



26 October 2007
Original: English

Broadband Infrastructure in Africa

Background Paper – Session Two

1. BACKGROUND

During the World Summit on the Information Society (WSIS), leaders from around the globe, within the spirit of the UN Millennium Development Goals (MDGs), recognized the important role of ICT connectivity in stimulating employment, economic growth and social development and developed a Plan of Action to spread ICT access across all regions. Efforts are underway in all parts of the world to accelerate progress in meeting the goals of the Summit. The *Connect Africa Summit* is one such effort aimed at mobilizing resources for implementation, especially in initiatives related to infrastructure development.

Whilst investment in ICT infrastructure in Africa has improved substantially over recent years, it has been focused mostly on improving mobile infrastructure and access. Significant gaps in backbone networks remain. As a result, the effective high-speed Internet services needed for important key business, government and consumer applications continue to be either very expensive (especially compared to average local incomes) or unavailable (depending on location). Where available, the cost of broadband Internet access in Africa is on average three times higher than in Asia, for example, where significant broadband infrastructure investments have been made. It is not surprising then that broadband penetration is below one per cent in Africa, compared with close to 30 per cent in some high-income countries.

These gaps in backbone infrastructure present challenges, but they also represent new opportunities for private investors and innovative “win-win” public-private partnerships to complement the successful experience of mobile telephony in Africa. Recognizing this potential, new players are entering the market. This has increased the need for coordination and information-sharing among public funding partners and the private sector to ensure coherent infrastructure and service roll-out across the region.

2. PURPOSE OF THIS PAPER

While the long-term objective is to expand effective and affordable connectivity throughout the continent, this Background Paper focuses on a potential immediate goal that, if achieved, would trigger further investment and development:

Interconnect all African capitals and major cities with ICT broadband infrastructure and strengthen connectivity to the rest of the world by 2012.

This paper provides an overview of the broadband infrastructure linking major cities in Africa and highlights current and proposed projects to address existing gaps. The objective is to provide a basis for discussion on the next steps that should be taken to improve connectivity in Africa with a special focus on sources of investment and regulatory prerequisites for attracting investments. In particular, it will focus on:

- a) The current status of high-capacity backbone infrastructure in Africa;
- b) The gaps in current network coverage and requirements for developing the networks to achieve the Summit goals; and
- c) The solutions to filling these gaps and meeting the Summit goals.

3. SUMMARY OF THE EXISTING SITUATION

A number of feasibility studies have been carried out by private sector and development institutions to explore ways and means of improving high-speed connectivity in the region. These studies have provided a picture of connectivity across different African countries and share similar views regarding the existence of gaps in broadband infrastructure at the national, cross-border, regional and international levels; however, prior to recent years, a consolidated approach covering the entire region did not exist. In 2002, the NEPAD Short Term Action Plan (developed by the African Development Bank in consultation with Regional Economic Communities and other African institutions) was an initiative to foster commitment to priority projects and accelerate the development of infrastructure. In 2005, the ITU undertook a continental level needs assessment covering the entire region that was adopted in July of that year by African Ministers in charge of telecommunications and ICTs as the reference framework for building ICT infrastructure in Africa. This assessment is now being updated. A survey of backbone network infrastructure across Africa was also recently commissioned by the World Bank which complements the existing picture of backbone network development in the region. Additionally, the African Development Bank has commissioned a study on infrastructure gaps, in the framework of the NEPAD Medium to Long-Term Strategic Framework study. It is clear from all these studies that high-capacity backbone networks within African countries are relatively poorly developed. Cross-border connectivity between countries in the region is also limited in extent and in capacity.

For historical reasons, many African countries have been well-connected to Europe. This meant that traffic from one African country to another typically had to transit a third country outside the continent. This situation has gradually improved since the 1960s and, over the last decade or so, there has been considerable activity in Africa in upgrading routes to digital microwave and optical fiber links. Intra-regional links are mainly extension of national backbones, where they reach the borders with neighboring countries. Regional organizations have provided considerable impetus to efforts to establish regional connectivity.

