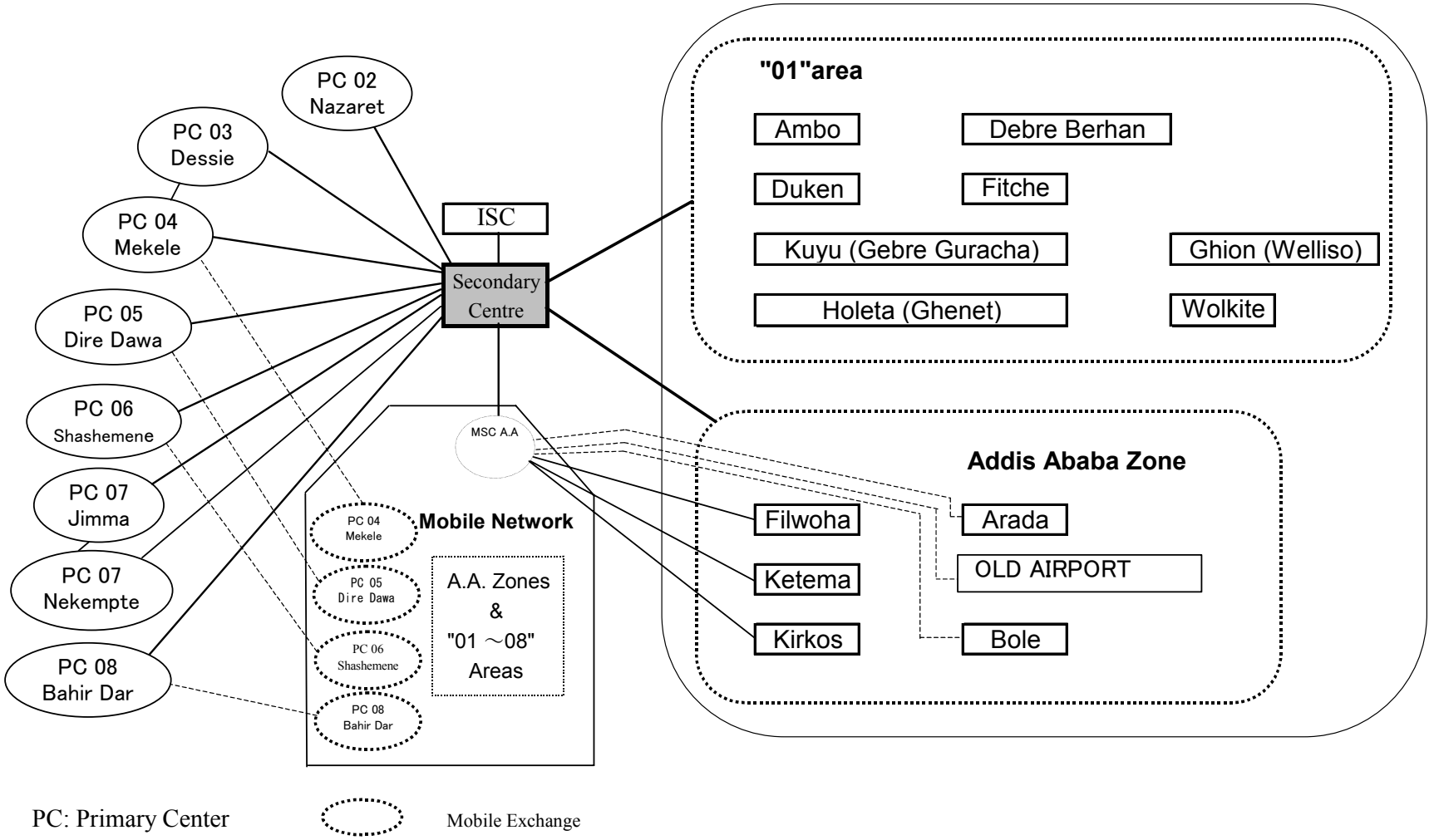


Figure 9.4-8 Network Diagram

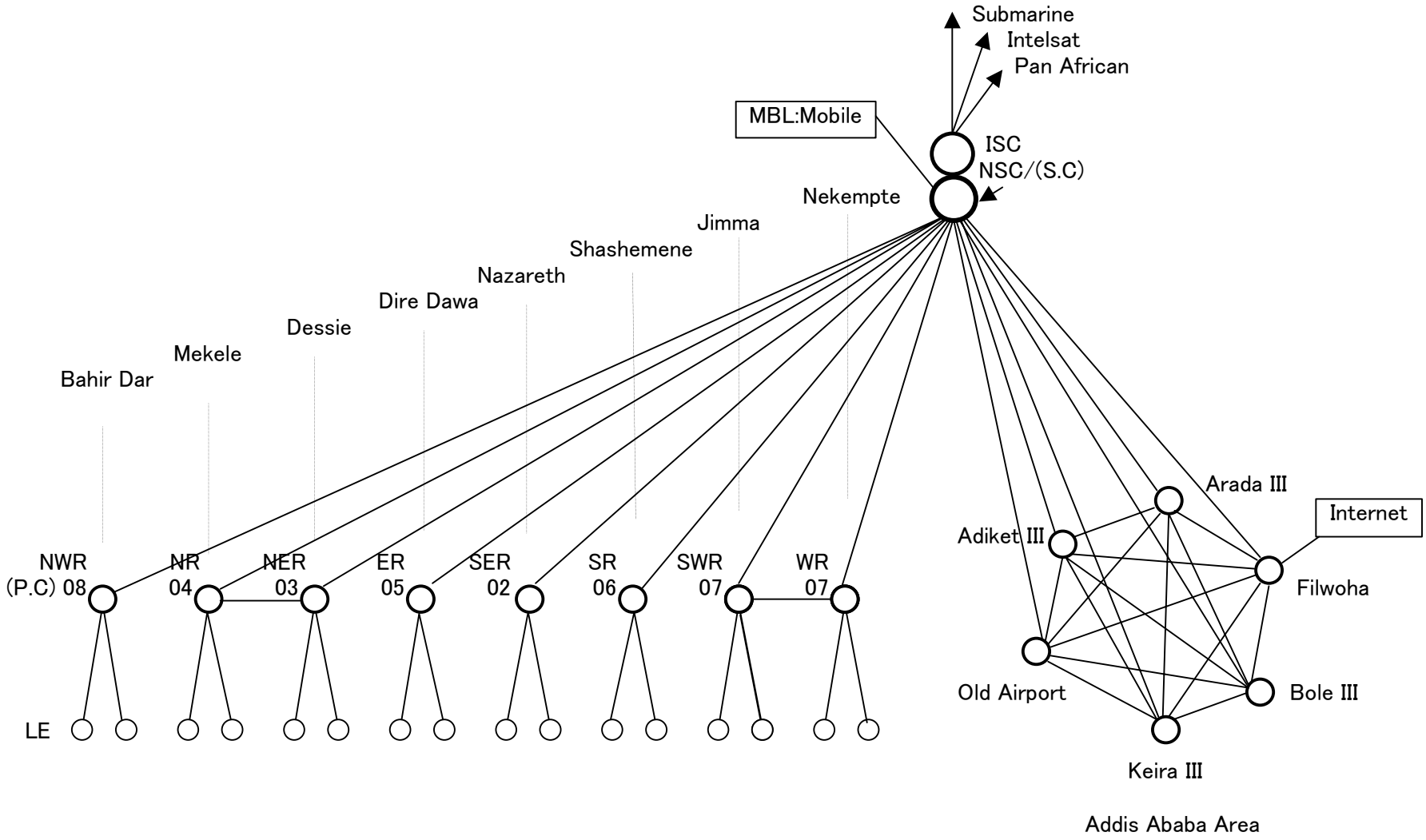


Figure 9.4-9 Present Routing for PSTN

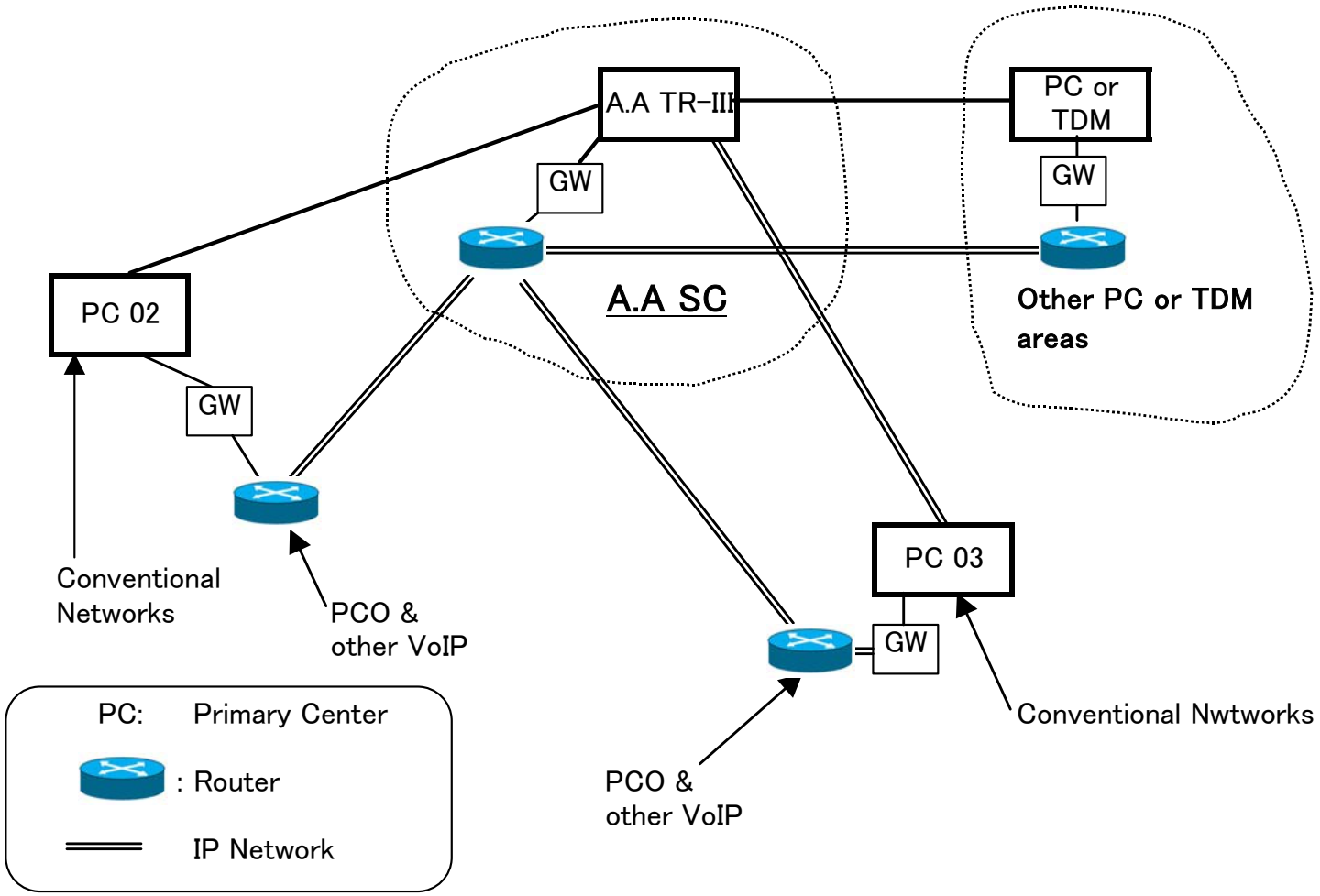


