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**TELECOMMUNICATION DEVELOPMENT**

**IN AFRICA\***

**Prepared by**

**the International Telecommunication Union**

11/5

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\* This document has not been edited.

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## 1. Context

In reviewing the state of development of the telecommunication sector in Africa, it is necessary to review the broad context within which the telecommunication services in Africa developed and are being operated with regard to the socio-economic impact of telecommunication, objectives of development, management environment, and technology.

### 1.1 Socio-Economic Impact of Telecommunication

Studies made to determine the macroeconomic and microeconomic benefits of improved telecommunication infrastructure and services, have revealed that at the macro-level:

- (1) the contribution of the telephone to the GNP increases with decreasing GNP per capita;
- (2) the percentage contribution of a telephone to a GNP could be a 1000 times greater for low GNP/countries compared to its contribution in countries with high GNP per capita.

This relation, particularly, holds true for countries with GNP per capita of less than US\$ 2,000 per annum. In Africa, at the end of 1987 only 4 (8%) out of a total of 51 countries had GNP/per capita of over \$ 2,000 (see Annex 1).

Moreover, in developing countries the benefits of telecommunication to specific sectors, such as foreign trade and transport, far exceed the investment costs for the telecommunication infrastructure needed for effective support.

In a case study in Kenya of the possible earning/saving of foreign exchange as a result of the provision of improved telecommunication services for the import/export activities of the country, the study revealed that the benefits derived from the export/import sector alone could be as much as 3.6 times the planned investment in the telecommunication sector (Annex 2).

It could be reasonably concluded, therefore, that the potential benefits of investment in telecommunication infrastructure and improved telecommunication services in Africa is, hence, far greater than in other more developed parts of the world.

Furthermore the cost of investment to provide services is far less than the benefits that could be generated as a result of improved telecommunication services, either through reduction of costs or through stimulating the generation of increased revenues.

Due to greater awareness of these benefits, there is today, increased appreciation, by African Governments, of the important role that telecommunications can play in raising the efficiency of economic, commercial and administrative activities and in the national distribution of benefits in a nation.

1.2 Telecommunication Sector Objectives and Strategy

The objectives and strategy for the development of the telecommunication sector in Africa have been laid down in the Lagos Plan of Action for the economic development of the African continent adopted by the Heads of State in December 1980 in Lagos.

These are:

- Rapid development and integration of the telecommunication infrastructure of the continent;
- Improved efficiency of the operation of existing telecommunication facilities;
- The promotion of local telecommunication industry;
- Increased use of local human and material resources and research and development in building the telecommunication service and industry infrastructure.

These objectives have been repeatedly reaffirmed by the Conference of Ministers of Transport and Communication of African States.

The specific objectives pursued by telecommunication administration essentially fall within the broad objectives adopted by the Heads of States of Africa.

Typically these objectives, at national level, fall under the following main categories:

- Expansion of the stock of main lines in service in the larger cities and economic centres to support the country's general economic development and generate the international financing needed to invest infrastructures and services;
- Balanced development between urban and rural areas through greater penetration of services to rural area;
- Appropriate use of new technologies having regard to the environment the level of personnel training and the amortization of existing infrastructures, etc;
- Improved efficiency of the operation and maintenance of existing facilities.

The Transport and Communication Decade for Africa proclaimed by the United Nations in 1977 reinforced these national and continental objectives and placed due emphasis on the integration of the network at a continental level.

### 1.3 Sector Organization and Management

The telecommunication services in Africa are at present operated invariably as a government monopoly. However, within this context of a monopoly the operating organizations in the countries in Africa have various degrees of centralized control by government, or, of common administration of posts and telecommunications.

A recent ITU survey of representative telecommunication administration showed that there are three main variations:

- (1) Direct and centralized control of combined post and telecommunication services, as department(s) under a Ministry and an allocated budget;
- (2) State-owned autonomous organization with combined posts and telecommunication services, generally, under a Board of Directors, appointed by the concerned Minister and financially self-supporting.
- (3) State-owned autonomous organization to operate telecommunications services, under a government appointed Board of Directors and financially self-supporting.

A further variation which has been a legacy of the colonial area, is the separation of international and domestic services. This arrangement has been, however, phasing out rapidly.

Better operational efficiency is achieved with increased autonomous status of a telecommunication organization, largely, due to the creation of a better environment for application of appropriate systems of management for human, material and financial resources utilization.

The future evolution of the structure and management of the telecommunication services in Africa tends towards to greater degree of autonomy of the telecommunication organization. The general trend of privatization in industrialized countries of the telecommunication services and the positive results obtained is being watched with interest by the developing countries in Africa. Some countries, on a modest scale, are giving serious consideration as to the extent and level of privatization that can already be introduced. Benefits expected are improved resource mobilization and utilization and more rapid introduction of new technology and better response to unmet demand.

