International Telecommunication Union

TELECOMMUNICATION/ICT
MARKETS AND TRENDS
IN AFRICA

2007

Kigali, Rwanda

Connect
Africa Summit

29-30 October 2007

ITU International
Telecommunication
Union

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PREFACE

During the World Summit on the Information Society (WSIS), governments and world leaders agreed on the need to work towards bridging the digital divide to build "*a people-centered, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life, premised on the purposes and principles of the Charter of the United Nations and respecting fully and upholding the Universal Declaration of Human Rights.*"[1]

Together with some other UN agencies, ITU was nominated as leading facilitator for several action lines at the WSIS in Tunis in 2005. Within its mandate, ITU launched the *Connect the World*[2] initiative in 2006. *Connect the World* is a multi-stakeholder effort, established within the context of the WSIS to encourage new projects and partnerships to bridge the digital divide. By showcasing development efforts which are now underway and by identifying areas where needs are the most pressing, *Connect the World* will generate the momentum to "*connect the unconnected by 2015*".

Connecting the unconnected is not an end in itself, but an important contribution to the UN Millennium Development Agenda, because it enables people to achieve development goals such as universal primary education, gender equality or environmental sustainability.

Connect Africa, part of ITU's *Connect the World* initiative, seeks to help assess the current situation, trends, challenges and opportunities of the telecommunication/ICT market in Africa.

ITU has been measuring the development of the Information Society for many decades by collecting data in cooperation with its Member States and partner institutions. Besides highlighting the need to connect the least connected region of the world, this report seeks to help governments, the private sector, civil society and the international development community to take informed policy decisions.

This report provides a comparative analysis of the development of the African telecommunication/ICT market. In this regard, trends in main (fixed) telephone lines, Internet, broadband and mobile cellular services are examined, as well as privatization and investment conditions. The report points out the challenges of the African telecommunication market, as well as the need for coordinated action.

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[1]   Geneva Declaration of Principles (2003): http://www.itu.int/wsis/documents.

[2]   ITU: http://www.itu.int/partners/index.html.

CONTENTS

1. OVERVIEW

In 2006, world population amounted to 6.6 billion inhabitants, of whom 923 million lived in Africa. Africa was the second most populated region after Asia, with 3.9 billion inhabitants.

Although Africa has a share of around 14 percent of the world's population, it accounted for little over two percent of the world's Gross Domestic Product (GDP) in 2006 (Figure 1.1). While the global GDP amounted to 48'800 billion USD, Africa accounted for a GDP of 996 billion USD[1]. Within Africa, the

distribution of wealth is rather uneven between countries. Out of a total of 54 African economies, South Africa alone accounted for a GDP of 240 billion USD, 25 percent of Africa's total GDP. The GDP per capita of the region stood at 1'079 USD in 2006, compared to 3'197 USD in Asia and 19'358 USD in the Americas.

With regards to access to Information and Communication Technologies (ICTs), Africa is lacking in investment-intensive infrastructure, such as main

Figure 1.1: Africa in comparison with other world regions
Population and Gross Domestic Product (GDP), main (fixed) telephone lines, mobile cellular subscribers, Internet users and broadband subscribers by region, 2006
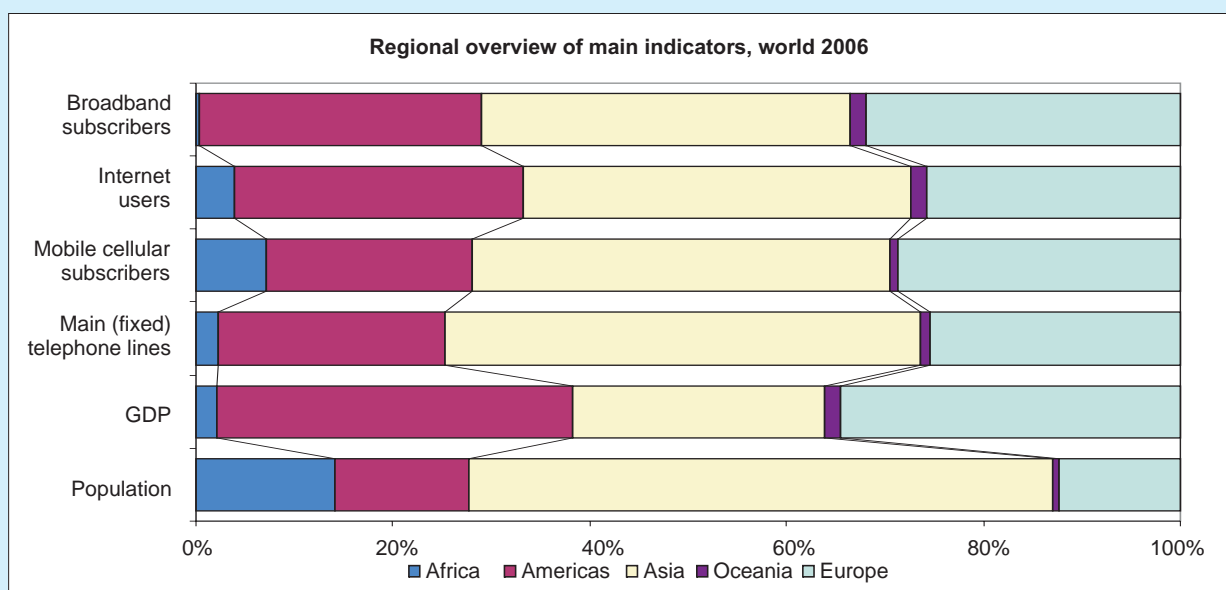
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

(fixed) telephone lines and fixed broadband. While there were 1'270 million main (fixed) telephone lines worldwide in 2006, less than two percent of these were located in Africa, while Asia for instance had a share of 48 percent (Figure 1.1). Obviously, Africa has still great potential to improve its telecommunications usage and infrastructure deployment.

Also due to prohibitively high tariffs and limited computer literacy, the number of broadband subscribers in Africa is rather small. While the world saw 281 million broadband subscribers by the end of 2006, one million, less than 0.4 percent, had subscribed in Africa (Figure 1.1). Since broadband access is a major tool for e-government as well as e-commerce, this is a striking indicator for Africa's future development. Broadband access has spread rapidly in Asia, where 104 million persons signed up for high-speed Internet access, followed by Europe and the Americas with 89 and 80 million subscribers respectively. Regarding its share of the world's population, Oceania with 4.5 million subscribers was quite well connected.

In 2006, Africa had an estimated number of Internet users of 44 million or 3.8 percent of the world's 1.1 billion Internet users (Figure 1.1). The share of Africa's Internet users is higher than its share of main (fixed) telephone lines and broadband subscriptions, due to the popularity of public access points or cyber cafés. This is particularly true for rural areas and villages, where the connectivity goals of the WSIS are more difficult to meet (Box 3.1.2).

Slow growth in main (fixed) lines leads Africans to use mobile cellular phones as means of communication. Mobile cellular technology has a higher coverage rate in the region. Cheaper infrastructure and larger regional penetration, cheaper handsets, competitive markets and business models oriented to the needs of the poorer segments of the population, such as affordable prepaid cards, have resulted in a mobile boom in Africa during the last decade. Nevertheless, the share of Africa with 7.2 percent of the worldwide 2.7 billion mobile subscribers shows still a lot of potential growth (Figure 1.1). Africa already experienced a significant yearly growth of mobile penetration. While Africa had 198 million mobile cellular subscribers in 2006, Asia had 1'137 million, Europe 768 million and the Americas 558 million subscribers respectively. Nevertheless, the African mobile market is still far away from saturation while the trend in several countries in the world is towards a second mobile per person. In 2006, Africa had a penetration of mobile cellular subscribers per 100 inhabitants of 22.0, the Americas of 62.0, Asia of 29.3, Europe of 94.3 and Oceania of 72.6.

Obviously, the African telecommunication market has just begun its rise. As the mobile boom has already proven, Africa has a strong demand for ICTs. This demand needs to be satisfied in order to insure the vital participation of Africans in the Information Society. Nowadays, it is broadly understood that access to ICT can contribute tremendously to economic development. To create access to ICT is a major challenge to African and foreign governments, the private sector and civil society. Regarding the advantaged of mobile technologies, Africa's ICT/telecommunication future will likely be wireless.

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[1] *Source:* ITU World Telecommunication/ICT Indicators (WTI) Database.

2. REGULATORY ENVIRONMENT

2.1 Privatization of incumbents

In mid-2007, 123 ITU Member States had a private fixed-line incumbent (Figure 2.1.1, left). The privatization of state-owned incumbents in developing countries in the 1980s and 1990s took place mainly through investment from high-income countries. Africa, with 26 state-owned incumbents, was the continent with the lowest share of private owned operators in mid-2007 (Figure 2.1.1, right). However, privatization is progressing: E.g. Kenya and Botswana are intending to privatize Telekom Kenya[1] and Botswana Telecommunications Corporation (BTC)[2].

While privatization continues worldwide, some re-nationalization is taking place, particularly in Latin America. Since the boom in Africa's telecommunication market has taken place mainly in the mobile sector, African fixed line operators might get less attractive to investors. Incumbents could probably obtain a mobile or Wireless Local Loop (WLL) licenses, in order to prove themselves attractive to potential investors.

2.2 Level of competition in different market segments of telecommunication services

In Africa, the number of monopolies in fixed line services is rather large. Leaving aside the partially competitive market (where, for instance, one company that is not state-owned has a de facto monopoly) in 2006, the African region accounted for 37 percent of

Figure 2.1.1: Privatizations of fixed line operators continues
The rise in privatized fixed line operators, 1995-2007, world (left) and Africa (right)
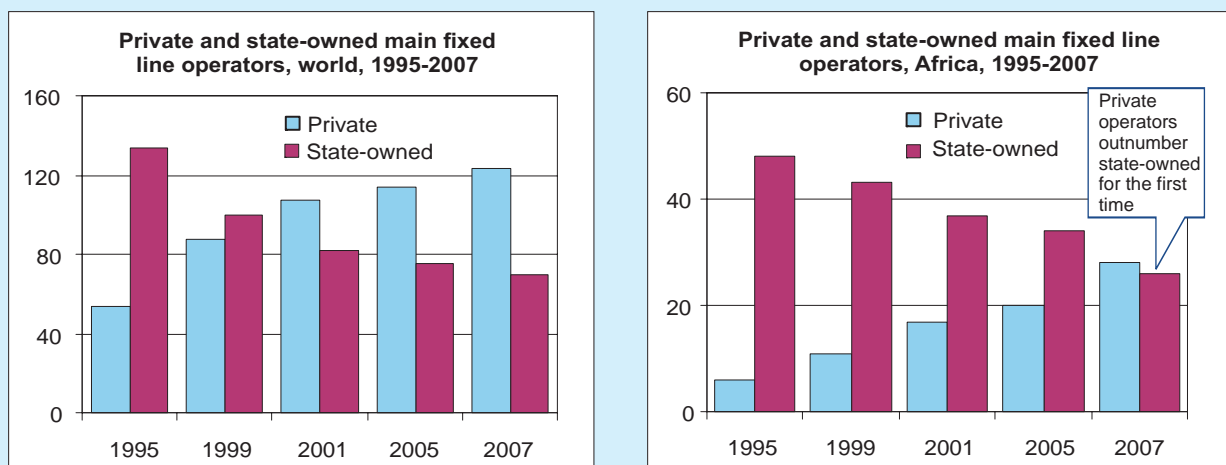
Source: ITU World Telecommunication Regulatory Database.

