

**ECONOMIC RESEARCH PAPERS**

**NO. 46**

**Infrastructure in Africa:  
The Record**

By

Afeikhena Jerome  
University of Ibadan, Nigeria

The views and interpretations in this paper are those of the author  
and not necessarily those of the African Development Bank

# INFRASTRUCTURE IN AFRICA: THE RECORD<sup>1</sup>

## 1. Introduction

In recent years, there has been a resurgence of interest in infrastructure development and policy reform in developing economies, with much of the debate centering on efficiency of use and an increased role for private sector participation in the provision of infrastructure (Jimenez, 1995; Mody, 1996; Kerf and Smith, 1996; and World Bank, 1994). The apparent interest emanates principally from the growing realization that human and physical infrastructure are critical elements for economic growth and poverty reduction. Infrastructure plays a pointed, often decisive-role in determining the overall productivity and development of a country's economy, as well as the quality of life of its citizens.

A broader source of interest, however, derives from the generally poor performance of state-owned monopolies, combined with the rapid globalization of the world economies, which has brought into sharp focus the economic costs of inadequate infrastructure and prompted a growing number of developing countries to seek new initiatives in promoting competition, private entry and foreign interest in the provision of infrastructure.

The term 'infrastructure' was coined during the Second World War by military strategists to indicate wide-ranging elements of war logistics. Thereafter, development economists began to use the term interchangeably with 'overhead capital' considered to include:

those services without which primary, secondary and tertiary production activities cannot function. In its widest sense, it includes all public services from law and order through education and public health to transportation, communication, power and water supply as well as such agricultural overhead capital as irrigation and drainage systems (Hirschman, 1958: 83).

There is no consensus in the literature on a common definition of infrastructure. What remains indisputable, however, is that is that they share some common characteristics which have hitherto been used to justify state involvement in their provision and

---

<sup>1</sup> A Background paper prepared for the African Development Report 1999.

financing. These characteristics include scale economies in production, consumption externalities and non-excludability. They are equally not generally tradeable.

Broadly defined, infrastructure refers to all basic inputs into and requirements for the proper functioning of the economy. They are usually grouped into two. The first category is social infrastructure, such as education and health which facilitate the supply of skilled and healthy personnel to manage and operate other resources. They also enhance the economic, political and social empowerment of the populace, with the attendant positive effects on poverty alleviation and efficient use of national resources. The second category is often referred to as economic infrastructure. Mody (1997) defines this category of infrastructure as the facilities that provide society with the services necessary to conduct daily life and to engage in productive activities. These include power, transportation, telecommunications, water, sanitation and safe water disposal, among other things. This report is devoted to the study of the complementary physical infrastructure, comprising telecommunications, power, transport (roads, railways, ports and airports), water supply, and sewerage.

Infrastructure has a pervasive influence on the whole economy. Telecommunications, electricity and water are used in the production process of virtually every sector of an economy, while transportation is necessary for the distribution of commodities. The quantity and quality of these services are therefore an important determinant of private sector productivity and output. In fact, there is a strong association between the availability of certain infrastructure -telecommunications (in particular), power, surfaced roads and safe water - and per capita GDP<sup>2</sup>. The relationship involves

---

<sup>2</sup>See World Bank (1994), Chapter 1.

both the supply side, in terms of the contribution of infrastructure to the generation of higher GDP, and the demand side, as higher incomes in turn generate higher demands for infrastructure services. Infrastructure thus makes an important contribution to expanding output.

Africa trails the rest of the world, both in the extent and quality of infrastructure. Notwithstanding the large amount of scarce economic resources absorbed in the development of infrastructure in Africa, there is clear evidence that the provision of infrastructure has been much below standard both in terms of quantity and quality in relative and absolute terms. Infrastructure bottlenecks continue to exist, particularly in the management of current stock.

Traditionally, infrastructure services have been viewed as public goods and the primary responsibilities for their provision have been entrusted to the government-owned 'natural monopolies'. Consequently, these sectors have become inextricably entangled with the public sector that dominated it. While the performance of government-owned providers of infrastructure, vary from one country to another, their overall performance in Africa has been very poor. The sector is characterized by operational inefficiency, lack of technological dynamism and poor service to consumers. In addition to their inadequacy, the provision of infrastructural services in most African countries is characterized by high prices compared with per capita incomes and long waiting time (several years in some countries) between the time of application for services and actual connection.

The cost of waste, in terms of forgone economic growth and lost opportunities for poverty reduction and environmental improvements, are unimaginably high. Poor

infrastructure is a major obstacle to the region's economic growth, and adversely affects the living standards of its people. Inadequate infrastructure adversely impacts on health, education and the capacity for effective governance as well as on the ability of industries to compete in international markets. Most evaluations of structural adjustment programmes in Africa point to deficiencies in infrastructure as a major cause of poor supply response in economies under reform (Ghura and Hadjimichael, 1996).

The provision of efficient infrastructure is important for the development of the continent particularly in view of the fact that many of its countries are landlocked. As shown in recent literature on the economics of geography, nearly all landlocked countries in the world are poor, except a handful in Western Europe that are closely integrated into the EC via an efficient infrastructure which facilitates low-cost trade.

This chapter takes stock of the state of infrastructure in Africa, investigates more deeply the root causes of the present unsatisfactory outcomes and explores the strategies and policies that can be instituted to improve infrastructure delivery in the pursuit of the overarching objectives of private-sector-led growth and poverty reduction. Accordingly, the paper is divided into four sections. The database on infrastructure in Africa is presented in section 2 while the record of infrastructure service is the focus of section 3. An appraisal of the causal factors in the dismal performance is conducted in section 4.

## **2. Data on Infrastructure in Africa**

Data on the different types of infrastructure in Africa are sketchy and difficult to find in one publication. An extensive database of physical infrastructure stock for a cross-section of 102 countries have been compiled and presented in the Appendix. The database has

been compiled for 53 African countries by region according to ADB classification. To allow for comparison, similar data is presented for 17 countries in Latin America, 8 countries in South East Asia and 24 OECD countries. The database comprises six measures:

- . Population, GNP per capita and percentage of population with access to safe water and sanitation;
- . Kilometres of paved roads;
- . Kilometres of railway lines;
- . Statistics on the power sector;
- . Telecommunication statistics; and
- . Information technology.

Apart from physical stocks, the database also provides some measures of the quality of infrastructure.

White It is imperative to sound a note of caution on these global statistics given their comparative basis, it should be noted, however, that the data provides a rough, albeit, useful basis for analyzing the development of infrastructure on a comparative global and regional basis. The data reveals a strong association between infrastructure capacity and level of development. Countries with lower income level are associated with lower levels of infrastructure capacity and service provision. It should be borne in mind that the performance of most African countries in all the indicators is quite dismal.

### **3. The Record of Infrastructure in Africa**

It is crucial to examine in greater details the situation in the major infrastructure sub-sectors with a view to highlighting the peculiarities of each sub-sector. For each type of infrastructure , the section examines the state of the available networks, tariffs charged,

supply and demand patterns, service quality; industry bottlenecks, and environmental consideration.

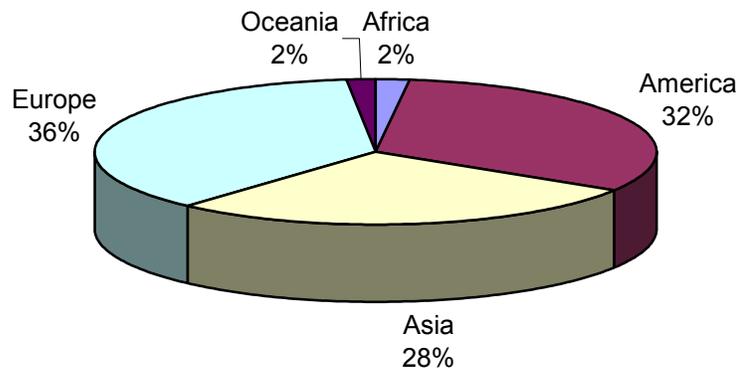
### **3.1 Telecommunications**

Telecommunications infrastructure lies at the heart of the information economy. Countries lacking modern telecommunications system cannot compete effectively in the global economy. The telecommunications industry in Africa has made limited progress despite concerted efforts and programs aimed at modernizing and expanding the sub-sector.

#### **3.1.1 Networks**

Despite the giant strides which a number of African countries have taken in reforming the telecommunications sub-sector in recent years, telecommunication coverage in Africa is amongst the lowest in the world. There are more telephones in Brazil than the whole of Africa. While Brazil has 15,105.9 main telephone lines, Africa has only 13, 695.1 main telephone lines. Africa accounts for only two per cent of telephone main telephone lines globally as shown in chart 1. Low network densities, long waiting

**Chart 1: Main telephone lines**



Source : International Telecommunication Union.

times for access to services, and clear willingness of some users to pay for access to the service illustrate the significant shortage of telecommunications services in the region.

The most common measure of telecommunications access is teledensity or the number of main telephone lines per 100 inhabitants. In 1996, teledensity varied from 0.08 in Democratic Republic of Congo to 34.01 in Reunion. Africa averages 1.85 compared to 30.38 in the Americas, 6.02 in Asia, 30.60 in Europe and 40.39 in Oceania.

There are substantial differences among the African sub-regions, with four countries currently in the forefront; namely, Reunion 34.01, Seychellis 19.51, Mauritius 16.21 and South Africa 10.2 . The laggards are sub-Saharan African countries with an average teledensity of 0.52. As many as 34 countries in Africa still have a teledensity of less than 1. These differences among countries are associated in part with variations in per capita GDP.<sup>3</sup> In part, GDP per capita may serve as an indicator of the extent of a country's rural population, which tended to receive fewer infrastructure services than urban areas did. It

may also reflect the affordability of services. However, a nation's teledensity is usually quoted as an average thus masking regional variability. For example, the distribution of telephone networks in South Africa presents striking internal contrasts. The average teledensity in South Africa is 10.05, but on a provisional level, this ranges between 22 in Gauteng (the region around Johannesburg and Pretoria) and 2 in the Northern province.