This trend will have significant implication for the establishment of local manufacturing of telecommunication equipment, both structurally and in the stimulation of entrepreneurs and in terms of resource mobilization from internal and external sources.

The pace of structural change towards privatization, however, will vary widely among African countries pending on the conduciveness of the prevailing economic and political environment.

#### 1.4 Technology

The greater part of the telecommunications equipment operating in Africa uses analogue electromechanical systems.

Because of the rapid pace of the change in telecommunication technology in the past two decades, African countries have been facing important decisions as to the choice of technology (analogue or digital) for their network extension. That phase has now passed and digital equipment is being procured almost universally for switching and transmission equipment.

Furthermore, the pressure of rapid technological advance is accelerating the obsolescence of existing facilities in the sense that, existing equipment cannot be maintained due to lack of spares and due to the phasing out of support services for the existing technology by equipment suppliers. Moreover, for new installations, only new technology equipment is available on the market increasing the pressure for change.

In general, the shift from electromechanical to microelectronics technology could create a more favourable environment for the development of telecommunication services and industry for the following reasons.

##### 1.4.1 Network Aspect

The countries in Africa are less encumbered by the analogue equipment due to the very small size of their existing networks compared to the developed countries.

Two other main advantages for Africa are also apparent. Firstly, African countries will be by-passing, the analogue technology and hence, immediately benefit from the cost, flexibility and the greater efficiency advantages that ensue from digital telecommunication technology.

Secondly, the potential for development of the market in African countries, provided economic obstacles are overcome, is great and is the cause for the fierce competition to establish footholds in African countries by major suppliers. The situation creates a favourable negotiating position for the transfer of technology as part of the process of procurement of equipment. The situation has been successfully exploited by several countries in other regions of the world.

##### 1.4.2 Industry Aspect

The shift from electromechanical technology to microelectronics in the production of telecommunication equipment has resulted in changes in the nature of the production process and towards greater simplicity.

The new technology has inherent features which could increase the possibility of entry of new modest sized producers, such as the African countries, into the market viz:

- a) Design of units is modular starting at basic levels;
- b) intensive use of integrated semiconductor components tends to make manufacturing more of an assembly process;
- c) Manufacture of the various units is not necessarily interdependent and integrated, with less demanding interfacing requirements than analogue systems
- d) Assembly stage skill level needed is not high and greater emphasis is on the software design and programming skills;
- e) Similarity and dependence of other information technology equipment essentially on the same process of production and components and the possibility of Selection and production of a specific item of equipment due to modularity from design to production and common software design skill characteristics.

## 2. Existing Telecommunications Network

### 2.1 Overall Situation

A comparison of the state of the telecommunication sector in African countries and in developed countries, with a comparable size of populations is presented in the tables of Annexes 3 and 4.

The data in these two tables reveal two major problems in the telecommunication sector in Africa.

Firstly, even at the present low levels of GDP/Capita, the investment in the telecommunication sector in the majority of African countries is far below the level that would be considered satisfactory for effective support and stimulation of economic activities and growth in other economic sectors.

Secondly, the quality of telecommunications services offered to users by the existing telecommunication network is, generally, not of acceptable standards.

The African Telecommunication Development Conference (Tunisia, January 1987), in reviewing the situation of the existing telecommunication network in Africa, attributed, the prevailing unsatisfactory state of the telecommunication services in Africa, to a number of inter-dependent and re-inforcing weaknesses in the sector. The major ones are mentioned here:

- The organization and management of the telecommunications sector, in many African countries is not appropriate and not conducive to rapid development and efficient operations of the telecommunication services.
- The standard of maintenance of the existing telecommunication network is poor and, over an extended period causes severe deterioration of operating telecommunication equipment. The consequence, often, is a costly programme of network rehabilitation or replacement, to restore telecommunication services to previously attained levels; resulting in a static cycle in sector development.
- In some African countries, poor planning such as unbalanced investment in the network together with inefficient operational practices result in under-utilization of existing facilities;



- With regard to manpower, in addition to the perennial shortage of skilled and experienced manpower at all levels, low productivity is also a serious obstacle to efficiency in the operation of the telecommunication services. The main cause low staff morale arises from inadequacies in the management systems and practices, in particular those affecting personnel policy and remuneration.
- Financial resources for investment in particular, the foreign currency component is never adequate. In a number of African countries, even operations and maintenance of existing telecommunications facilities are hampered due to inability to procure spares, tools, vehicles and maintenance materials contributing to the premature deterioration of costly telecommunications facilities.

