

**Cyberspace Across Sub-Saharan Africa: From Technological
Desert Towards Emergent Sustainable Growth?**

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Introduction

Over the past three decades much of the continent of Africa, and especially the Sub-Saharan region, has been viewed as technological desert [8]. Spanning over 24 million square kilometers from the Sahara in the north to the Cape Verde in South Africa, Sub-Saharan Africa comprises 49 countries and is home to 659 million people [12]. With her many problems of hunger, epidemics, war, and other related socio-economic problems, the diffusion of the Internet might be the last thing to be associated with Sub-Saharan Africa. While much research has been published on the status and impact of Internet diffusion in other regions of the world [1,2,3,4], little is found in mainstream journals on the diffusion of the Internet in Africa [5], particularly in Sub-Saharan Africa. An update of the status of the Internet is thus in order, along with a discussion of some inhibitors and contributors that appear to shape the diffusion of the Internet in this region.

Current Status of the Internet in Sub-Saharan Africa

Sub-Saharan Africa may be a late starter on the Internet but it is currently undergoing a rapid transformation. The countries in this region are experiencing growth in Internet connectivity, the use of computers, and in the diffusion of wireless communications [6, 11, 12]. Current statistics show that:

- No longer is the telephone density (the ratio of fixed telephone lines to population) of Sub-Saharan Africa trapped below the one per cent threshold, which is considered essential to economic growth and development. For example,

in the millennium year fixed telephone density grew from 0.9 per cent to 1.2 per cent [6];

- By 2001, the number of mobile subscribers had outpaced fixed line subscribers with a recorded ratio of approximately 17 mobile phone subscribers per 1000 population compared to 14 per 1000 for landline phones [6]; and
- No longer is the region as stifled by a lack of fair regulation and free competition. Within the last two years, 36 new operators launched mobile services and well over half of the countries across the region established independent organizations to regulate their information and telecommunications sectors [7].

These changes have largely taken place since the mid 1990s, before which most of Sub-Saharan Africa was a technological desert [5, 8]. Statistics obtained in 1995 (Figure 1) show a continent with sparse Internet presence and low connectivity. Much of this has changed (Figure 2). In November 2000, Eritrea obtained a local Internet connection, finally bringing all 54 of Africa's countries and territories online. Currently, the number of dialup Internet subscribers exceeds the one-million-mark and the total outgoing international Internet bandwidth is above the 1-gigabit-per-second mark. This represents substantial growth compared to the figures in 1995 (Figure 1).