Figure 2.2.1: Level of competition in main (fixed) line, mobile and Internet services

Distribution of monopolies for local main (fixed) line services by region in 2006 (top left), level of competition in local main (fixed) line services by region in 2006 (top right), level of competition in main (fixed) line, mobile and Internet services in Africa, 2006 (bottom left) and level of competition in Sub-Saharan Africa, 2006 (bottom right)
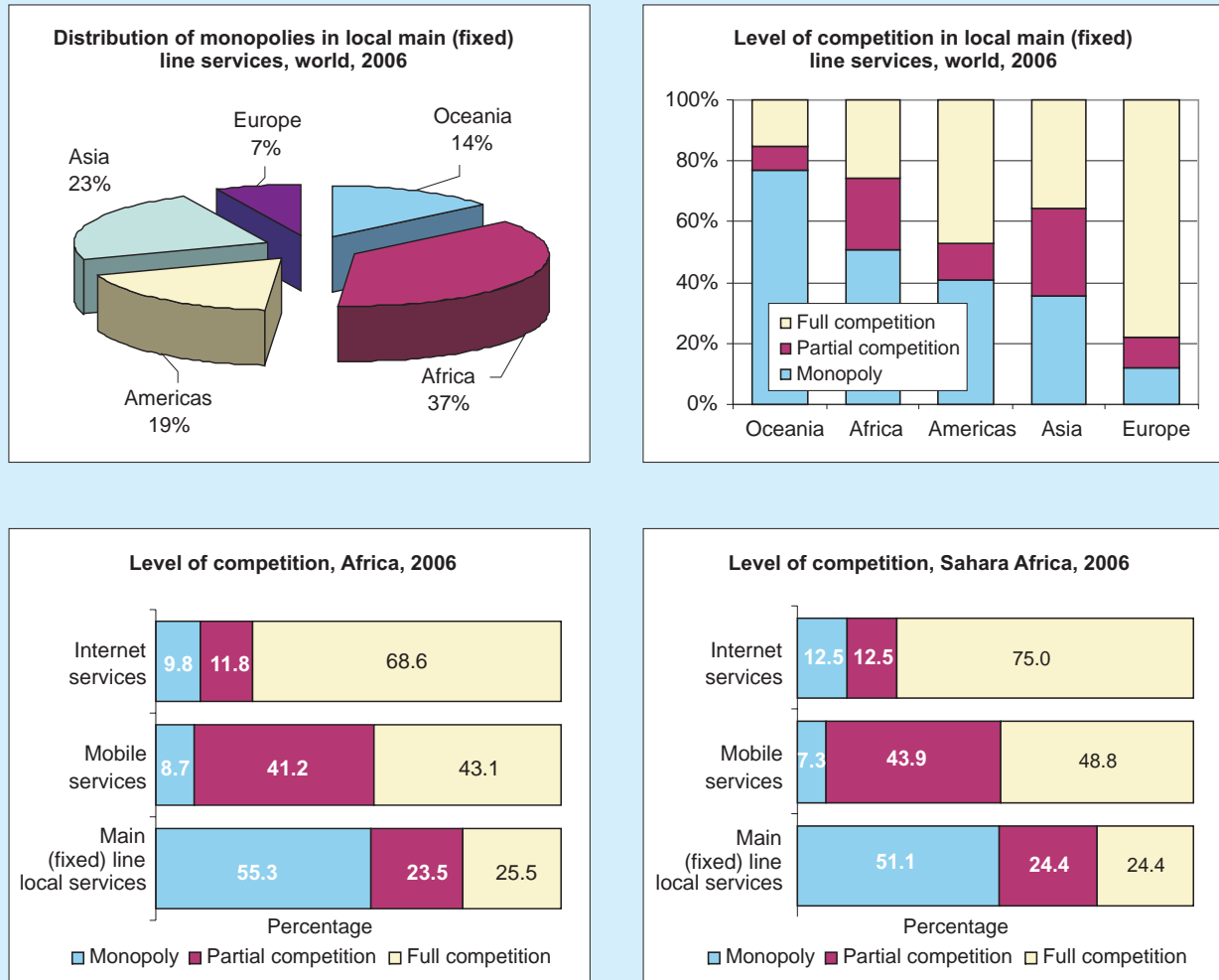
Distribution of monopolies in local main (fixed) line services, world, 2006

Europe 7%
Oceania 14%
Asia 23%
Americas 19%
Africa 37%

Level of competition in local main (fixed) line services, world, 2006

□ Full competition
■ Partial competition
■ Monopoly

Oceania   Africa   Americas   Asia   Europe

Level of competition, Africa, 2006

	Monopoly	Partial competition	Full competition
Internet services	9.8	11.8	68.6
Mobile services	8.7	41.2	43.1
Main (fixed) line local services	55.3	23.5	25.5

Percentage
□ Monopoly ■ Partial competition □ Full competition

Level of competition, Sahara Africa, 2006

	Monopoly	Partial competition	Full competition
Internet services	12.5	12.5	75.0
Mobile services	7.3	43.9	48.8
Main (fixed) line local services	51.1	24.4	24.4

Percentage
□ Monopoly ■ Partial competition □ Full competition

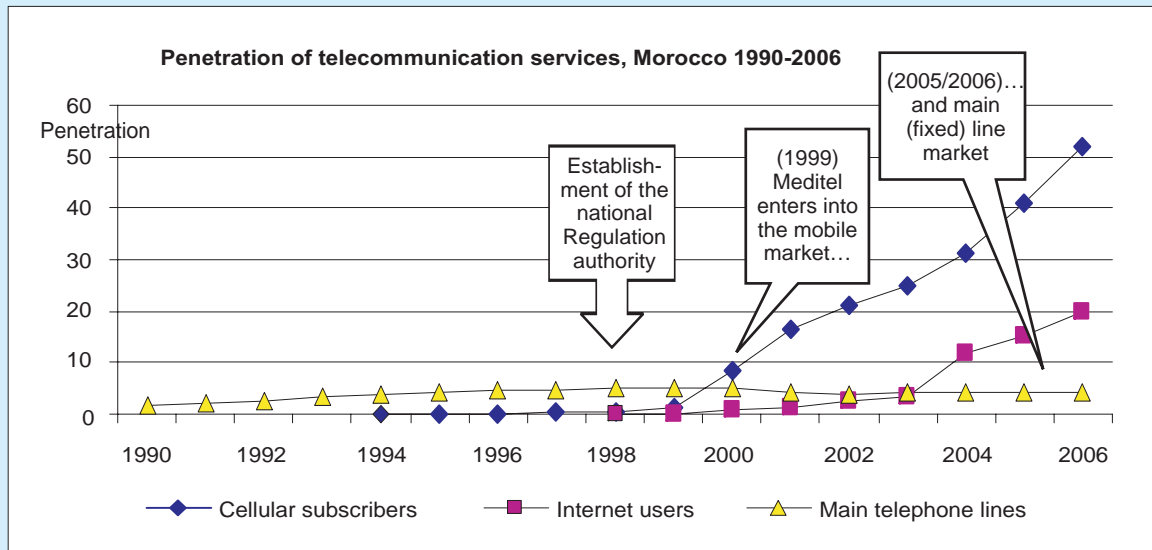*Source:* ITU World Telecommunication Regulatory Database.

world's fixed line monopolies (Figure 2.2.1, top left). Fixed line telephony is the least competitive voice service is Africa, while the African mobile market, facing fewer state-owned incumbents from the start, is often in private hands, with 93.3 percent of the economies having achieved partial or full competition (Figure 2.1.1, top right).

The Internet market is the most competitive one in Africa, with 68.6 percent of the economies allowing full competition and another 11.8 percent partial competition (Figure 2.2.1, bottom left). Within Africa, the largest number of monopolies is found in Sub-Saharan Africa where 51.1 percent of the fixed line

markets and 12.5 percent of the Internet markets are under the monopoly of one operator (Figure 2.2.1, bottom right). With 48.8 percent of its cellular mobile markets, Sub-Saharan Africa has achieved a higher level of privatization than Africa as a whole.

2.3 Regulatory environment

The telecommunication market and the customers usually profit from competition, as the example of Morocco shows (Box 2.2.2). In order to create and keep competition in the telecommunication market functioning, a sound regulatory environment needs to be established, usually with an independent

Box 2.2.2: e-Morocco: Higher penetration through market liberalization

Penetration of telecommunication services, Morocco 1990-2006

Establish-ment of the national Regulation authority

(1999) Meditel enters into the mobile market…

(2005/2006)… and main (fixed) line market

— Cellular subscribers — Internet users — Main telephone lines

Traditionally in Morocco, almost all public telecommunication infrastructures have been controlled by the government. Until the late 1990s, Morocco was, like many other countries, a monopolistic telecommunication market. The state-owned incumbent *National Office of Post and Telecommunications* (NOPT) was unable to satisfy the increasing demand for services. Besides the bad quality of telephone services, millions of applicants had to wait for a telephone line to be installed for up to 80 months. Additionally, the cost of telephone services was very high.[3]

In 1997, the Moroccan parliament adopted the *Post Office Telecommunication Act* and some related laws, which opened the way for the foundation of the *National Telecommunication Regulation Agency* (ANRT) in 1998. This agency was appointed in charge of the introduction of competition through transparent tenders and regulation policy. One of the major achievements of this regulatory authority has been its outstanding dispute settling mechanism avoiding costly and time-consuming conflicts.[4]

In 2000, the French global media company *Vivendi Universal* bought its first 35 percent equity stake and another 16 percent

of the incumbent *Morocco Telecom* (IAM) in 2004. While the mobile market was already liberalized in 1999 with the market entry of *Meditel* competing with the larger *Maroc Telecom*, the fixed-line market is still dominated by *Maroc Telecom*, even though the second mobile operator is allowed to operate its own international gateway.[5]

As the graph above indicates, mobile and Internet technologies that were provided by privatized operators acting under competition have enjoyed the greatest uptake by the Moroccans. In May 2006, Meditel was granted a licence to offer fixed-wireless services.[6] Limited wireless in the local loop (WLL) services offer *Meditel* and the new third Operator *Wana* (under the brand name *Bayn*) the opportunity to compete directly with Maroc Telecom in the fixed line market.

Customers usually profit from privatization and the creation of competition through lower prices, better quality of services and openness for innovation in a regulated telecommunications market. In Morocco, privatization and liberalization has accompanied increases in mobile and Internet penetration rate. With competition recently introduced, the penetration of main (fixed) line services could also improve.
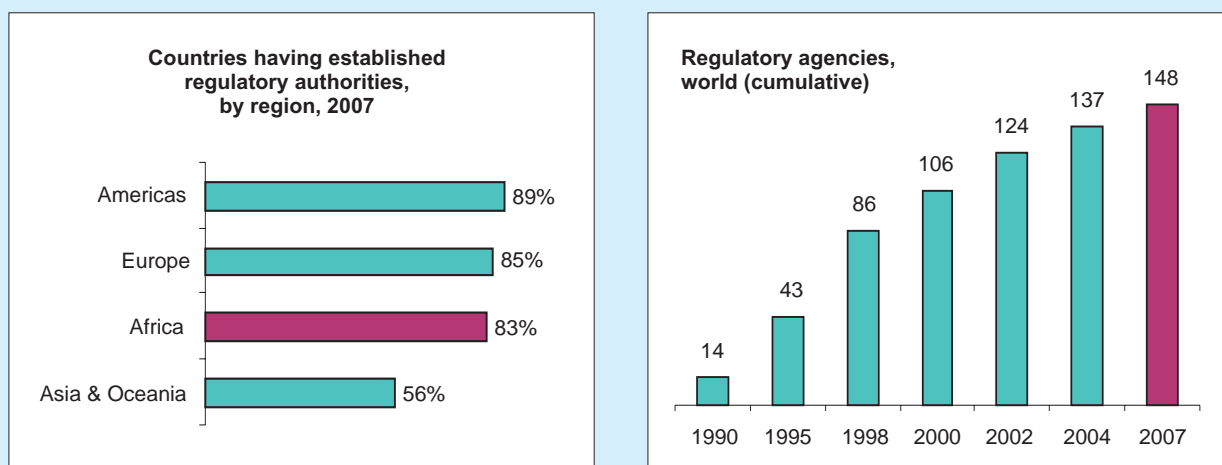
regulatory authority. In mid-2007, 148 ITU member countries had a regulatory authority (Figure 2.3.1, right). By mid-2007, 83 percent of the African economies had established such an authority (Figure 2.3.1, left).

