248	89,963	14.13	421	473	625	820	1,074
149			Kibanda	Kigumba	11	25	36	2,364	85,265	87,627	2.70	161	181	239	314	411
			(TOTAL)		232	135	367	15,079	258,919	273,918	5.50	783	879	1,162	1,526	1,998
150		Mbarara	Bukenga				0		83,152	83,152	0.00	140	156	205	267	347
151			Ibanda	Ibanda (PCO)	1	55	56	3,125	152,398	155,523	2.01	209	234	306	398	518
152			Isingiro				0		154,673	154,673	0.00	191	215	279	364	473
153			Kashari				0		126,264	126,264	0.00	176	197	257	335	436
154			Kazo				0		67,900	67,900	0.00	125	140	183	238	310
155			Mbarara Municipality	Mbarara	954	974	43,108		0	43,108	100.00 *	1,463	1,635	2,139	2,786	3,626
156			Nyabushozi	Rushere (PCO)	1	25	26	0	60,182	60,182	0.00	136	154	202	263	342
157			Rwampara	Kinoni (PCO)	1	18	19	0	126,410	126,410	0.00	175	196	256	333	434
			(TOTAL)		957	178	1,075	46,233	782,979	829,212	5.51	2,617	2,924	3,826	4,983	6,487
158		Ntungamo	Kajara	(Rwashamaire)			0		67,114	67,114	0.00	144	276	406	573	790
159			Rushenyi				0		78,070	78,070	0.00	135	258	380	537	740
160			Ruhaama	Ntungamo	17	12	29	2,743	135,937	138,680	1.98	197	377	555	783	1,080
			(TOTAL)		17	12	29	2,743	301,121	303,864	1.96	476	911	1,341	1,893	2,610
161		Rukungiri	Kinkizi				0	9,291	156,553	165,844	1.95	216	166	256	375	526
162			Rubabo				0	0	107,260	107,260	0.00	151	124	192	280	394
163			Rujumbura	Rukungiri	84	30	114	10,352	124,107	134,459	7.70 *	398	296	463	674	949
			(TOTAL)		84	30	114	13,642	396,921	410,563	3.32	765	587	912	1,329	1,871
			GRAND TOTAL		23,666	6,976	32,642	1,965,284	15,530,425	17,515,710		79,337	84,204	117,753	165,859	226,841

* : ESTIMATED DEMAND BY NETWORK & DEVELOPMENT SECTION OF UPTC AND STUDY TEAM

4.3 National Non-Telephone Services Demand

4.3.1 Telegraph Service Demand

The telegraph service is usually utilized until the diffusion of the telephone service reaches a certain degree. Actually, in a number of countries over the world, the telegraph service has been absorbed by the introduction of the suitable telephone service.

At present in Uganda, the telegraph service is used as a substitute for the telephone service, especially in rural areas. Customers can use this service through 15 UPTC offices in Uganda. The number of domestic and international messages increased until 1992. However, it suddenly decreased in 1993. This is because the telegraph demand in the urban area has been transferred to other media, such as telephone and facsimile. The demand for telegram messages will rapidly decrease in the urban area, while in rural areas, it will gradually decrease in line with the expansion of the telephone service areas in the forecasting years up to 2009/2010.

4.3.2 Telex Service Demand

The historical growth of telex services is described in Chapter 3. However, the accurate data on the number of waiting applicants is not available. According to UPTC, the number of waiting applicants is very small, because many large companies, i.e., major users of this service, tend to use other media, e.g., facsimile, for business communications. For the above reason and the following the world trend, the demand of telex will be rapidly decreased in the near future. It seems that the capacity of new telex exchange replaced at the end of 1993, will be able to cover the telex demand during the forecasting years up to 2009/2010.

4.3.3 Data Communication Service Demand

There are a variety of networks over which data communications can be implemented:

- Leased circuits
- PSTN (Public Switched Telephone Network)
- CSPDN (Circuit Switched Public Data Network)
- PSPDN (Packet Switched Public Data Network)
- ISDN (Integrated Services Digital Network)

At present, data communications in Uganda are provided only by leased circuits. For data communications services, the demand for leased circuits and data communication services (including packet data and ISDN services) were estimated in this study.

(1) Leased Circuits

The past operating data on leased circuits in Uganda are not well pigeonholed and unavailable as the statistical data for demand forecast. Hence, for estimate of the future demand, the following regression model presents a correlation between main line and leased circuits densities in 64 countries:

$$Ln(LCt/POPt \times 100) = -6.087 + 1.313 \times (MLt/POPt \times 100)$$

(R squared = 0.80)

where,

Ln	:	natural logarithmic operator
LCt	:	the number of leased circuits in period t
POPt	:	population in period t
MLt	:	the number of main lines in period t

The result of the demand forecast for leased circuits service up to 2009/2010 is shown in Table 4-3-1.

Table 4-3-1 Leased Circuits Demand

Year	1992/1993	1999/2000	2004/2005	2009/2010
No. of Leased CCT.	28	99	190	326

The data used for the regression analysis of the leased circuits demand estimation is shown in Table 4-3-2.