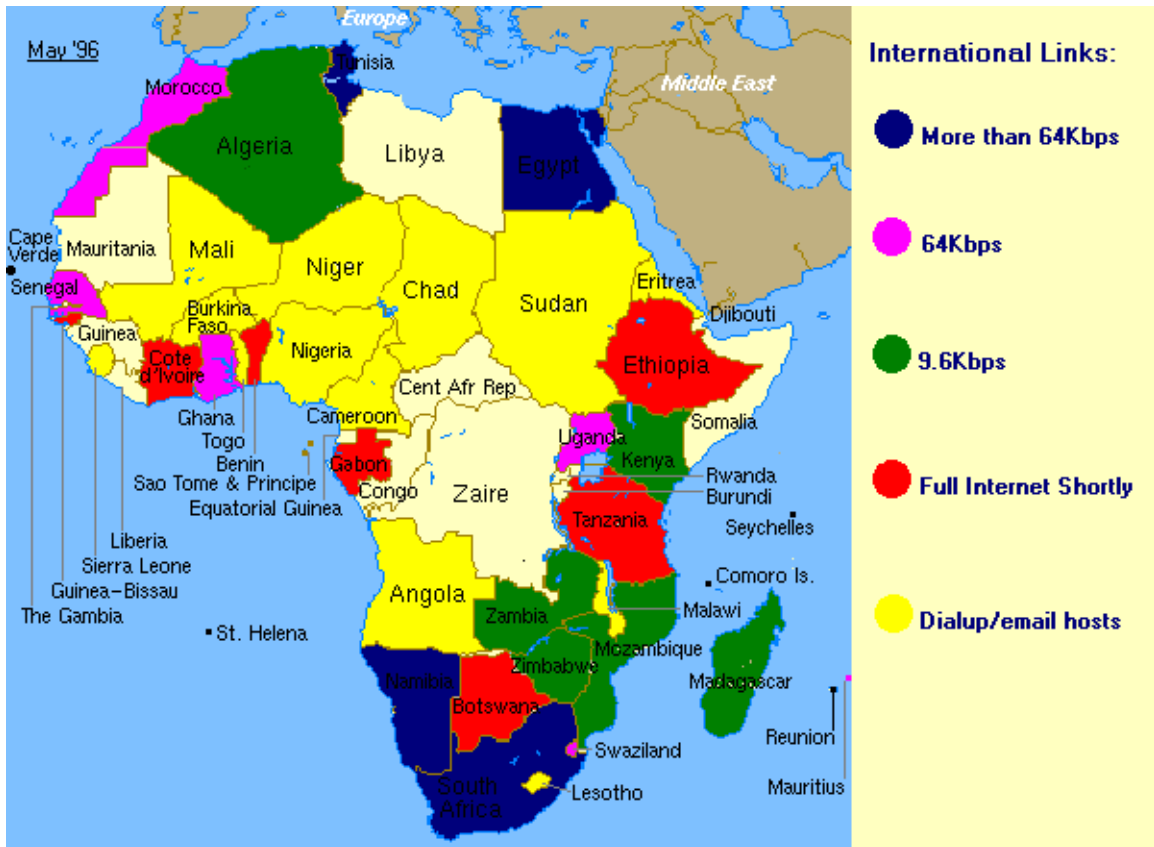


Figure 1: Africa's Internet Access & International Bandwidth in 1995.
 Source: United Nations Economic Commission for Africa [10].