Although the number of African authorities is quite impressive, the staff of a well-functioning regulatory authority needs to be well educated, trained and networked with colleagues from other countries in

order to exchange its experiences and ideas on new emerging issues, such as 3G/4G, VoIP, NGN or CyberSecurity. The ICT environment is changing rapidly, and keeping the policy and regulatory frameworks in line with the constant evolution of technologies, applications and services is a challenge for governments and regulators around the world. In order to support regulatory authorities in Africa, ITU carries out projects with strong partners (Box 2.3.2).

Figure 2.3.1: Regulatory authorities for an enabling environment

Percentage of regulators in each region 2007 (left) and number of regulatory agencies worldwide 1990-2007 (right)

Countries having established regulatory authorities, by region, 2007

Region	Percentage
Americas	89%
Europe	85%
Africa	83%
Asia & Oceania	56%

Regulatory agencies, world (cumulative)

Year	Value
1990	14
1995	43
1998	86
2000	106
2002	124
2004	137
2007	148

Source: ITU World Telecommunication Regulatory Database.

Box 2.3.2: A success story: ICT market harmonization in West Africa

ITU has catalyzed the development of harmonized ICT regulatory guidance together with the ECOWAS member states addressing challenges and providing an ICT-enabling environment for the region. ECOWAS Member States will embark on the challenge of translating these decisions into their national legal frameworks and the creation of a common ICT market in the region by end of 2007. These guidelines advise the legislative framework for ICT in Member States, recommend approaches to spectrum management, competition policy, interconnectivity tariffs, infrastructure sharing and licence fees. The guidelines advise the operators to ensure national and international roaming at rates that are competitive and affordable. The liberalization of the regional telecommunications market is crucial to the realization of West Africa's aspiration for the deployment of regional broadband infrastructure, as well as regional roaming and cross-border connectivity.

Source: ITU: http://www.itu.int/ITU-D/treg/index.phtml.

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[1] Allafrica.com (Kwamboka, Evelyn), Kenya - MPs Move to Court to Block Safaricom IPO, 25 September 2007.

[2] Allafrica.com (Mmegi), Botswana - BTC Social Responsibility Commendable, 4. September 2007; Developing Telecoms (Alec Barton), Botswana privatises nearly half its telecoms company, 03 August 2006.

[3] Ibrahine, Mohammed, Towards a national telecommunications strategy in Morocco, December 2003.

[4] ITU/infoDev, Regulation Toolkit, http://www.ictregulationtoolkit.org/en/index.html.

[5] Ibrahine, Mohammed, Towards a national telecommunications strategy in Morocco, December 2003; Global Technology Forum: Morocco - A lesson in competition, 10 August 2007.

[6] Global Technology Forum, Morocco - A lesson in competition, 10 August 2007.

3. MARKET SEGMENTS

Figure 3.1.1: Main (fixed) telephone lines growth limited to urban areas and South and North Africa

Distribution of main (fixed) telephone lines by region (top left), main (fixed) telephone lines per 100 inhabitants by region, 1996-2006 (top right), main (fixed) telephone lines in urban and rural areas in Tunisia (bottom left) and distribution of main (fixed) telephone lines in Africa, 2006 (bottom right)
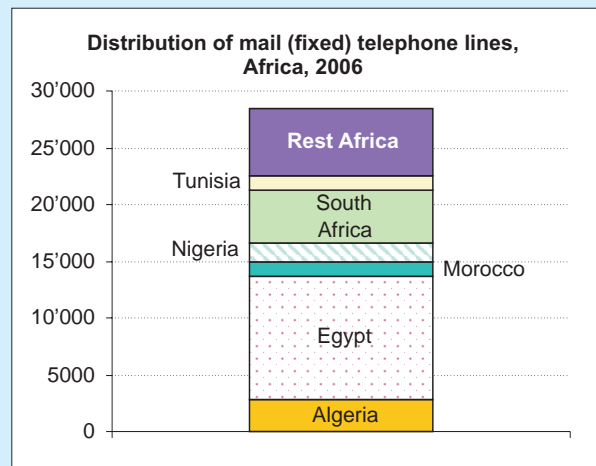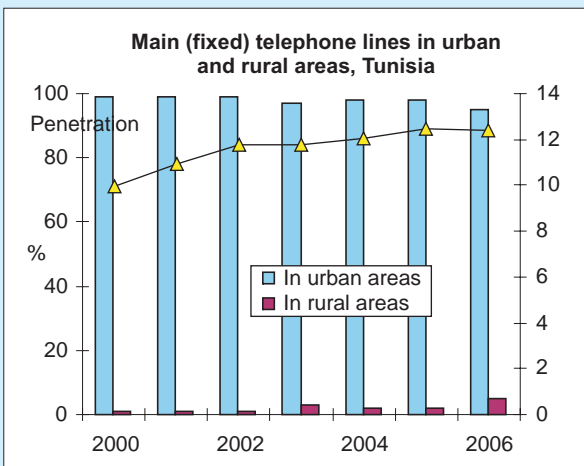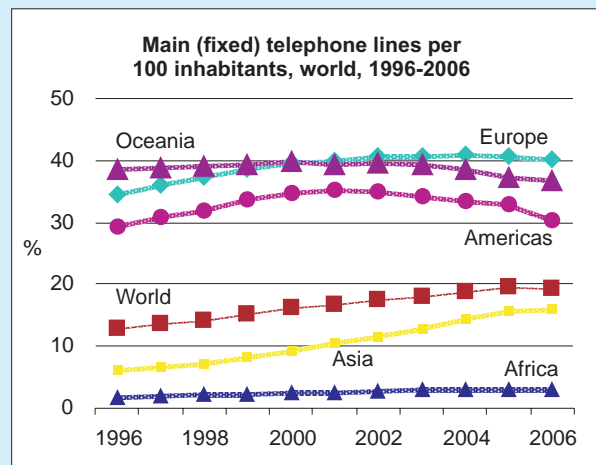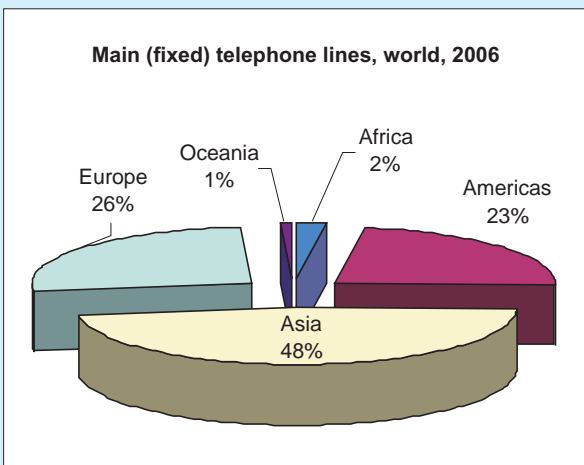
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

3.1 The fixed line market

With 28.5 million main (fixed) telephone lines in 2006, Africa had a share of two percent in worldwide total main (fixed) telephone lines (Figure 3.1.1, top left). Africa experienced strong growth in the number of main (fixed) telephone lines of 6.2 per cent over the period 2001 to 2006, only topped by Asia with 9.7 percent (Figure 3.1.1, top right).

Most of Africa's main (fixed) telephone lines are concentrated in just six of its 54 economies. Algeria, Egypt, Morocco, Nigeria, South Africa and Tunisia

account for almost 80 percent of all fixed lines in Africa (Figure 3.1.1, bottom right).

Those main (fixed) telephone lines are almost exclusively located within cities and randomly in rural areas, as the example of Tunisia shows (Figure 3.1.1, bottom left). Generally, Africa's main (fixed) telephone line penetration was 3.1 per 100 inhabitants compared to 32.4 main (fixed) lines per 100 inhabitants in Americas or 39.7 in Europe (Figure 3.1.1, top right). The world average in 2006 was 19.4 main (fixed) lines per 100 inhabitants, more than six times higher than the penetration rate of Africa.
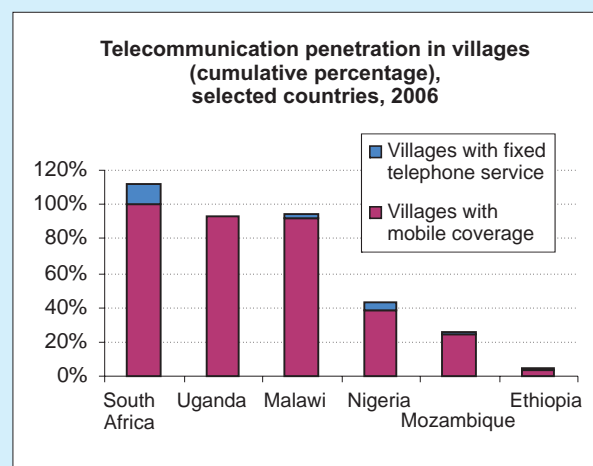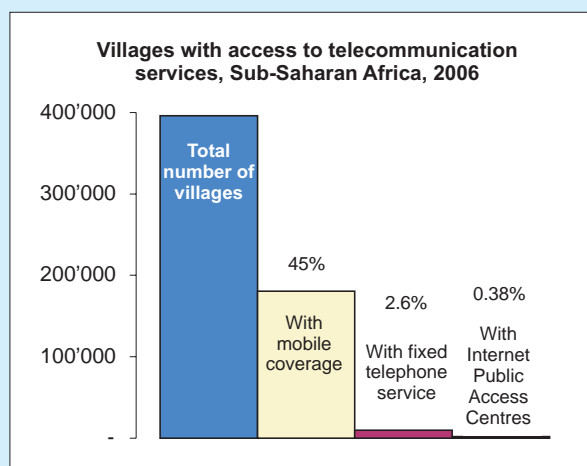

Box 3.1.2: Connecting the villages by 2015

While teledensity in Africa and especially in Sub-Saharan Africa is rather low, teledensity in rural areas is particular limited (Figure 3.1.1, bottom left). The gap between urban and rural areas in terms of telecommunication access is significant because many people are living in rural areas. It is estimated that in Sub-Saharan Africa nearly two-thirds of the population resided in rural areas in 2004.

WSIS set a target to connect the villages by 2015. Measuring the current situation of villages in order to undertake focused actions depends largely on the definition of the object of interest. Based on national definitions of rural areas according to official data, geo-coded information and approximations, it is estimated there were around 400'000 localities[1] in Sub-Saharan Africa, of which 99 percent are villages. Less than three percent of these have currently a (fixed line) telephone connection and less than 0.4 percent of the villages have access to Internet in Public Access Centres (PIAC) (Figure below, left). Accordingly, it is estimated that 55 percent of village population are unconnected without access to fixed, mobile and/or data services. Although many African countries have some type of universal service program for connecting rural areas, they have for the most part, not proven very successful.

For mobile cellular penetration, the picture looks much better. It is estimated that 45 percent of Sub-Saharan African villages were covered by a mobile signal[2] in 2006 (Figure below, left). Coverage with a mobile signal does not mean connectivity. Nevertheless, with initiatives such as applying the GrameenPhone model in Uganda to legal license obligations to establish public facilities in South Africa, African governments and companies have proved quite successful in bringing mobile cellular phones to rural areas.