The distribution of telecommunications services is biased in most African countries in favour of the urban areas, which account for over 80 per cent of the services, while the rural areas, where over 80 per cent of the population reside, enjoy 20 per cent of the service. About 72.9 per cent of telecommunications mainlines were in urban areas in 1995 compared to 27.1 per cent in rural areas. Two countries, however, had most of their telephone mainlines located in rural areas. These are Sao-Tome and Principe (87.0 per cent) and Central African Rep. (57.0 per cent).

In terms of quality, networks are burdened with a high percentage of outmoded equipment and high fault rates. The information on faults per main lines, a standard measure of service quality, indicates that the average faults per 100 main lines for the region in 1996 was 78.1 compared with an average rate of 8.9 for America, 19.9 for Europe, 43.7 for Asia and 47.8 for Oceania. The recorded fault rates in the region, however, range widely- from 1.0 (Eritrea) to 937.5(Guinea).

The most effective route to increasing service quality is the installation of digital exchanges. African countries are striving to modernize their systems - albeit at great cost - in order to remain plugged into the global network. Many telecommunications authorities in Africa, especially in those countries undergoing reforms are installing

---

<sup>3</sup>See Internal Telecommunication Union/OECD (1994a).

digital technologies and costly equipment in order to become competitive. In the absence of local manufactures, African countries are dependent on industries outside the region for the purchase of telecommunications equipment and spare parts. Such imports are generally made on a non- selective basis of 'ready-made' packages with little room for adaptation to local needs through local enterprise and know-how. Consequently, telecommunications services in Africa do not have the usual multiplier effects (via research and development, local manufacturing, services and employment) as they do in other regions of the world.

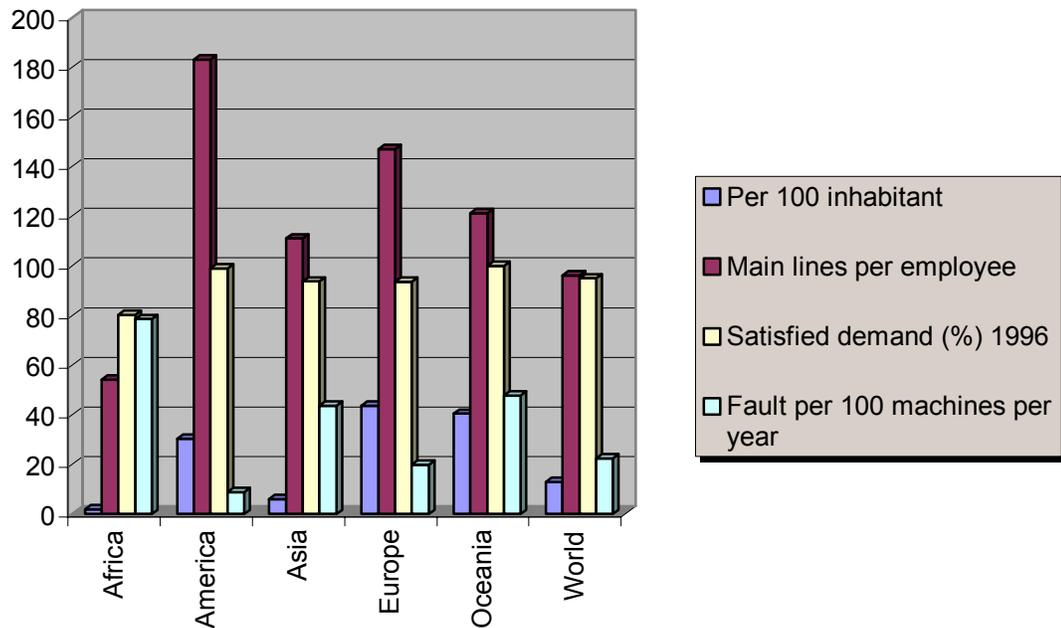
**Table 1:  
Comparative Statistics on Telecommunications Indicators in Africa and the Rest of the World (1996)**

	<i>Main telephone lines Total</i>	<i>Per 100 Inhabitants</i>	<i>Main Lines Per Employee</i>	<i>Satisfied demand (%) 1996</i>	<i>Waiting time Years</i>	<i>Fault per 100 Main Lines per year</i>
<i>Africa</i>	13,695.1	1.85	54	80.2	3.5	78.5
<i>America</i>	237,481.6	30.38	183	98.8	0.3	8.9
<i>Asia</i>	206,647.2	6.02	111	93.6	0.7	43.7
<i>Europe</i>	274,232.1	43.60	147	93.4	2.4	19.9
<i>Oceania</i>	11,605.7	40.39	121	99.9	-	47.8
<i>World</i>	520,198.1	12.88	96	94.9	1.0	22.3

Source: International Telecommunication Union

### 3.1.2 Supply and Demand Patterns

**Chart 2: Comparative Telecommunications Statistics for Africa and the rest of the World**



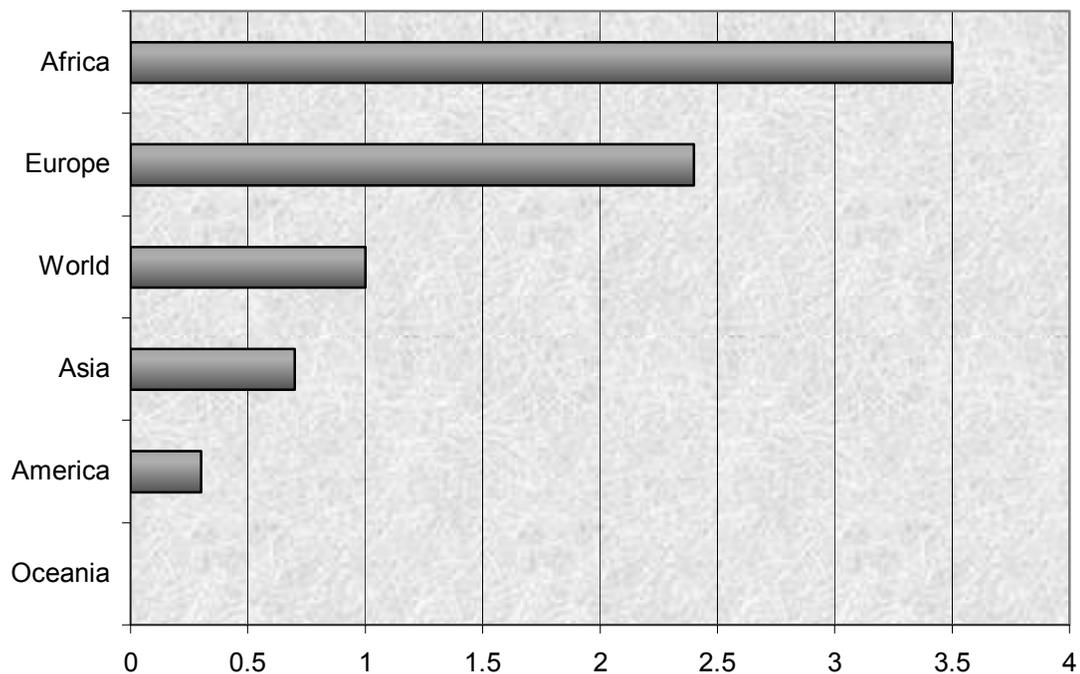
Source: International Telecommunication Union.

Large waiting lists are evident in several African countries, but the demand for telephone connections is in all likelihood considerably higher. A sizable latent demand lies concealed since prospective users do not even register on waiting lists until there is a realistic chance of receiving a telephone connection. The overall average expected waiting time for services in Africa for 1996 was 3.5 years, the highest in the world, compared with 0.3 in America, 0.7 in Asia and 2.4 in Europe as shown in chart 3. Ten countries recorded a waiting time greater than 10 years. These are Algeria, Eritrea, Ethiopia, Gambia, Malawi, Mozambique, Sao Tome & Principe, Sierra Leone and Tanzania. With such long waiting times in African economies, there may well be a

significant number of discouraged potential subscribers who have not yet joined the queue for services.

Development of cellular networks in African economies provides one example of customers' willingness to pay for quick access to reliable services. This willingness is particularly true of businesses and high-income households. While the cellular network penetration rates are still comparatively small, (7.9 per cent of total telephone subscribers in 1996 ranging between 1.1 in Kenya and 18.3 in South Africa), the growth rates in the number of subscribers are considerable in some countries. This level of demand has been achieved despite the fact that charges for cellular services

**Chart 3: Waiting time for Connection to a Phone (years)**



Source : International Telecommunication Union.

are substantially above those for fixed services in the region and those for cellular services in the EU. Surveys of business users in the region confirm this willingness to pay for quick access to reliable telecommunications services.<sup>4</sup>

The introduction of competition has been most notable in mobile cellular and other value-added services, with almost half of the Africa countries allowing more than one provider in these areas. In the majority of markets where cellular mobile services are now provided, private capital has been introduced in the form of joint ventures with state-owned enterprises or stand-alone private ventures

### **3.1.3 TARIFFS**

The structure of tariffs falls relatively heavily on businesses and more lightly on households, but the overall level remains low in most countries. In several African countries, there is no clear practice of pricing services, hence rough and ready norms for billing are adopted. Call waiting and forwarding for residential customers remains largely the domain of dominant local providers.

While detailed data on long-distance and international tariffs are not available, average monthly subscription and installation charges for households and businesses provide some indication of tariff levels and structures. Table 2 presents average monthly subscription charges and connection rates for both household and business consumers by regions in the world. A comparison across these regions reveals that telecommunications

---

<sup>4</sup> See International Telecommunications Union (1994b).

tariff in Africa is the lowest in the world relative to both the global average and other regions in the world. The relatively low levels of tariffs in much of the region limit the extent to which internal cash flows and private finance can be raised for new investments. Most countries, characterized by underinvestment and low network growth, are unlikely to break out without reform of the tariff structure. As a rule, those countries at more advanced stages of development have adjusted tariff structures to allow for more balanced charges between households and businesses and have raised the overall level of tariffs. The need for investment in this sector to expand capacity and improve service quality is substantial. The necessary expansion in networks will not be achieved without recourse to private finance. However, unlocking this finance will require a commercial approach to telecommunications and credible reform of tariff structures.