Figure 9.4-10 Interconnection of IP Network with PSTN

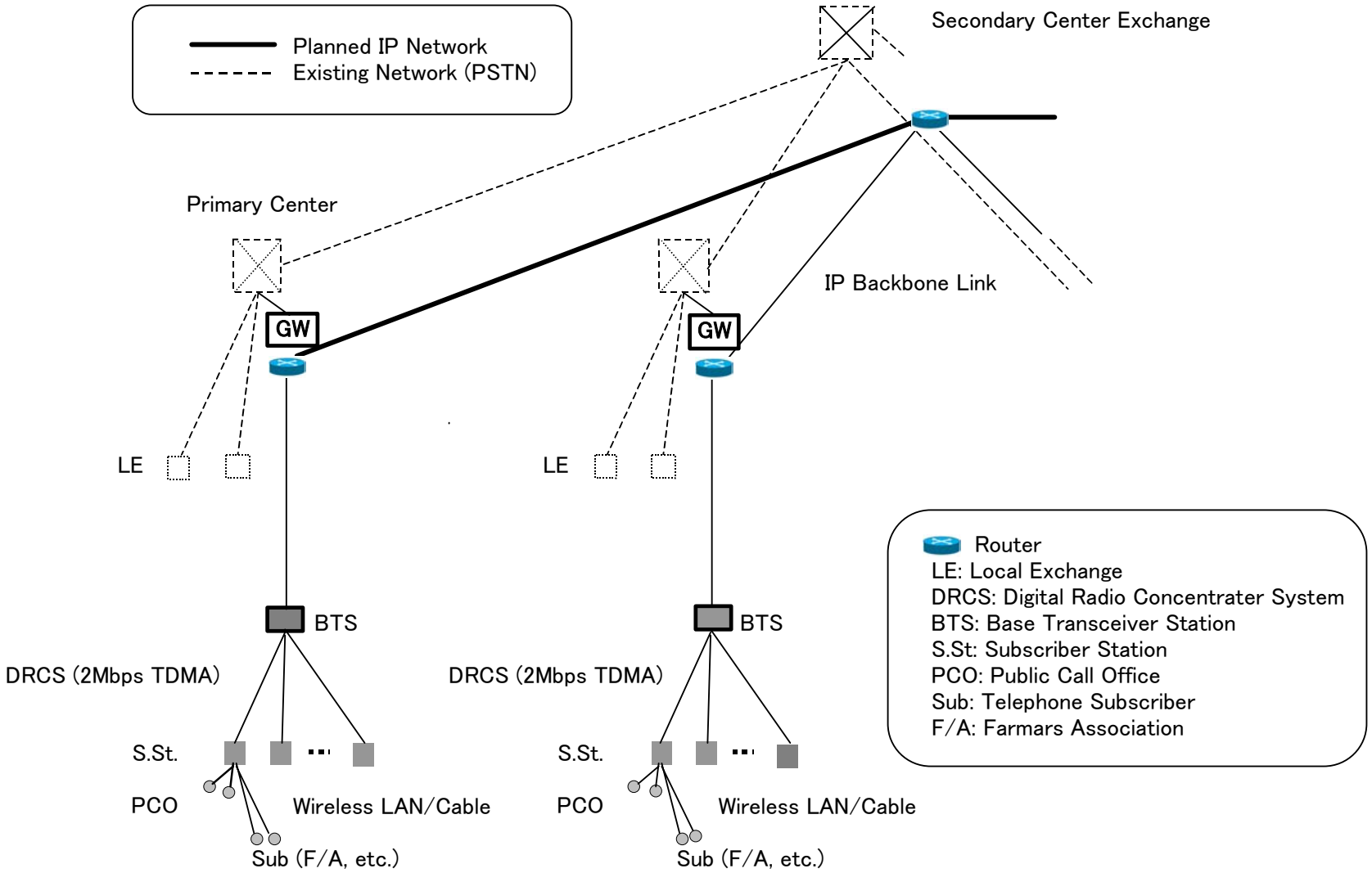


Figure 9.4-11 Rural Network (VoIP)

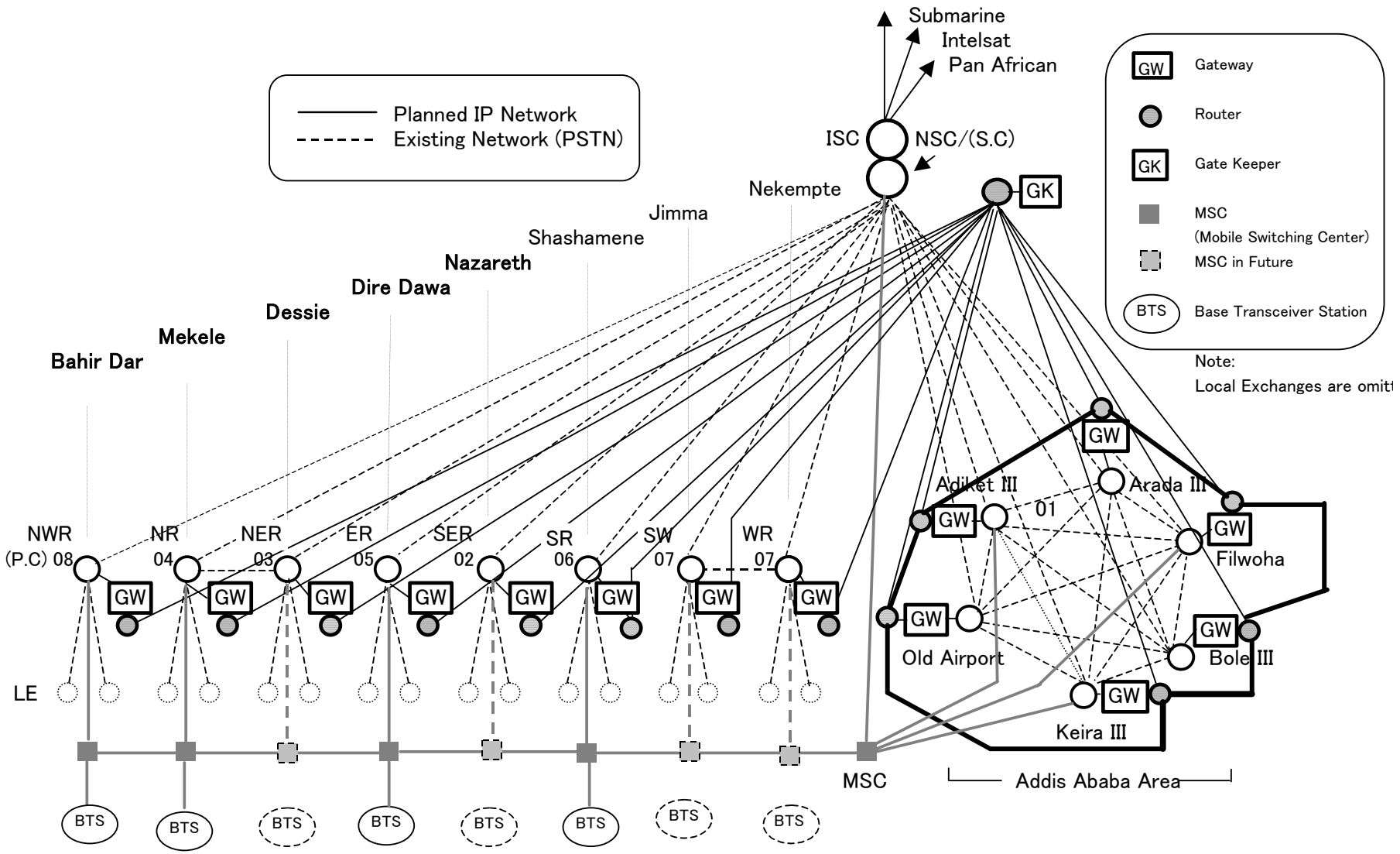


Figure 9.4-12 Routing Plan for IP Network (2005)