Table 4-3-2 Leased Circuits Service of Various Countries

No.	Countries	Population	TELEPHONE LINES	TELEPHONE LINES /100 POP.	LN (TELEPHONE LINES /100 POP.)	LEASED CIRCUITS	LEASED CIRCUITS /100 POP.	LN (LEASED CIRCUITS /100 POP.)
1	Austria	7,857,000	3,344,179	42.56	3.75098655429	23,188	0.29513	−1.22035504
2	Belgium	10,021,000	4,264,342	42.55	3.75077518494	118,365	1.18117	0.166505087
3	Denmark	5,167,000	3,002,000	58.10	4.06215866989	165,545	3.20389	1.164365719
4	France	57,289,000	30,100,000	52.54	3.96158672453	55,000	0.09600	−2.34336054
5	Germany	80,293,000	35,400,000	44.09	3.78619956208	144,000	0.17934	−1.71845424
6	Ireland	3,519,000	1,175,000	33.39	3.50826147524	11,200	0.31827	−1.14484817
7	Italy	57,103,000	23,071,000	40.40	3.69888994889	300,000	0.52537	−0.64365927
8	Luxembourg	387,000	196,000	50.65	3.92486015219	12,700	3.28165	1.188347486
9	Norway	4,283,000	2,214,065	51.69	3.94534667984	43,023	1.00451	0.004496065
10	Hungary	10,303,000	1,291,133	12.53	2.5282551985	2,127	0.02064	−3.88030767
11	Poland	38,429,000	393,800	1.02	0.02444569031	1,173	0.00305	−5.79183291
12	Romania	23,332,000	2,308,747	9.90	2.29204933022	10,576	0.04533	−3.09382362
13	Egypt	55,979,000	2,015,000	3.60	1.28081276098	753	0.00135	−6.61125176
14	Israel	5,239,000	1,804,000	34.43	3.5390459672	12,480	0.23821	−1.43458837
15	Kuwait	1,190,000	597,648	50.22	3.91646355176	1,600	0.13445	−2.00653477
16	Oman	1,640,000	184,189	11.23	2.41868106951	1,125	0.06860	−2.6794983
17	Qutar	520,000	105,010	20.19	3.00539695813	250	0.04808	−3.03495299
18	Saudi	15,267,000	1,665,987	10.91	2.38989429031	11,135	0.07294	−2.61818543
19	Arab King.	1,969,000	491,549	24.71	3.20734453656	631	0.03172	−3.45066651
20	Brunei	268,000	48,107	17.95	2.88761090215	327	0.12201	−2.1036119
21	Fuji	748,000	49,610	6.63	1.89195963433	412	0.05508	−2.89896472
22	Fran. Poli	210,000	41,231	19.63	2.97725305588	436	0.20762	−1.57205038
23	Hongkong	5,799,000	2,613,565	45.07	3.80819988682	54,171	0.93414	−0.06812487
24	India	889,700,000	6,650,000	0.75	−0.2910972866	40,000	0.00450	−5.40458997
25	Indonesia	184,796,000	1,276,593	0.69	−0.3698875175	2,266	0.00123	−6.70382144
26	Japan	124,310,000	57,300,000	46.09	3.83069236391	997,000	0.80203	−0.22061277
27	Macau	367,000	120,777	32.91	3.49375420796	2,082	0.56730	−0.56686269
28	Malaysia	18,630,000	2,091,578	11.23	2.41831580639	21,385	0.11479	−2.16466854
29	Myanmar	43,466,000	74,779	0.17	−1.7600270194	77	0.00018	−8.63851397
30	Nauru	8,000	1,180	14.75	2.69124308279	4	0.05000	−2.99573227
31	Nepal	19,795,000	65,298	0.33	−1.1090530656	20	0.00010	−9.20003748
32	Papua Newg	3,834,000	33,875	0.88	−0.1238164584	726	0.01894	−3.966699
33	Singapore	2,792,000	1,101,079	39.44	3.67470260921	9,649	0.34559	−1.06248899
34	Solomon	339,000	4,850	1.43	0.35814878356	6	0.00177	−6.33682573
35	South Korea	43,663,000	15,593,454	35.71	3.57552033525	316,786	0.72553	−0.32085969
36	Sri Lanka	17,464,000	125,834	0.72	−0.3277631342	43	0.00025	−8.30928188
37	Taiwan	20,727,000	10,058,636	48.53	3.88216455681	37,366	0.18028	−1.71326109
38	Thailand	56,801,000	1,790,000	3.15	1.14783187463	17,732	0.03122	−3.46676811
39	Tuvalu	9,500	120	1.26	0.23361485118	1	0.01053	−4.55387689
40	Aruba	66,000	28,000	42.42	3.74771995414	21	0.03182	−3.4477174
41	Bahamas	264,000	73,710	27.92	3.32935955804	300	0.11364	−2.17475172
42	Barbados	259,000	80,095	30.92	3.43155555444	1,033	0.39884	−0.91919069
43	Belize	196,000	21,276	10.86	2.38463520364	37	0.01888	−3.96976184
44	Bolivia	7,739,000	185,138	2.39	0.87224391966	211	0.00273	−5.90475472
45	Brazil	151,381,000	10,780,512	7.12	1.96311040795	6,793	0.00449	−5.40649226
46	Cayman Is.	28,080	14,934	53.18	3.97375309944	51	0.18162	−1.70581704
47	Colombia	33,392,000	2,828,571	8.47	2.13662547278	23,153	0.06934	−2.66877708
48	Costarica	3,161,000	366,580	11.60	2.45074325232	9,756	0.30864	−1.17559105
49	Dominica	7,471,000	629,610	8.43	2.13148662809	2,936	0.03930	−3.23656584
50	Mexico	84,439,000	6,751,000	8.00	2.07883144787	8,792	0.01041	−4.56477226
51	Venezvela	20,184,000	2,304,161	11.42	2.43499659351	16,201	0.08027	−2.52240234
52	Algeria	26,401,000	883,100	3.34	1.20745146326	512	0.00194	−6.24541764
53	Burundi	5,657,000	10,263	0.18	−1.7069336147	3	0.00005	−9.8446218
54	Djibouti	557,000	6,635	1.19	0.17496361384	3	0.00054	−7.52653804
55	Ethiopia	53,845,000	127,041	0.24	−1.4441847728	49	0.00009	−9.30462962
56	Kenya	26,985,000	200,000	0.74	−0.2995488825	1,805	0.00669	−5.00730566
57	Malawi	9,484,000	30,529	0.32	−1.1335142097	61	0.00064	−7.34907268
58	Morocco	26,239,000	653,937	2.49	0.91317906995	961	0.00366	−5.60961282
59	Senegal	7,691,000	48,464	0.63	−0.4618146528	90	0.00117	−6.75058152
60	Swaziland	826,000	15,418	1.87	0.6241110705	224	0.02712	−3.60753381
61	Tanzania	25,809,000	73,011	0.28	−1.2626982465	728	0.00282	−5.87076259
62	Tunisia	8,413,000	337,062	4.01	1.38790366813	739	0.00878	−4.73482058
63	Uganda	17,194,000	25,954	0.15	−1.8908196384	415	0.00241	−6.02662234
64	Zimbabwe	9,871,000	127,072	1.29	0.25256759652	595	0.00603	−5.11138013