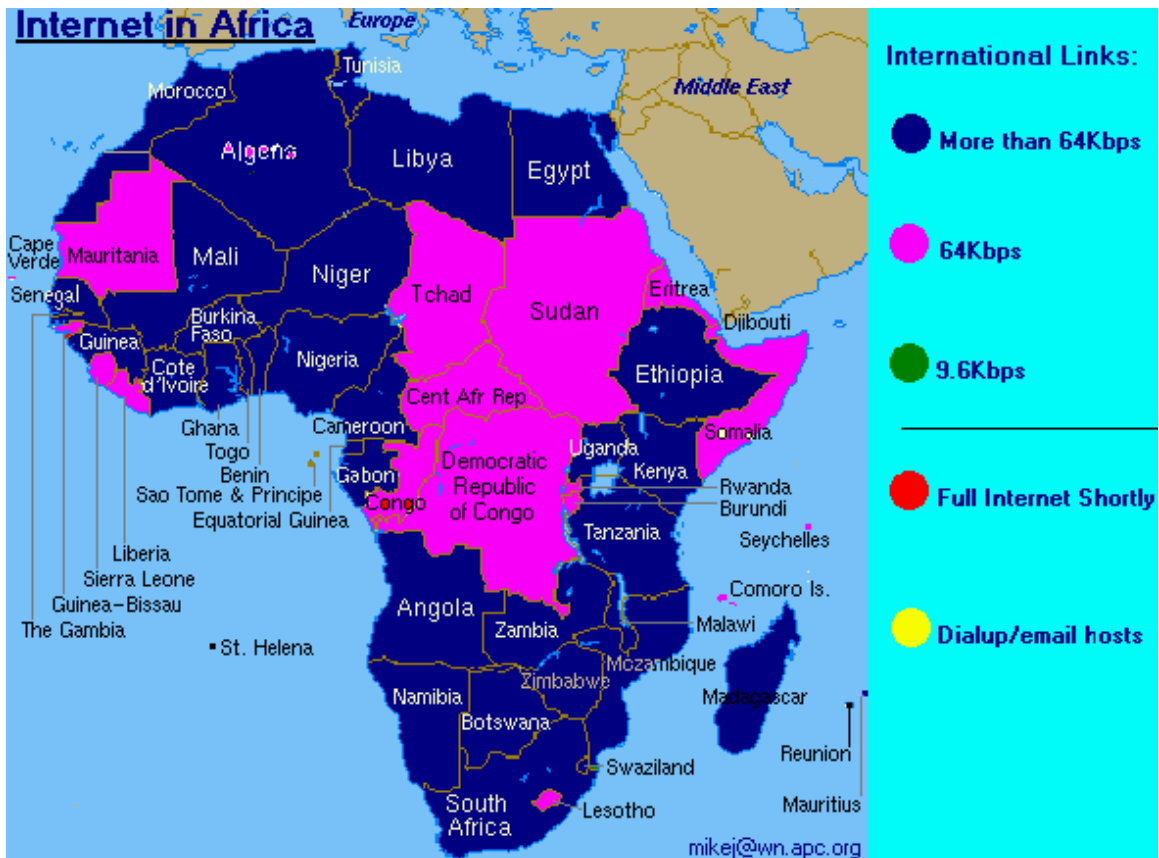


Figure 2: Africa's Internet Access & International Bandwidth in 2001.
 Source: United Nations Economic Commission for Africa [10]

Internet diffusion has been largely confined to the major cities, where a minority of the population lives, although a growing number of countries have points of presence (POPs) in some of the secondary cities. There are now about 250 POPs across the region, with 100 in South Africa.

Sixteen countries (Benin, Burkina Faso, Cape Verde, Ethiopia, Gabon, Malawi, Mali, Mauritius, Mauritania, Namibia, Niger, Senegal, South Africa, Tchad, Togo, and Zimbabwe) now have local-call charges for all calls to the Internet (Table 1). Seychelles has gone a step further and made charges for calls to the Internet 50% lower than normal voice calls to further encourage Internet use. With the reduced costs for those in remote areas that this provides, it is surprising that more countries have not adopted this strategy.

End-user Connectivity & Subscriber Population

The total number of computers permanently connected to the Internet (excluding South Africa) was about 35,000 in 2001 as measured by Network Wizards (www.nw.com). However, these figures are becoming increasingly meaningless because of the widespread use of .com and .net domains, and more importantly, the frequent use of Network Address Translation (NAT). NAT allows the re-use of the same address across many computers in different networks. As a result many of the countries show zero or only a handful of hosts in the Network Wizards surveys when in actual fact there might be hundreds if not thousands of machines connected to the Internet.

It is also difficult to measure the total numbers of Internet users. The World Bank [11, 12] currently estimates that there are about 3.7 million users (Table 2). This works out to an average of about one Internet user for every 200 people compared to a world average about 1 in 30, a North American and European average of about 1 in 3, 1 in 125 for Latin America and the Caribbean, 1 in 200 for South East Asia & the Pacific, 1 in 250 for East Asia, and 1 in 500 for the Arab States [11, 12].

Presently, 24 countries have 1,000 or more dialup subscribers, 19 have more than 5,000 and 6 have over 20,000 subscribers (Table 1). Although exact data on the number of rural vs. urban users has proved difficult to obtain, the clustering of ISPs and POPs within major cities suggests that users in the cities and towns greatly outnumber rural users. There are now local Internet Society chapters in all the regions of Sub-Saharan Africa and in most of the countries with large Internet user populations.

Internet Access Cost

Currently, the average total cost of using a local dialup Internet account for 20 hours is about \$68/month. These costs include usage fees and local call telephone time, but not telephone line rental. ISP subscription charges range from \$10 to \$100 a month. Cost of subscription is typically paid in local currency. The huge variance in subscription charges is a reflection of (1) the different levels of maturity of the markets, (2) the varying tariff policies of the telecom operators, and (3) the different regulations on private wireless data services and on access to international telecommunications bandwidth across the countries of the region.