Primarily as a result of mobile competition and despite numerous barriers, a number of African countries are approaching full universal access or near coverage of all inhabited rural areas with a mobile signal. Countries with mobile rural population coverage over 90 percent includes Comoros, Kenya, Malawi, Mauritius, Seychelles, South Africa and Uganda, which should meet the WSIS target of village connectivity ahead of schedule. Other countries on the way to meeting the WSIS target before the end of the decade include Botswana, Burkina Faso, Burundi, Cape Verde, Guinea, Namibia, Rwanda, Senegal, Swaziland and Togo all of which have rural mobile population coverage rates in excess of 50 percent.

Villages with access to telecommunication services, Sub-Saharan Africa, 2006

Telecommunication penetration in villages (cumulative percentage), selected countries, 2006

Source: ITU (2007).

Figure 3.2.1: Mobile growth continues, but will it be enough?

Mobile cellular subscribers by region, 2001-2006 (top left), mobile cellular subscribers in Africa by sub-region, 2001-2006 (top right), 15 largest African markets in terms of total (fixed and mobile) telephone subscribers per 100 inhabitants in cumulative percentage, 2006 (bottom left), and revenues from mobile cellular services in percentage of total telecommunication revenues per region (bottom right)
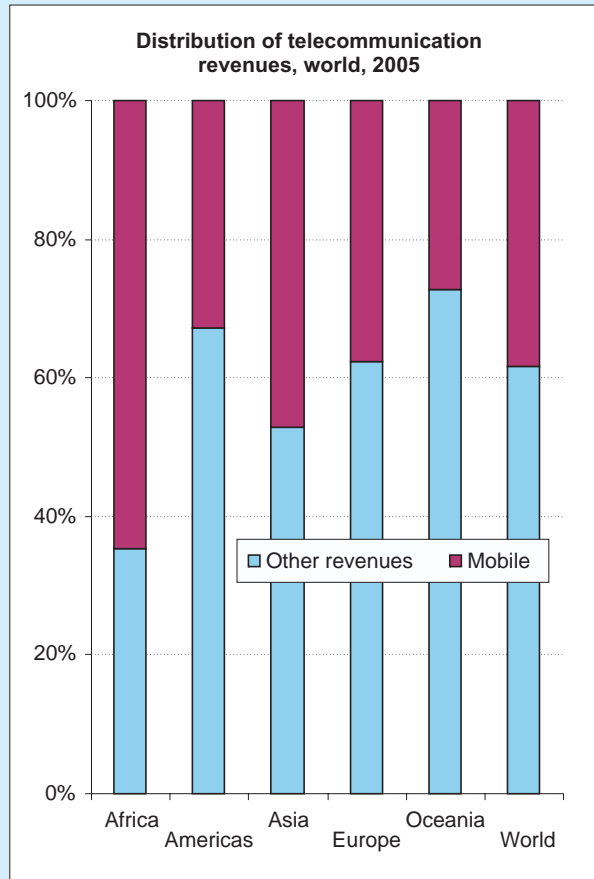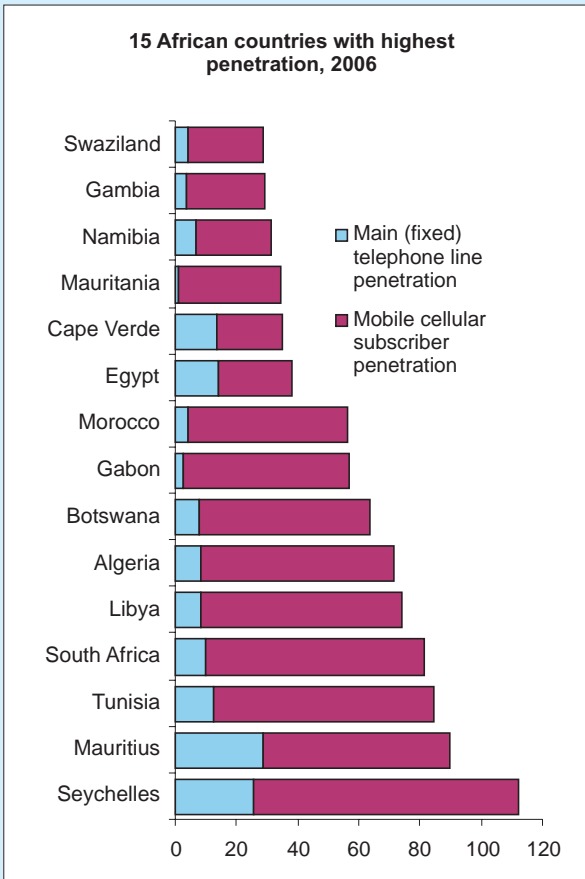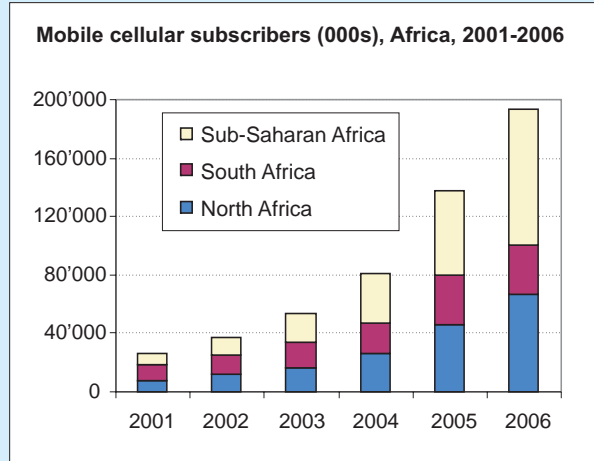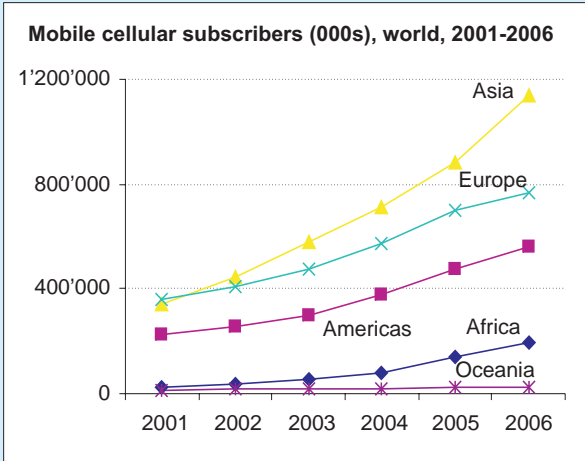
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

3.2 The mobile cellular market

The African mobile cellular market is known for its impressive growth rates. The development of mobile telephony in Africa is an ongoing success story. During 2006 Africa added another 55.3 million mobile cellular subscribers to its subscriber base (Figure 3.2.1, top left). Within Africa, North and especially Sub-Saharan Africa were able to add the largest number of new subscribers (Figure 3.2.1, top right). Africa achieved the impressive growth rate of 46.2 percent of the mobile subscriber between 2001 and 2005. Accordingly, by end 2006, mobile penetration in Africa was at 22.0 subscribers per 100 inhabitants while Asia had 29.3, the Americas 61.9, Oceania 72.7 and Europe a penetration rate of 94.3 (Figure 1.1). Likely, the mobile boom in Africa will continue while in other world regions the growth seems to slow down probably due to almost saturated markets like for instance in Europe and the Americas.

Considering the 15 African countries with the highest penetration rate of telephone (fixed and mobile) services per 100 inhabitants, it becomes obvious that most of their success is not due to the spread of main (fixed) telephone lines but due to cellular subscriptions (Figure 3.2.1, bottom left). In 2006, the Seychelles was the first African countries that passed the 100 percent total (fixed and mobile) penetration rate, meaning that at least statistically every person on the islands had signed up for a phone connection or bought a SIM card. According to the observation that in Africa the mobile cellular subscription is higher than the main (fixed) telephone line subscription, Africa is the only region where more revenues were generated from mobile services than from fixed line services (Figure 3.2.1, bottom right).

Table 3.2.2 shows that *Vodacom South Africa* and *MTN South Africa* lead Africa in regards of numbers of mobile cellular subscribers, with 21.8 and 12.5 million subscribers in 2006. *MTN Nigeria* shows an impressive and continuous growth rate of 46.7 percent between end 2005 and end 2006. If *MTN Nigeria* is capable of continuing such high growth rate recorded during 2004 to 2005, it might challenge other established players. Innovative business models such as the cross-border roaming free services of *Celtel* (Box 3.2.3) could transform these rankings as well.

Table 3.2.2: Nigerian companies challenging the established players
Top 10 mobile cellular operators in Africa in terms of national subscribers

|		Subscribers			Mobile revenues		
		Total ('000)		Change	Total (million USD)		Change
Rank	Operator	Dec-05	Dec-06		Dec-05	Dec-06	
1	Vodacom (South Africa)	17'600	21'800	23.9%	2'451	2'661	7.9%
2	MTN (South Africa)	10'235	12'483	22.0%	2'632	2'859	7.9%
3	MTN (Nigeria)	8'370	12'281	46.7%	1'740	2'053	15.2%
4	Glo Mobile (Nigeria)	9'000	11'000	22.2%	…	…	…
5	Maroc (Morocco)	8'237	10'707	30.0%	1'375	1'627	15.5%
6	Djezzy (Algeria)	7'109	10'531	48.1%	1'074	1'531	29.8%
7	Mobinil (Egypt)	6'696	9'267	38.4%	928	1'114	16.7%
8	Vodafone (Egypt)	6'125	8'704	42.1%	878	1'243	29.4%
9	Mobilis (Algeria)	4'908	7'476	52.3%	341	…	…
10	Celtel* (Nigeria)	5'400	6'400	18.5%	1'777	1'381	-28.7%
	Africa	**83'680**	**110'649**	**32.2%**	**13'196**	**14'469**	**8.8%**

Note: * For 2005, the subscriber figure of the former company Vmobile reflects the value of May 2006. As the original revenue covered seven months, the five months revenue of Vmobile has been included. 2005 revenue has been estimated taking into account the Vmobile's five months revenue.
Source: ITU based on company annual reports.

Box 3.2.3: Celtel abolishes cross-border roaming charges in Eastern and Central Africa

While the *Commission of the European Union (EU)* recently decided to limit cross-border roaming charges, Africa is one example of innovative business models and regulation in this respect.

Celtel launched the *One Network* in September 2006. Under this initiative, *Celtel* offers its customers in Uganda, Kenya and Tanzania the opportunity to use their mobile phone in all three countries under the same conditions as in their home country without charging any roaming fee. After this model had worked well, *Celtel* expanded its offer to Congo, Gabon and the Democratic Republic of Congo in 2007. By the end of 2007, 15 countries should be part of the *One Network* plan.
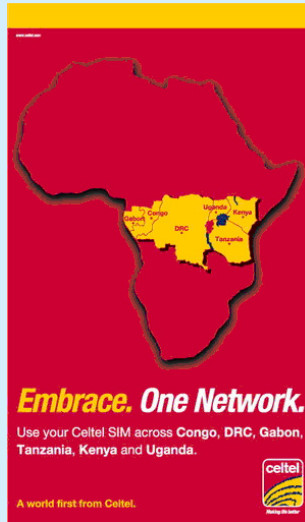
Customers cannot only receive calls from their countries without roaming charge, but they can also use recharging cards bought in any of those countries. Nevertheless, there is still room to create further market integration. It still costs twice as much money to call for example a *Celtel* customer in Tanzania or to send an SMS from a Ugandan mobile phone in Tanzania.