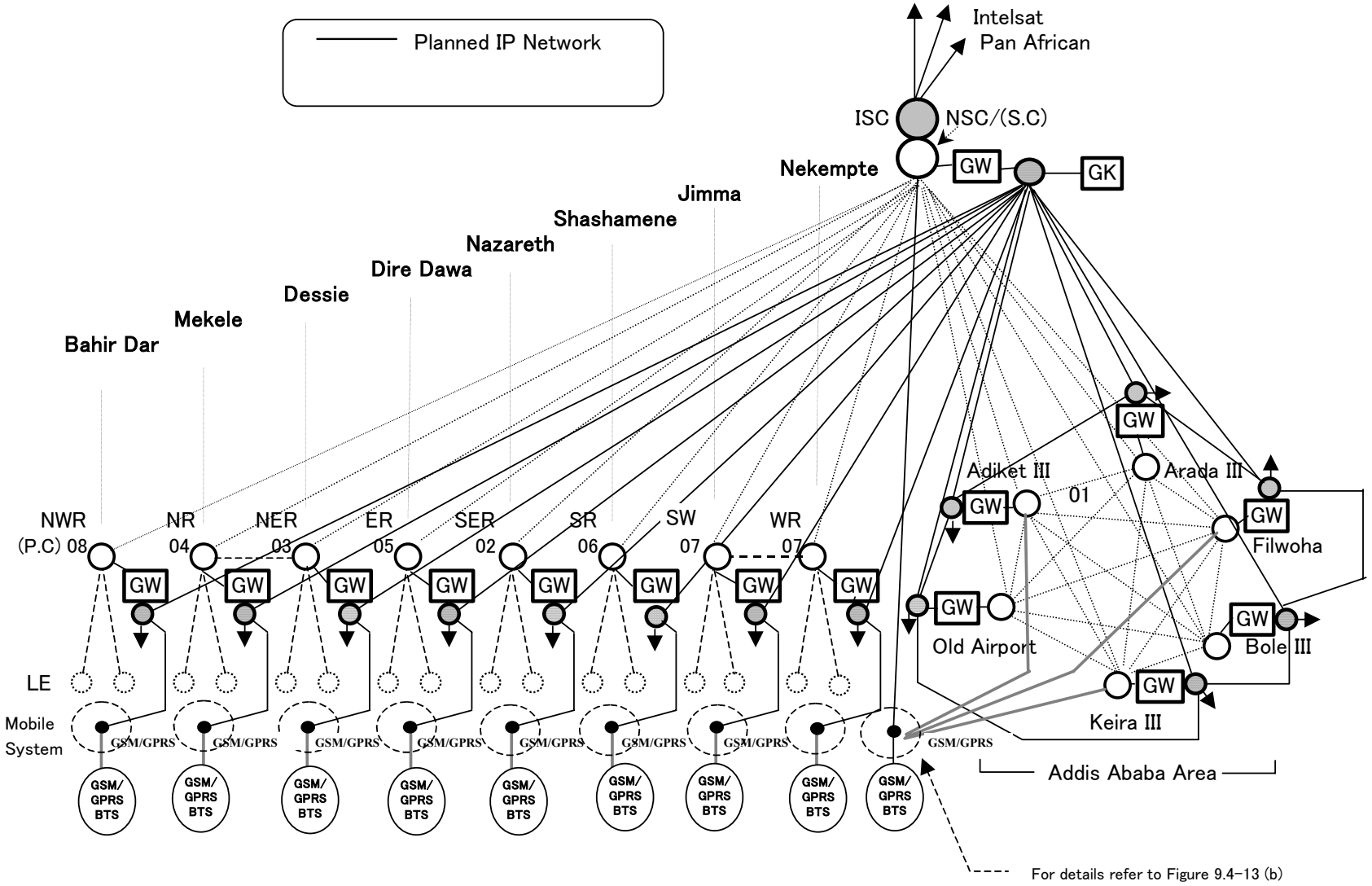


Figure 9.4-13 (a) Routing Plan for IP Network (2010-2020)

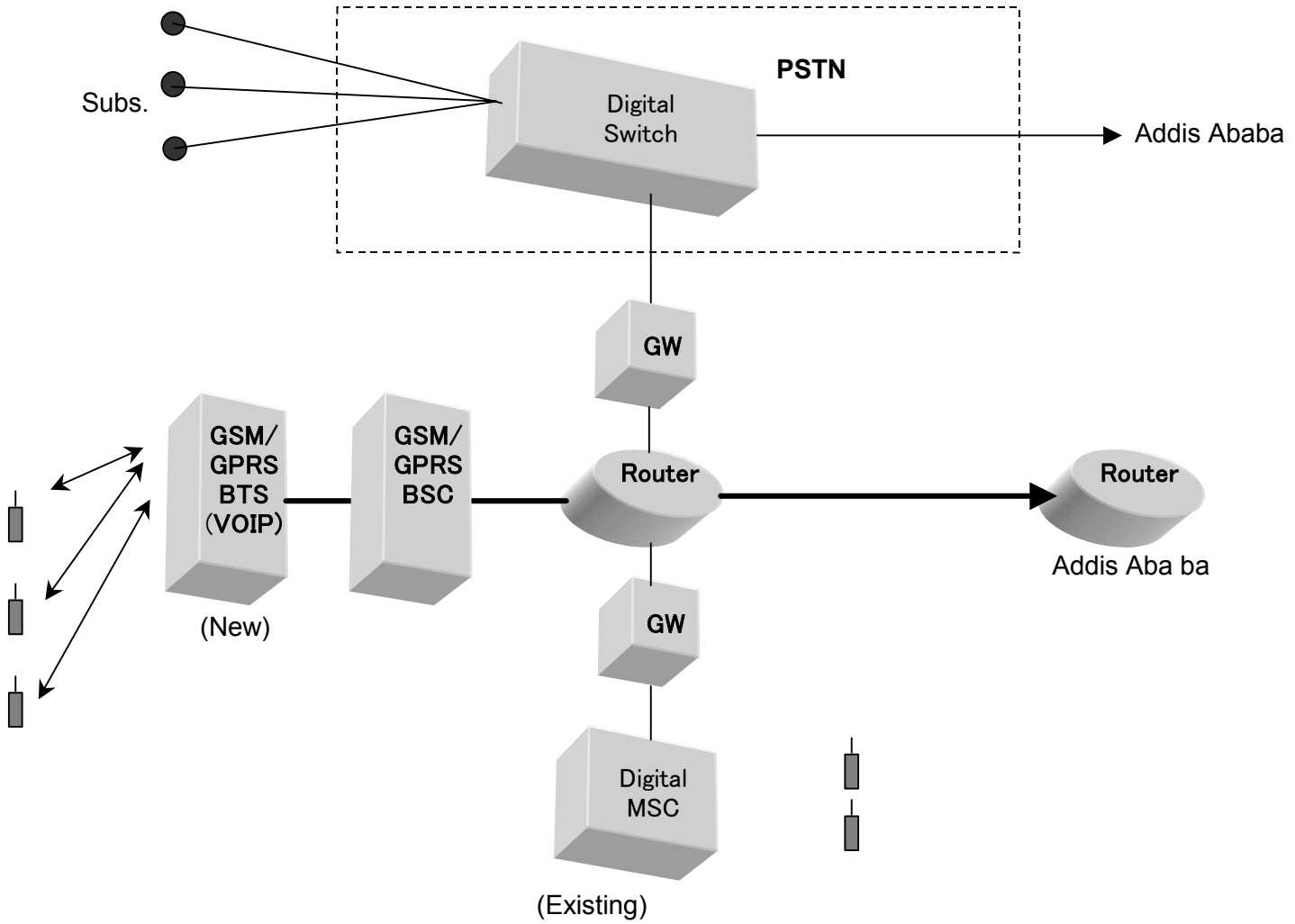


Figure 9.4-13 (b) Details of Connection (Mobile VoIP)

9.5 Universal Service

The telecommunications infrastructure is of an extreme importance for regional development as promoted in the Fifth 5-Year Development Program by ETC, and must be implemented with efficient and economic manner.

Importance, methodology and plan for such services are given below.

The provision of universal access is an important objective of telecommunication policy and legislation in many emerging market countries. Even now in Africa, it is common for there to be fewer than one telephone per 100 people, compared to 10 lines per 100 people in Latin America and over 64 in the United States. *(Source: ITU, Towards Universal Access)*

The concept of universal access, its content and the implementation of policy may vary depending on a country's specific needs and, indeed, to be effective, the concept and policy must be sufficiently flexible to adapt to the changing needs of the country concerned. There does not seem to be one common "prescription" for ensuring universal access.

The objectives of Universal Access policies and programs focus primarily on social and economic development of rural areas. The provision of telephone lines and Internet services is a means to accelerate and support social and economic development. Objectives may also be tied directly to government goals for decentralization of governance to regional and district levels in order to provide more effective social service delivery and more effective local decision-making. Decentralization requires that front-line service delivery agents and local government officials have access to affordable and effective communication and information sharing tools.

It is generally acknowledged that telecommunication services stimulate social and economic development. The cost of commercial and household transactions, in the absence of telecommunication services, can be very high. Finding markets for rural products, determining market conditions and prices, negotiating prices and transportation and engaging supply chain services can be virtually impossible without access to telephones, faxes and (more and more) e-mail and web services.

Access to knowledge and information about key social services such as health, education, agricultural extension, water and sanitation is very limited when there is no access to telecommunication services. Telecommunication services are also vital to community safety and national security. Through telecommunication services, security and protection services can be notified and summoned to take action in the event of criminal activities and natural and man-made disasters.