SOURCE :
WORLD TELECOM DATABOOK 1993/1994 (TELECOM INFORMATION LIMITED)
LN : NATURAL LOGARITHMIC OPERATION

(2) Data Communication Circuits (Data Terminals)

Usually, data communication services tend to be utilized by large companies and parastatals (Banks, Airline Companies, Foreign Companies etc.) in their initial installation stage. In consideration of this trend in a number of countries, the study team conducted the field survey with questionnaires and interviews in the following business categories.

Table 4-3-3 Category of Institutions / Organizations

Category	No. of Samples
A Bank and Financial Institutions	5 Samples
B Public Service	4 Samples
C Industries	1 Samples
D Transports	3 Samples
E Hotels	0 Samples
F Embassies	5 Samples
G N.G.O.s	1 Samples
Total	19 Samples

From the collected nineteen (19) questionnaires for new services in Uganda, it has been known that every entity has stand-alone personal computers, and several entities have some work stations connected to a host computer. Especially, all banks have evident needs of data communication services.
From the results of the field survey, the study team forecasted the number of the data terminals to be connected with the public data circuits in the future. Preconditions for the forecast were as described below:

a) One data terminal is necessary for each 10 work stations connected to a host computer in principle (e.g., in case of 11 stations, 2 data terminals).

b) One data terminal is necessary for each 20 stand-alone personal computers in principle (e.g., in case of 21 computers, 2 data terminals).

c) The sum of the above a) and b) is adjusted, based on the number of DEL in each entity.

d) For each hotel, an average number of 3 data terminals is assumed.

e) For each airline office, it is assumed that every work station requires one data terminal. As for stand-alone personal computers, b) above is applied.

It can be said that the estimated number of data terminals shows the necessary number of circuits for data communication.

The results of the field survey for new communications and an average of estimated data terminal demand per user in each category is shown in Table 4-3-4.

Table 4-3-4 Results of Field Survey for New Services

	Name of Companies / Parastatals	Business Categories	No. of Staffs	No. of Branchs	DEL's	Exts.	PABX	Telex	Fax	Host Computer	Work Station	Personal Computer	Plan for Data Comm.	Interest for Paging	Interest for Mobile	Data Terminal Estimated	Data Terminal Average
1	Standard Charterd Bank	A	120	1	9	40	1	2	3	2	19	* 20	W/ I 5 Years			4	
2	Uganda Commercial Bank	A	400	70	46	500	1	4	4	2	140	35	W/ I 5 Years	X	X	16	
3	Stanbic Bank	A	150	1	30	40	1	3	1	1	15	28	W/ I 5 Years	X	X	4	7 / User
4	East African Dev. Bank	A	74	1	17	70	1	1	1	1	9	* 15	W/ I 1 Year	X		3	
5	Barclays Bank of Uganda	A	317	5	64	110	8	4	2	2	* 20	* 30	W/ I 5 Years	X		8	
6	National Water and Sewerege Corp.	B	1300	9	15	20	1	0	0	0	0	5	W/ I 5 Years			1	
7	Uganda Electricity Board	B	3367	33	64	136	25	5	4	2	65	50	W/ I 1 Year	X (80)	X	10	
8	Uganda Hotels Limited	B	700	15	16	NA	8	0	1	0	0	2	W/ I 5 Years			1	3.5 / User
9	B.A.T. Uganda	B	733	8	19	49	3	3	3	0	0	27	W/ I 1 Year	X	X	2	
10	Esso Standard	C	43	2	5	50	1	1	2	1	0	9	W/ I 5 Years			1	2 / User
11	British Airways	D	12	2	11	8	0	0	1	1	5	* 11	W/ I 5 Years			7	
12	Ethiopian Airlines	D	NA	1	9	6	3	3	0	0	0	4	No Plan			1	5 / User
13	Uganda Airlines	D	500	3	25	97	16	4	2	* 1	* 5	23	W/ I 1 Year	X	X	7	
14	Embassy of Italy	F	20	0	6	0	1	1	1	0	0	9	W/ I 5 Years	X	X	1	
15	High Commission of INDIA	F	14	0	14	2	0	1	1	0	0	1	W/ I 5 Years	X		1	
16	Embassy of Germany	F	NA	NA	5	22	1	1	1	0	0	3	No Plan	X		1	1 / User
17	Embassy of American	F	NA	NA	12	21	1	0	1	NA	NA	NA	W/ I 1 Year			1	
18	Embassy of Russian	F	25	1	4	0	0	2	0	NA	NA	NA	No Plan			1	
19	UNICEF	G	160	2	12	100	2	1	2	2	43	0	Within 5	X	X	3	3 / User
	TOTAL				383	1273	74	36	30	14	296	196				52	

According to the list of parastatal bodies and large companies and embassies, there are 135 large users who are served by a considerable number of telephone lines of UPTC. The study team categorized these entities in user categories and calculated the number of necessary data terminals at present as shown in Table 4-3-5.