Obviously *Celtel's* model is considered attractive and possibly successful by its competitors and has already caused some pressure on them. *MTN* is offering a similar plan in nine countries by the end of September 2007.

Source: Celtel, http://www.celtel.com/en/news/press-release54/index.html, 8 August 2007; MTN, http://www.mtn.cm/coverage/gofree.html, 7 October 2007.

With the abolition of cross-border roaming charges, Celtel has responded to the particular needs in Africa, where often strong cross-border relationships exist. It is well-known that low subscription prices, prepaid services and low recharging cards have contributed to the African mobile boom[3]. Particularly in Africa, prepaid subscriptions accounted for the majority of all mobile cellular market in 2006 (Figure 3.2.4, right). In 2006, Africa had reached to 198 million mobile cellular subscribers and will probably exceed 278 million subscribers by end 2007. In order to acquire new customers, new needs will have to be satisfied or, more likely for the lower income countries, new business models need to be found or scaled up.

Figure 3.2.4 (left), shows the number of potential customers is smaller. Customers earning more than

**Figure 3.2.4: The need for new business models**
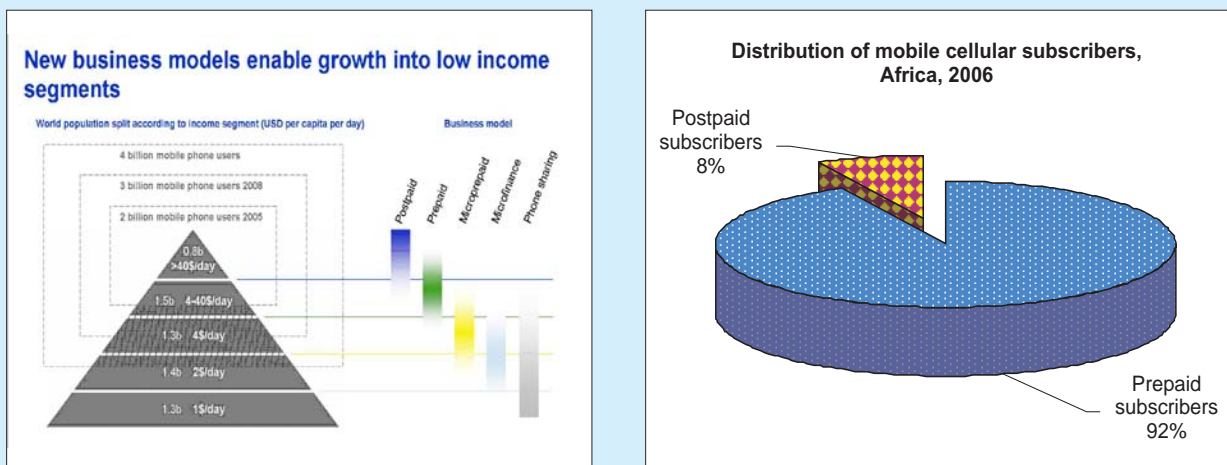
Source: Left: Nokia, Granath, Rauno, Voice services in new growth markets, presentation to the ITU Workshop on the Future of Voice (15-16 January 2007), Geneva.
Right: ITU World Telecommunication/ICT Indicators (WTI) Database.

40 USD per day are can afford to use postpaid mobile services, because they are able to pay regular bill. Lower income groups living on four to 40 USD per day are usually less likely to pay a monthly subscription fee. Prepaid business models enable companies to offer their services to these persons, without large financial risk. Average Revenue per User (ARPU) is higher in the upper customer segment of the pyramid and easier to predict, so companies serve these customers first to saturation. In order to open up new markets, companies have to develop new business models, such as even cheaper prepaid

offers or phone-sharing to reach the customers at lower levels of the pyramid. ARPU for lower end-costumers may be smaller but the market larger. Accordingly, it is possible to make a lucrative business even in these segments on a large scale, since the demand for communication technologies is not limited to wealthier customers. The deployment of more extensive national and regional fiber backbones and the direction of less mobile cellular traffic via expensive satellite-backbone based services could open room to further price reductions (Box 3.4.2).

Figure 3.3.1: Where is Africa on the Net?
Internet subscribers (top left) and Internet subscribers and users per 100 inhabitants by region, 2006 (top right), top 15 African countries by Internet penetration, 2006 (bottom)
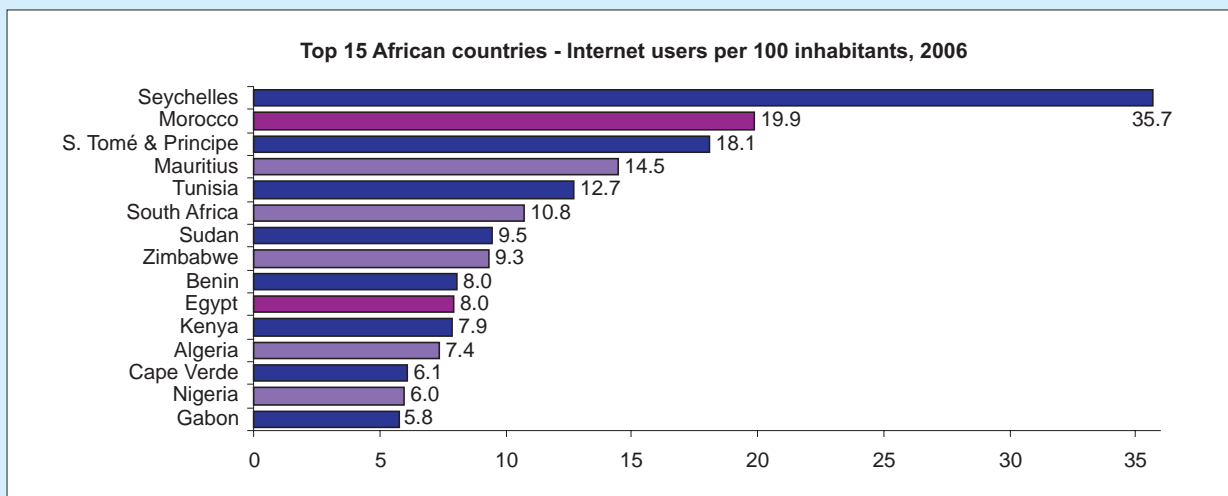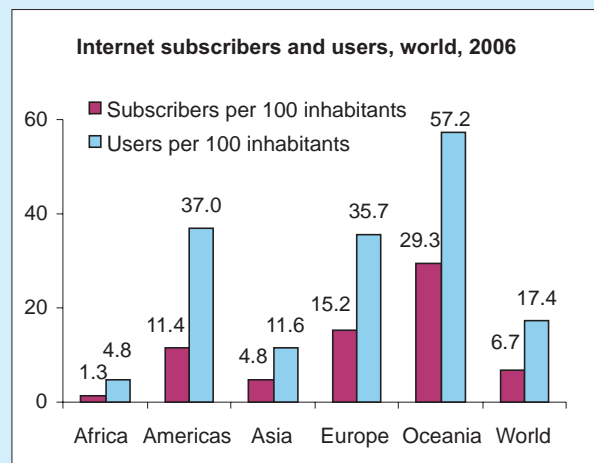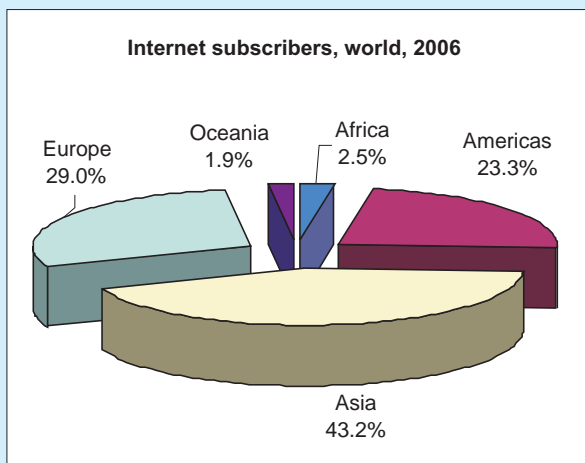
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

3.3 The Internet

Less than three percent of the world's Internet subscribers, or 10.7 million, were located in Africa in 2006 (Figure 3.3.1, top left). Taking the population of Africa into consideration, this means that 1.3 percent of the inhabitants were subscribers to an Internet Service Provider (Figure 3.3.1, top right). For Africa, as for other world regions, an Internet subscription is often used by different members of the household, by clients of a cybercafé, by visitors at a library. Therefore it is estimated that the number of effective Internet users in Africa is considerable higher at 4.8 users per 100 persons (Figure 3.3.1, top right). Affordability, lack of fixed line infrastructure and a low level of ICT literacy are the most striking reasons for the low levels of Internet use in Africa.

African countries vary greatly in their Internet penetration rate. While the average Internet user penetration stands at 4.8 percent in whole Africa, the Seychelles for example as the country with the highest rate, reports penetration of 35.7 per 100 inhabitants. In comparison, South Africa or Egypt had an Internet penetration rate of eleven and eight respectively (Figure 3.3.1, bottom).

Whilst comparing the mobile, fixed line and Internet penetrations of the Seychelles (Figure 3.2.1, bottom left/Figure 3.3.1 bottom), it becomes evident that mobile cellular phone is the mostly used medium of communication. Affordability, mobility and easy use favor mobile cellular technology. So far, in Africa, the mobile phone is used only rarely to access the Internet, also due to its slow speed of (9.6 kbps) available through GSM. The Internet is a phenomenon that allows multi-way communication or the presentation and searching of information. Many Web 2.0 applications for e-government for instance are created for the Internet. The Information Society to be really global and not centered in the North, needs local content in local languages for Africa. More local content available could be an incentive for the population of Africa to use and to learn how to use the Internet. Additionally, the world, including the international development community, could learn more about the local conditions of its focus groups.

Not only the quantity, but also the quality of these services, poses limitations and frustrations to the African users. The poor quality of Internet services is partly due to infrastructural shortcomings, low Internet bandwidth, unreliable electricity, outdated end-user technology, interconnectivity issues, large software solutions or the small number of 18 African Internet Exchange Points (IXPs) by 2007[4], compared to hundreds of Internet Exchange Points across Asia.

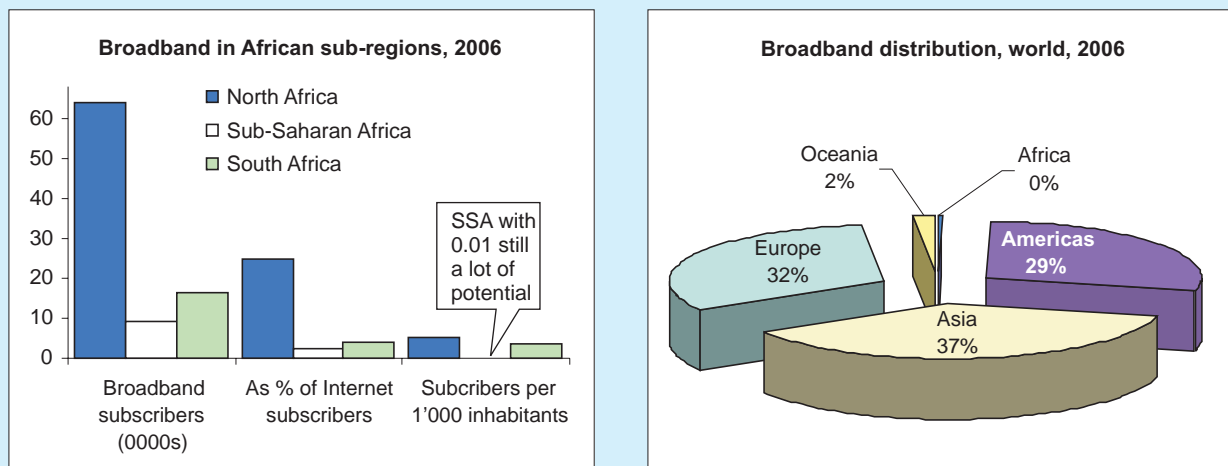## 3.4 Broadband

3.4.1 Fixed broadband

The African broadband operators typically serve telecommunication services to limited numbers of wealthier inhabitants with extraordinary high prices for bandwidth and voice. As already observed in the mobile boom on the continent, voice and data prices are coming down, while volumes continue to increase. Not only companies, but also governments are very keen on getting fast broadband access to make use of applications like e-commerce or e-government. The availability of reliable broadband access is crucial for investors because it allows the companies to take part in the global division of labor (e.g. outsourcing) and enables governments to take informed and transparent decisions.[5]

Nevertheless, 16 countries in Africa still rely on a single ten Mbps international Internet connection (or less). In at least 25 African countries, broadband was available in 2006. South Africa alone had 881.5 Mbps of international Internet bandwidth in 2006. This statistic alone illustrates the digital divide within Africa. African countries all together had a total of 28'177 Mbps bandwidth available in 2006, while, for instance, Asia accounted for 809'951 Mbps of the world's 5'504'127 Mbps bandwidth. In comparison, Norway alone had 43'019 Mbps bandwidth in the same year, almost one and a half times more bandwidth than all of Africa. Europe accounted for 3'060'002 Mbps, the Americas for 1'360'991 and Oceania for 245'052 Mbps respectively.