As a consequence, the telecommunication sector in many African countries continues to be a heavy financial burden on Governments instead of being an important source of revenue generation and of self-sustained growth and playing a positive supporting role to other economic growth sectors.

The problems that confront African telecommunications administrations are hence complex and the development of the telecommunication services is a task of enormous proportions.

The state of the telecommunication sector infrastructure in Africa is briefly reviewed below at the national network and regional network level. Data on the size of the telecommunication network in each country is presented in Annex 5.

## 2.2 National Networks

The following summary table gives an overall size of the existing telecommunication facilities in Africa during 1986/1987.

TABLE 1

	Africa all	Africa s/Sahara	Africa North	Total World (1987)
Population million	556	447	109	
Average GDP/Capita	544	387	1295	
Connected lines	3461	1214	2247	
Telephone sets	4518	1870	2648	
Exchange capacity teleph.	4667	2003	2664	
Writers Telephone	1953	522	1431	
Unmet demand %	36	30	35	
Telephone density/100	0.67	0.3	2.06	
Tel. density growth %	6.72	2.14	2.06	
Telephone growth %	10.35	5.9	-	
Population growth %	2.75	2.82	2.6	

The level of development of the telecommunication network is very low. The number of connected telephone lines in Africa constitutes less than 1% of the total installed in the world.

The telephone density, particularly for the 46 countries of Africa South of the Sahara, is not keeping up with the population growth rate. The telephone density growth rate is negative. There is also a constantly high level of unsatisfied demand of up to 36%.

The economic stagnation of African countries in the last decade is one major cause of the situation. In terms of investment, the present invested capital in telecommunication in Africa, corresponding to the exchange capacity of 4.7 million lines may be estimated to be approximately as follows:

- Exchange equipment including local network + subscriber equipment .....	US\$ 14.5 billion
- Transmission equipment (20%) .....	US\$ 3.5 billion
Total .....	US\$ 18 billion
- A per capital total investment of .....	US\$ 32

This amount of money corresponds approximately to the yearly investment in telecommunication in the US in 1981 amounting to a yearly per capita investment of US\$ 80.

The rate of development of the telecommunication subsector in Africa is evidently severely hampered by under-investment.

### 2.3 Regional Network

Telecommunication constitutes a vital component in the socio-economic integration of the countries of Africa. In recognition of this important role of telecommunications, African countries as early as 1962 agreed to coordinate their efforts to establish the Pan-African Telecommunications Network (PANAFTEL).

Steady progress has been made in this respect since 1962.

The following summary highlights the achievements:

- 38 international automatic telephone exchanges have been installed or are under construction.
- 44 countries already had semi-or fully automatic international telex exchanges by the end of 1986.
- 73 satellite earth stations for international service are in operation, under construction, or in the planning stages for 50 African countries. In addition, nine countries in Africa are installing or already operating domestic satellite communication systems, including one in the ARABSAT system.

- The West African inland route linking Senegal, Mali, Burkina Faso, Niger and Benin is fully operational with automatic service available in two sections.
- Under the ECOWAS programme, two microwave links (Mali-Côte d'Ivoire and Burkina Faso-Ghana) came into service during 1986. Four other links forming part of the same programme are under construction and were ready for service by mid-1988, thus providing additional links between eight countries.
- The East African north-south route from Djibouti to Botswana via Ethiopia, Kenya, Tanzania, Zambia and Zimbabwe is operational with a semi-automatic service.
- Thirty countries operate direct satellite communication circuits with other African countries.
- Steps are being taken to increase the capacity of the submarine cable originating in Europe and connecting Morocco, Senegal, the Côte d'Ivoire and Nigeria by the installation of TASI equipment.

The states of development of the PANAFTEL network is shown in Annex 6.

In 1988, African countries launched a feasibility study for a Regional African Satellite Communication System for the Development of Africa (RASCOS). The study lays great emphasis on meeting the telecommunications needs of rural Africa in a continental context. The coming decade is foreseen to be a period of phased and coordinated implementation of the RASCOS project. It is hoped that the RASCOS project will come up with a viable solution to the rural telecommunication requirements of African countries.

### 3. Future Development

It is extremely difficult to forecast with accuracy the level of the future development of Telecommunication services in Africa due to the fact that there is scant reliable historical data on the subject. This fact holds true for both forecasting at a national level and for the continent as a whole.

In the data collection exercise for the African Satellite Communication system feasibility study (RASCOS), an attempt was made to gather information on the long-term development plans of each country up to the year 2005. Only a dozen African countries supplied the data which is presented in the table below.

In the summary table, the quantity of the new equipment to be procured for the major categories of equipment are presented and a comparison is made for switching equipment and telephones and telex subscriber terminals with the situation in 1986/1987. The detailed forecast by each country concerned is presented in Annex 7.