Table 4-3-5 Estimated Number of Data Terminal

Category	Number of entities	Average of Terminal	Number of Data Terminals
A : Bank and financial	15	7/users	105
B : Public Services	42	3.5/users	147
C : Industries	27	2/users	54
D : Transports	6	5/users	30
E : Hotel	5	3/users	15
F : Embassies	26	1/users	24
G : N.G.O.s	14	3/users	42
Total at 1992/1993	135		147

The above table shows that the demand for data communications circuits (data terminals) is roughly 147 in Uganda at present. The average number of data terminals per entity is six (6).

For the demand forecast of data communication circuits in the future, the following regression model was applied to estimate the number of data users:

$$Ln(DUt/POPt \times 1000) = -4.2347 + 1.2748 \times (MLt/POPt \times 100) + 115 \times ID$$

(R squared = 0.82)

where,

Ln	:	natural logarithmic operator
DUt	:	the number of data users in period t
POPt	:	population in period t
MLt	:	the number of main lines in period t
ID	:	1 for Uganda
		0 for other countries

The data used for the regression analysis of data users estimation are shown in Table 4-3-6.

Table 4-3-6 Data Communication Users of Various Countries

No.	Countries	Population	TELEPHONE LINES	TELEPHONE LINES /100 POP.	LN (TELEPHONE LINES /100 POP.)	DATA USERS	DATA USERS /1000 POP.	LN (DATA USERS 1000 POP.)
1	Belgium	10,021,000	4,264,342	42.55	3.75077518494	15,386	1.535	0.428775114
2	Denmark	5,167,000	3,002,000	58.10	4.06215666989	22,435	4.342	1.4683299901
3	Germany	80,293,000	35,400,000	44.09	3.78619956208	106,700	1.329	0.2843387143
4	Greece	10,288,000	4,723,114	45.91	3.82666034632	7,395	0.719	−0.330174071
5	Italy	57,103,000	23,071,000	40.40	3.69888994889	325,000	5.691	1.7389685276
6	Norway	4,283,000	2,214,065	51.69	3.94534667984	10,969	2.561	0.9404194138
7	Hungary	10,303,000	1,291,133	12.53	2.5282551985	3,610	0.350	−1.048727343
8	Romania	23,332,000	2,308,747	9.90	2.29204933022	2,090	0.090	−2.412661743
9	Egypt	55,979,000	2,015,000	3.60	1.28081276098	700	0.013	−4.381651564
10	Saudi	15,267,000	1,665,987	10.91	2.38989429031	9,809	0.642	−0.442393305
11	Australia	17,562,000	8,540,000	48.63	3.88419371685	94,341	5.372	1.6811784008
12	Hongkong	5,799,000	2,613,565	45.07	3.80819988682	45,756	7.890	2.0656374418
13	Japan	124,310,000	57,300,000	46.09	3.83069236391	383,000	3.081	1.1252565434
14	Malaysia *	18,630,000	2,091,578	11.23	2.41831580639	1,918	0.103	−2.273490208
15	Phillipines	63,609,000	853,887	1.34	0.29445880377	347	0.005	−5.211185469
16	Sri Lanka	17,464,000	125,834	0.72	−0.3277631342	75	0.004	−5.450408785
17	Thailand	56,801,000	1,790,000	3.15	1.14783187463	1,841	0.032	−3.429245029
18	Brazil	151,381,000	10,780,512	7.12	1.96311040795	42,681	0.282	−1.266045981
19	Colombia	33,392,000	2,828,571	8.47	2.13662547278	2,320	0.069	−2.666749165
20	Costarica	3,161,000	366,580	11.60	2.45074325232	819	0.259	−1.350559628
21	Dominica	7,471,000	629,610	8.43	2.13148662809	4,334	0.580	−0.544537956
22	Mexico	84,439,000	6,751,000	8.00	2.07883144787	3,800	0.045	−3.101028313
23	Peru *	22,454,000	594,213	2.65	0.97318397591	442	0.020	−3.927914169
24	Venezvela	20,184,000	2,304,161	11.42	2.43499659351	5,598	0.277	−1.28248082
25	Ethiopia	53,845,000	127,041	0.24	−1.4441847728	79	0.001	−6.524416975
26	Kenya	26,985,000	200,000	0.74	−0.2995488825	481	0.018	−4.027169165
27	Malawi	9,484,000	30,529	0.32	−1.1335142097	128	0.013	−4.305331183
28	Morocco	26,239,000	653,937	2.49	0.91317906995	270	0.010	−4.576580174
29	Senegal	7,691,000	48,464	0.63	−0.4618146528	235	0.031	−3.488220579
30	S. Africa	32,063,000	3,524,000	10.99	2.39706417671	42,300	1.319	0.2770843687
31	Tunisia	8,413,000	337,062	4.01	1.38790366813	527	0.063	−2.770332859
32	Uganda	17,194,000	25,954	0.15	−1.8908198384	74	0.004	−5.448250672
33	Zimbabwe	9,871,000	127,072	1.29	0.25256759652	932	0.094	−2.36002363

SOURCE :
WORLD TELECOM DATABOOK 1993/1994 (TELECOM INFORMATION LIMITED)
LN : NATURAL LOGARITHMIC OPERATOR

The result of demand forecast up to 2009/2010 is shown in Table 4-3-7.

Table 4-3-7 The Number of Forecasted Data Users

Year	1992/1993	1999/2000	2004/2005	2009/2010
No. of Data Users	135	182	241	324

Table 4-3-8 shows the data communication circuits demand up to 2009/2010 in both modest and optimistic cases.