Internet Service Providers (ISPs)

The capital cities of most countries in Sub-Saharan Africa now have more than one ISP. There are about 575 public ISPs across the region (excluding SA, where the market has consolidated into 3 major players with 90% of the market and 75 small players with the remainder). Five countries (Kenya, Nigeria, South Africa, Tanzania and Togo) have 10 or more active ISPs. Fifteen countries have 5 or more ISPs, and 20 countries have only one ISP. Although Ethiopia and Mauritius are the only countries where a monopoly ISP is still national policy (i.e. where private companies are barred from reselling Internet services), there are other countries in which this practice still continues, predominantly in the Sahel sub-region where markets are small.

In response to the high cost of Internet services and the slow speed of the web, and also because of the overriding importance of electronic mail, lower-cost email-only services have been launched by many ISPs. A large proportion of users also access the

free Web-based services such as Hotmail, Yahoo or Excite. These services can be more costly and cumbersome than using standard email software because extra online time is needed to maintain the connection to the remote site. However, they provide the added advantages of anonymity and perhaps greater perceived stability than a local ISP, which may not be in business next year.

Internet kiosks, cyber cafés and other forms of public Internet access are growing rapidly. Emerging Internet-access practices include adding PCs to community phone-shops, schools, police stations and clinics that can share the cost of equipment and access amongst a larger number of users. This is happening even in remote towns where a long-distance call provides the linkage to the nearest dialup access point. In addition a growing number of hotels and business centers provide PCs with Internet access, and some ISPs are rolling out a new generation of branded cyber cafés in major cities.

Public Telecommunications Operators (PTOs)

In the last few years PTOs have established Internet services in 33 countries. This follows trends in the more developed countries where almost all of the PTOs have established Internet services. In many Francophone countries the PTOs operate as the major value added service providers in joint ventures with France Cable and Radio, called Telecom-Plus in many countries and DTS in Madagascar.

The PTO has usually been the sole International link provider in most of the countries within this region. However, in a growing number of countries (Côte d'Ivoire, Nigeria, Mozambique, South Africa, Uganda and Zambia), the PTOs now compete with the private sector's international VSAT links. Elsewhere, the PTOs operate the

international gateway and access to the national backbone, and leave the resale of end-user Internet access to the private sector. In Botswana, Cameroon, South Africa, Zambia, and in most of the francophone countries the PTOs also compete with the private sector in the provision of end-user dialup accounts.

International Bandwidth

Due to high international tariffs and lack of circuit capacity, obtaining sufficient international bandwidth for delivering web pages over the Internet is still a major problem. Until recently few of the countries outside of South Africa had international Internet links larger than 64Kbps, but today 23 countries have links carrying 5Mbps or more, and 13 countries have outgoing links of 10Mbps or more (Figure 2). Excluding South Africa, the total international outgoing Internet bandwidth installed in Sub-Saharan Africa is about 400Mbps.

Two-way satellite-based Internet services that use very small aperture terminals (VSAT) to connect directly to the US or Europe have been quickly adopted wherever regulations allow (DRC, Ghana, Mozambique, Nigeria, Tanzania, Uganda and Zambia). More consumer oriented VSAT services similar to services now available in the US and Europe, are now being launched by satellite operators.

With the exception of some ISPs in Southern Africa, almost all of the international Internet circuits in Sub-Saharan Africa connect to the US. A few connect to the United Kingdom, Italy, France and Singapore. However, Internet Service Providers in countries that border South Africa benefit from the low tariff policies instituted by the South African telecom operator for international links to neighboring countries. As a

result South Africa acts as a hub for some of its neighboring countries - Lesotho, Namibia, and Swaziland. Unfortunately there remains dismal direct cross-border Internet and telecommunications traffic across other countries that share common borders in this region.

Regional Inhibitors of IT (Internet) Assimilation:

There exist various technological, environmental, operational and financial bottlenecks that continue to constrain the growth of Internet connectivity.