TABLE 2

New Equipment to be Procured by the Year 2005  
by the Countries listed

	1986/1987	2005 (additional)	
Telephone (units)	938,500	2,942,800	Botswana, Cameroon, CAR, Congo, Ethiopia, Mozambique, Seychelles, Sierra Leone, Swaziland, Tanzania, Tunisia, Zaire
Telex Terminal (units)	8,350	97,480	
Telephone Exchange (lines)	628,780	1,558,400	
Telex Exchange (lines)	11,269	31,700	

(Source Annex 7)

The size of the corresponding additional local cable network and transmission equipment could be taken to increase by the same ratio in magnitude. The data indicates that the network size in these countries will, on the average, increase to approximately 4 times of its 1986 size in 20 years. It implies essentially a yearly growth of the network of about 6%.

These forecasts have been made in the environment of an adverse and stagnant economic situations in general in Africa and tend to be rather conservative.

For comparison, it is useful to consider setting tentative targets for telephone density. The average annual rates of population growth of the continent of Africa as a whole is expected to level to 3% by the year 2005-the total population increasing to 993 million inhabitants compared to 556 million in 1986.

For a telephone density of 1 DEL/100 inhabitants, the size of the network will be about 10 million connected telephone lines which corresponds to a yearly average network growth of 6%.

On the other hand, for the African countries whose average telephone density in 1986/1987 was 0.3, and whose total population was estimated at 447 million, and will be increasing to 807 million by the year 2005, it will imply an increase from 2 million lines to 8 million lines - a four fold increase and an annual growth rate for the network of 7% only.

It is apparent, from these very rough estimates that, a much accelerated growth rate will be needed for the telecommunication sector, if African countries are to draw the full socio-economic benefits that the information age of the 21 century will be able to offer.

A more desirable target for annual growth of the network would be in the range of 15%. For the whole of Africa, it would result in a telephone density of 4.5 lines/100 inhabitants by the year 2005, which will be still only 50% the estimated world average of 9 lines/100 at the end of 1987.

For African countries South of the Sahara, it will mean more than a ten-fold increase in density compared to 1986/1987.

The attainment of such expansion, although rather modest in absolute terms, compared to other region of the world, will be, by itself, a great improvement on present trends.

Taking a telephone connection growth rate of 15% for the first 10 years and 12% for the next, a projection of the market size of equipment for switching, for example, would then be as follows:

	1987	1990	1995	2000	2005
Lines: 15%(x 1000)	3,460	5,262	10,584	18,652	32,870
Population (3%) Million	556	607	703	815	845
Telephone/100	0.62	0.87	1.5	2.3	3.9
Increase/lines		1,802	5,322	8,064	14,218

Taking past trend and present conditions, these figures may appear unachievable.

However, there have been cases in Africa, where, under the right operating and organizational environment, far greater rates of growth have been recorded.

With appropriate sub-sector organization and management system and ease of access to foreign exchange, the growth rate of 15% could be considered an achievable target.

#### 4. Telecommunication Industry

##### 4.1 Existing Situation

There are no sizeable telecommunication equipment production facilities in Africa. The Annex 8 lists the countries where local productions of telecommunication equipment of one sort or other exists. However, there is no detailed information on the items of equipment, and material produced, on specifications and quantities. In some cases, it is even uncertain if production facilities still continue to operate at economic levels of capacity.

It is therefore, difficult to evaluate the role that local industry plays in the development of the telecommunication networks in Africa. Judging from the scant data and the scattered and small size of local production units in Africa of various items of equipment, the contribution of local production in saving scarce foreign exchange and stimulating growth of the sector, is not significant.

Moreover, the existing size of the market in many African countries (in contrast to the potential market) is not attractive.

As indicated earlier, Africa's population was estimated to be 556 million in 1987 with 447 million South of the Sahara. A growth rate of 2% in telephone density amounts to an annual increase of 80,000 subscriber lines/year.

A scenario could be worked out starting from this figure for the equipment that is required to sustain this rate of growth. Taking a high utilization ratio of facilities of 80%, then the requirement will be for:

- switching equipment: 96,000 lines/year
- local network: 340,000 pairs km (2.7 km/subscriber/year)
- transmission terminals: 9,600 terminals/year
- telephone sets: 180,000 sets/year.

It is not possible to make an estimate of the transmission system as the physical configuration of the networks of the countries varies very widely. These values broadly indicate the size of the telecommunication market as it stands today. Due to its physical distribution and fragmentation into the requirements of over 40 countries, the size of the market at present, does not appear to be interesting from the point of promoting local production for any one country.