Regarding broadband subscribers, Africa had 1.1 million broadband customers in 2006, compared with 280 million subscribers worldwide (Figure 1.1, Figure 3.4.1, right). This means that one tenth of all African Internet subscribers had signed up for a broadband access. Again, also in broadband subscriptions, the gap between the African regions is tremendous. 75.5 percent of the broadband subscribers or 808'900 subscribers were located in the four northern African countries in 2006, namely Algeria, Egypt, Morocco and Tunisia. Since most of these subscribers are concentrated in that region, Sub-Saharan Africa had a much lower broadband penetration of 0.12 per 100 inhabitants (Figure 3.4.1, left).

Figure 3.4.1: Broadband - a technology for the North?
Broadband in African sub-regions in 2006 (left) and distribution of broadband subscribers by region in 2006 (right)

Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

Expanding access to broadband services is a challenge and a chance for Africa to benefit of the Information Society. Therefore the establishment of access to the global backbones will be crucial for the development of Africa's telecommunication markets as well as to other sectors (Box 3.4.2).

3.4.2 Broadband wireless deployment: A solution for Africa

Since Africa is lacking fixed line infrastructure, wireless access is considered a solution to bridge the digital divide. However, neither 2 G nor 2.5 G (GSM/GPRS) have fulfilled these high hopes, due to rather expensive handsets, their focus on voice transmission and regulators' hesitation to license UMTS. Instead, high hopes are set on broadband wireless access (BWA) on the basis of WiMAX. As Figure 3.4.4 shows, companies expect the growth of revenues in data services to continue growing worldwide.

Broadband wireless access is defined as offering instantaneous bandwidth greater than 1 MHz and supporting data rates greater than 1.5 Mbit/s[6]. This means a user could have the same speed of data transfer as with fixed broadband access through, for instance, cable or ADSL. Broadband wireless access could in both the licensed and the unlicensed band be deployed for wireless metro access, last-mile/first-mile and large area coverage. There are several advantages of broadband wireless access:

• New, cost-effective and flexible standards for wireless technologies such as WiMAX (IEEE802.16).

• Providers, possibly also local champions, can offer broadband services to geographically challenging areas.

• Public service applications, such as e-government or e-learning, can be used via these technologies. Further, many models of financing these services are possible: local municipality could enter into partnerships with business owners; wealthier users might be charged more for the use than poorer neighbourhoods, or free public access points could be established all over the city

• Companies can easily observe and direct their production-chain and do e-business.

With the support of global players such as *Intel*, it appears that the WiMAX standard could become dominant. The technical challenges of interoperability and quality of service (QoS) provisions and often insufficient spectrum management could surely been overcome since WiMAX has already addressed the security concerns and *Line in Sight* thematic of Wi-Fi. The IMT-2000 and IMT-Advanced standard is currently being discussed by the ITU *World Radio Communication Conference* and may be selected by

## Box 3.4.2: The East African Submarine Cable System (EASSy)

Currently 85 percent of international bandwidth traffic in Africa is directed via Europe to its final destination. Access to the global backbone is vital for the development of this region. By mid-2007, there were four major undersea cable projects engaged in the race for the first fibre-optic link connecting the African eastern seaboard to the rest of the world's backbones. According to a study by the NEPAD e-Africa Commission in 2004, Africa is lacking of 52'040 km necessary backbone infrastructure: 15'950 km in Central, 2'200 km in Northern, 19'330 km in Western and 145'060 km in Eastern and Southern Africa.

One of these initiatives intents to deploy the East African Submarine Cable System (EASSy): Six Development Finance Institutions (DFIs) are providing support to the collaboration of other global and regional development institutions, the governments and the 26 mainly African operators. The total cost of construction is estimated at 235 million USD. The cable is expected to be in operation by 2009. This initiative intends to provide access to the 260 million Africans in the region

through its open access policy towards service providers. EASSy could reduce the wholesale and therefore the retail prices of Internet access tremendously. Already a reduction in the price of international telecommunication services by ten percent would benefit consumers by more than 2.5 billion USD, according to the consertium.

The bandwidth prices of the West African cable SAT3 are slowly falling. This is probably a reaction to the expected competition from EASSy or the other cable initiatives. EASSy should connect later also the land locked countries via land loops and might attract former SAT3 customers. Nevertheless, the success of the project will depend largely on political decisions, such as South Africa's intention to allow cables to land on its coast only if they are owned by an African company. 2007 and 2008 will show which of the redundant initiatives will make the race. Whatever consortium will finally build the connection, these competing initiatives show that investing in African ICT infrastructure is attractive and Africa offers a viable market place.

Current and planed optical fibre networks
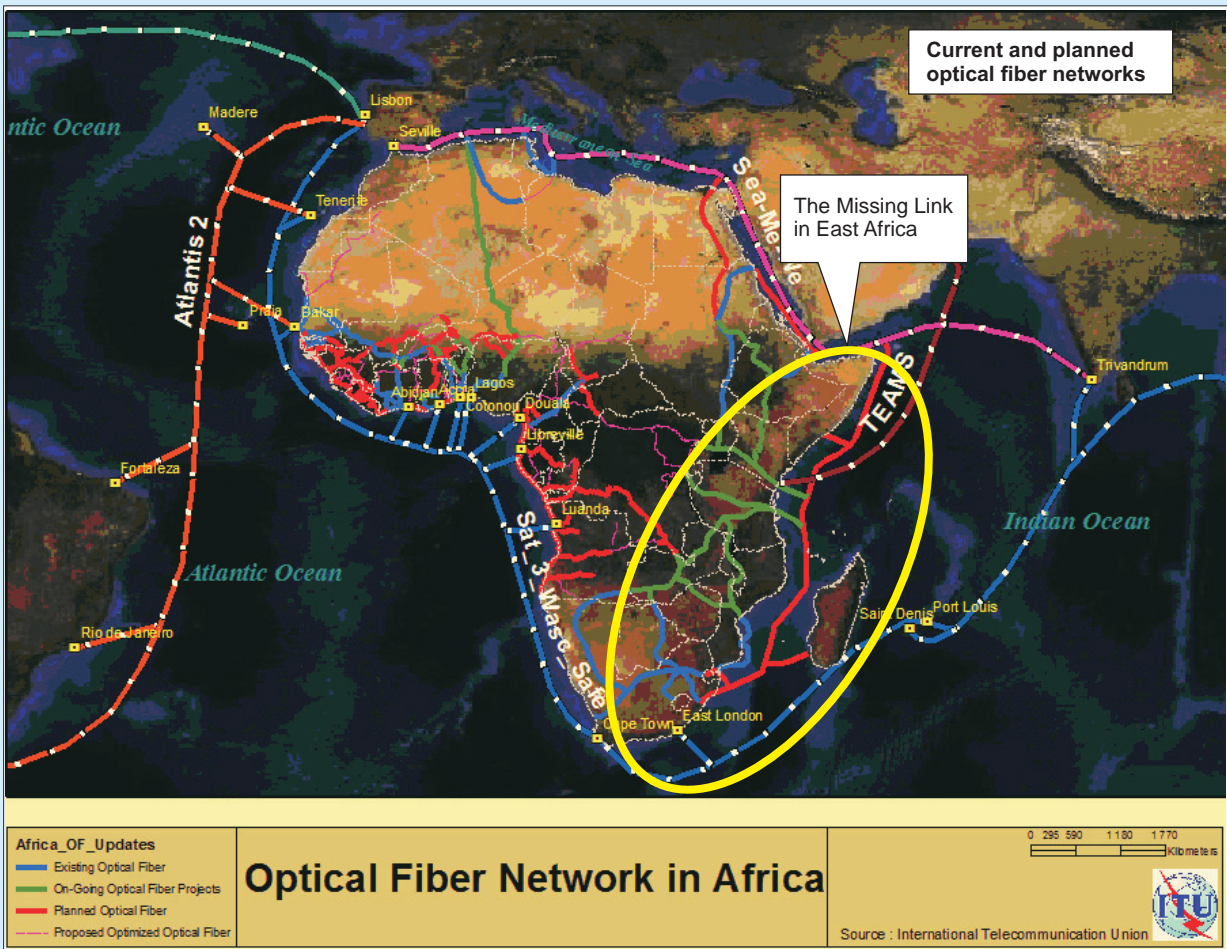
Source: ITU, World Bank.

Figure 3.4.4: Future business in data services
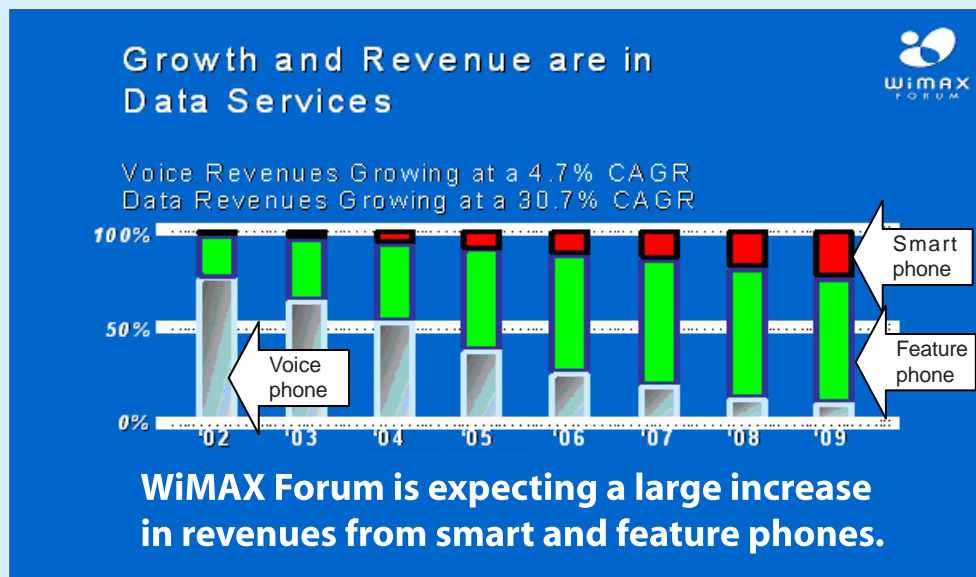
Source: Adjusted from WiMAX Forum (Presentation by Chang, Dean S.K.) (2006): Mobile WiMAX: Mobile Internet Ready for Global Deployment, http://www.itu.int/osg/spu/ni/voice/presentations/S5-5-WiMAX-CHANG.ppt.

the ITU membership by July 2009.[7] Recently, the conference approved WiMAX as 3G communication standard. This means that companies holding a 3G licence can now provide WiMAX services.