Universal access requires establishing a certain level of telephone service to meet the needs of communities where there is low or even no telephone penetration. Typical access targets are 1 public telephone per 500 population, or 4 to 5 telephones (1 payphone plus 3 to 4 business or institutional lines) per village [Dymond, 1998]. In this Master Plan, each PCO is equipped with up

to 8 telephone lines. The Master Plan recommends that each PCO (Public Call Office) should be constructed roughly every two school areas taking the accessible distance to telecommunication services into consideration. (Refer to the Chapter 8.8.6)

Upon establishing Universal Access Facilities, most economizing methods must be sought. For example, introduction of PCOs and delegation of their management may be first brought to Farmers Associations as the promotion of agricultural production. Next priority will be given to such places as guest houses and restaurants, where many people gather, are other suitable sites.

In those places, while lands for necessary towers must be procured, costs may be reduced through the utilization of existing buildings and operation licenced to site people.

(1) Universal Access and Rural Transmission Network

The study team considered to cover the rural area according to ITU Recommendation with different systems depending upon the traffic and subscriber distribution.

(a) Data Obtained

The study team has obtained following data with the counterparts through the investigation:

1)	Total towns listed in the Statistical Abstract 2000 issued by Federal	923
2)	Democratic Republic of Ethiopia, Central Statistical Authority	
3)	Total towns having telephone services (except Addis Ababa)	649
4)	The towns without telephone services [1)-2)]	274
5)	Candidate DRMASS Stations (The Eighth Development Program)	109
6)	Candidate Stations for Universal Access Services, Phase 2 (The Eighth Development Program)	116+1(Ali)

(b) Strategy for Rural Areas

Candidate DRMASS stations of 109 and Candidate stations of 117 for universal access services above described shall be implemented as scheduled in the Eighth Development Program to solve the inconvenience of such towns without telephone services as much as possible. However, the evaluation of the Seventh 5-year plan reports that the rural transmission networks using DRMASS, VSAT and UHF/VHF systems achieved only 49% of the plan. Therefore, the Eighth Development Program shall be thought over this fact and shall be carried out to complete the program of the Eighth Development. If 100% of the plan could not be achieved in the Eighth Program the remaining shall be shifted to and completed in the next program, which corresponds to the middle term (Phase 2) of the Master Plan.

The Ethiopian population is about 65 million and the people who obtain the benefit of telephone services would be about 10 million at most even if 923 towns above mentioned are benefited by telephone services.

The remaining 55 million people without telephone services who live in the remote areas shall be relieved from the inconvenience of communications.

The resolution plan for such inconvenience will be as follows;

1) 11,095 of primary schools exist in the whole Ethiopia with 65 million people, according to the statistical data, which indicate the distance being easily accessible every day by the pupils and by the students.

2) According to the above fact, PCOs (Public Call Offices) are recommended for remaining 55 million people in rural areas throughout Ethiopia to cover their telecommunication needs, that is, each PCO shall be constructed roughly for every two school areas taking the accessible distance to telecommunication services into consideration. The reason for taking primary schools as an index of designing PCO is that they are existed uniformly in Ethiopia rather than health centers, and cooperative farm villages etc. The Accessible population to the telephone sevice in 2020 is to be 86% which will be worthy of appreciation in the plan. If the rural fund will be avaiable, the number of PCO might be increased.

3) Total numbers of PCO to be constructed except Addis Ababa region shall be around 5,000 with 22,000 telephone lines approximately (2 to 8 telephone lines /PCO) in rural areas. This means that telephone services could be realized all over the country in Ethiopia .The priority for implementation shall basically be taken by the population of the questioned woredas.

The target plan to be implemented in each phase will be as follows:

Phase 1 (up to the year, 2005) 700 PCOs

Phase 2 (up to the year 2010) 2,225 PCOs including the Phase 1

Phase 3 (up to the year 2020) 5,116 PCOs including the Phase 2

Rough idea of PCO to be constructed in Each Region will be as follows

Table 9.5-1 Number of PCOs

No.	Region	Woredas				PCO			
		Phase1	Phase2	Pahse3	Total	Phase1	Phase2	Phase3	Total
1	Tigrey	5	10	20	35	55	115	208	378
2	Affar	3	8	15	26	10	18	21	49
3	Amhara	10	27	70	107	179	382	847	1,408
4	Oromiya	15	42	121	178	269	541	1,122	1,932
5	Somari	6	12	24	42	20	35	29	84
6	Benishangul-Gumuz	3	6	11	20	33	50	46	129
7	SNNP	6	21	59	86	112	347	588	1,047
8	Gambela	2	3	3	8	18	29	18	65
9	Harari	-	-	-	-	2	4	5	11
10	Dire Dawa	-	-	-	-	2	4	7	13
	Total	50	129	323	505	700	1,525	2,891	5,116

Further details are made in the attached table, Table 9.5-1 (Data File), Number of PCO planned & Expected Conn. Point, as a reference.

In Table 9.5-6, the mark (*) shows that the PCOs planned in the Master Plan are coordinated with existing rural transmission circuits which are listed in D.Table 3.3-1 and not overlapped with them in the plan because there are to be implemented plural numbers of PCO in the same Woredas. Another mark (**) shows that the PCOs planned in the Master Plan are also coordinated with the rural transmission circuits which are going to be implemented in the ETC's Eighth Telecommunications Development Program which are listed in Table 4.5-3 and not overlapped with them for the same reason of the above.

PCO maps are shown in Fig.9.5-1, 9.5-2 and 9.5-3as references, in which described numbers of PCO in each phase.

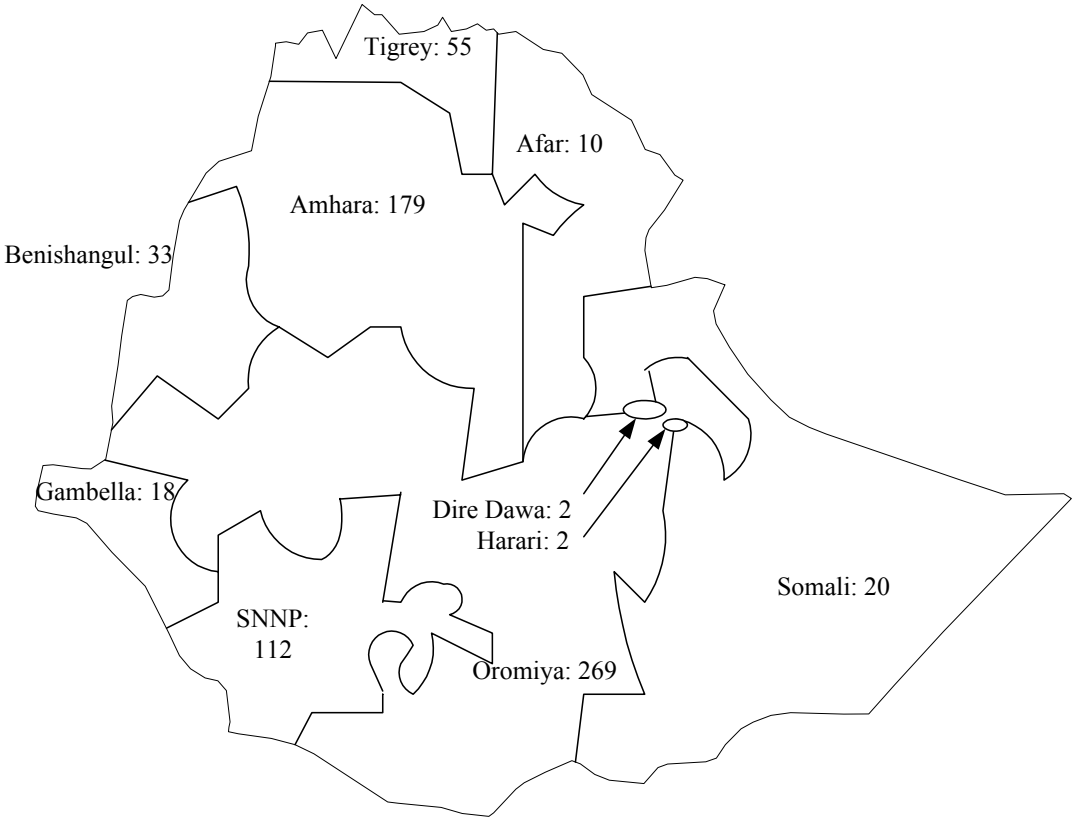


Fig. 9.5-1 Number of PCOs: Phase 1 (Year 2005)

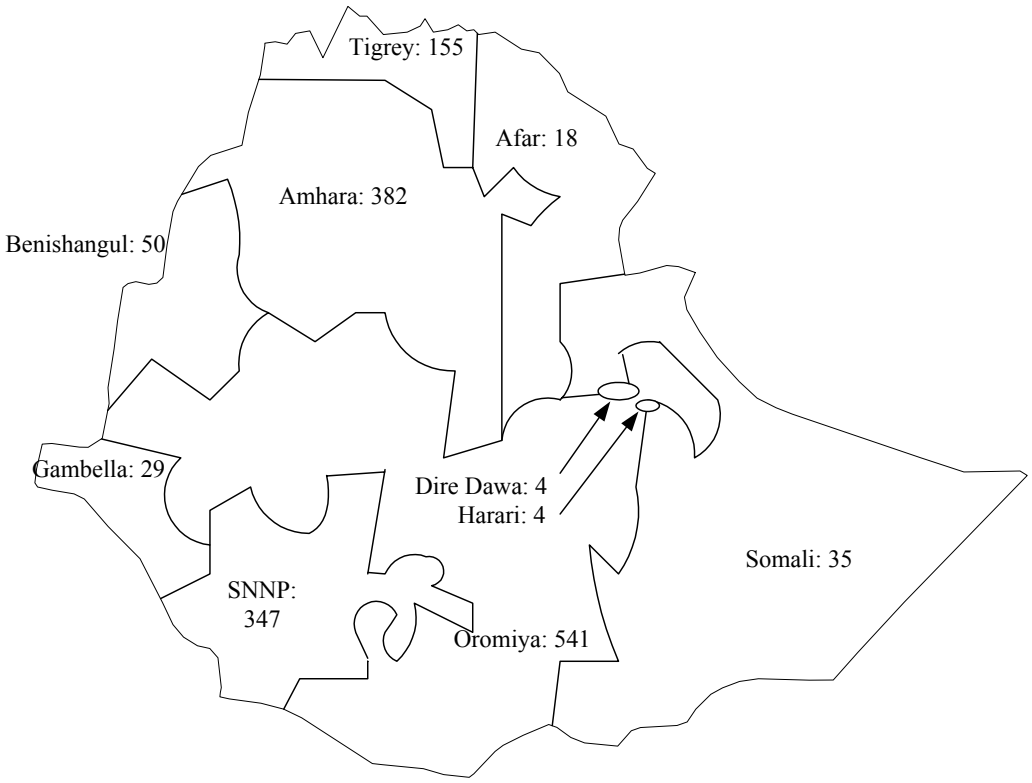


Fig. 9.5-2 Number of PCOs: Phase 2 (Year 2010)