In addition to the limited size of national markets, there are several other prevailing constraints. The major ones are:

- Low level of economic integration of regional and subregional markets;
- Limited access to foreign exchange both, for investment and operational needs;
- Gradual deterioration of existing production equipment due to lack of spare parts and insufficient local maintenance skills;
- Scarcity of high quality, top level management and technical staff;

- Lack of supporting research and development facilities on processes and products;
- At times, lack of a coherent and consistent industrial policy of governments for the promotion of local industry;
- The agravating situation of the keen competition from and the protectionist attitudes of industrialized countries.

## 5. Future Strategy

The problems enumerated above have been the subject of discussion at several forums in Africa at the national, sub-regional and regional level. A broad outline of the strategy for the development of the telecommunication industry to overcome these obstacles has emerged, as a result, for the telecommunication industry.

These are:

### 1) Linkages

Greater and stronger structural linkage to other industries that supply material and parts and components to support the telecommunications services and industries which should help determine the priority items to be produced by the telecommunication industry and form the basis for the establishment of technically and economically viable local assembly production facilities and workshops for telecommunication products.

### 2. Creation of Research Development Capability

- Research and development is to be directed mainly to the adaptation of processes and products to suit local needs and other characteristics.

It would cover initially a range of items that may not be necessarily telecommunication equipment, but would contribute to the reduction of the foreign exchange burden on the telecommunication services and industry, if locally produced.

### 3. Developing Regional Industrial Cooperation

- The limited size of national markets for telecommunication products and the constraints of resources, both human and material, to establish and operate research and development activities, favour the pooling of resources and effort on a regional level for certain telecommunication products.
- Such cooperation appears highly feasible taking the cooperation mechanisms that have already been created in the regional, such as PATU, PTA, ECOWAS etc.



4. Technology Transfer

African countries ought to give greater consideration to the transfer of technology and know-how during the procurement of telecommunication equipment from industrialized countries. In the preparation of long-term telecommunication network development plans, this aspect of transfer of technology should be included. The orientation of technical cooperation programme, from bilateral or multilateral sources, should also increasingly aim at promoting technology transfer and know-how.

6. Conclusion

1. With the gradual evolution of a more favourable economic environment in Africa, the potential market for telecommunication services and products in Africa is quite enormous. It is, therefore, necessary, at this stage, to chart a strategy for the development of the telecommunications industry in Africa.

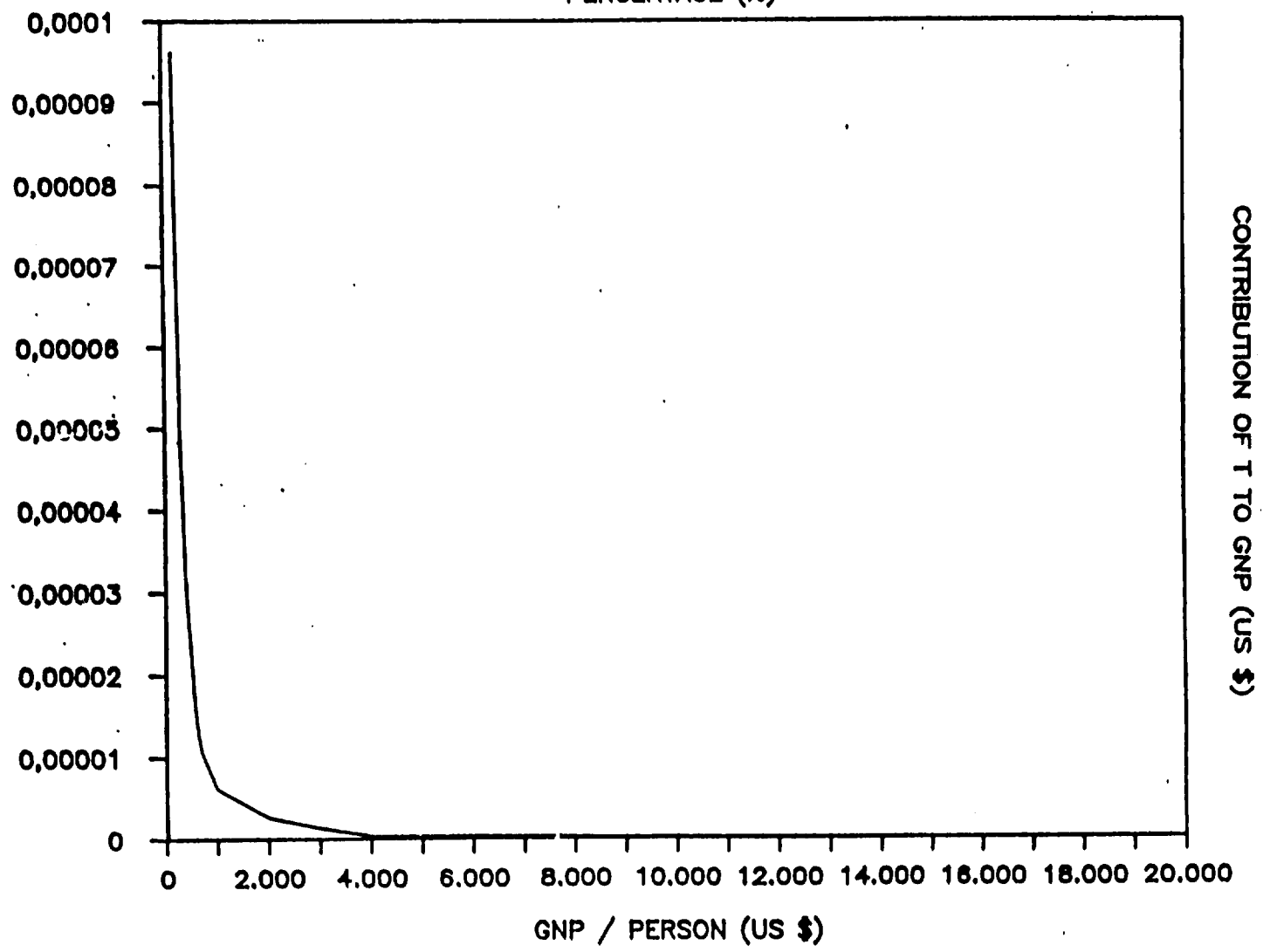
A detailed inventory of existing industrial production facilities of telecommunication equipment needs to be carried out, together with a feasibility study on a national and sub-regional level to determine the appropriate type, location and size and costs and benefits of industries that are economically viable.