**Table 2:**

**Telephone Tariffs in Africa and Other Regions in 1996 (US\$)**

	<b>Residential</b>		<b>Business</b>		<b>Local Call</b>	
	<b>Connection</b>	<b>Sub</b>	<b>Connection</b>	<b>Sub</b>	<b>Amount</b>	<b>As a</b>
	<b>Monthly</b>		<b>Monthly</b>		<b>% of</b>	<b>Per Capita</b>
					<b>GDP</b>	
Africa	95	6.4	120	6.8	0.10	19.3
America	165	7.8	205	16.8	0.07	2.8
Asia	160	6.7	245	11.7	0.04	8.3

Europe	187	8.0	301	11.1	0.11	1.4
Oceania	67	9.2	89	15.1	0.12	5.1
World	144	7.3	208	11.6	0.08	8.6

Source: International Telecommunication Union

**Table 3:**

**Telecommunications Revenue and Investment in 1996 (US\$)**

	<i>Telcom.Rev. per mainline</i>	<i>Telecom Rev per Employee</i>	<i>Investment per main line</i>	<i>Telecomm Investment</i>	<i>Total Investment</i>
<i>Africa</i>	688	37018	226	2870.0	2870.0
<i>America</i>	987	183790	176	40347.9	40347.9
<i>Asia</i>	786	114285	353	69654.5	49654.5
<i>Europe</i>	736	107978	182	49327.3	49327.3
<i>Oceania</i>	1,380	161153	367	4,186.2	4186.2
<i>World</i>	839	125294	231	166385.9	166385.9

Source: International Telecommunication Union

### **3.1.4 Reform Activities the Sector**

The telecommunications sector in Africa faces a challenging future given the number of internal and international constraints confronting telecommunications administration, and the demand for value-added services by increasingly sophisticated consumers. Many African countries are already committed to reforms in the field of telecommunications, including promotion of private sector participation. In the past few years, a domino effect has occurred in Africa's Telecommunications sector resulting in a flurry of reform activities which put the continent at par with the developments in other regions. Some of the major reforms being carried out include creation of a regulatory environment to accommodate private companies, institution of well-defined tariff regimes, privatization of state-owned telecommunications operations; and licensing independent telephone companies to provide value added services.

Reform efforts across the region focused initially upon the separation of the telecommunications and postal operations and, subsequently, upon the development of

separate regulatory agencies. By 1998, 27 countries in Africa had separated their postal and telecommunications operations, and 30 countries had corporatized the primary operator.

In the regulatory sphere, 18 countries across Africa had undertaken the establishment of a separate regulatory agency by 1998. However, most telecommunications regulatory agencies so far created in Africa have limited powers -the sector ministry retain the authority to issue directives to the regulator, appoint the heads of the agency, and control the agency's funding. In Uganda, for example, the ministry in charge of telecommunications is also responsible for tariff approval and the establishment of licence fees, while in Namibia, the operator is responsible for numbering, tariffs and interconnection rates. In many instances, the establishment of the regulatory agency has occurred in tandem with the privatisation process. In other countries, the introduction of a regulator has occurred prior to the initiation of liberalization and privatisation plans, such as in Botswana, Mauritius, Nigeria, Tanzania and Zambia.

Privatisation of state-owned national carriers in Africa began in 1989 with the sale of the majority of shares in Guinea-Telecom in Guinea-Bissau, and STP/CST of Sao Tome and Principe in the same year. Between 1989 and 1997, close to 25 per cent partially privatised their state-owned telecommunications operator. In addition, six more countries have initiated, or announced, plan to sell equity stake in their state-owned telecommunication operator to private investors. However, competition in nation-wide basic services is allowed in just two markets, Ghana and Uganda, where second national operator licenses have been issued.

The cumulative effect of these reforms is a substantial increase in telecommunications infrastructure. In 1996, Africa recorded its highest annual growth rate of 10 per cent in telephone main lines. The highest growth rates were recorded by Botswana, the Gambia, Cape Verde and Mauritius. North African countries, however, recorded marginal decline.

### 3.2 Internet Access

Internet is today one of the most dynamic telecommunication markets in Africa in spite of the fact that the region remains behind the rest of the world in informatics and information technology, accounting for less than 1 per cent of global spending in the sub-sector.

**Table 4: Privatization of African PTOs, 1996-97**

Date Sold	Company	Country	% Sold	Price (US\$m)	Price per Line (US\$)	Note
Mar-96	Sotelgui	Guinea	60%	45	6909	Sale to Telekom Malaysia
Dec-96	Ghana Telecom	Ghana	30%	38	1626	Sale to G-COM Ltd. Consortium headed by Telekom Malaysia
Jan-97	CI-Telecom	Cote d'Ivoire	51%	210	3172	Sale to FCR (France Telecom subsidiary) for FF1.05 billion
Mar-97	Telkom	South Africa	30%	1261	987	Sale to Thintnana consortium (SBC (USA) (60%) and Telekom Malaysia (40%) for R5.58 billion
Jul-97	Sonatel	Senegal	33%	90	2840	Sale to FCR (France Telecom subsidiary) for FF650 million

---

<b>Total/Average</b>	1,644	1,170
----------------------	-------	-------

---

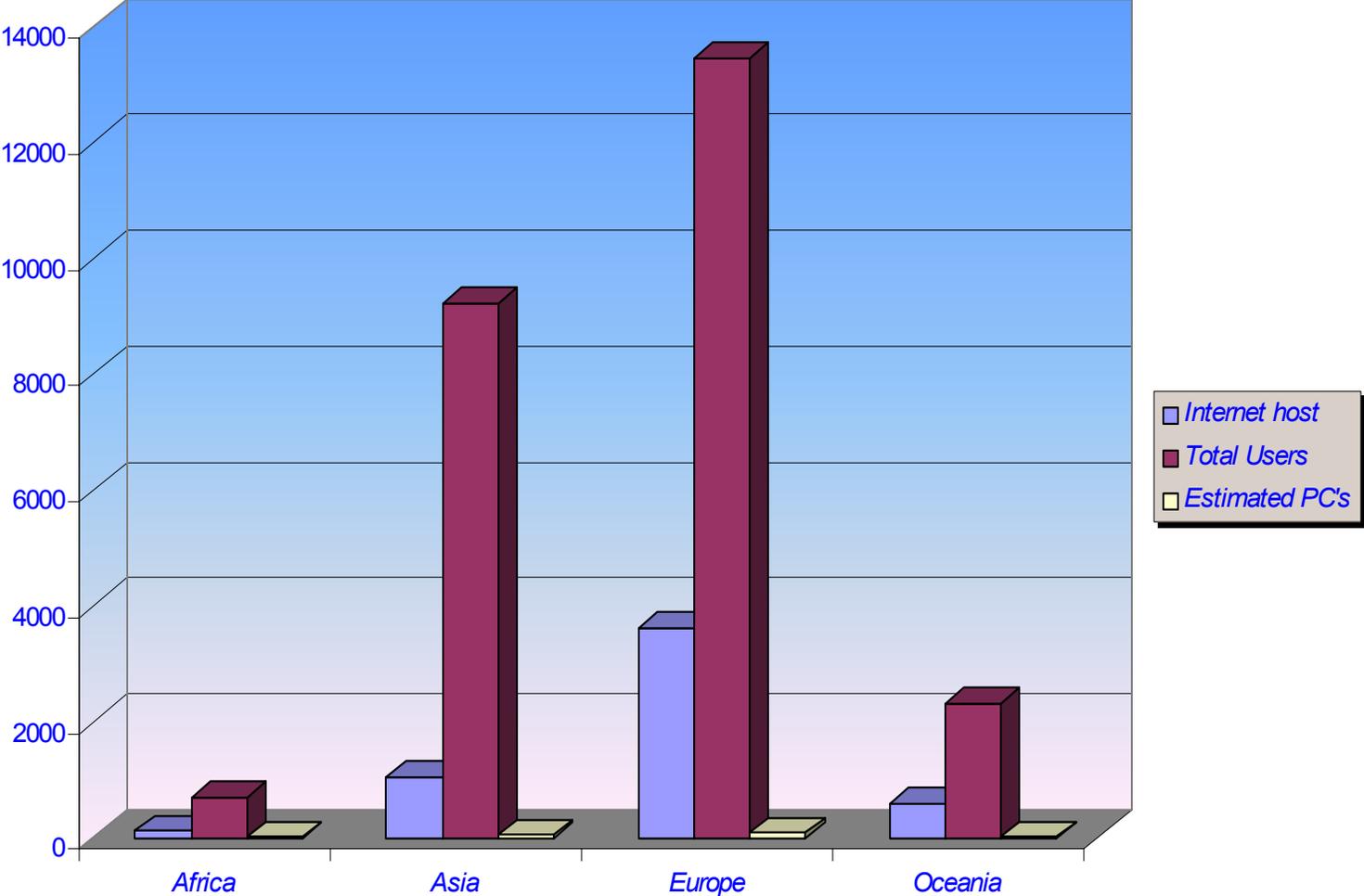
Source: International Telecommunication Union

**Table 5: Comparative Internet Statistics for Africa and the Rest of the World, 1996**

	<b>Internet Host</b>	<b>Host per 10,000 inhab</b>	<b>Total Users</b>	<b>Estimated PCs</b>	<b>Estimated PCs per 100 Inhab</b>
Africa	<b>106,675</b>	<b>1.44</b>	<b>684,445</b>	<b>2,985</b>	<b>0.64</b>
America	<b>10,881,849</b>	<b>139.18</b>	<b>24,434,982</b>	<b>113,093</b>	<b>15.87</b>
Asia	<b>1,042,738</b>	<b>3.04</b>	<b>9,209,732</b>	<b>36,608</b>	<b>1.26</b>
Europe	<b>3,621,752</b>	<b>45.67</b>	<b>13,455,435</b>	<b>72,864</b>	<b>9.56</b>
Oceania	<b>599,744</b>	<b>208.71</b>	<b>2,304,748</b>	<b>6,650</b>	<b>30.31</b>
<b>World</b>	<b>16,252,756</b>	<b>28.14</b>	<b>50,089,342</b>	<b>234,200</b>	<b>4.65</b>

Source: International Telecommunication Union

**Chart 4: Comparative Internet Statistics for Africa and the rest of the World  
(Thousands)**



Source: International Telecommunication Union.