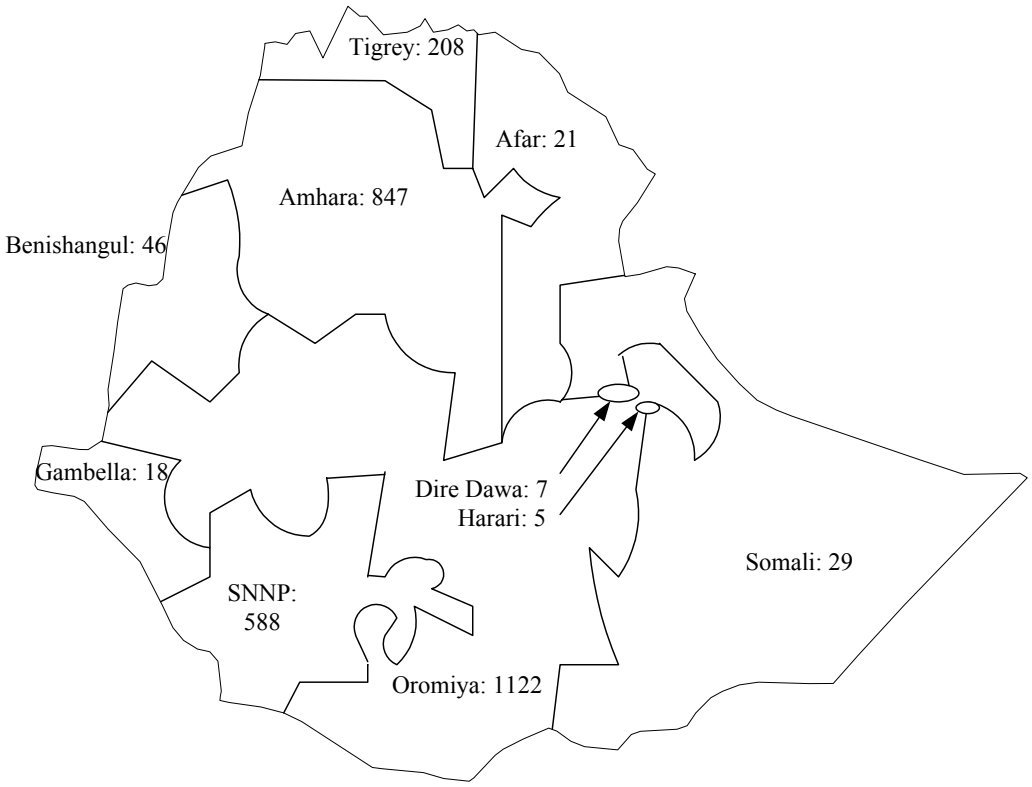


Fig. 9.5-3 Number of PCOs: Phase 3 (Year 2020)

(2) Application of Transmission System for PCO

There are several transmission systems to be applied to rural areas as described below.

Transmission systems considered for rural areas will be:

- 117 Candidate Stations for Universal Access:

Point to multi-point system (DRMASS)	1.5 GHz or 2.4 GHz Radio
Point to point system (PDH or SDH)	UHF or 7 GHz Radio
WLL system	450, 800 MHz or 1.9GHz Radio
VSAT system	

  Optical fiber cable system shall take priority over the radio system if the transmission route is available along the access roads.

- 5,116 PCOs:

Point to point system (PDH or SDH)	UHF or 7 GHz Radio
DRCS (Digital Radio Concentrator System) (*1)	2.4 or 3.5 GHz Radio
Wireless LAN (*2)	2.4 to 2.5 GHz Radio
VSAT system	

Notes

(*1): Brief system description

System Capacity: 2 Mb/s x 2 (256 kb/s x 15)

(Wide Band solution: 256kb/s per PCO)

Connection to Exchange: Digital exchange with 2 Mb/s transmission line

Data Interface: ITU-T, V.24/V.28, V.35, V.24/V.11, G.703, and I.430 (2B+D)

Covering Range: Up to 500 km with radio repeaters

(*2): Brief system description

This system is considered to be used for subscriber connections with IP-based network in PCO which covers a few or several km in radius in case of metallic cable connections unavailable.

* Radio Standard: Based on International Standard IEEE802.11b
* Mod/Dem: Direct Sequence Spread Spectrum (DS-SS)
* Transmission Rate: 1 Mb/s (BPSK), 2 Mb/s (QPSK), 5.5 Mb/s, 11 Mb/s (CCK)
* Wire Connection IF: 10 Base-T (IEEE802.3)

All the rural transmission system shall be wide band in order to provide multi-media service to the rural community for the future in PCO.

Basically, the network designing for the rural PCO transmission network in the master plan is carried out on the assumption that the commercial power supply could be available in all PCO areas.

The typical plan for rural network system configuration is shown in Fig. 9.5-4, Rural Transmission Network Configuration for PCO.

PCO shall be located to be available for the majority of the rural citizens with emphasis that must be placed on developing public access points such as telecenters, farmers associations & agricultural centers, cyber cafés, etc.

Optical fiber cable system shall take priority over the radio system if the transmission route is available along the access roads.

Another solution for transmission line to access to those stations in rural areas would be to construct optical fiber cable systems along the electric power lines of EEPCO (Ethiopian Electric Power Corporation).

Alternatively, the study team will recommend digital HF radio transmission system for data transmission (Telegram / Fax) which could be adopted economically and simply operated in rural areas beside VSAT system, but limited to data transmission, statistical black & white and color graphics. The system has a self tuning system with automatic frequency band selection and packet transmission system which does not directly connect to PSTN but is to be manually operated by operators for the public communications. The main specification is as follows,

Frequency Range:	1.6 kHz to 29.999999 MHz
1) Frequency Variable Step and Setting:	1Hz and Synthesizer Control, Automatic Link Establishment System
2) Transmitting Output Power:	125W (nominal)
3) Memory Channels:	1,000
4) Type of Emission:	J3E(USB, LSB), R3E(USB), H3E(USB), A3E(AM), 1A(CW) F1B(FSK), J2D(DAT)
5) Transmission Speed:	2,400 bps. (max.)
6) Audio Frequency Response:	Less than 3 dB at 300 to 3,000 Hz