Broadband wireless access will not only challenge the regulators, but also service providers. It will likely transform the current landscape of telecommunication companies: New Wireless Internet Service Providers (WISP) could emerge from among current mobile operators and Internet Service Providers (ISP).

Probably, just like mobile cellular technologies, broadband wireless will first be deployed on a large scale in North America, Europe, the Far East and Asia before it becomes available in Africa. The one billion mobile broadband users *Juniper Research* forecasts by 2012 are expected in these regions and not in Sub-Saharan Africa.[8]

Nevertheless, some pioneer activities are already underway in well populated African areas: In Kenya, the Government is developing a Digital Village Scheme in order to provide rural inhabitants with electronic access to government services. The plan is to install Internet connectivity in some 200 locations. From there, access will be extended to more remote rural areas through kiosks that will offer wireless connectivity back to the main centres.[9]

Wireless connectivity includes both WiMAX and 3G technologies such as EDGE and EV-DO: *Horizon Wireless* launched a 3.5 GHz broadband wireless network in Nigeria;[10] just recently *Warid Telecom Uganda* selected *Motorola* to deploy a WiMAX network after it already made experiences deploying such a network in Pakistan[11], *MTN Rwanda* also is going to establish broadband wireless access with the service of *Cambridge Broadband Networks* in its capital, Kigali.

Beyond the excitement about the opportunities broadband wireless access offers, it should be noted that also last mile wireless solutions rely on strong fixed infrastructure. There is no alternative for connecting Africa to the global backbones and to increase the number of national and local Internet Exchange Points (IXPs).

[1] *Localities* refer to a country's villages, towns and cities.

[2] According to ITU, *population* covered by a mobile cellular network is the percentage of the total population that lives within the range of a mobile cellular signal, irrespective of whether or not they are subscribers.

[3] Bertolini, Romeo; Olaf, Nielinger; Muylkens, Monika, Market in Transition, D+Z, volume 12, http://www.inwent.org/E+Z/content/archive-eng/12-2006/tribune_art3.html, 2006.

[4] ITU World Telecommunication Regulatory Database.

[5] Touré, Hamadoun I. (2007), Competitiveness and Information and Communication Technologies (ICTs) in Africa, in: African Competitiveness Report 2007, World Economic Forum, p. 87-109, http://www.weforum.org/pdf/gcr/africa/1.5.pdf.

[6] ITU (1997), Recommendation I.113, http://www.itu.int/itudoc/itu-t/com13/circ/055.html.

[7] Source: infoDev (2005), Open Access Models; Intel (2004), Understanding Wi-Fi and WiMAX as Metro-Access Solutions; WiMAX Forum (2006), Mobile WiMAX - A Performance and Comparative Summary; ITU (2007), One in two people now has access to a mobile phone - India and China lead the world in growth in mobile subscribers.

[8] AllAfrica.com (03 October 2007), Internet growth to spur job creation, http://allafrica.com/stories/200710010915.html.

[9] PR Newswire (17 May 2005), Horizon Wireless Speed Internet access Deploying Portable Wireless Broadband Forum Navini Networks, http://allafrica.com/stories/200710010915.html.

[10] Cellular-news (7 August 2007), Mobile Broadband Users to Pass 1 Billion by 2012, http://www.cellular-news.com/story/25294.php.

[11] CNN money.com (27 September 2007), Warid Telecom Uganda Selects Motorola for WiMAX Deployment.

4. REVENUES AND INVESTMENT

4.1 Revenues

Africa accounted for 37.6 billion USD, a share of 2.9 percent of the worldwide 1'287 billion USD revenues[1] in 2005 (Figure 4.1.1, top left). The largest amount of revenues in telecommunication services was achieved by Europe with revenue of 446.7 billion USD. Within Africa, the total telecommunication revenue was distributed quite evenly among the three African sub-regions (Figure 4.1.1, top right).

The average revenue per telephone (fixed and mobile) subscriber amounted to 248 USD. Regarding the revenues per subscriber, Africa is almost on the same level as the Asian market. The average revenue per telephone subscriber was much higher in South Africa at 355 USD. In Africa, the low average revenue per subscriber is probably due to the majority of mobile and prepaid users spending limited their resources in a very cost-controlled manner.

4.2 Investment

Of the total global 201.5 billion USD of telecom investment[2], four percent or 8.1 billion USD, were invested in Africa (Figure 4.2.1, top left).Investment in Africa is higher than Africa's share on revenues in the same year (Figure 4.1.1, top left). In 2005, Asia with 80.8 billion USD enjoyed the highest overall investment, while 44.0 billion USD were invested in the Americas and 63.9 billion USD in Europe respectively. Africa had an investment per capita of only 12.9 USD, Oceania for instance had an almost 14 times higher investment of 190.8 USD per inhabitant. Regarding this difference, it is quite obvious that Africa needs more investments in telecommunication in order to participate better on the Information Society as well as in the regional and global economy.

Viewing the investment as percentage of revenues of the same year, it turns out that Africa actually received a relatively high percentage of 21.5. The investors were not at all hesitated to entrust into the profitability of doing business in Africa (Figure 4.2.1, top right). This leaves reason to hope that investors understood that doing ICT business in Africa has a future. Figure 4.2.1 (bottom) shows that Africa has so far seen annual investments in telecommunication services increasing each year.

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[1] According to ITU's definition, *revenue* is the gross telecommunication revenue earned from all services (fixed, mobile and data) within the country.

[2] According to ITU's definition, *investment* is the total annual investment in telecom. It also refers to annual capital expenditure in telecom including fixed, mobile and other services for acquiring the ownership of property (including intellectual and non/tangible property) as well as networks. These applications must be available for public use and excludes investments in telecoms software or equipment for private use.

Figure 4.1.1: Low revenues in the African telecommunication sector

Revenues from fixed, mobile and data telecommunication services by region in 2005 (top left), revenues by African sub-regions, 2005 (top right) and average revenue per telephone subscriber, 2005 (bottom)

Revenues from telecommunication services, world, 2005

- Oceania 2%
- Africa 3%
- Americas 32%
- Europe 36%
- Asia 27%

Revenues, African sub-regions, 2005

- Sub-Saharan Africa 29%
- North Africa 35%
- South Africa 36%

Average revenue per telephone subscriber (in USD), 2005

Region	Value
Oceania	902
Americas	574
Europe	458
World	394
South Africa	355
Asia	268
Africa	248
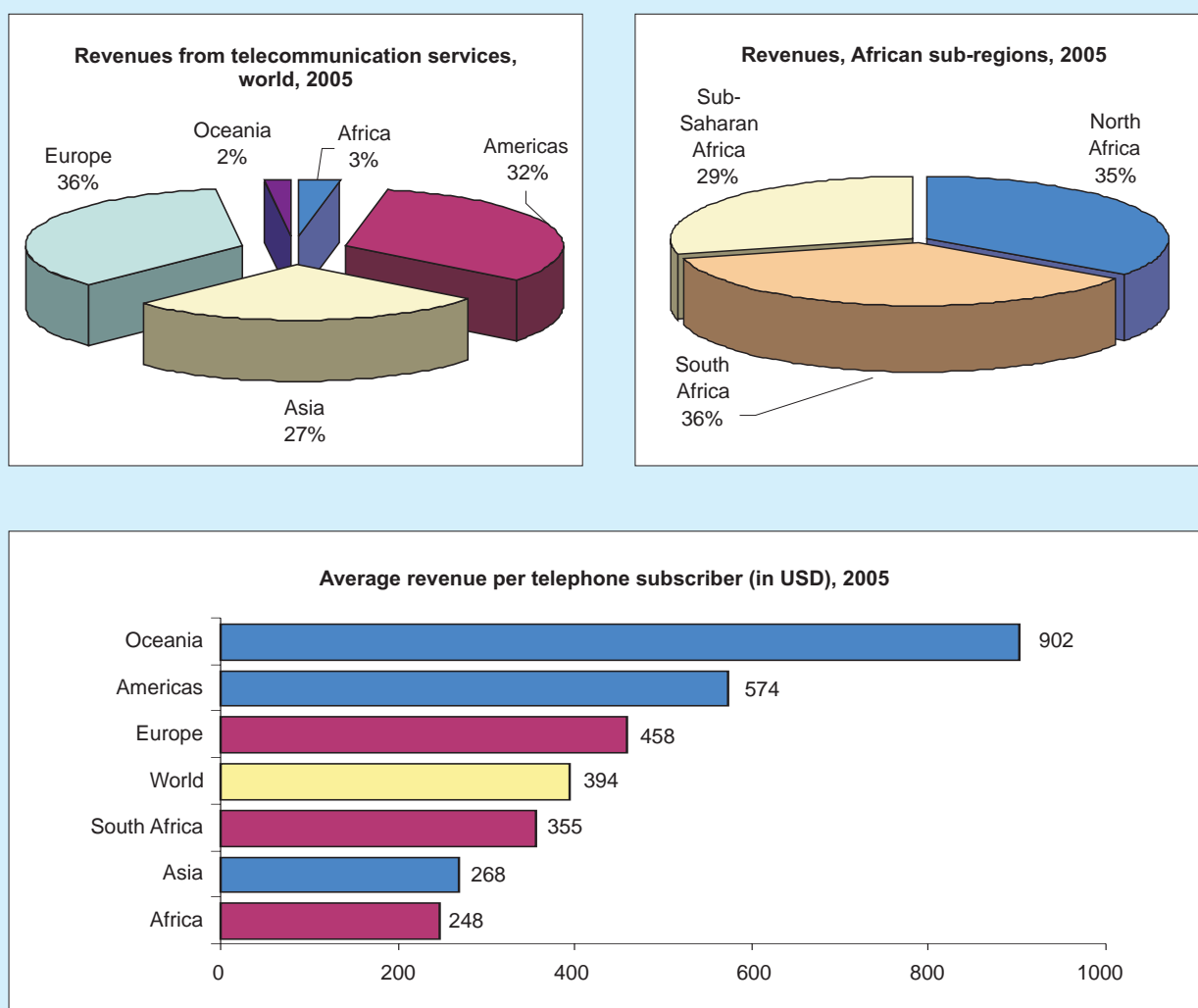
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