Table 4-3-8 The Estimated Data Circuits

Year	1992/1993	1999/2000	2004/2005	2009/2010
Modest case				
Data communication cct.	405	546	723	972
Data terminal / entity	3	3	3	3
Optimistic case				
Data communication cct.	405	910	1,446	2,268
Data terminal / entity	3	5	6	7

4.3.4 Mobile Communication Service Demand

(1) Mobile Telephone Service (Car-Phone, Handy-Phone)

Mobile telephone service demand is estimated by the regression model drawn up, based on the number of main telephone lines and mobile telephone line densities in 62 countries. The regression model obtained is as follows:

$$Ln(MTt/POPt \times 1000) = -1.6446 + 1.1792 \times (MLt/POPt \times 100)$$

(R squared = 0.81)

where,

Ln	:	natural logarithmic operator
MTt	:	the number of mobile telephones in period t
POPt	:	population in period t
MLt	:	the number of main lines in period t

The data used for the regression analysis for the mobile telephone demand estimate are shown in Table 4-3-9.

Table 4-3-9 Mobile telephone Service of Various Countries

No.	Country	Population	TELEPHONE LINES	TELEPHONE LINES /100POP.	LN (TELEPHONE LINES / 100 POP.)	MOBILE TELEPHONE	MOBILE TELEPHONE /1000 POP.	LN (MOBILE TELEPHONE /1000 POP.)
1	Austria	7,857,000	3,344,179	42.56	3.750986554292	197,014	25.07	3.221869938
2	Belgium	10,021,000	4,264,342	42.55	3.750775184938	62,995	6.29	1.838372467
3	Cyprus	580,000	290,852	50.15	3.914956629178	11,920	20.55	3.022944837
4	Denmark	5,167,000	3,002,000	58.10	4.062156669894	241,758	46.79	3.845644977
5	Finland	5,033,000	2,742,046	54.48	3.997858315269	411,957	81.85	4.404902747
6	France	57,289,000	30,100,000	52.54	3.961586724528	475,000	8.29	2.115206171
7	Germany	80,293,000	35,400,000	44.09	3.786199562076	1,246,512	15.52	2.742422086
8	Iceland	261,000	135,558	51.94	3.950049371681	16,454	63.04	4.14380348
9	Ireland	3,519,000	1,175,000	33.39	3.508261475245	47,471	13.49	2.60194214
10	Italy	57,103,000	23,071,000	40.40	3.698889948885	408,500	7.15	1.96763526
11	Luxembourg	387,000	196,000	50.65	3.924860152189	873	2.26	0.813510863
12	Norway	4,283,000	2,214,065	51.69	3.945346679837	320,702	74.88	4.315858644
13	Spain	39,085,000	13,792,200	35.29	3.563534639292	2,222,400	56.86	4.04060421
14	U. K	57,561,000	26,084,000	45.32	3.813647030475	1,268,000	22.03	3.09235088
15	Hungary	10,303,000	1,291,133	12.53	2.528255198497	26,000	2.52	0.925661423
16	Poland	38,429,000	393,800	1.02	0.02444569031	6,000	0.16	−1.85705291
17	Baharain	531,000	113,100	21.30	3.058680547868	12,000	22.60	3.117899908
18	Israel	5,239,000	1,804,000	34.43	3.539045967202	37,000	7.06	1.954787272
19	Jordan	3,636,000	272,273	7.49	2.013335970111	1,451	0.40	−0.9186312
20	Kuwait	1,190,000	597,648	50.22	3.916463551761	55,000	46.22	3.833379878
21	Oman	1,640,000	184,189	11.23	2.41868106951	4,706	2.87	1.054142048
22	Qutar	520,000	105,010	20.19	3.005396958131	4,204	8.08	2.08996292
23	Saudi	15,267,000	1,665,987	10.91	2.389894290306	15,828	1.04	0.036086887
24	Turkey	58,584,000	9,471,881	16.17	2.783036078947	61,395	1.05	0.046866777
25	Arub King.	1,989,000	491,549	24.71	3.207344536564	48,919	24.59	3.202533869
26	Australia	17,562,000	8,540,000	48.63	3.884193716851	67,300	3.83	1.34342276
27	Brunei	268,000	48,107	17.95	2.887610902146	4,103	15.31	2.728486712
28	China	1,165,888,000	14,990,000	1.29	0.251315190694	350,000	0.30	−1.20330515
29	Fuji	748,000	49,610	6.63	1.891959634327	1,000	1.34	0.290352301
30	Hongkong	5,799,000	2,613,565	45.07	3.808199886818	255,000	43.97	3.783578056
31	Indonesia	184,796,000	1,276,593	0.69	−0.36988751745	43,000	0.23	−1.4580524
32	Japan	124,310,000	57,300,000	46.09	3.830692363905	1,766,600	14.21	2.654033629
33	Laos	4,409,000	7,559	0.17	−1.76349409306	100	0.02	−3.786233
34	Macau	367,000	120,777	32.91	3.493754207955	13,000	35.42	3.567342788
35	Malaysia	18,630,000	2,091,578	11.23	2.418315806388	83,118	4.46	1.4954881
36	Myanmar	43,466,000	74,779	0.17	−1.76002701938	1,000	0.02	−3.77197902
37	Nwe Z	3,481,000	1,534,000	44.07	3.785729280104	100,200	28.78	3.35984858
38	Pakistan	130,129,000	1,116,113	0.86	−0.15350396683	20,000	0.15	−1.87279399
39	Papua Newg	3,834,000	33,875	0.88	−0.12381645842	1,018	0.27	−1.32606873
40	Phillipines	63,609,000	853,887	1.34	0.29445880377	73,000	1.15	0.137704471
41	Singapore	2,792,000	1,101,079	39.44	3.674702609206	135,000	48.35	3.878516594
42	South Korea	43,663,000	15,593,454	35.71	3.575520335254	346,000	7.92	2.069937714
43	Sri Lanka	17,464,000	125,834	0.72	−0.32776313422	6,000	0.34	−1.06838215
44	Taiwan	20,727,000	10,058,636	48.53	3.882164556811	450,000	21.71	3.077810385
45	Argentina	33,070,000	3,698,000	11.18	2.414335791959	70,000	2.12	0.749868715
46	Aruba	66,000	28,000	42.42	3.747719954137	1,000	15.15	2.718100537
47	Bahamas	264,000	73,710	27.92	3.329359558043	1,810	6.86	1.925133021
48	Barbados	259,000	80,095	30.92	3.431555554442	922	3.56	1.269717162
49	Bermuda	59,588	38,466	64.55	4.167490708704	2,300	38.60	3.65321019
50	Brazil	151,381,000	10,780,512	7.12	1.963110407951	67,500	0.45	−0.80767224
51	Canada	277,337,000	16,300,000	5.88	1.771101920581	1,165,500	4.20	1.435672085
52	Cayman Is.	28,080	14,934	53.18	3.973753099444	756	26.92	3.292983797
53	Chile	13,599,000	1,359,000	9.99	2.30192306053	67,000	4.93	1.594696359
54	Costarica	3,161,000	366,580	11.60	2.450743252316	3,400	1.08	0.072886998
55	Dominica	7,471,000	629,610	8.43	2.13148662809	7,190	0.96	−0.03833769
56	Mexico	84,439,000	6,751,000	8.00	2.078831447856	370,000	4.38	1.477473625
57	Peru	22,454,000	594,213	2.65	0.973183975914	19,500	0.87	−0.14105431
58	Venezvela	20,184,000	2,304,161	11.42	2.434996593514	130,000	6.44	1.862644239
59	Morocco	26,239,000	653,937	2.49	0.913179069954	5,000	0.19	−1.65780894
60	Nigeria	89,666,000	257,691	0.29	−1.24691555624	6,000	0.07	−2.70433219
61	S. Africa	32,063,000	3,524,000	10.99	2.397064176711	13,500	0.42	−0.86501303
62	Tunisia	8,413,000	337,062	4.01	1.387903668129	3,000	0.36	−1.03116584