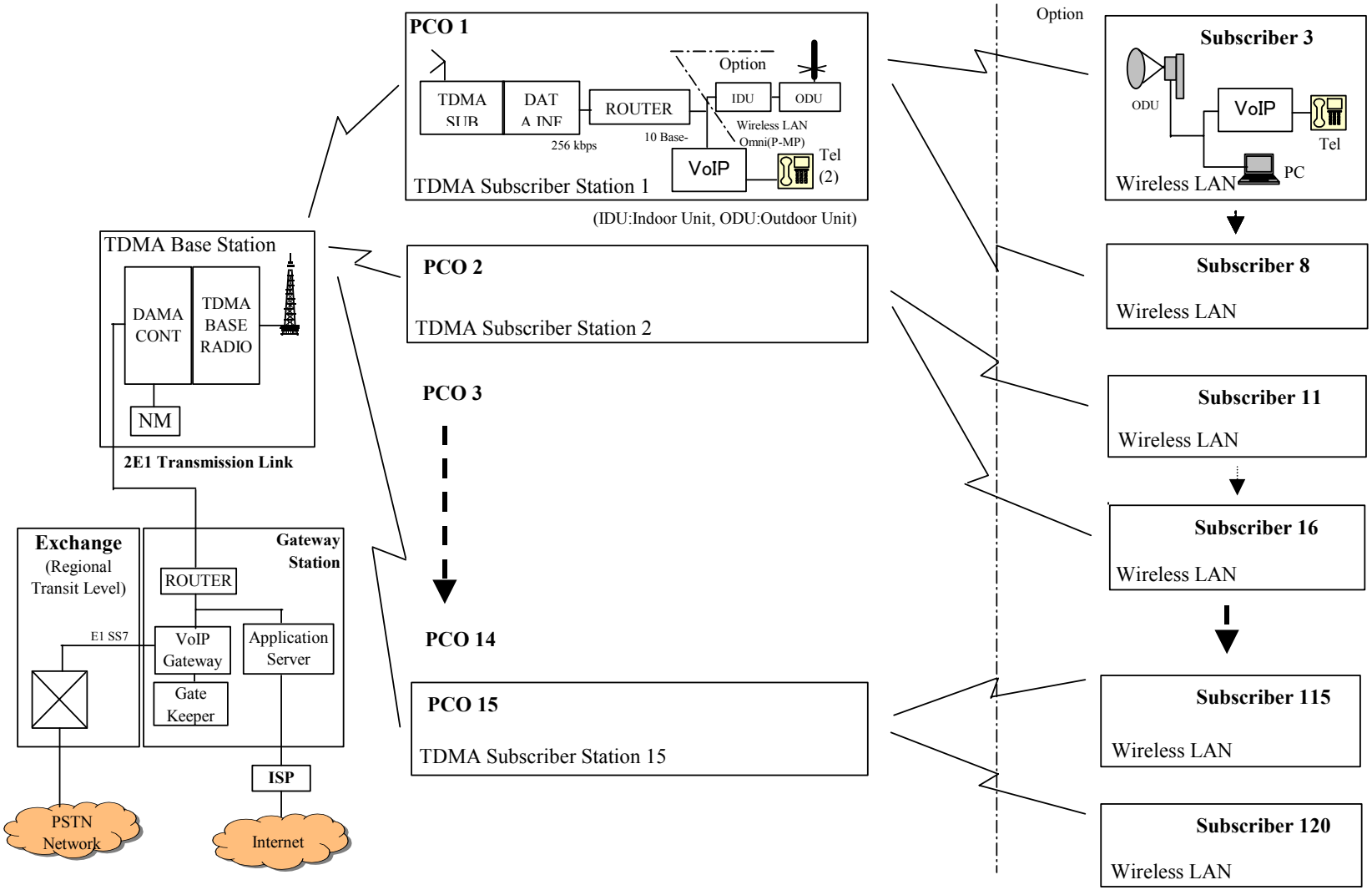
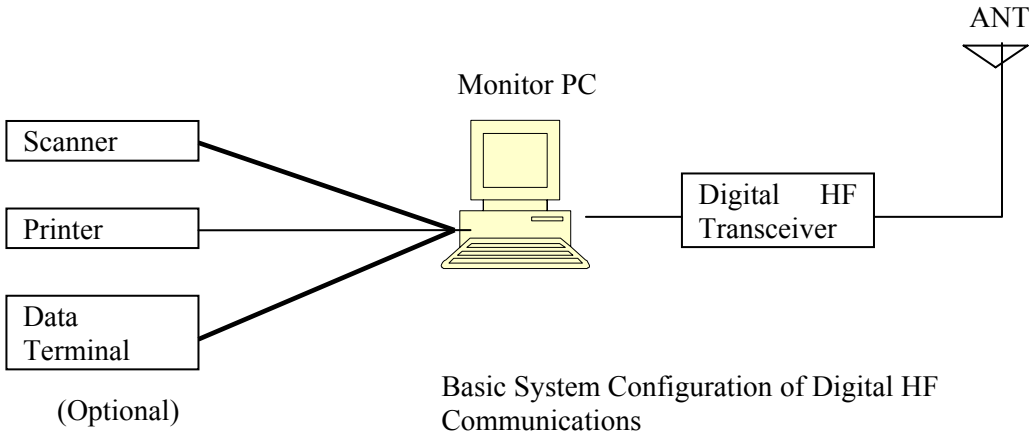


Fig. 9.5-4 Typical Rural Transmission Network Configuration for PCO

This system might be an economical solution for the rural areas without telecommunication service obtained beside VSAT.

The typical system configuration is shown below.



Basic System Configuration of Digital HF Communications

Fig. 9.5-5 Basic System Configuration of Digital HF Communications

The selection of a suitable system to be applied shall be practiced in consideration of the system economical use, appropriate and technically suitable to the requirement. Moreover, it shall be added that rural areas are characterized by low population density and long distances between the settlement areas. Due to unfavorable geographic and climate conditions and access to rural areas is often difficult. Hence, subscriber access system will be a principal means of telecommunications in rural areas.

Needless to say, the basic objectives to which telecommunications services have to contribute are to trigger and sustain structural and economic development, to minimize the disadvantage in rural areas and to improve the quality of life.

Being based upon the above, various system adaptations of subscriber access are tabled below,

Table.9.5-2 Comparison of the Systems

	Applied System	Coverage (km)	Transmission Rate	Technology	Rough Idea of Price Expectation
1	Point to Multi-Point Radio				
1.1	DRCS	20 – 30 (depend on antenna)	2 E1 (*1)	TDMA	Medium
1.2	WLL	10 - 15	3,000 / 90,000 Subscribers (*2)	CDMA	High
1.3	Wireless LAN	up to 5 (depend on antenna)	256 kb/s	DS-SS (Direct Sequence Spread Spectrum)	Low
2	Optical Fiber Cable				Higher (for Less Subscribers)
3	VSAT		8/16 voice Ch.(*3)	TDMA	High
4(*4)	HF Digital Communication System (Alternative of VSAT)	Several Hundred	1 voice or data Ch.	SSB Simplex, Data: Packet	Low

Notes

(*1): 256 kb/s x 15

(*2): Max. 3,000 subscribers / WSC (Wireless Service Controller)

Max. 90,000 subscribers / WSC

Interface: V.5.2, E1

(*3): Eight (8) voice channels of VSAT system shall be used until the life time of existing satellite, NSS703 will come to 2009.

(*4): It would be suitable for data communications like Telegram and Fax. by means of operator.

(3) Selection of the System

Rural areas are usually situated on low population density and scattered with long distances as described above. Study Team considered a combined system for suitable subscriber access that is selected from the above table listed. The point to multi-point radio system will be the best solution for the scattered rural areas.

a) DRCS system shall be applied for long distance use. If access road is available optical fiber cable subscriber access system will be also as an alternative solution on condition that the subscriber density is high.

Comparison of DRCS and DRMASS radio system for PCO network is given in the supporting Document.

b) Each PCO will have the capacity of 8 subscriber lines (max.) of use for:

* Public call	2 lines (telephone)
	1 line (Fax)
	1 line (reserved for computer)
* Farmers Association &	2 lines
Agricultural Technical Center	
* Clinic	1 line
* School	1 line
* (Administration of Local Government	1 line, if located in the PCO) (*1)
* (Police Office	1 line, if located in the PCO) (*1)

Note, (*1): Necessary subscriber lines for administration and police shall be provided for their own lines out of 8 lines provided by a PCO, if their offices will be localized in the same PCO area.

c) Drop Wire Line (Wireless LAN)

Eight (8) subscriber lines are provided for each PCO and shall be distributed to the required locations. If the means of distribution will be a metallic wire (Drop wire) of 0.4 Ø, for

example, the length of telephone line shall be limited to 1.6 km approx. in case of VoIP telephone for the sake of power feeding to telephone apparatus(24VDC, 450Ω). If longer distance required, Wireless LAN system will be recommended to use for subscriber distribution lines.

d) HF Digital Communication System

This system will be recommendable for the use of outlying region due to simple installation and operation (Refer to Chapter11.6, Universal Service, as an alternative solution of VSAT. The system will be limited to use for telegram and fax. communication. No connection to PSTN line is directly available but by means of operator. It may be very much effective for temporary or emergency use.

(4) Considerations

The Study Team estimated rough expectation of benefited population on PCO in rural area when it is implemented at each phase planned. The calculation of the expected beneficial plan for PCO is shown below.

Table.9.5-3 Expected Beneficial Plan for PCO

Item		Phase 1	Phase 2	Phase 3	Total
Number of PCO		700	1,525	2,891	
Number of Assumed Rural Community/PCO		16	16	16	
Estimated Population / Community	High Pop. Area	800	800	800	
	Mid. Pop. Area	600	600	600	
	Low Pop. Area	400	400	400	
Beneficial Population / PCO	High Pop. Area	12,800	12,800	12,800	
	Mid. Pop. Area	9,600	9,600	9,600	
	Low Pop. Area	6,400	6,400	6,400	
System Distribution	High Pop. Area	0.5	0.4	0.2	
	Mid. Pop. Area	0.3	0.3	0.3	
	Low Pop. Area	0.2	0.3	0.5	
Benefited Population	High Pop. Area	4,480,000	7,808,000	7,400,960	
	Mid. Pop. Area	2,016,000	4,392,000	8,326,080	
	Low Pop. Area	896,000	2,928,000	9,251,200	
	Total	7,392,000	15,128,000	24,978,240	47,498,240
Benefited Population Rate (%)		13.4	27.5	45.4	86.4

Notes,

Assumptions:

1) The calculation is based on the Population of 2002.

2) Rural Community Area:

   a) 5 km x 5 km / Community

   b) Populations in Community,

   - High Population Area: 700 – 1,000, (800)

- Middle Population Area: 500 – 700, (600)
- Low Population Area : less than 500, (400)

c) Coverage of one PCO would roughly be assumed to be 16 communities.

In conclusion, the expectation of the benefited population to be accessible to telephone service in 2020 will reach to 86 % among the population of 55 million (86 million corresponding to the year, 2020) who have no telephone services obtained.

9.6 Mobile Telephone Network

Mobile telecommunications system is also going to be used for multimedia communications such as Internet etc. The expansion plan for mobile telephone in Ethiopia considering new technology trend will be recommended in this chapter.

ETC has a remarkable expansion plan for mobile communications as described in CHAPTER 3 which will be very much encouraged.

9.6.1 Strategy for Future

The future's strategy on mobile communications shall be studied especially for rural areas without telephone services available and how to cover those areas in economical way.

One of the solutions will be that the European Telecommunications Standards Institute (ETSI) has established a regional standard for implementation of the Global System for Mobiles (GSM) in 400 MHz band according to Final Report of ITU-D Focus Group 7 issued by BDT (Telecommunication Development Bureau) in ITU.

The use of frequencies in 400 MHz band rather than the 900/1800 MHz bands, enables a wider areas to be covered by each base station. Wider area coverage is better suited to low density rural populations spread over a wide area. According to the information from this report, GSM 400 covers the same areas of GSM 900 using approximately half the number of cell sites. A typical cell in the 400 MHz band has a 40 km radius when using 2-watts mobile-phone units. Using higher gain or directional antennas, or with higher power mobile-phones, a longer range can be achieved depending upon the geographical and propagation conditions.