To this end, an ITU/UNIDO project for the preliminary stage of such a study, which is being processed for UNDP funding, upon completion, will provide a basis for further detailed study and subsequent action.

2. It is apparent that the population sizes of at least nine African countries will exceed 40 million by the year 2005. Based on the target of 4 telephones/100, serious consideration should be given to the establishment of national telecommunications industries in these countries, well defined plans need to be developed. ed in
3. On-going efforts of African Sub-regional organizations for the integration of sub-regional markets favour sub-regional cooperation in the establishment of telecommunication industries in countries with favourable conditions. This cooperation should include the negotiation of transfer of technology from industrialized nations. It would offer benefits for both sides - the African countries and the providers of technology.
4. The preparation of long-term national development plans for the telecommunications services and industry should be integrated or closely coordinated. As the major purchasers, in almost all countries of Africa, are the telecommunication administration, the industry's output will be highly dependent on the size and rate of development of the telecommunication network.

FIG.1 : CONTRIBUTION OF ONE T/GNP

PERCENTAGE (%) T : TELEPHONE.



SOURCE : ITU

**Summary of Foreign Exchange Benefit-Cost  
Ratio Arising from the proposed  
Telecommunications Expansion Project  
(Kenya)**

---

**A. Benefits**

- Number of export-oriented businesses covered by survey .... 20
  - Annual export volume of these businesses ..... Ksh 4.4. billion
  - Total annual exports of all Kenyan businesses ..... Ksh 24.7 billion
  - Coverage of all exports by surveyed firms ..... 17,7 %
  - Annual foreign-exchange benefits accruing  
to sample firms due to improved telecommunications services..sh 33.0 million
  - Total estimated annual foreign-exchange benefits  
accruing to all firms from improved telecommunications services:
- Ksh 33.9 million - 17.7% ..... Ksh 186.2 million  
US\$ 11.6 million

**B. Costs**

- Foreign exchange capital cost of 5 year development plan.....US\$ 32.6 millio  
(national telecommunications network)
- Annual charge assuming average finance cost over life of project of 6% (above  
rate of inflation) and 4% annual depreciaiton (25 year, straight line)  
..... US\$ 3.26 million

**C. Benefit-Cost Ratio**

US\$ 12.0 Million - US\$ 3.26 million ..... 3.6 : 1

**TABLE I**  
**Country Comparisons - Developing vs. Industrialised**

<b>Population Group (millions)</b>	<b>Country</b>	<b>GDP/Capita U.S. \$</b>	<b>Telephones/100</b>	<b>Date of Statistics</b>
3.0 - 4.0	Benin	310	0.51	1982/1987
	Central African Republic	256	0.1	1987
	Sierra Leone	140	0.46	1987
	Togo	178	0.39	1987
	Ireland	3,890	26.52	1985
	New Zealand	6,509	64.49	1985
	Norway	13,835	62.02	1985
8.0 - 10.0	Angola	442	0.56	1987
	Côte d'Ivoire	598	0.66	1987
	Mali	130	0.13	1987
	Zimbabwe	560	2.05	1987
	Austria	8,809	49.22	1985
	Belgium	9,619	44.01	1985
	Sweden	12,001	89.00	1985
30 - 100	Egypt	825	2.6	1987
	Ethiopia	139	0.28	1987
	Nigeria	560	0.32	1987
	Zaire	190	1.18	1982/1987
	Spain	4,340	36.27	1985
	Italy	6,548	44.76	1985
	United Kingdom	7,529	54.00	1985
	France	10,735	60.08	1985