SOURCE :
WORLD TELECOM DATABOOK 1993/1994 (TELECOM INFORMATION SERVICES LIMITED)
LN : NATURAL LOGARITHMIC OPERATOR

The result of the demand forecast for mobile telephone service up to 2009/2010 is shown in Table 4-3-10.

Table 4-3-10 Mobile Telephone Demand

Year	1992/1993	1999/2000	2004/2005	2009/2010
Mobile Tel. Lines	318	999	1,810	2,958

(2) Radio-Paging Service Demand

The radio-paging service is now becoming popular in many countries. The demand for radio-paging service is strongly linked to the diffusion of PCOs (Public Call Offices). That is, the radio-paging demand growth will be pessimistic until the PCOs diffusion reaches such a level as to permit the called person to call back to the caller as an response to calling signals. The radio-paging service will be provided in major cities for business users.

According to collected nineteen (19) questionnaires for new services in Uganda, ten (10) companies have interest in use of the radio-paging services in 1993. Especially, Uganda Electricity Board, which has 3,367 employees in headquarters and 33 branches, want to use eighty (80) paging-terminals at present. Another nine (9) companies or parastatals replied to our questionnaires that their executive persons want to use the radio-paging service. The average number of radio-paging terminals to be used in these entities is three (3).

Total demand was 107 radio-paging terminals in the above mentioned 19 entities. The average number of necessary radio-paging terminals per entity was about six (6) terminals in case of large users served by the telephone service. It can be said that the demand for radio-paging terminals is roughly **756 radio-paging terminals** in Uganda at present.

For the demand forecast for radio-paging in the future, the following regression model is applied:

$$Ln(PGSt/POPt \times 1000) = -2.5506 + 1.2661 \times (MLt/POPt \times 100) + 648 \times ID$$

(R squared = 0.86)

where,

Ln	:	natural logarithmic operator
PGTt	:	the number of radio-paging subscribers in period t
POPt	:	population in period t
MLt	:	the number of main lines in period t
ID	:	1 for Uganda 0 for other countries

The data used for the regression analysis of the radio-paging demand estimation are shown in Table 4-3-11.

The result of the demand forecast for radio-paging service up to 2010 is shown in Table 4-3-12.

Table 4-3-12 Radio-Paging Demand

Year	1992/1993	1999/2000	2004/2005	2009/2010
No. of Paging Sub.	756	1,012	1,330	1,797