GSM 400 occupied frequency bands is as follows:

Frequency Bands	GSM 450 band
	Uplink: 450.4-457.6 MHz
	Downlink: 460.4-467.6 MHz
	GSM 480 band
	Uplink: 478.8-486 MHz
	Downlink: 488.8-496 MHz
Frequency Spectrum	7 MHz
Duplex Separation	10 MHz

Carrier Spacing	200 kHz
Coverage	Up to several dozen km

<Source: Final Report of ITUD Focus Group 7>

The Report adds that GSM 400 systems are expected to have the capabilities to extend the range of both voice and high-speed data coverage in comparison to existing GSM systems and the specifications include support for features such as General Packet Radio Service (GPRS), Enhanced Data for GSM Evolution (EDGE) etc.

The system mentioned above will also be suitable for the future's mobile data communications plan of ETC.

Another solution would be CDMA technology in and around 450 MHz band. The use of frequencies in the 400 MHz band provides wider coverage from each base station, rather than 850 MHz or 1900 MHz, as described above. The use of CDMA technology is well suited as a wireless air interface for use in this spectrum. CDMA will provide operators and their end users with significant improvements in:

1) Capacity
2) Coverage
3) Voice clarity
4) Call clarity
5) Privacy and security
6) Power consumption
7) Infrastructure economics
8) Enhanced services/Data services
9) Fixed wireless access

These improvements will allow operators to serve rural areas to provide improved services for their subscribers. For example, services that support medical care, or offer the Internet access with the potential for educational services and global market access for local small businesses, will be available.

CDMA 450 will be implemented based on internationally recognized standards that offer packet data service up to 144 kb/s, as well as a double capacity of voice traffic of previous generations of CDMA technology. Further, the use of state of the art technology will provide operators the benefits of continuing equipment availability and potential economies of scale derived from global deployment and common platforms. However, ultimately, plans call for the development of dual mode, dual band CDMA 450/GSM 900 handsets, thereby allowing roaming between areas served by these technologies. (*Source: Final Report of ITU-D Focus Group 7 issued by BDT in ITU*)

Frequencies which will be occupied for both GMS 450 and CDMA 450 are reserved in Ethiopian Frequency Allocation Table as Fixed + Mobile from 401 to 470 MHz band.

For expanding mobile terminals, sufficient backbone digital transmission lines shall be secured.

In addition, international mobile telecommunication system, 2000 (IMT-2000) is recommended by ITU as the international standard, which is, applied 2 GHz frequency band, spectrum dispersal transmission with packet transmission for high speed wideband CDMA.

IMT-2000 is called a third generation mobile communication system, which is standardized by ITU-R and targeted to,

* High level of designing and it's common use on a worldwide scale,
* Commonness of service on IMT-2000 system and fixed network,
* High quality,
* Use of small terminal through the world, and
* Loaming ability on a worldwide scale

ITU-D Focus Group 7 reports that IMT-2000 is the ITU vision of global mobile access in the 21st century. It is an advanced mobile communications concept intended to provide telecommunication services worldwide regardless of location, network, or terminal used.

ETC, however, has already adopted GSM mobile standard according to the business plan and will undoubtedly pursue on this line for the following reasons,

* Availability of existing GSM infrastructure and the experience on the system,
* Capability of the enhanced GSM system to support GPRS (General Packet Radio Service and
* Ease of evolution towards UMTS (Universal Mobile Telecommunication System), the third generation (G3) mobile system standardization process without adopting different interim standard.

ETC is calling for the international bids for expansion of 400,000 mobile subscriber lines of GSM with GPRS system which enhances data communications, SMS and Internet access. GPRS involves overlaying a packet based air interface on the existing circuit switched GSM network.

9.6.2 Transmission Line

The transmission line of mobile communications for rural areas shall utilize the existing digital transmission network of fixed telephone services which is operated nearby station and the mobile base station will be installed there.

9.6.3 Phase 1 (year 2003 to 2005)

The plan which ETC is carrying on is to immediately expand the mobile network to 200,000 capacities to cater for 12 major towns and as the next step expand the network to 400,000 of mobile subscribers by the end of 2005. This plan expands the customers more than ten times in

comparison with those of the year 2002, which will be an encouraged strategy for ETC with expecting high profit as a monopoly business.

According to the ETC's plan the prepaid card (SIM card) for mobile-phones shall be introduced in this phase.

The Study Team will recommend that new services shall be provided in this phase to cope with their requests of new services, such as SMS, e-mail, Internet etc.

9.6.4 Phase 2 (year 2006 to 2010)

According to the study of Demand forecast based upon the ITU model and considering the world trend of initial demand, subscribers would be expected to be 311,400 + 179,700 (shifted from fixed-phone) in total at the end of Phase 2 which corresponds to the year of 2010. While ETC's expansion plan is 400,000 subscriber lines by 2005 as described above. But, in this phase, the expansion plan of mobile equipment facilities shall be approximately 1.2 times of the demand covering the shifted demand from fixed-phone services, which correspond to 550,000 subscriber lines to enhance and to promote the popularization of mobile telephones.

9.6.5 Phase 3 (year 2011 to 2020)

According to the study of Demand Forecast based on the above mentioned method, subscribers would be expanded to 431,400 + 233,000 (shifted from fixed-phone) in total at the end of the year 2015 which corresponds to the middle stage of the Phase 3. The expansion of mobile equipment facilities in this stage shall be planned to facilitate 700,000 subscriber lines which means approximately 1.3 times of the demand forecast with the same reason of the above described.

In the year of 2020, the demand forecast reaches to 614,800 subscribers according to the study and the expansion of mobile equipment facilities shall be 1.5 times (considering the shift from fixed-phone) of the demand which correspond to 960,000 subscriber lines.

The plan includes 12 major cities in which the system will be expanded and new eight major cities which cover the principal cities through Ethiopia. The new eight major cities with more than 50,000 of populations are as follows,

Table 9.6-1 The New Eight Major Cities With More Than 50,000 of Populations in Phase 3

No.	Region	Zone	Woreda	Town
1	Tigray	Misrakawi	Ganta Afeshun	Adigrat
2	Amhara	Semen Shewa	Debre Berhan	Debre Berhan
3	Amhara	Semen Shewa	Yaya Gulelena	Debre Libanos
4	Oromiya	Misrak Shewa	Ada: A Chukala	Debre Zeit
5	Oromiya	Misrak Harerge	Gola Odana	Meyumuluke
6	Somali	Jijiga	Jijiga	Jijiga
7	SNNP	Semen Omo	Sodo Zuria	Sodo
8	SNNP	Semen Omo	Arba Minch Zuria	Arba Minch

.

Service Coverage Plan for each stage from the existing to phase 3 is shown in Fig. 9.6-1 to Fig. 9.6-3 as references.

MSC (Mobile Switching Center) and GMSC (Gateway MSC) shall plurally be provided for the mobile network at the stage of phase 2 or 3 in order to avoid the concentration of traffic to the MSC in Addis Ababa and to lighten the burden of the transmission traffic concerned. Local MSC with adequate capacity shall be implemented and connected to the nearest located PSTN.

There would be one solution for the mobile traffic distribution on the network that MSC and BSC (Base Station Controller) shall newly be implemented in Mekele (04) area, Dire Dawa (05) area, Shashemene (06) area and Bahir Dar (08) area and to connect respectively to each existing digital exchange.

In another areas of Nazareth (02), Dessie (03), Nekempte (07) and Jimma (07), MSC and BSC may be implemented if a rapid increase of the traffic will be observed.

The mobile network may also be used for universal access in rural areas, where possible.