Over the past five years, the number of African countries with access to the internet has risen dramatically. It was first introduced to Africa through a range of initiatives by national,

international and non-governmental organizations, Internet is now clearly becoming a commercial undertaking with increasing private investment. Most of the countries (47 of the 54 nations) in the region have developed some form of Internet access in capital cities, either through local dialup, store and forward e-mail with a gateway to the internet, or through a full leased-line service. About 44 countries and territories have achieved full Internet public access services at least in capital cities. There are only five countries- Comoros, the Republic of Congo, Eritrea, Libya and Somalia that do not have plans for full internet access.

### **3.2.1 Network**

The key indicators of internet development are: (1) the number of host computers, (2) the number of internet service providers (ISPs) and (3) the number of users.

a. Internet host computers: In 1997, there were 129,326 internet host computers in Africa, of which 122,025 were in South Africa, 3,310 in North Africa and 3, 991 in Sub-Saharan Africa. The density of internet hosts was 28.16 hosts per 10,000 people in South Africa, 0.25 in North Africa and 0.07 in Sub-Saharan Africa. The average for Africa was 1.70.

b. Internet Service Providers (ISPs): About half of the countries in Africa allow competition and have more than one ISP. Of the 300 or so ISPs in the region, around 200

offer full internet services. South Africa has the highest concentration of ISPs with nearly 80 service providers.

c. Internet Users: In 1997, there were 896,120 Internet users on the continent of Africa, in addition to 800,000 in South Africa. This is equivalent to approximately six users for each host computer. The number of users averages about one user per 5,000 people (excluding south Africa with a rate of one to 65 people), compared to a global figure of one internet user per 45 people; or one per 6 in Europe and North America.

### **3.2.2 Tariffs**

The high price of internet connections and personal computer (PCs) relative to income is a major inhibiting factor to a wider use of internet in Africa.. Estimated PCs per 100 inhabitants in 1996 was just 0.66 compared with 15.87 in America, 9.56 in Europe and 30.31 in Oceania. Considering the lower incomes of most African countries, it is unrealistic to expect widespread Internet usage on the continent. As the internet market in Africa becomes increasingly liberalized, and market forces take firmer root, prices will be driven lower owing to increasing competition among ISPs, the privatisation of state-owned telecommunications corporations, and the liberalization of domestic telephone markets.

### **3.2.3 Bottlenecks**

Internet use in Africa is limited. The basic obstacles in the path of rapid Internet growth are the lack of telecommunication infrastructure, and the relatively high hardware and transmission costs. Although many countries have taken major steps to improve their

infrastructure, great variation still remains between regions and countries; rural areas, where 70-80 per cent of the population resides, are largely uncovered by telephone service. International internet bandwidth is lacking because international leased lines are costly and crowded, and peering between ISPs is limited. Proposals, such as the Africa One and SAFE-2 undersea fibre-optic cables, or wireless technologies including WLL, VSAT, HF radio and GMPCS systems, or stratospheric Helium supported balloons promise to extend internet services to both urban and rural areas. Hardware is much more expensive in Africa relative to many other parts of the world due to high import tariffs and little price competition.

An increasing number of countries are allowing internet service provider (ISP) competition, even though more than ten countries still hold monopoly control. PTOs have assumed a monopoly position especially in countries where the Public Telecommunications Operator (PTO) established the international internet backbone with some exceptions, such as South Africa, Mozambique and Zambia. Foreign internet service providers are increasingly entering into Africa and are expected to gain market share from the local companies. Open entry for ISPs, however, is not enough to ensure rapid Internet growth. An appropriate, “Internet-friendly” regulatory framework is also important to achieve effective entry, survival and growth of ISPs. High license fees, for example, can limit the entry of ISPs.

**Table 6:  
Selected African PTOs Providing Internet Service**

<b>Country</b>	<b>PTO</b>	<b>URL</b>
Benin	OPT	<a href="http://www.opt.bj">www.opt.bj</a>
Botswana	BTC	<a href="http://www.btc.bw">www.btc.bw</a>
Burkina Faso	ONATEL	<a href="http://www.onatel.bf">www.onatel.bf</a>
Cameroon	Intelcam	<a href="http://www.camnet.cm">www.camnet.cm</a>
Cape Verde	Cabo Verde Telecom	www.cvtelecom.cv
Centre Afri. Rep.	SOCATEL	www.socatel.intnet.cf
Chad	OPT	<a href="http://www.tit.td">www.tit.td</a>
Djibouti	STID	<a href="http://www.intnet.dj">www.intnet.dj</a>
Ethiopia	ETA	www.telecom.net.et
Guinea	SOTELGUI	kassa.leland-gn.org
Madagascar	TELECOM MALAGASY	<a href="http://www.telma.net">www.telma.net</a>
Mali	SOTELMA	<a href="http://www.sotelma.ml">www.sotelma.ml</a>
Mauritania	OPT	<a href="http://www.opt.mr">www.opt.mr</a>

Morocco	ONPT	<a href="http://www.onpt.net.ma">www.onpt.net.ma</a>
Mozambique	TDM	<a href="http://www.tdm.mz">www.tdm.mz</a>
Niger	STIN	<a href="http://www.intnet.ne">www.intnet.ne</a>
Senegal	SONATEL	www.sonatel.senet.net
South Africa	Telkom	www.telkom.co.za
Togo	Togo Telecom	www.togotel.net.tg
Zambia	ZAMTEL	<a href="http://www.zamtel.zm">www.zamtel.zm</a>

Source: International Telecommunication Union

### **3.3 Transport**

Transport constitutes an important sector for the enhancement of economic growth and the socio-economic integration of the African region, particularly the promotion of intra- and extra-African trade. However, despite the efforts made in the past five decades to develop the transport sector in Africa, it has remained inadequate and ineffective. The general lack of repairs and maintenance in infrastructure has led to further deterioration in the sector in recent years, and has, as well, increased the magnitude of its operational problems and costs. The environmental implications of transport policies and projects also received low priority.

However, despite the difficult environment of high operating costs and low capacity utilization, the various sub-sectors of transport have shown some remarkable resilience.

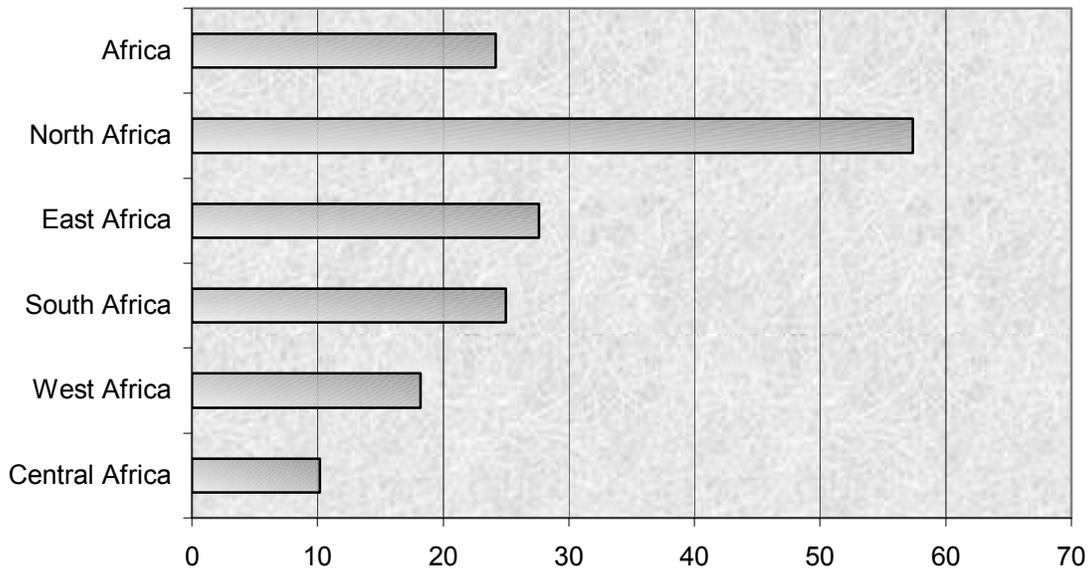
#### **3.3.1 Roads**

In Africa, road transport is the most widely used means of transportation. The fragmentary nature of the railway system and the limitations imposed on the scope of inland water transport by geographical factors are such that the transport of people and goods by rail and inland waterways has to be supplemented usually by road transport over long distances.

##### **3.3.1.1 Road Network**

An accurate assessment of the development of the road networks in African countries is made difficult by the lack of reliable statistical information and the compelling necessity to employ, for analytical purposes, surrogate indicators, such as aggregate lengths, classified according to operating conditions, instead of such standard indices as ton-kilometre or passenger/ kilometre.

**Chart 5: Paved Roads as Percentage of Total Road Network by Region (1996)**



Africa had approximately 311,184 kilometers of paved roads in 1991 (see Table A2), with half of them in poor conditions. Chart 4 indicates that only 24.2 percent of total road network in Africa were paved in 1996 albeit with considerable regional diversity. 57.4 percent of the roads in North Africa were paved compared to 25 percent in South Africa and 10.2 percent in Central Africa. Road densities per km<sup>2</sup> are generally much lower than those of Asia and Latin America. Road construction and maintenance standards vary greatly in Africa: few countries are able to construct and maintain trunk-road systems to stipulated requirements and standards according to volume and weight of traffic. Road building has traditionally been given more priority than road maintenance in most African countries, with scant attention to the imperatives of recurrent costs and road management once a road has been constructed. Besides, as the road networks expands, the institutional and financial

burden has tended to increase much more rapidly than the national budget could cater for, especially in times of socio-economic crisis.

Another important dimension to the quality of infrastructure is maintenance and renewal. Lack of maintenance has left over 50 per cent of the paved roads in poor conditions. Over 80 per cent of the unpaved main roads in Africa would be considered just fair. The case of rural feeder roads is even worse; up to 85 per cent are estimated to be currently in poor conditions.