**TABLE II**  
**Indicators of Quality of Service**

Quality of Service Indicators	Range of Values in Africa	Range of Values in Industrialised Countries
Completion rate of automatic telephone calls :		
- Local	50 - 70 %	60 - 70 %
- National	20 - 25 %	55 - 65 %
- International	20 - 30 %	35 - 40 %
Completion rate of manual international telephone calls		
- within 1 hour	40 %	80 %
- within 2 hours	60 %	90 %
- overall	70 %	95 %
Number of faults per subscriber per year	1.4 - 6.0	0.25 - 0.5
Speed of fault clearance :		
% cleared same day	10 - 35 %	70 - 80 %
% cleared same day + 1	40 - 60 %	80 %
% cleared within 7 days	60 - 80 %	99 %
Traffic loss in exchange due to technical reasons	10 %	2 %

Telecommunication Statistics

REGION	COUNTRY	POPULATION	GDP/CAP	MAIN LINES	TELEPHONES	TELEPHONE EXCH. CAP	GROWTH(%) DEL	DENSITY DEL/100	GROWTH(%) DEL/100
AFRICA	ALGERIA	23.50	2590	634.90	769.00	806	13.26	2.70	10.27
	EGYPT	52.00	760	1118.00	1200	1238	12.94	2.15	N/A
	LIBYA	N/A	N/A	270.00	325	305	N/A	ERR	N/A
	MOROCCO	23.37	590	266.19	311	303.4	6.55	1.14	N/A
	TUNISIA	7.60	1140	227.70	367.8	317	11.25	3.00	N/A
	ANGOLA	9.00	N/A	62.00	46.6	65.2	N/A	0.59	
	BENIN	4.10	270	13.00	17	22.8	6.94	0.32	4.80
	BOTSWANA	1.17	840	10.95	20.2	14	8.10	0.94	2.52
	BURK. FASO	8.70	150	11.56	16	18.9	12.56	0.13	7.12
	BURUNDI	4.92	240	6.60	6.6	8.1	12.15	0.13	5.73
	CAMEROON	11.20	910	32.40	41.56	41	8.07	0.29	2.77
	CAPE VERDE	0.32	340	3.95	5.72	10	1.5	1.23	1.5
	C.A.R.	2.70	290	3.90	5	9.1	5.42	0.14	1.95
	CONGO	1.90	990	10.57	12.5	11.6	4.85	0.56	0.61
	COTE D'IVO	10.70	730	65.00	72	83.3	N/A	0.61	N/A
	DJIBOUTI	0.37	N/A	4.45	8.09	6	9.79	1.20	8.01
	ETHIOPIA	47.30	120	108.00	126.4	124	6.89	0.23	1.57
	GABON	1.06	N/A	14.00	26	29.3	N/A	1.32	N/A
	GAMBIA	0.70	N/A	3.00	3.85*	n/a	6.12	0.43	3.41
	GHANA	13.40	390	39.60	72.6	55.3	1.04	0.30	-2.01
	EQT. GUINEA								
	GUINEA	6.70	N/A	N/A	21.2	18.5	13.00	0.24	N/A
	GUINEA B.	0.8	180	6.23	7.5	6.8	11.3	0.78	n/a
	KENYA	22.03	300	145.27	272	181.6	9.29	0.66	4.61
	LESOTHO	1.60	370	8.98	16.2	13.6	N/A	0.56	N/A
	MADAGASCAR	10.00	230	23.46	30.1	32.2	3.45	0.23	3.39
	MALAWI	8.00	160	22.47	44	303.4	5.91	0.28	2.21
	MAURITIUS	1.02	1200	46.00	67.6	47.8	9.76	4.51	8.38
	MAURITANIA	1.80	420	4.08	5.3	6.07	N/A	0.23	N/A
	MOZAMBIQUE	14.55	210	40.17	59.7	49.8	3.57	0.28	1.27
	NIGER	6.60	260	9.00	11.9	14.1	6.61	0.14	3.82
	NIGERIA	103.00	640	200.00	259.6	329	N/A	0.19	N/A
	UGANDA	15.30	230	27.85	57.3	51.2	2.35	0.18	0.00
RWANDA	6.70	290	6.60	8.84	n/a	10.37	0.10	5.84	
SAO TOME P.	0.108	342	2	2.87	2.85	20	1.85	N/A	
SENEGAL	6.70	420	27.40	35.15	33.2	5.92	0.41	2.37	
SIERRA L.	3.85	310	15.10	18.38	14.8	4.72	0.39	1.73	
SOMALIA	5.4	264	9.1	10	9.1	N/A	0.17	N/A	
SUDAN	22.60	320	58.00	70.76	68.83	4.59	0.26	1.11	
SWAZILAND	0.71	400	9.64	20.8	14.9	10.58	1.36	6.68	
TANZANIA	24.00	250	58.80	127.6	53.3	5.93	0.25	2.51	
CHAD	5.18	N/A	2.40	3.2	2.4	N/A	0.05	N/A	
TOGO	3.25	250	9.90	13.8	9.3	6.54	0.30	2.51	
ZAIRE	31.70	160	29.00	38.8	39.8	1.97	0.09	0.00	
ZAMBIA	7.20	300	51.76	87.75	75.6	6.45	0.72	3.25	
ZIMBABWE	8.60	600	112.80	186.3	156.2	2.49	1.31	0.00	