Table 4-3-11 Paging Service of Various Countries

No.	Country	Population	TELEPHONE LINES	TELEPHONE LINES /100 POP.	LN (TELEPHONE LINES /100 POP.)	PAGING TERMINAL	PAGING TERMINAL / 1000 POP.	LN (PAGING TERMINAL / 1000 POP.)
1	Austria	7,857,000	3,344,179	42.56	3.75098655429	89,328	11.37	2.43091013
2	Belgium	10,021,000	4,264,342	42.55	3.75077518494	178,472	17.81	2.87974884
3	Cyprus	580,000	290,852	50.15	3.91495662918	3,980	6.86	1.92600899
4	Denmark	5,167,000	3,002,000	58.10	4.06215666989	55,000	10.64	2.36504094
5	Finland	5,033,000	2,742,046	54.48	3.99785831527	43,644	8.67	2.16004959
6	France	57,289,000	30,100,000	52.54	3.96158672453	294,000	5.13	1.63547113
7	Germany	80,293,000	35,400,000	44.09	3.78619956208	234,600	2.92	1.07219949
8	Iceland	261,000	135,556	51.94	3.95004937168	4,020	15.40	2.73451677
9	Ireland	3,519,000	1,175,000	33.39	3.50826147524	10,908	3.10	1.13131961
10	Italy	57,103,000	23,071,000	40.40	3.69888994889	184,300	3.23	1.17170821
11	Luxembourg	387,000	196,000	50.65	3.92486015219	5,793	14.97	2.70598088
12	Norway	4,283,000	2,214,065	51.69	3.94534667984	109,428	25.55	3.2406131
13	Spain	39,085,000	13,792,200	35.29	3.56353463929	88,500	2.26	0.81726379
14	U. K.	57,561,000	26,084,000	45.32	3.81364703047	720,000	12.51	2.52640596
15	Poland	38,429,000	393,800	1.02	0.02444569031	3,500	0.09	−2.3960494
16	Egypt	55,979,000	2,015,000	3.60	1.28081276098	4,050	0.07	−2.6262597
17	Israel	5,239,000	1,804,000	34.43	3.5390459672	53,000	10.12	2.31416127
18	Oman	1,640,000	184,189	11.23	2.41868106951	11,333	6.91	1.93302258
19	Saudi	15,267,000	1,665,987	10.91	2.38989429031	66,763	4.37	1.4754554
20	Turkey	58,584,000	9,471,881	16.17	2.78303607895	73,868	1.26	0.23181809
21	Japan	124,310,000	57,300,000	46.09	3.83069236391	4,222,000	33.96	3.52528578
22	Laos	4,409,000	7,559	0.17	−1.7634940931	90	0.02	−3.8915935
23	Malaysia	18,630,000	2,091,578	11.23	2.41831580639	10,000	0.54	−0.6221881
24	Nwe Z	3,481,000	1,534,000	44.07	3.7857292801	38,000	10.92	2.39026655
25	Pakistan	130,129,000	1,116,113	0.86	−0.1535039668	8,500	0.07	−2.7284601
26	South Korea	43,663,000	15,593,454	35.71	3.57552033525	850,516	19.48	2.96934216
27	Sri Lanka	17,464,000	125,834	0.72	−0.3277631342	1,962	0.11	−2.1861773
28	Aruba	66,000	28,000	42.42	3.74771995414	900	13.64	2.61274002
29	Bahamas	264,000	73,710	27.92	3.32935955804	2,236	8.47	2.13649473
30	Bermuda	59,588	38,466	64.55	4.1674907087	2,000	33.56	3.51344825
31	Bolivia	7,739,000	185,138	2.39	0.87224391966	3,200	0.41	−0.8831217
32	Dominica	7,471,000	629,610	8.43	2.13148662809	5,819	0.78	−0.2499004
33	Swaziland	826,000	15,418	1.87	0.6241110705	58	0.07	−2.6561518
34	Zimbabwe	9,871,000	127,072	1.29	0.25256759652	403	0.04	−3.1984199

SOURCE :
WORLD TELECOM DATABOOK 1993/1994 (TELECOM INFORMATION LIMITED)
LN : NATURAL LOGARITHMIC OPERATOR

CHAPTER 5

DEVELOPMENT STRATEGIES

CHAPTER 5 DEVELOPMENT STRATEGIES

5.1 Review of Previous Master Plan by ITU

To recover and rehabilitate the telecommunication facilities damaged by civil wars in 1979, UPTC prepared the master plan titled "Telecommunication Development Plan (1985 -2000)" with the assistance of ITU in 1985.

This master plan covered the period between year 1985 and year 2000, and presented a project plan with future telephone demand forecast. In this plan, a high growth rate was assumed for the first years of development to compensate for the deterioration of the network during the last ten years and the annual growth rate of 10% was assumed up to year 2000 for all the area switching centers, except for Kampala area switching center. In Kampala, significant investments have already been made and a lower rate of 8% was used.

Table 5-1-1 Forecast of Telephone Demand

Year	1985	1990	1995	2000
Telephone Sets	29,222	69,060	111,223	177,956
Telephone Sets/ 100 inhabitants	0.20	0.40	0.56	0.78

Then, another civil war occurred in year 1985 and the nation was destroyed again. The economic growth was stopped and the facilities were damaged. In consequence, the demand forecast by the master plan study became quite unrealistic.

Main objectives of the network structure were

- a national automatic network for direct dialling, including both trunk and local networks, and
- evolution of Integrate Digital Network.

As the strategy towards this end, the rehabilitation of the existing network and the introduction of digital transmission and switching systems starting with the top of the network hierarchy (area switching centers) were recommended.

5.2 Problems in Telecommunications

5.2.1 Planning and Construction

(1) Low Telephone Density

In 1993, the telephone main line density is only 0.2 per 100 inhabitants, lower than the average (0.5) of Sub-Saharan countries. Such low density is due to serious damage to telecommunications facilities caused by the civil wars and the delay of rehabilitation work. With such poor services, it is difficult to maintain normal economic activities and promote the national development.

(2) Insufficient Supply to Meet Demand

The waiting list for telephone connection reaches about 9,000 in 1993, while the number of existing subscribers is about 24,000 in total. Based on the forecast in this study, the total telephone demand is estimated to be about 73,000 subscribers in 1993. The current supply is not sufficient to meet such demand.

(3) Unbalanced Facility Provision

Capacities of telecommunication's facilities are not well balanced in each exchange area. For example, in Kampala, the large capacity (43,000 LU) of switching system had not been fully utilized (connected lines: 15,000) in the past 5 years due to an old and small capacity local cable network though it has been rehabilitated and expanded now. On the other hand, in Entebbe, the existing switching system (1,200 LU) is too small in capacity and cannot be expanded even though the local cable network has been expanded up to 4,800 pairs.

5.2.2 Operation and Maintenance

(1) Poor Service Grade

The existing telecommunication facilities were installed 10 to 20 years ago, and are old-fashioned and aged. It is difficult to maintain satisfactory service grade with them. For example, the call completion rate is 30-40% which is by far the lower than the target value (60%). This situation invites the loss of revenue, worsening the financial conditions of UPTC.