The constructing of international road networks on a sub-regional basis in Africa has received much greater attention. However, a real regional African road system does not as yet exist; what exists, instead, is a large number of separate national road networks that are ineffectively coordinated, and are at best a series of ad hoc inter-country road links and connection.

### **3.3.1.2 Demand and Supply Pattern**

National road networks in Africa have not kept pace with the growing demand: kilometre lengths are limited and their standards of construction often low. The existence of inadequate and poorly maintained rural and feeder roads connecting villages and farming areas with each other, and to market centres is a major gap in rural transport in most countries. And few cities have been able to keep pace with road network needs. As agriculture and industry expand, and as national and subregional economies develop, existing road networks will require tremendous extensions and improvements in quality. In particular, road links between nations will have to be strengthened to meet large scale demand for intra-and inter-subregional goods traffic; all of this require heavy capital investment and expenditure on roads in many African countries.

### **3.3.2 Rail**

Railways in Africa are fragmented, and can hardly be described as a system since the railways run from the interior to sea ports, a reflection of their antecedent as a transport system designed for external trade purposes.

#### **3.3.2.1 Available Network**

The aggregate network of African railways is estimated at 73,000 route kilometres, of which South Africa alone accounts for some 22,500 km. Eleven countries namely; Burundi, Central Africa Republic, Chad, Cape Verde, Comoros, Djibouti, Mauritius, Seychelles, Somalia, the Gambia, Guinea Bissau and Libya have no railway system. With the exception of North Africa, railways in Africa generally have a low level of traffic. Most of the lines are of light rail, and are unsuited for fast and heavy traffic. Moreover, there is general deterioration due to maintenance problems.

The national railway networks in Africa are mostly independent of each other and, with the exception of Eastern and Southern African railways, unconnected among themselves. All the networks in Africa were built at the end of the nineteenth century or the beginning of the twentieth century, with different technical characters, gauges, couplings, brake systems, buffers, etc. The only exceptions are, Tazara, the Trans-Gabonese, the Trans-Cameroonian and the mining lines. The 1.067 m gauge predominates, especially in sub-Saharan Africa, whereas the 1.435 m gauge accounts for 76.1 per cent of the total kilometrage in North Africa.. Upgrading existing railway lines would involve major investments in track realignment, resignalling, safety systems and rolling stock..

### **3.3.2.2 Demand and Supply pattern**

Almost all the railways in Africa enjoyed monopoly or near-monopoly status at inception, especially for long- and medium- distance transport of goods and peoples. With the spectacular development of road transport and to a lesser extent, air transport, in the 1970s, railways have, however, faced increased competition in the transport market, to which they have not always been able to positively respond and adapt.

### **3.3.2.3 Tariffs**

Railway tariff has stagnated or declined in recent years, and measures of operational efficiency have shown little improvement. For example, locomotive availability remained generally low at around 50 percent, although both Uganda and Zimbabwe have improved performance in response to restructuring plans. Most railway authorities in Africa have not pursued sustainable tariff policies. Being public or semi-public enterprises, they were not always profit-oriented or cost- conscious in their operation, limiting their ability to maintain the existing networks, let alone upgrade or expand them. Whenever they made profits, they were required to pass them to the users in the form of reduced tariff rates. The tariff basis was the same throughout the network, varying only with distance.

Freight rates by rail in Africa are on average about twice as high as those in Asia and one and half times those in Latin America. But, at the same time, rail operations run at a deficit. A number of reform programs are under way. These include increased managerial autonomy and sub-contracting more services to the private sector. Some have sub-contracted part, or all, track maintenance to the private sector (Cameroon, Gabon, Nigeria

and Senegal) and Senegal has also sub-contracted cleaning of rolling stock, maintenance of wagons, catering and parcels traffic. The broadest private sector initiative involves re-unifying the railways of Cote d' Ivoire and Burkina Faso, with a view to operating them under a concession agreement with the private sector.

### **3.3.3 Airports**

Air transport network in Africa is still relatively underdeveloped. All countries in the region have at least one international airport as well as several smaller ones. Few of them are capable of handling large amount of traffic. Less than 50 per cent of the 5,304 potential air links among the countries in the region are actually operational or being actively exploited at present. The countries with the highest number of airports are Egypt (17 airports) and Nigeria (15 Airports). Most of the airports lack modern equipment and infrastructure. They are characterized by deteriorating runways, and obsolete traffic control equipment. Much of the infrastructure required for ancillary activities, such as customs and immigration, air cargo, catering, baggage handling and connecting surface transportation, is lacking compared with market needs. For example, operational and safety shortcoming that plague Nigeria's international airports have given them the reputation of being among the worst in the World.

Almost every African country own at least one airline although some of them are being privatized in recent times. However, Air Afrique is a regional airline, jointly owned by ten countries. The privatized airlines include Kenya Airways incidentally the first airline to be privatized in Africa, Royal Air Maroc and Air Tunisia both of which are partially privatized. Nigeria, however, adopted the liberalisation of the domestic aviation

industry resulting in the licencing of 22 private carriers, of which 14 offer scheduled passenger service, 7 carry cargo and the balance provide charter flights.

Only Cote d' Ivoire is currently actively reforming its airports with the ceding of the management of Abidjan's international airport to a French international consortium, Aeria, which has pledged to spend CFA 14 billion upgrading the airport.

#### **3.3.3.1 Tariffs**

The airlines in Africa suffer from high operational costs compared with their counterparts world-wide, including other developing regions; they lack proper maintenance facilities locally and their tariffs are generally uncompetitive in the absence of subsidies. With the growth of mega-airlines in many regions of the world, the African airlines, being mostly small and poorly equipped, are unable to compete in the international market. And the only hope for survival for most of them lies in mergers with bigger and more competitive carriers.

#### **3.3.3.3 Demand and Supply Pattern**

Air services are restricted by low demand in several countries. Apart from Air Mauritius which accounted for about 50 per cent of total persenger traffic in 1997, the share of African airlines in international traffic is very low, owing in part to a reputation of poor services and reliability. For example, the share of Air Egypt in international traffic is only 25 per cent at most, despite fare reductions in recent times.

### **3.3.4 Sea Ports**

Maritime transport is extremely important to African countries due to the nature of its operations, and the high proportion of traded goods transported by sea. However, the poor quality of port services and infrastructure in Africa, and the low level of trade volumes are some of the major limitations on the growth of this sub-sector. Port productivity is, on average, about a third of international norm due to poor management, excessive bureaucracy, and inadequate as well as unreliable of equipment. Delays in clearing goods are frequently a problem. Most ports are in need of modern, better managed facilities to serve traffic for which sea transport has a significant cost advantage over surface transport, such as dry and liquid bulk cargoes or containerized cargo. The port of Mombassa, for instance, has only two cranes one of which is frequently out of order. The main port of Ghana was recently rehabilitated and expanded but suffers from mostly human inefficiencies. Manufacturers habitually post employees in the port for several days on end to make sure that the goods move in and out of the port on time. There is generally a need for upgrading of existing ports in Africa.

Less than two per cent of the African merchant fleet capacity are container ships; the majority being conventional cargo ships. The shipping lines that principally service long-distance sea routes consider most of Africa's coastal traffic as mere subsidiary to their traditional overseas activities.

#### **3.3.4.2 Tariff**

Ocean freight charges in Africa are competitive. The impression that ocean freight charges from Africa are prohibitively high is not supported by the facts. Empirical evidence

provided by Biggs, et al. (1994) and presented in Table 7 on freight and port charges from five African countries to the port of New York/Newark and a comparison with similar charges from Sri Lanka and Bangladesh, two countries in East Asia, indicate that freight charges generally reflect their relative distances to the port of destination and appear to give West African countries a slight competitive advantage. However, port charges in the principal ports in Africa are higher than the comparable charges in the two Asian ports. Consequently, when freight and port charges are added up, the costs of transportation from some ports in Africa may actually be higher than from those ports in East Asia. Interviews with a number of large shipping agents indicate that the frequency of sailing from the principal African ports to New York/Newark is also not a constraining element.

**Table 7: Shipping Costs from Selected Ports to New York/Newark for a 40 Foot Container filled with Garments**

Country	Zimbabwe	Kenya	Cote d'Ivoire	Senegal	Ghana	Sri Lanka	Bangladesh
Port	Durban	Mombasa	Abidjan	Dakar	Accra	Colombo	Chittagong
<u>Costs</u> Ocean Freight to NY/Newark (US\$\$)	3,360	4,600	4,380	4,330	4,580	5,190	5,120
Port Charges (US\$\$)	2,060	2,044	1,580	1,411	578	276	333
Total (US\$\$)	5,420	6,644	5,960	5,741	5,158	5,466	5,543
<u>Time</u> Duration of Sailing (Days)	38	35	15	17	20	32	37
Overland Transportation (Days)	5-10	1-2	n.a	n.a	n.a	n.a	n.a
Total Transport Time (Days)	43-48	36-37	15	17	20	32	37

Source: Biggs, et al (1994).

### 3.4 Electricity

#### 3.4.1 Available Network

Total electricity generation in 1994 was 350,000 Gigawatt-hours. The generation mix is dominated by fossil fuel generating plants which account for 81 percent of total electricity generation, with hydro accounting for just 15 per cent. A small fraction of available hydro resources is utilized in Africa, with 64.4 percent of the exploitable hydro capacity located in East and Southern Africa, 34.2 percent in West Africa and 1.2 percent in North Africa. This is mainly due to shortfalls in water-flow associated with

climate change in some countries, low demand in countries endowed with immense hydro resources, and potential transmission losses associated with long distance transmission from countries endowed with immense hydro resources to energy deficient countries and regions. Oil-based generation is more uniformly distributed in Africa while coal-based generation feature prominently in the southern African countries of South Africa, Zimbabwe, Botswana, and Mozambique; and in Morocco in North Africa and Niger in West Africa. Gas fuelled plants are of increasing importance in Algeria, Nigeria Tunisia. Nuclear and geothermal plants are relatively unimportant at 2.7 and 0.1 per cent respectively. Kenya remains the only country exploiting its geothermal resources, though progress in this direction remains lack-lustre.