NOTES:

(1) Source - Yearbook of Common Carrier Telecommunication Statistics, 1986 & 1987

(2) population in Millions; Main Lines in Thousands;

Currency in US\$

(3) Average growth rates cover the period 1980 to 1986



## TELECOMMUNICATION INVESTMENT

## A - SUBSCRIBER APPARATUS FORECAST - 1988 - 2005

Year Quantity	Botswana	Cameroon	CAR	Congo	Ethiopia	Mozambique	Seychelles	Sierra	Swaziland	Tanzania	Tunisia	Zambia	Zaire	Total	Existing Total 1986-1987
1.1 Telephone	43,446	403,360	61,114	19,239	655,000	245,000	13,600	20,000	171,296	1,105,800	165,000	174,890	41,890	2,942,751	938,490
1.2 PBXs	1,806	8,000	87	34	2,000	800	119	31	3,300	6,800	-	-	1,600	24,577	-
1.3 Facsimile machines	364	3,780	150	-	5,275	1,000	71	-	-	-	-	-	1,000	11,840	-
1.4 Telex machines	1,103	26,740	1,200	498	3,442	5,700	95	-	400	38,100	3,000	4,504	2,700	97,482	8,347
1.5 Data Equipment	160	3,210	-	-	742	2,000	89	-	-	41,730	-	-	-	49,931	-
1.6 PCD	-	-	314	20	4,398	22,000	222	50	-	4,00	1,000	-	-	31,944	-



## TELECOMMUNICATIONS INVESTMENT

## INVESTMENT - EQUIPMENT FORECAST (1988-2005)

## B. SWITCHING EQUIPMENT - TRANSMISSION EQUIPMENT - LOCAL NETWORK MATERIAL

Year Quantity	Cameroon	CAR	Congo	Ethiopia	Mozambique	Tunisia	Zambia	Zaire	Total	Total Existing Equipment (1986-1987)
2. Switching Equipment Lines	577,280	22,700	12,000	347,500	145,260	206,000	103,100	45,800	1,558,368	638,780
3. Telex Switching Equipment Lines	43,000 (5)	1,118	510	4,200	5,000	4,000	4,504	4,000	31,728	11,269
4.1 PCM Terminal Units	2,661 (analogue)	3	164	12	1,244	522	-	-	5,138	N/A
4.2 Digital Radio Stations (1+1) Various capacity	562	16	103	300	631	42	-	295	2,037	N/A
4.3 Fibre Optics p/km	5,420	-	-	200	1,000	4,100	30	-	14,020	N/A
4.4 Earth Stations (No.)	32	-	-	21	38	-	1	-	127	73
5. Overhead Underground local network p-km	1,400,000	121,000	30,000	7,780,000	296,000	553,000	186,000	147,000	14,055,000	N/A

TELECOMMUNICATION INDUSTRIES ( Existing)

Country Products	C A M E R O O N	E G Y P T	M A D A G A S C A R	N I G E R I A	Z A M B I A	Z I M B A B W E
	1	2	3	4	5	6
Telephone sets	x	x				x
Batteries		x	x	x	x	x
Cables		x		x	x	x
Switching equipment		x	x*			x
Power equipment		x				x
Transmission equipment		x				x
Local network equipment		x				x
Electronic sub-assemblies		x	x*			x
Poles		x		x		
FVC ducts	x	x		x	x	x

\* Prototypes developed by the national telecommunication laboratory