(2) Poor Maintenance

About 30% of the existing subscriber lines are damaged and not repaired yet. In daily maintenance, only 25% of troubles can be remedied within 24 hours while its target is 60%. These problems are mainly caused by the shortage of materials and transportation means for maintenance crews.

5.2.3 Management and Organization

(1) Critical Financial Status

On the financial status of UPTC, the foreign exchange losses are a most disturbing factor to the profit and loss account. Due to this, it is difficult for UPTC management to keep reasonable financial conditions.

In addition to that, key factors of financial status were also decreasing during the past 3 years as follows:

	1990/91	1991/92	1992/93
- Profit/Revenue (before forex loss)	58%	44%	19%
- Revenue/Net Assets	71%	57%	55%
- Profit/Net Assets	41%	25%	9%

The major reason of the above decrease is a large amount of bad debts due to uncollected bills. This problem is attributable to the ineffective billing system and insufficient follow-up actions for cash collection.

(2) Slow Decision Making (Red Tape)

Due to the complicated functional arrangement, any decision has to be made through many departments/divisions. For example, the payment for local purchase of maintenance materials requires approval by general managers of three departments, i.e, TO&M, CS and F&A.

(3) Shortage of Skilled Personnel

At present, the number of higher educated personnel is not so large. The total number of staff qualified as diploma or higher grade is 251 in UPTC. This accounts for only 10 % of the whole staff. It is difficult for the manager to assign proper persons for complicated jobs.
On the other hand, the vacancy of staff reaches 762. It constitutes about 20% of the authorized establishment. Chronic delay is observed in a lot of routine works in each department.

(4) Insufficient Provision at Nakawa Training School

The program, facilities and instructors are not balanced at the training school of UPTC. The training materials and furniture are not sufficiently provided even though many large buildings have been constructed by the World Bank project. The number of instructors is also short. Therefore, the training program may have to be scaled down.

5.3 National Development Policy

5.3.1 Long Term Objectives

According to the latest "Rehabilitation and Development Plan" by the Government of Uganda, the long term objective for the national development is to achieve an **"independent, integrated and self sustaining economy"**.

Movement towards this objective implies increased emphasis on:

- promotion of inter-sectoral linkages, especially for agro-processing, and the use of local mineral resources in manufacturing;
- efficient import substitution;
- efficient and sustained investment in export oriented industries, and expansion of external markets;
- development of a viable and resilient banking sector as a source of medium term investment funds for industrial development, as well as the development of active capital markets;
- in addition to developing indigenous technology, a program to induce inflows of research and technology;
- rehabilitation, expansion and maintenance of economic infrastructure.

5.3.2 Communication Sector Policy

Effective communications infrastructure is a crucial element of Government's medium term strategy. Objectives in this sub-sector include:

- restoration and development of post and telecommunications services in both urban and rural areas;
- promotion of international communications links with neighboring countries.

5.4 Basic Concept on Master Plan

5.4.1 World Trend in Telecommunications

(1) Growth of Telecommunication Needs

Formally, telecommunications was for a limited number of special persons who could pay high cost for these services. Nowadays, however, telecommunications is for everybody as an infrastructure of socio-economic activities, like transportation, electricity, water supply and housings. The telecommunications is one of essential needs for the human life. Moreover, telecommunications can support the development of other sectors in national economy. In most countries, the development of telecommunications is one of the priority programs. Considering such situation, the average investment share of telecommunications increased from 0.3 % to 0.5 % of the national GDP during the past 5 years.

(2) Integration of Services

In connection with the change of business and life styles, various kinds of telecommunications media were developed and became popular. Such development further results in demand for more advanced services, i.e., integrated services. To cope with such demand, "ISDN" (Integrated Services Digital Network) was developed. The ISDN can provides the multi-media telecommunications with simple subscriber lines. This ISDN is now being upgraded from the "narrow band" type to the "wide band" type.

(3) Privatization

In many countries, the public telecommunications services have been opened to the private investors aiming to provide more convenient services in the competitive conditions. This trend is predominant in the well-developed countries, followed by the middle-advanced and under-developing countries. The privatization, However, must be carefully studied considering the situation of common carriers and national economy.

5.4.2 Development Policies in Uganda

(1) Objectives of Development

Objectives of telecommunications development in Uganda to be achieved by the year 2010 are as follows:

a) To provide the basic telecommunication services in the whole country for keeping urgent communication means in times of emergency, such as natural disasters, sudden illness, accidents, etc., and for improving and rationalizing government's administrative services aiming at upgrading of the welfare of the people of Uganda.

b) To support the national development, focusing the attention on the Government policy of an "independent, integrated and self sustaining" economy.

(2) Development Phases

The planning period is to be divided into the following three development phases:

Phase-1 (1995/96-1999/2000) : Development of network
UPTC will develop the nationwide telecommunications network to provide the basic services for large and middle size towns. During this stage, the isolation problem will be solved on district basis. Advanced services will also be provided in the capital area.

Phase-2 (2000-2005) : Enhancement of services
UPTC will enhance the telecommunications services in their volume and quality. The automatic network must be expanded to cover 60% of county headquarters in rural areas. Advanced services will also be provided in major cities to support economic activities.

Phase-3 (2005-2010) : Taking-off and self-sustaining
UPTC will take-off achieving the goal of service level and management capability. The network expansion will be executed by the own budget and bank credits. The automatic telephone network must be expanded to cover all counties (163 locations) to provide the basic telecommunications services.

(3) Supply Policy

The following supply policies are proposed for the provision of telecommunications services:

a) To reach the Sub-Saharan level in 2004/05.
b) To fill 70% of demand in 2009/10.
c) To invest 0.5% of GDP every year.

In items b) and c), average figures in similar countries are applied as guidelines for Uganda.

(4) Management Policy

The following management policies are proposed for UPTC:

a) Improving customer satisfaction
b) Effective and efficient operation
c) Commercial basis management