- In most countries, Internet services are still limited to the urban centers. Very few ISPs have POPs outside the cities. This, it has been argued, is mainly due to the poor telephone connections in regions outside of the major cities.
- Local telephone infrastructure problems which include low levels of teledensity low-speed and narrow-bandwidth lines, the poor quality of connections, and high landline telephone installation charges and usage fees, continue to constrain the reach of the Internet.
- The high cost of the available international long-haul (terrestrial or satellite) links to the high-speed Internet backbones may be the key obstacle to Internet growth. These usually translate into high subscription and connection charges for end-users.
- The acute shortage of technical staff to design, install, operate and maintain the networks and requisite Internet technologies remains a major impediment to growth. Lack of technical support for end-users is another serious limitation.

Numerous Internet initiatives and projects have been delayed or even postponed due to the shortage of people with proper technical skills.

Regional Stimulants of Internet Assimilation:

On the other hand, several factors have continued to foster Internet growth in Sub-Saharan Africa.

- Public Internet access through cyber-café's, and rapidly falling service charges, are providing an opportunity for many more people to use the Internet regularly.
- Rapid growth in mobile communications is freeing up landlines that are then being dedicated to Internet connectivity.
- The role of governments has been a major impetus to Internet growth on the continent. Many governments have responded to the advent of the Internet, allowing for the commercialization of the Internet sector, and also actively participating by launching government-owned web sites and Internet services. The concurrent deregulation and liberalization of the telecommunications sector in most of these countries has added impetus in accelerating the diffusion of Internet services within this region.
- Many governments now allow computers to be imported to their countries duty free or at reduced rates. This has resulted to higher diffusion rates of computers among the Sub-Saharan population and, in turn, to higher Internet connectivity and use.

Conclusion

Although Sub-Saharan Africa still has a long way to go before catching up with the rest of the World, the region is experiencing rapid growth in Internet diffusion. This is in part because of the liberalization of policies toward Internet connectivity, the telecommunications sector, and PC purchase and import policies. The rapid diffusion of wireless technologies and the falling prices of telecommunications and Internet services have also contributed to this high level of Internet diffusion.

The diffusion of Internet in Sub-Saharan Africa is substantially helping Africa solve some of its critical problems. For example, many Africans are obtaining college education through Internet-based distance learning initiatives such as the African Virtual University. Another example is that of telemedicine. Through several HEALTHNET (a telemedicine provider) initiatives, many doctors in Africa are being educated on recent developments in the medical field such as steps to combat HIV/AIDS, a major killer in Sub-Saharan Africa.

While it is hard to project what the future holds for Africa's Internet penetration, we believe growth in Internet and related technologies will continue for years to come. We also contend that within the next decade, the Internet will no longer be a mystery and a luxury for most Africans, but a necessity for the day-to-day activities of inhabitants within the SSA region.