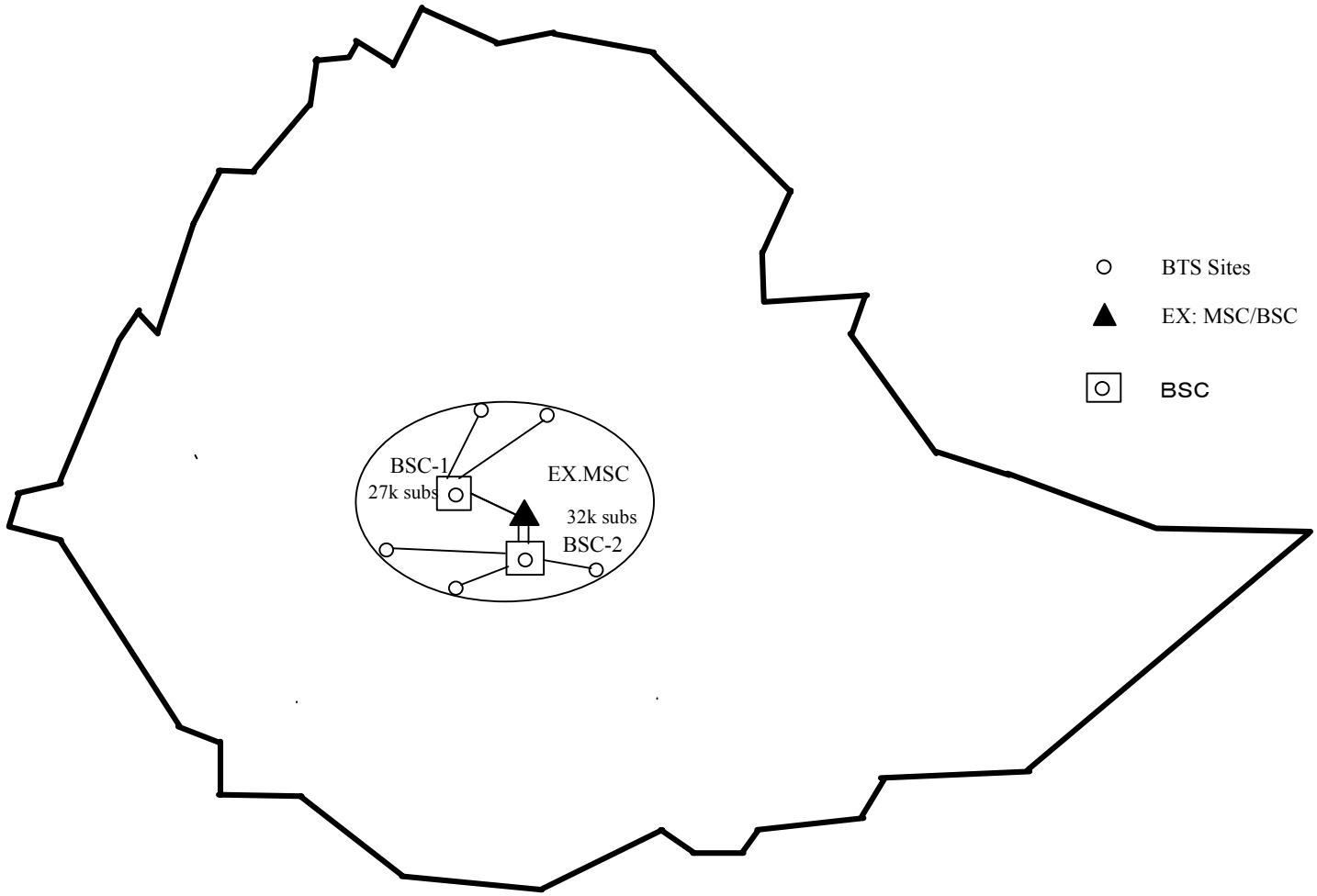


FIG. 9.6-1 Existing Mobile Link for Addis Ababa City

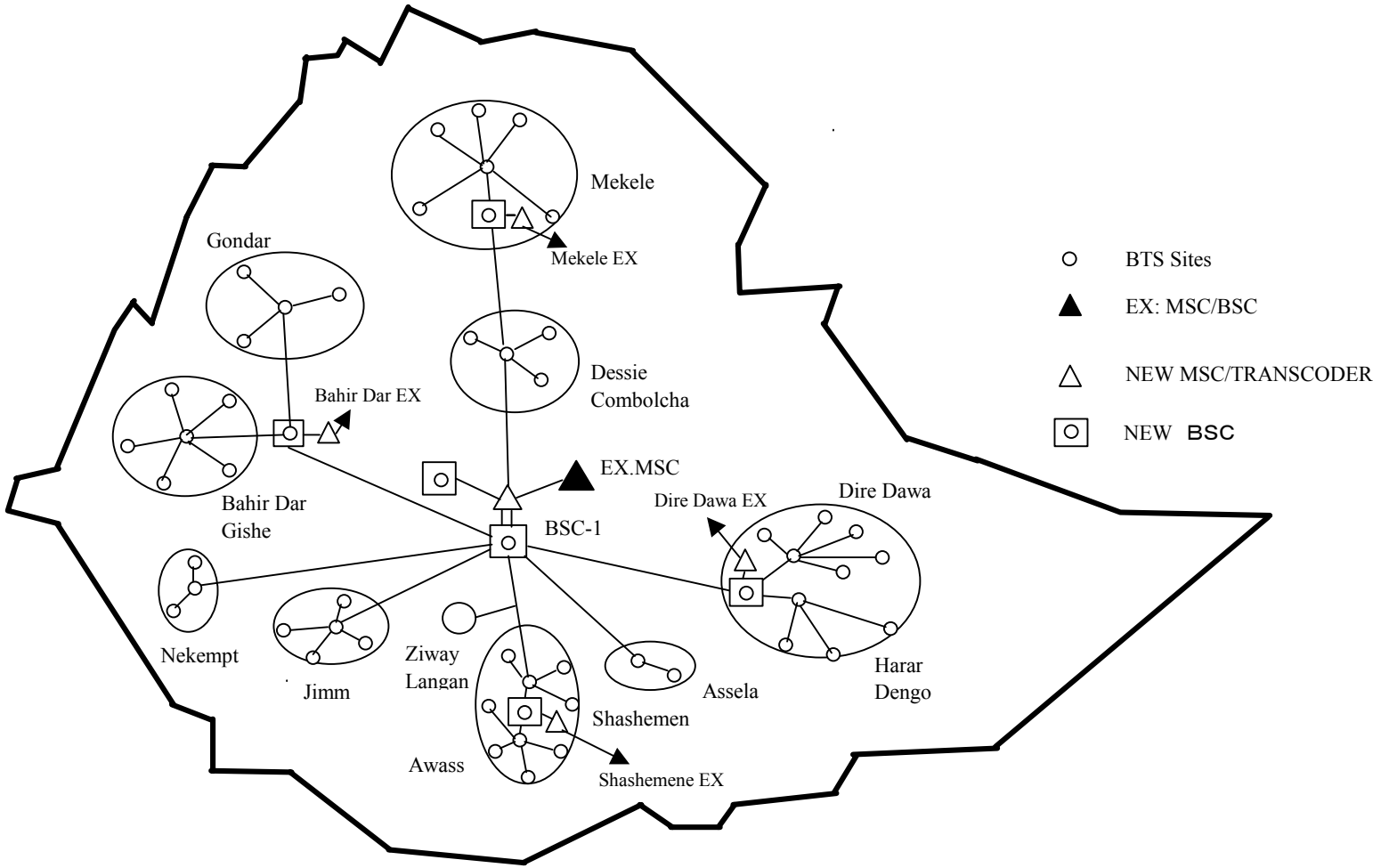


FIG.9.6-2 Service Coverage Plan for 12 Major Cities at Phase 2 Stage, (Reference)

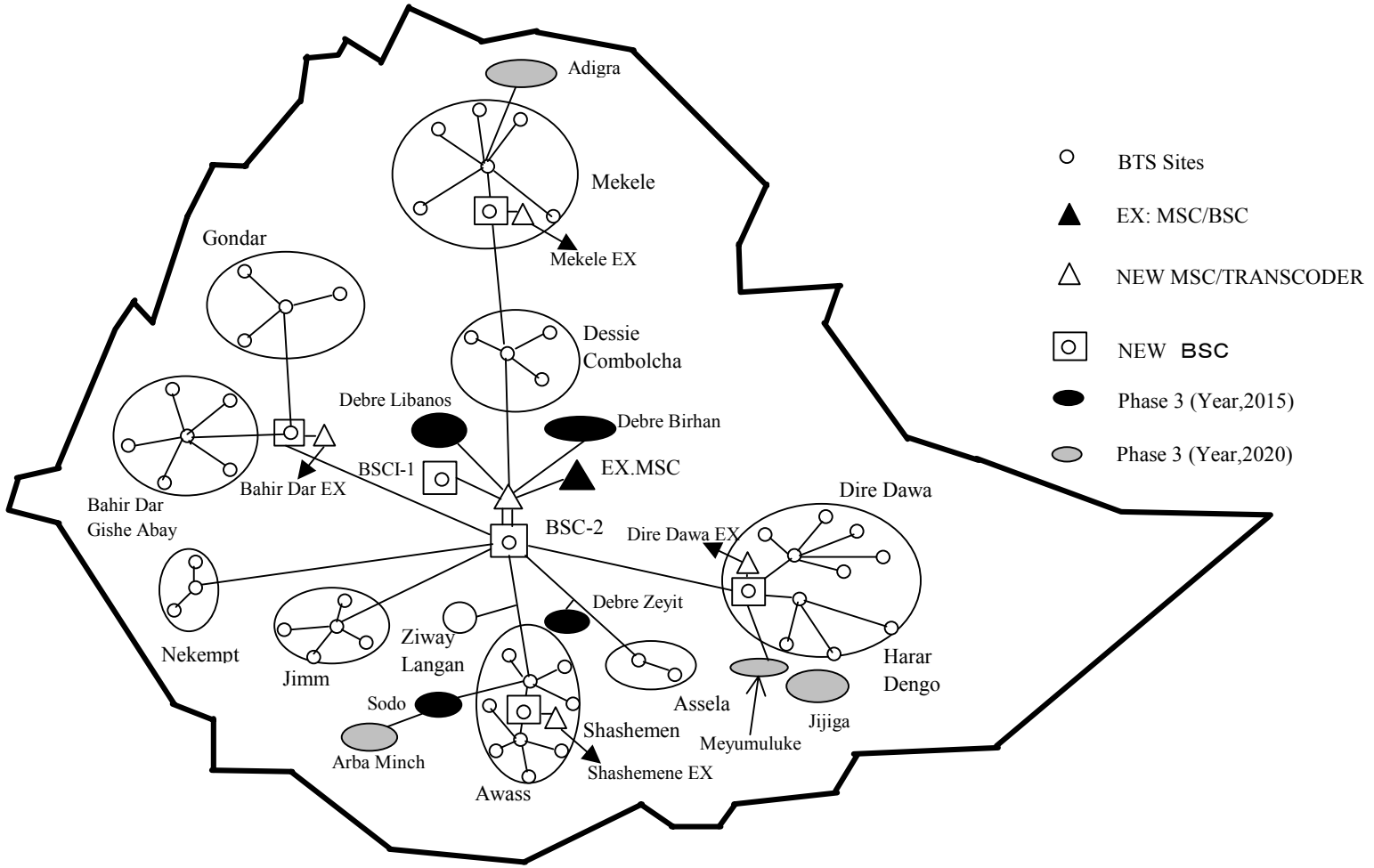


FIG. 9.6-3, Service Coverage Plan for Phase 3 stage, (Reference)