In terms of regional distribution, North Africa accounts for about one third of Africa's electricity production based largely on burning oil supported by coal and natural gas. West Africa's share of 9 per cent is based on a mixture of hydro, oil and gas. Central Africa's share of 4 per cent is dominated by hydro and East Africa's share of 3 per cent consists of s mixture of oil and hydro. Southern Africa produces the largest share of Africa's electricity production-about-55 per cent which is dominated by hydro and coal-burning generating plants.

The region's generation, transmission and distribution systems tend to be old and inefficient, resulting in often substantial losses of generated energy, as much as 40 percent in the case of Uganda. These system losses have further limited the amount of energy available for production and consumption. Furthermore, in many countries consumers have experienced frequent power outages as well as voltage fluctuations, which damage electronic equipment and motors. This unreliability has forced many

enterprises in the region to buy and install their own generators, thus raising their overhead costs.

Self-provision of electricity is common across the region. In Uganda, most large customers maintain stand-by diesel generators.<sup>5</sup> In Guinea, between 1983-1992 the private sector installed for its own use some 70 MW of power generation, and in 1993 produced some 109 GWH of electricity, almost as much as the national electric utility<sup>6</sup>

### **3.4.2 Demand and Supply Pattern**

Africa's state-owned energy sector in the early 1990s typifies some of the worst failings of the African public monopoly model. While deficiencies in the public enterprises model are hardly unique to Africa, its weak administrative capacity and legacy of political instability exacerbate the problem.

Countries in the region have one state-owned company performing the four separable activities of generation, transmission, distribution and supply. Only a few countries, such as Ghana, have separate companies responsible for generation and transmission, and distribution. Private sector participation in the power sector, although not legally prohibited, is negligible in most countries in the region. Available data on the structures of power sectors in the region and the policies of different governments suggest that the pattern of vertically integrated monopoly enterprises with little or no autonomy from government to operate in a commercial manner is typical of Africa. For example, the utility SONEL in Cameroon is approximately 93 percent state-owned, with a board of directors

---

<sup>5</sup>ESMAP (1995b)

<sup>6</sup>World Bank (1995b)

appointed by the government' UEB in Uganda handles generation, transmission and distribution, and also regulates itself; and NEPA in Nigeria is a state monopoly, and government controls all procurements and foreign exchange transactions. Almost all countries in the region have opted for an electric utility industry that is an arm of government and generally vertically integrated.

Table 8 presents two performance indicators for selected countries in the region: transmission and distribution losses and rate of return on net fixed asset. Countries perform differently according to these indicators. Uganda has, for instance, transmission and distribution losses of 38 percent and zero rate of return on net fixed asset, while Ghana has lower transmission and distribution losses (17.8 percent) and a higher rate of return on net fixed asset (6 per cent) than Uganda. Such differences are also observed when countries in the region are compared with some countries in other regions of the world (Table 8). Comparing the performance of the power sectors in most of these SSA countries with that of Chile, a developing country which has reformed its power sector, the latter outperforms most of the former (at least according to the two indicators that we cite in Table 8). (The only exception is South Africa<sup>1</sup>).

Most of these countries have rates of return on net fixed asset and debt service coverage that are very low. For instance Nigeria, Sierra Leone and Guinea obtained negative returns in the range of minus 6.2 to 16 percent (Gutierrez 1996). On the issue of reliability, data for power systems in Africa are extremely limited; moreover, supply is widely considered to be low in several African countries. Alternatively, electric utility industry reforms in Chile and Argentina, which led to significant increases in plant

availability factors, have reduced the number, length and frequency of outages as compared to their previous experiences (Gutierrez 1996).

**Table 8: Power Sector Performance Indicators of Selected Countries 1993/94**

<i>Country</i>	<i>Transmission and distribution losses (per cent)</i>	<i>Rate of return on net asset (per cent)</i>
<i>Ghana</i>	17.8	6.0 (1993)
<i>Cote D'Ivoire</i>	16.3	NA
<i>Mali</i>	21.2	1.2 (1994)
<i>Guinea</i>	27.0	-6.2 (1993)
<i>Sierra Leone</i>	38.5	-16.0 (1993)
<i>Nigeria</i>	30.0	-8.2
<i>Senegal</i>	14.3	3.7 (1993)
<i>Cameroon</i>	13.0	NA
<i>Zambia</i>	8.0	-8.0 (1994)
<i>Zimbabwe</i>	11.0	5.8 (1993/94)
<i>Kenya</i>	12.5	15.0 (1994)
<i>Uganda</i>	38.0	0.0 (1994)
<i>South Africa</i>	7.0	11.5 (1994)
<i>Chile</i>	10.6	8.1 (1994)
<i>Malaysia</i>	15.8	8.2 (1994)
<i>Argentina</i>	25.4	7.0 (1994)

Source:- Turkson J. and I. Rowlands (1998)

### **3.4.3 Electricity Tariffs**

Prices of electricity have typically been between 3 and 4 cents per KWH, compared to 8 and 9 cents or higher in developed economies. Prices have thus been insufficient to generate revenue to cover long run marginal cost, taking into account asset depreciation. These problems are further exacerbated by difficulties in billing and billing decision. Traditionally, state-owned enterprises have played a dual role in electric utility services, acting both as providers of services and regulators. The regulatory structure is not transparent, often characterized by undesired distortive effects. Tariffs, for example, are set by cabinet decision or by the line ministry responsible for the power sector. Most countries have had relatively high inflation (i.e., double-digit) during the past twenty years. As a consequence, there has been a definite tendency to use the cabinet's or the line ministry's ability to manipulate electricity prices as part of broader anti-inflationary programmes. This

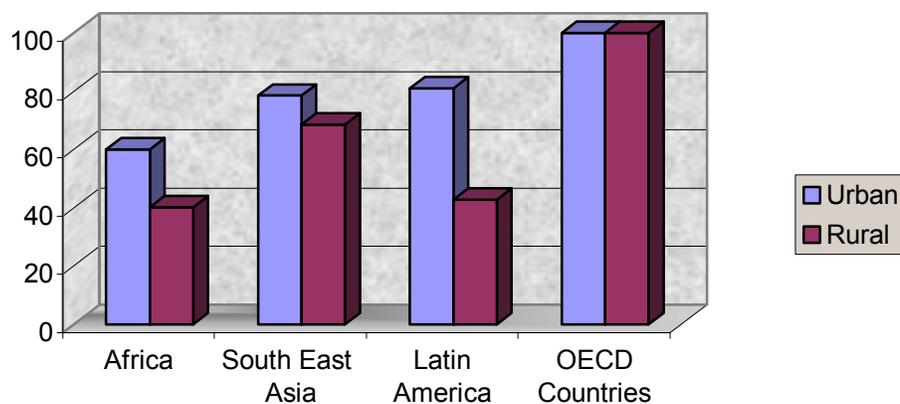
suggest that real electricity prices have actually fallen drastically in those countries in the region with high inflation.

### **3.5 Water and Waste Management**

Africa made some progress during the International Drinking Water Supply and Sanitation Decade (1980-90). The number of persons served in urban and rural areas rose from 110 million in 1980 to 230 million in 1990 (114 million of the later being in urban areas). But this was overshadowed by rapid population growth, resulting in more urban residents being without adequate water supplies in 1990 than in 1980. Water supply and treatment are also deficient in the region. In 1995, only 60.1 and 40.24 percent of the region's urban and rural population respectively had access to safe water, albeit with substantial variation in different countries the range was 18 and 18 percent in Central African Republic and 95 and 100 percent for urban and rural areas respectively in Mauritius. Chart 5 presents a comparative analysis of the percentage of population with access to safe water for Africa and other regions. Most of the water pipe networks are old and urgently require repair and replacement.

Source: Adapted from World Bank (1998).

**Chart 6: Percentage of Population with Access to Safe Water (1995)**



Africa's performance in terms of access to sanitation is equally deplorable. In 1995, only 36.6 per cent of the population had access to sanitation compare to 51 per cent in South East Asia, 64.1 percent in Latin America and 96.7 OECD countries (see Table A1). However, why Mauritius attained 100 per cent access, the comparative figures for Zambia, Congo Republic and Lesotho are 23, 9 and 6 per cent respectively

A few urban water utilities have been restructured (Conakry, Abidjan, Banjul, for instance). They have moved from being government departments operating with little commercial autonomy and no accountability to commercially run public agencies or to fully or partially privatized firms. Experience has shown that delivery of water to the poorest segments of the population becomes both cheaper and more reliable through such reforms but this transition is still in its early stages.

### 3.5.2 Tariffs

Except in very few countries, water and waste-water sectors rely on governments for a substantial part of funding requirements, especially for capital investment. Charges are thus

kept low to convey benefits to households. Table 9 presents the median price of water for several African countries in 1993. The figures compare favourably with the median price of \$0.54 in Asia Pacific but low compared to \$2.24 in industrialized economies. As with other infrastructure sectors, the balance between household and industrial water tariffs tends to fall more heavily on industry. Currently, the price of water does not reflect its scarcity, resulting in wasteful use of water.

**Table 9: Accessibility to Water and Tariff Rates in Selected African Cities**

City	Access to Portable Water	Consumption of Water	Median Price of Water
	< 200m	1/pers/day	1993 US\$/M <sup>3</sup>
Abidjan	61.70%	111.00	\$0.35
Addis Ababa	76.60%	27.00	\$0.44
Bamako	53.00%	50.00	\$0.14
Cairo	97.9%	360.00	\$0.04
Conakry	75.00%	50.00	\$0.50
Dakar	92.00%	69.00	\$0.50
Nairobi	93.00%	69.00	\$0.20
Tunis	96.30%	70.00	\$1.49
Yaounde	85.30%	60.60	\$1.00

All figures are for 1996, except stated otherwise

Source: UNCHS Global Urban Indicators Database [Urban bias]

### 3.6. War Affected Countries

Many devastating conflicts have persisted in several African countries ( Ethiopia, Namibia, Uganda, Angola and Mozambique) while pernicious internal struggle continue to plague others (Liberia, Somalia, Sudan and Sierra Leone). The damage inflicted on the social capital and economic potential of these countries have been horrific. The impact of warfare on physical infrastructure has been enormous, exacerbating the already precarious situation. While war ravaged, infrastructure stocks including roads and bridges were often the primary targets. Existing infrastructure stocks were often severely depleted. For example, in Uganda, the transport infrastructure suffered greatly from neglect during the troubled period between 1971 and 1986. The international airport at Entebbe was extensively damaged during the conflict with Tanzania in 1979-80. The railway system was not left out as many sectors of tract, apart from the rolling stock, were in serious need of remedial work by 1986. This has been the trend in many war ravaged economies.