Figure 4.2.1: Trust in Africa's future

Investment in telecommunication by region, 2005 (top left), investment in telecommunication services as percentage of revenues by region, 2005 (top right), investment in telecommunication in Africa compared to population 2001-2005 (bottom)
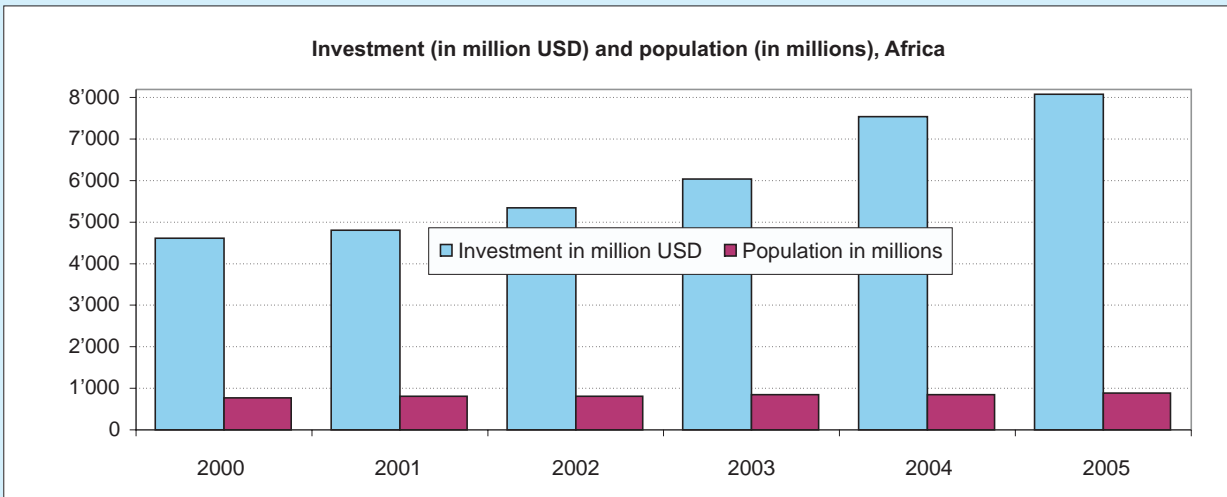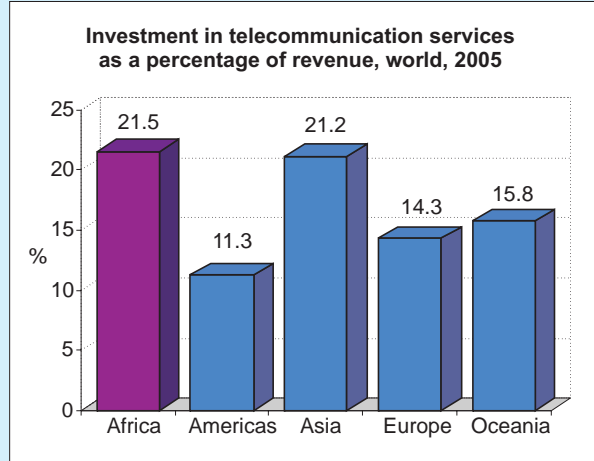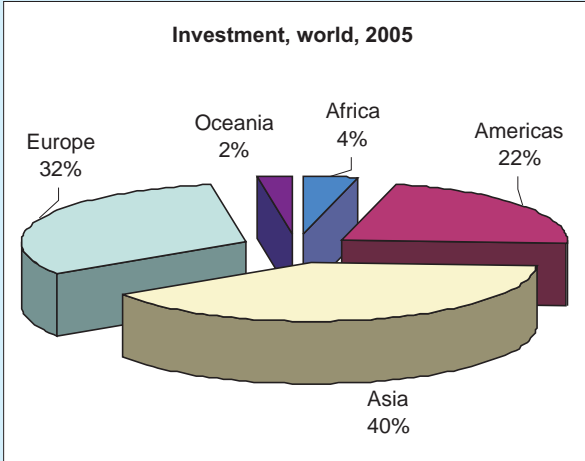
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

5. EMPLOYMENT IN THE TELECOMMUNICATION SECTOR

Not only companies or governments generate income in the telecommunication sector but also employees. In 2005, there were around 264'400 employees of telecommunication companiges in Africa of which eleven percent worked in mobile cellular companies.

Comparing the number of subscribers per employee in 2001 and 2005, a trend can be identified: Within these five years, an increase of total subscribers per employee took place (Figure 5.1). Since the total

subscribers include fixed and mobile cellular subscribers, it is likely that the ratio is mainly improved due to the mobile boom. Additionally, this development might be due to more efficient structures and processes among operators, caused by privatization (Figure 2.1.1).

Employees with skills in outdated technologies are constantly leaving while the companies are competing for high-qualified graduates. Whether the number of

Figure 5.1: Employees became more efficient
Subscribers per employee (in 000s) in selected African countries, 2001 and 2005
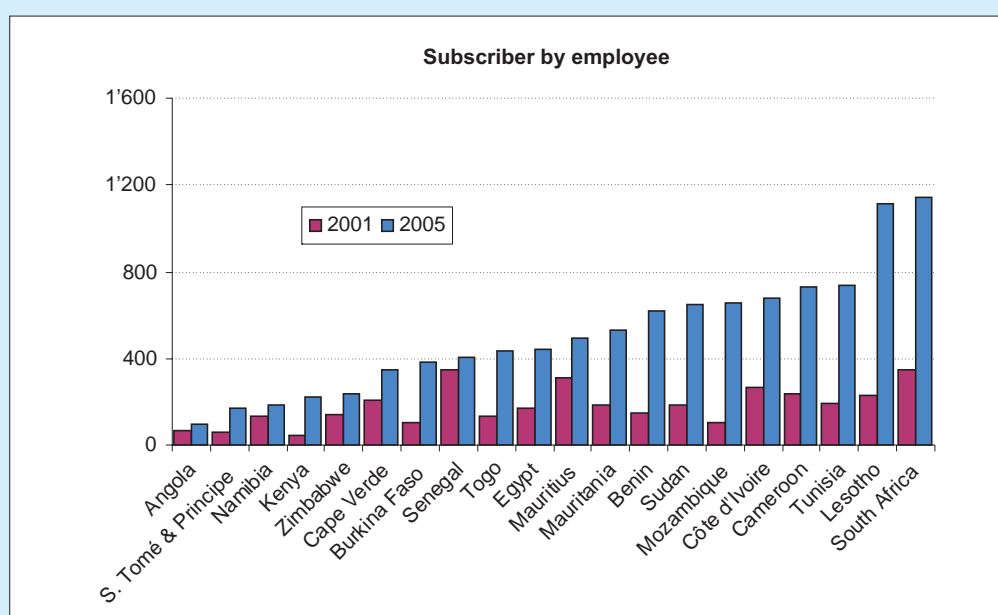
Source: ITU World Telecommunication/ICT Indicators (WTI) Database.

employees has decreased cannot be determined so far. One ITU Study Group is currently discussing how to make the changes visible in regards of numbers of employees but also regarding gender, age and health status aspects. In order to insure its competitiveness in the future, Africa needs to ensure to educate people in related subjects and keep or attract professionals with relevant skills.

ANNEX 1

	Population	Main telephone lines		Mobile subscribers		Internet users	
			per 100		per 100		per 100
	000s	000s	inhabitants	000s	inhabitants	000s	inhabitants
Algeria	33'354	2841.3	8.52	20'998.0	62.95	2'460.0	7.38
Egypt	75'437	10807.7	14.33	18'001.1	23.86	6'000.0	7.95
Libya	5'968	483.0	8.09	3'927.6	65.81	*232.0*	*3.96*
Morocco	30'735	1266.1	4.12	16'004.7	52.07	6'100.0	19.85
Tunisia	10'210	1'268.5	12.42	7'339.1	71.88	1'294.9	12.68
North Africa	**155'704**	**16666.6**	**10.70**	**66'270.5**	**42.56**	**16'086.9**	**10.34**
South Africa	47'594	*4729.0*	*9.97*	39'662.0	83.33	*5'100.0*	*10.75*
South Africa	**47'594**	**4729.0**	**9.97**	**39'662.0**	**83.33**	**5'100.0**	**10.75**
Angola	15'802	98.2	0.62	2'264.2	14.33	*85.0*	*0.55*
Benin	8'703	77.3	0.89	1'056.0	12.13	700.0	8.04
Botswana	1'760	136.9	7.78	979.8	55.68	*60.0*	*3.40*
Burkina Faso	13'634	94.8	0.70	1'016.6	7.46	80.0	0.59
Burundi	7'834	31.1	0.41	*153.0*	*2.03*	60.0	0.77
Cameroon	16'601	100.3	0.61	*2'252.5*	*13.80*	370.0	2.23
Cape Verde	519	71.6	13.80	108.9	20.99	*29.0*	*6.09*
Central African Rep.	4'093	10.0	0.25	*100.0*	*2.48*	13.0	0.32
Chad	10'032	13.0	0.13	466.1	4.65	60.0	0.60
Comoros	819	*16.9*	*2.12*	*16.1*	*2.01*	21.0	2.56
Congo	4'117	*15.9*	*0.40*	490.0	12.25	70.0	1.70
Côte d'Ivoire	18'454	260.9	1.41	4'065.4	22.03	300.0	1.63
D.R. Congo	59'320	9.7	0.02	4'415.0	7.44	180.0	0.30
Djibouti	807	10.8	1.56	*44.1*	*6.37*	11.0	1.36
Equatorial Guinea	515	10.0	1.99	*96.9*	*19.26*	8.0	1.55
Eritrea	4'560	37.5	0.82	62.0	1.36	100.0	2.19
Ethiopia	79'289	725.1	0.91	866.7	1.09	164.0	0.21
Gabon	1'406	36.5	2.59	764.7	54.39	81.0	5.76
Gambia	1'556	52.9	3.40	404.3	25.99	58.0	3.82
Ghana	22'556	356.4	1.58	5'207.2	23.09	609.8	2.70
Guinea	9'603	26.3	0.33	*189.0*	*2.36*	50.0	0.52
Guinea-Bissau	1'634	*10.2*	*0.76*	*95.0*	*7.10*	37.0	2.26
Kenya	35'106	293.4	0.84	6'484.8	18.47	2'770.3	7.89
Lesotho	1'791	*48.0*	*2.67*	*249.8*	*13.92*	*51.5*	*2.87*
Liberia	3'356	6.9	0.21	*160.0*	*4.87*	...	...
Madagascar	19'105	129.8	0.68	1'045.9	5.47	110.0	0.58
Malawi	13'166	*102.7*	*0.80*	*429.3*	*3.33*	59.7	0.45
Mali	13'918	82.5	0.59	1'513.0	10.87	70.0	0.50
Mauritania	3'158	34.9	1.10	1'060.1	33.57	100.0	3.17
Mauritius	1'256	357.3	28.45	722.4	61.50	*300.0*	*24.10*
Mozambique	20'158	67.0	0.33	2'339.3	11.60	*178.0*	*0.90*
Namibia	2'052	*138.9*	*6.84*	495.0	*24.37*	80.6	3.97
Niger	14'426	*24.0*	*0.17*	323.9	*2.32*	40.0	0.28
Nigeria	134'375	1688.0	1.26	32'322.2	24.05	8'000.0	5.95
Rwanda	9'230	16.5	0.18	314.0	3.40	65.0	0.70
S. Tomé & Principe	160	7.6	4.74	18.0	11.51	29.0	18.11
Senegal	11'936	282.6	2.37	2'982.6	24.99	650.0	5.45
Seychelles	81	20.7	25.44	70.3	86.52	29.0	35.67
Sierra Leone	5'678	24.0	0.49	*113.2*	*2.21*	*10.0*	*0.19*
Somalia	8'496	*100.0*	*1.22*	*500.0*	*6.08*	94.0	1.11
Sudan	36'993	636.9	1.72	4'683.1	12.66	3'500.0	9.46
Swaziland	1'029	44.0	4.27	250.0	24.29	*41.6*	*4.02*
Tanzania	39'025	157.3	0.40	5'767.0	14.78	*384.3*	*1.00*
Togo	6'306	82.1	1.30	708.0	11.23	320.0	5.07
Uganda	29'856	108.1	0.36	2'008.8	6.73	750.0	2.51
Zambia	11'861	93.4	0.79	1'663.0	14.02	500.0	4.22
Zimbabwe	13'085	331.7	2.54	832.5	6.36	1'220.0	9.32
Sub-Saharan	**719'220**	**7080.4**	**0.99**	**92'220.0**	**12.90**	**22'499.7**	**3.16**
Africa	**922'510**	**28475.9**	**3.10**	**198'153.0**	**21.58**	**43'686.7**	**4.77**