Table 1: African Country Internet Status Summary Jun 2002

Country	Dialup Internet Subscribers	International Bandwidth Kbps Outgoing	Internet Hubs Number	Number ISPs	Population Millions 2000	GDP/ Capita USD 1999	Cities with POPs	Dialup Access Cost USD
AFRICA	1351075	723038	6	644	768.66	1185.55	147	67.94
SOUTH AFRICA	750000	300000	5	80	44.31	2979	100	40
ANGOLA	4000	192	1	4	12.09	1684	5	
BENIN	4000	1024	1	2	5.78	374	2	
BOTSWANA	25000	14000	1	6	1.57	3252	4	
BURKINA FASO	3000	256	1	3	11.31	199	1	42
BURUNDI	150	64	1	2	6.46	159	1	
CAMEROON	2500	256	1	7	14.31	617	2	40
CAPE VERDE	1800	1024	1	1	0.41	876	1	
CENTRAL AFRICAN REPUBLIC	200	64	1	1	3.48	276	1	
CHAD	300	64	1	1	7.27	149	1	
COMOROS	200	64	1	1	0.66	382	1	
CONGO	200	128	1	1	2.79	833	2	
COTE D'IVOIRE	10000	5120	2	5	16.2	767	2	
D.R CONGO	4500	2048	3	5	49.3	400	4	
DJIBOUTI	300	64	1	1	0.62	846	1	
EQUATORIAL GUINEA	200	64	1	1	0.43	668	1	
ERITREA	1000	128	1	4	3.58	161	5	70
ETHIOPIA	2500	512	1	1	59.65	103	1	75
GABON	2500	512	1	2	1.17	5121	2	
GAMBIA	3000	128	1	1	1.23	284	1	
GHANA	15000	4096	3	8	19.16	372	7	
GUINEA	4000	128	3	2	7.71	677	3	
GUINEA-BISSAU	250	64	1	1	1.13	245	1	
KENYA	35000	6144	1	34	29.01	347	6	123
LESOTHO	250	512	2	2	2.06	547	1	
LIBERIA	75	128	1		2.67	1000	1	
MADAGASCAR	8000	2556	2	7	16.36	224	4	
MALAWI	2400	1024	3	2	10.75	242	2	
MALI	3000	128	1	5	10.69	230	1	130
MAURITANIA	550	384	1	5	2.53	455	2	
MAURITIUS	35000	4096	1	1	1.15	3661	1	
MOZAMBIQUE	6000	2048	3	5	18.88	86	4	31
NAMIBIA	15000	3072	2	3	1.66	2051	13	40
NIGER	350	192	1	1	10.08	161	1	
NIGERIA	50000	9216	5	15	113.5	551	5	40
REUNION	500	576	1	2	0.68	9270	1	
RWANDA	1000	128	3	1	6.6	317	1	
SAO TOME & PRINCIPE	200	64	1	1	0.14	358	1	
SENEGAL	15000	48000	1	8	9	518	1	51
SEYCHELLES	3000	4098	2	2	0.08	6995	1	
SIERRA LEONE	500	128	1	1	4.57	209	1	
SOMALIA	250	64	1	1	10.63	169	1	160
SUDAN	2000	256	1	1	28.29	364	1	
SWAZILAND	1200	256	2	2	0.95	1388	2	
TANZANIA	20000	4096	3	14	32.1	244	2	

TOGO	1700	1536	2	12	4.4	324	1	
UGANDA	10000	2048	4	8	20.55	317	1	109
ZAMBIA	6500	3072	3	3	8.78	463	3	
ZIMBABWE	20000	5120	1	8	12.68	712	4	46
Dialup internet access costs calculated for 20hours a month of local call time plus internet subscription fee								
"Call Cost" is converted to US\$/hour								
Source of Data: Direct contact with Internet Service Providers, regulators and hub operators in African countries								

Table 2: Profile of Sub-Saharan Africa

1996
1999
2000

People

Population, total
595.3 million
643.3 million
658.9 million

Population growth (annual %)
2.8
2.5
2.4

Life expectancy at birth (years)
..
..
46.5

Fertility rate, total (births per woman)
..
..
5.2

Mortality rate, infant (per 1,000 live births)
..
..
91.2

Urban population (% of total)
32.0
33.8
34.4

Illiteracy rate, adult male (% of males 15+)
34.0
31.1
30.1

Illiteracy rate, adult female (% of females 15+)
52.0
48.0

46.7

Economy

GNI, Atlas method (current US\$)

318.2 billion

312.4 billion

310.0 billion

GNI per capita, Atlas method (current US\$)

530.0

490.0

470.0

GDP (current \$)

332.7 billion

319.6 billion

322.7 billion

GDP growth (annual %)

4.7

2.4

3.1

Inflation, GDP deflator (annual %)

21.0

9.6

11.9

Agriculture, value added (% of GDP)

19.0

17.8

17.0

Industry, value added (% of GDP)

30.6

28.5

30.0

Services, etc., value added (% of GDP)

50.4

53.7

53.1

Information and Telecommunications Technology and infrastructure

Fixed lines and mobile telephones (per 1,000 people)

13.4

24.3

31.6

Telephone average cost of local call (US\$ per three minutes)

0.1

0.1

0.1

Personal computers (per 1,000 people)

..
8.2
9.2

Internet users
648.0 thousand
2.4 million
3.7 million

Source: *World Development Indicators database, April 2002* [12]

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