### **3.7. Landlocked Countries and Infrastructure**

Africa has a considerable number of landlocked countries, incidentally among the poorest countries in the world. The current state of infrastructure provision in these countries is demonstrably poor relative to other African countries, thus constituting impediments to the growth potentials of these economies. Countries like Malawi, Uganda, Zimbabwe and Zambia rely on neighbouring countries to ensure reliable delivery. Transportation problems are compounded for landlocked countries by problems in intermodal transportation. In many cases, railway systems differ among countries, schedules are not coordinated, and even in transport by road, goods tend to be delayed by customs control. It takes a typical Ugandan business man, three and half months from the time of shipment departure from Europe until arrival Kampala, three times what will be needed under comparable conditions elsewhere in the world (Donaldson, et. al. 1997).

### **3.8 Infrastructure and the Environment**

Infrastructure development in Africa has largely proceeded with minimal consideration for environmental standards and quality. This has been a major factor in the severe degradation of the environment in the form of industrial pollution. In any case, environmental issues have not been given serious policy considerations in Africa's development agenda. Environmental awareness has only become perceptible in recent years since the Earth Summit in Rio de Janeiro in Brazil in June 1992. The concept of sustainable infrastructure development has become relevant in Africa. Creating a sustainable infrastructure economy based on efficient resource use should be given greater consideration. The environmental problems within urban areas often termed the 'brown agenda' is more immediate in Africa. The issues involve include the lack of safe water supply and sanitation, inadequate solid and hazardous waste management, emissions from cars etc. The need

arises to introduce environmental sound practices in the management of existing infrastructure in Africa.

#### **4. Causal Factors in the Inadequate Provision and Delivery of Infrastructure Services in Africa.**

A pertinent question is what led to the present unsatisfactory outcomes? In spite of the recognition that each infrastructure sector has its own peculiar problems, there are common weaknesses in most African countries. An extensive inquiry is beyond the scope of this paper, but it suffices to focus on several general reasons affecting infrastructure delivery in Africa.

While political and economic instability, low per capita incomes and often challenging geographic conditions have significantly constrained the development of Africa's infrastructure, there is abundant evidence that the protracted crisis in the sector is due mainly to past and current policy choices. A major explanatory factor is the prevalence of a regime of price controls that for a long time had little consideration for commercial objectives including cost recovery. Prices amount, on average, to just above a third of supply costs and are half as much as those in industrial countries. The pricing regime is characterized by administered prices that are in many cases appreciably below what is required to operate, maintain and rehabilitate facilities, and consequently entail large efficiency losses and social costs. Too often, controlled prices often imposed on state infrastructure monopolies, prices that are unresponsive to changing market conditions, encourage uneconomic investment of resources targeted at meeting the inefficient and unsustainable growth in the demand for infrastructure services. It is evident that prices that are below economic costs and what is needed to finance infrastructure development

and maintenance expenditure in the face of escalating cost conditions in the industry are unlikely to restrain excessive demand and minimize uneconomic investment of resources. With negative or at best low positive financial and social rates of return to infrastructure investment associated with low product prices, it is not surprising that supply shortages persisted in the sector. In response to these shortages, many businesses and households have resorted to self-provision, often at high cost. For example, according to a 1988 study of 179 Nigerian manufacturers, 92 percent of firms surveyed owned electricity generators, and 44 percent had boreholes to assure their own private water supply. In the face of chronically unreliable public services, many also had acquired radio equipment for communications (37 percent of firms) and vehicles to transport personnel (37 percent) and freight (63 percent). For firms with 50 or more employees that could practice economies of scale, the extra costs of private power generator amounted to some 10 percent of the total machinery and equipment budget; for smaller firms, the burden was as high as 25 percent.<sup>7</sup> Substantial self-provision of infrastructure is also the norm for low income consumers, relief from the failure of public providers often comes through the informal sector. The best known examples are private water vendors who use trucks or smaller receptacles to haul water either for distribution at central locations or to individual dwellings. In some places, private vendors served 90 percent of households, and in several places purchases of private water amounted to more than 30 percent of household income.

A fairly robust analysis of incremental reserves that would arise from moderate and achievable increase in financial returns through pricing reforms in Africa's infrastructure, albeit dated, indicates that the net benefit on resource mobilized would amount to about one fifth and one third of public revenues as shown in Table 11 (Anderson,1989). Furthermore,

---

<sup>7</sup>Lee and Anas (1992)

such reforms apart from being easy to administer would entail negligible ‘deadweight’ or efficiency losses.

**Table 11: Incremental Reserves from Pricing Reforms in Africa’s Infrastructure**

Sector	Current contribution to Public Revenue	Potential Contribution as Percentage of Public Revenue	
		Overall	Incremental Effect
Electricity	small or negative	5 – 10 per cent	5 – 10 per cent
Water	small or negative	2 – 5 per cent	2 – 5 per cent
Telecoms	varies but marginal	5 – 10 per cent	5 – 10 per cent
Roads	10 – 15 per cent	10 – 25 per cent	5 – 10 per cent

Source: Anderson (1987).

Apart from administered prices, several demand and supply-related factors, some of them intertwined, have had a profound negative impact on infrastructure development in Africa. As in most other developing countries, governments in the region have assumed responsibility for almost all of these infrastructure services through state owned enterprises created precisely in order to make socially productive investments so as to eliminate impediments to the overall economic development. Almost without exception, the provision of infrastructure in Africa is the exclusive responsibility of the government. Government own, operate and finance nearly all infrastructure. Thus, the record of success and failure in infrastructure is largely a story of government's performance. However, these enterprises have established a poor reputation across Africa. Besides trying to provide a particular service to an acceptable quality, they are also expected to pursue a variety of

“social” goals, including the creation of employment and the subsidization of prices to consumers, ostensibly with the view to providing broad and affordable access to the poorer parts of society. These objectives have in reality imposed a variety of costs on the enterprises as a major employment mechanism has resulted in significantly bloated workforces. Similarly, the prevalence of widespread input and output subsidies creates significant wedges between product prices and costs and in the process confront these enterprises with soft budget constraints and dysfunctional government interference in sector activities and enterprise management functions that encourage gross inefficiency in production, distorted demand patterns and investment choices, induced endemic and expensive delays and cost overruns that encouraged widespread corruption in infrastructure construction and equipment and material purchases and minimized the market responsiveness of the sector to changing demand and supply conditions through excessive regulations. The subsidization of services in reality often allows the more affluent citizens to benefit disproportionately from artificially low prices by providing them with better access to these services. In Lusaka, Zambia, for instance, only 28% of the households in the poorest fifth of the population have access to electricity, compared to 70% in the richest segment. Similarly, it has been estimated that the poorest fifth of the population in Tanzania receives only about 10 per cent of the government subsidy for water, whereas the richest fifth receives about 40 percent. At the same time, these subsidization policies have invariably translated into smaller revenues. Public utilities have thus often found themselves in the difficult financial position of not being able to cover their operating expenses. It has not been possible in many cases to maintain existing facilities adequately, and new investments have consistently had to be postponed. At the same time, most governments have suffered from chronic budget deficits, which have kept them from filling the financial gap. In the end, countries have been left with inadequate infrastructural facilities, while the responsible enterprises, not motivated by commercial objectives, have had little incentive to improve their performance significantly. The Nigerian experience provides considerable support for the distortionary effects and the disincentives associated with excessive political interference in investment decision, pricing policy, plant location, equipment choice and employment structure resulting in higher costs and low earning ability of public infrastructure.

Economic theory justifies an important role for government intervention in efficient and equitable infrastructure use and provision. The arguments rest on several “traditional” notions of market failure, such as: externalities in consumption and production; scale economies; non-excludability; information problems about benefits alleviation. But infrastructure services are diverse and each exhibits these characteristics to varying degrees. Policies often fail when they do not make such distinctions within infrastructure. There are several reasons why public provision of infrastructure services have not had the desirable impact in Africa.

First, under a public sector dominated regime, investments in infrastructure are often misallocate for various reasons. For example, most of the selected projects are not based on the articulated needs of the society. Hence, there is no informed prioritisation of project selection or implementation. Hence, projects of lowest priority could be preferred to those of topmost priority in terms of the real needs of the society at a given point in time. Another dimension relates to the obsession with new projects. In this regard, there is usually excessive concentration of resources on new structures and little or no allocation to maintenance of infrastructural facilities. Interestingly, however, infrastructure is the easiest prey for speeding cuts during periods of fiscal crisis, while priority is given to consumption-promoting expenditure and projects of short term benefit to the economy. Many on-going infrastructural projects are usually abandoned, only to be revived, if at all, at very exorbitant costs later on. Another major source of disenchantment with this policy stance relates to the quality of services. The delivery of high quality services is usually hampered by technical inefficiency and outright waste. Inadequate maintenance leads to erratic service supply and distribution, while the low productivity of such facilities results in very high unit operating costs which are often times passed on to the consumers. The useful life of affected facilities are also shortened. The world Bank (1994b), observed that low-income communities are not offered suitable transport and sanitation options that provide services they value and can afford. Rather, premature investments in capacity especially in water supply, railways, power and irrigation have often absorbed resources that could otherwise have been devoted to maintenance, modernisation or improvements in service quality. More significantly, because infrastructure investments are immobile and serve local markets, excess capacity

cannot serve other markets and it remains under-used. And in some cases, large public projects have been overambitious, placing a costly burden on the economy. Also important is the twin problem of waste and inefficiency, that seems to claim a large share of resources that could be used for infrastructural services delivery.

The nature of public decision process with multiple, nebulously defined and often conflicting objectives which place less emphasis on nor provide adequate incentives for efficiency of operations is at the root of this problem. Arising therefrom, investment decisions and tariff policies are often driven primarily by political considerations. Many infrastructure projects in Africa should never have been embarked upon. Decisions to proceed with new projects are sometimes taken at the political level. It is not uncommon for the political element, for reason of prestige or with unjustified claims insist on an overdesigned capacity. Even within the state-owned enterprises, management is often appointed more on the basis of political loyalty than competence, and staffing profiles are more often dictated by political demands rather than felt needs. Costing and pricing decisions are also guided less by economic but more by political considerations. It is against this background that agitation have mounted for private sector involvement in the provision of infrastructure. This, it is hoped, would enhance the preference for economic considerations and demand-driven decisions process. Greater emphasis will be placed upon efficiency with its attendant positive effects on economic growth, enhance standard of living and poverty alleviation. The reduced pressure on government revenue will also facilitate internal and external equilibria and stimulate foreign investment. Overall, permission for private provision of infrastructure will suggest to international and national investors, or development institutions government's commitment to sound fiscal management, efficiency and substantial role for the private sector (Kerf and Smith, 1996).

**Table 11: Private Infrastructure Projects Worldwide, 1985 – 1995.**

<i>Region</i>	<i>Number of projects</i>		
	Total	With project costs	Cost US\$ billion
<i>East Asia/Pacific</i>	223	165	185.6
<i>OECD Europe</i>	252	145	156.6
<i>Latin America</i>	233	168	58.5
<i>USA/Canada</i>	290	219	31.1
<i>South Asia</i>	27	13	6.3

<i>Middle East/N. Africa</i>	13	7	4.7
<i>C&amp;E Europe</i>	38	18	3.5
<i>Former Soviet Union</i>	30	14	2.5
<i>Africa</i>	64	7	1.2
<b>Total</b>	1,170	756	450.0

Source: World Bank Infrastructure Project Database and FIAS, World Bank Group.

Redefining public-private sector interface in the provision of infrastructure services has become an important though controversial policy issue in the search for a more viable infrastructure sector in Africa. This is particularly vital since the efficiency, productivity and reliability of infrastructure provision impacts on the efficiency of domestic production and investment as well as the international competitiveness of the economy. A crucial variable is also the role of foreign capital. Foreign private involvement in Africa's infrastructure has been quite limited as shown in Table 11 which presents private infrastructure projects world-wide between 1985 and 1995. A cursory examination of the table indicates that only sixty-four projects were recorded for Africa in the ten year period, compared to 223 for East Asia/Pacific and 252 for OECD countries. The project sum at \$1.2 billion (less than 1 per cent) is equally deplorable and the reasons are not farfetched.

The region is yet to broaden its investment base beyond energy and mining which remain the prime attractions. Africa has the unenviable reputation of having uncompetitive product markets, thin capital markets, perceived high risks as well as legal, procedural and regulatory impediments. Public enterprises in infrastructure have a lower net worth and are less attractive to foreign buyers, except perhaps in telecommunications. African governments until recently resist selling to foreigners. Investors are reluctant to take an equity position in infrastructure because governments have established consistent pricing and other macroeconomic policies which continue to undermine infrastructure. Even in countries where the sector is open to private participation, there is often the problem of the inability of regulatory and legal institutions to provide credible commitments to create opportunities for potential investors to cover their investment costs and make profit including the risk-adjusted opportunity cost of capital. Macroeconomic and political

instability as well as legal restrictions on foreign capital discourage the flow of direct investment to this sector. Investors are wary of internal political volatility and the uncertainty of obtaining the enforcement of contracts.

## References

Ahmed, R., (1996) *A Critique of The World Development Report 1994: Infrastructure For Development*, International Monetary and Financial Issues for the 1990s. (Washington, D. C.: International Food Policy Research Institute).

Alexander, I., and C. Mayer, (1997) *Creating Incentives for Private Infrastructure Companies to Become More Efficient*, World Bank Policy Research Working Paper 1736.

Ariyo, A. and T. A. Jerome (1999), "Privatization In Africa: An Appraisal", World Development, Vol. xx, No.1 (forthcoming)

Biggs, T. (1994) *Africa Can Compete! Export Opportunities and Challenges for Garments and Home Products in the U.S. Market*. World Bank Discussion Papers. Africa Technical Department Series 242.

Baumol, W.J. and K.S. Lee (1991). "Contestable Markets, Trade and Development." *The World Bank Research Observer*. Vol. 6 No. 1 pp. 1-17.

Baumol, W. J., J. C. Panzar and R. D. Willig. (1988). *Contestable Markets and the Theory of Industry Structure*. San Diego California: Harcourt Brace Jovanovich

Brook, C. and J. Penelope, (1996). *The Guinea Water Lease – Five Years On*. The World Bank. Public Policy for the Private Sector. Note No. 78

\_\_\_\_\_ (1997). *Getting the Private Sector Involved in Water – What to Do in the Poorest of Countries*. The World Bank. Public Policy for the Private Sector. Note No. 102.

Commander, S and T. Killick (1988) ."Privatization in Developing Countries: A survey of the Issues." In P. Cook and C. Kirkpatrick (Eds.) *Privatization in Less Developed Countries*, N.Y. St. Martins Press.

Donaldson, D. J., F. Sader and D. Wagle (1997) *Foreign Direct Investment in Infrastructure. The Challenge of Southern and Eastern Africa*. Foreign Investment Advisory Service, Occasional Paper 9, The World Bank, Washington D.C.

Eggertsson, T.(1990). *Economic Behaviour and Institutions*. Cambridge Surveys of Economic Literature. Cambridge.

Europe Bank for Reconstruction and Development (nd). *Infrastructure for Transition*.

Furubotn, E. and S. Pejovich (1972). "Property Rights and Economic Theory: A Survey of Recent Literature."*Journal of Economic Literature*. Vol 10, No.4 December. pp. 1137-1162.

Guislain, P. (1997) *The Privatization Challenge – A Strategic, Legal and Institutional Analysis of International Experience*. World Bank Regional and Sectoral Studies.

Guislain, P. et al. (1996). *Getting Connected – Private Participation in Infrastructure in the Middle East and North Africa*. The World Bank Group.

Gutierrez. L. E. (1996) “How do Sub-Saharan African Utilities Compare?” in proceedings of symposium on *Power Sector Reform and Efficiency Improvements in Sub-Saharan Africa* ESMAP, Report No. 182/96, June.

Hirshman, A. (1958) *Strategies of Economic Development*, New Haven, CT: Yale University Press.

International Telecommunication Union. (1998) *African Telecommunication Indicators*. ITU, Geneva.

International Telecommunication Union (1998). *World Telecommunication Development Report*. ITU, Geneva.

International Telecommunication Union (1998). *General Trends in Telecommunication Reform. Africa* Vol. I&II. ITU Geneva.

Iwayemi, A. (1998), *Economic Perspectives on Infrastructure Deficiencies in Nigeria*, Mimeo.

Jensen, C. M. and M. H. Meckling (1976). "The Theory of the Firm, Managerial Behaviour, Agency Costs and Ownership Structure." *Journal of Financial Economics*, Vol. 3, pp. 305-60.

Jerome, A. (1997) *Public Enterprise Reform in Nigeria: Evidence from the Telecommunications Industry*. Final Report Presented To African Economic Research Consortium, Nairobi, Kenya.

Jimenez, E. ( 1995) *Human and Physical Infrastructure: Public Investment and Pricing Policies in Developing Countries*, Chap. 43 in Behrman, J and T. N. Srinivasan [Eds] *Handbook of Development Economics*, Vol 111B, Elsevier.

Turkson J. and I. Rowlands (1998). “Power Sector Reform: Lessons for Sub-Saharan Africa” Conference Proceedings on Experimenting with Freer Market : Lessons from the Last Ten Years and Prospects for the Future, International Association for Energy Economics, May 13 – 16 Quebec, Canada. Pp 289 – 98.

Kerf,M. and Smith,W. (1996) *Privatising Africa's Infrastructure: Promise and Challenge*. World Bank Technical Paper No.337, African Region Series. The World Bank, Washington,D.C.

Kohli, H, Mody and Michael Walton. (1997) "Making The Next Big Leap: Systemic Reform for Private Infrastructure in East Asia in Choices for Efficient Private Provision of infrastructure in East Asia (eds) The World Bank Washington, D.C.

Lee, K.S. and A. Anas. "Manufacturers' Responses to Infrastructure Deficiencies in Nigeria: Private Alternatives and Policy Options." Chapter 11 in Chibber, A. and S. Fischer (eds.) *Economic Reform in Sub-Saharan Africa* pp. 106-121.

Liebenstein H. (1966). "Allocative efficiency vs. X-efficiency." *American Economic Review*. 56, 392-415.

Millward, R. (1988). "Measured Sources of Inefficiency in the Performance of Public and Private Enterprises in LDC." Ch.6 in P. Cook and C. Kirkpatrick (eds.) *Privatization in Less Developed Countries*. N.Y. St. Martins Press.

Mody, A. (1997), "Infrastructure Delivery through Central Guidance" in Mody, Assokha (ed), *Infrastructure strategies in East Asian. The untold story*. EDI increasing Resources Series. The World Bank. Washington D.C.

Nellis, J. R. (1988). *Public Enterprise in Sub-Saharan Africa*. World Bank Discussion Paper No.1 The World Bank Washington D.C.

Ross, S. (1973). "The Economic Theory of Agency: The Principal Problem." *American Economic Review*. Vol 63 pp. 134-139.

Swarrop, V. (1996), "The Public Finance of Infrastructure: Issues and Options", in Mody Asokha (ed), *Infrastructure Delivery: Private Initiative and the Public Good*. EDI Development Studies The World Bank, Washington D.C.

United Nations Economic Commission for Africa (1995) *Economic and Social Survey for Africa : 1994-1995*, ECA Addis Ababa.

Van de Walle, N (1989). "Privatization in Developing Countries. A Review of the Issues." *World Development*. Special Issue. Vol. 17 No. 5 pp. 601-615.

World Bank (1994), *World Development Report, Infrastructure for Development*. (London Oxford University Press).

World Bank (1998), *World Development Report 1998/99, Knowledge for Development* (London Oxford University Press).

World Bank (1998), *World Development Indicators*, The World Bank Washington D.C.