The high-capacity backbone infrastructure of incumbent operators has been expanded and upgraded steadily over time. Alternative networks have also recently developed as high-capacity backbone infrastructure, often taking advantage of other infrastructure networks such as electricity and railways networks, oil and gas pipelines. In many cases, these networks are available for use by other operators and service providers.

The third component of the backbone infrastructure in Africa is the networks established by mobile operators which have grown very rapidly over the last ten years. In the absence of adequate available backbone capacity from incumbent fixed line operators, these mobile operators have usually built their own backbone networks. The mobile businesses and their associated backbone networks have expanded to provide coverage to more than half of the population of the region. With the continuing liberalization of telecommunication markets, mobile operators with operations in contiguous countries are obtaining international gateway licenses – where this is legally permitted – and are interconnecting their operations in different countries, thus forming regional backbones. The mobile operators' backbone networks are now extensive in coverage but they are typically dimensioned to carry voice traffic and are not currently capable of delivering high-bandwidth services. In addition, they are often not available to other operators and service providers and therefore do not function as shared "national backbone networks".

In summary, there are multiple backbone networks in Africa, but there are few that are capable of carrying high-bandwidth services. Many of them are not available for use by multiple voice and data service providers. Intra-regional capacity is also limited, as is connectivity outside the region. This situation is constraining the development of the market for broadband services and maintaining high prices and the low quality of ICT services in the region. It is also limiting countries' access to intra-regional connectivity, which would increase the flow of communications traffic between countries and help promote regional integration.

4. CHALLENGES AND OPPORTUNITIES

Backbone networks in Sub-Saharan Africa are continually developing and there are significant projects currently underway in several countries in the region. Some telecommunication companies are linking up their networks between countries to establish regional backbone networks and new carrier operators are emerging, specifically aiming at providing high-capacity backbone services to other companies.

However, despite these developments, major gaps in the high-capacity backbone infrastructure remain. A recent needs assessment conducted by ITU identified a significant numbers of missing links between Africa Capital-and major cities. The breakdown for each sub-region is presented in Table 1 below.

Table 1: Backbone infrastructure required (in route kilometers)

Land	Central Africa	Eastern Africa	Northern Africa	Southern Africa	Western Africa	TOTAL
Planned	4'406	4'367	3'277	14'757	14'285	41'092
Proposed	4'390	1'919	3'889	9'478	5'239	24'915
Sub-Total	8'796	6'286	7'166	24'235	19'524	66'007
Submarine Cable Planned						25'778
Total						91'785

Annexes I and II provide an overall picture of backbone connectivity in Africa.

This picture is confirmed by a recent World Bank study, which indicated that high-capacity backbone infrastructure is mainly concentrated in urban areas and does not extend beyond to smaller towns and cities. It is clear that only a small proportion of the population of Sub-Saharan Africa lives within range of these high-capacity backbone networks.

These gaps exist for a number of reasons, including the policy and regulatory situation, the enabling environment and the need for capacity-building in companies and institutions. The following issues help explain the existence of gaps in the high-capacity backbone infrastructure of Sub-Saharan Africa:

- Gaps in policy and strategy formulation, as well as implementation;
- Lack of regulatory harmonization on the sub-regional level;
- Incomplete liberalization and regulatory reform;
- Underestimation of open access as key policy objective for the backbone network;
- Historically poor intra-country and inter-country connectivity;
- Differential and inadequate policies for rural and remote areas, where access lags behind urban access;
- Insufficient utilization of public resources for backbone network development;
- Lack of utilization of Public-Private Partnerships (PPPs) as a potential mechanism for leveraging investment and operational resources of the private-sector;
- Lack of technical and managerial skills for effective development and management of the sector, coupled with the brain drain of highly-skilled and educated staff.

In order to facilitate the development of high-capacity backbone networks, these issues will have to be addressed. However, even with a well-functioning market, it is unlikely that all the gaps high-capacity backbone networks in Africa can be bridged by the private-sector alone. If these networks are to be extended to smaller towns and villages in order to allow the provision of advanced ICT services in these areas, it is likely that some form of public support would be required. In this case, it is important that this public support is provided in a way that leverages the maximum amount of private-investment and takes advantage of private-sector expertise in constructing and operating backbone networks in Africa.

5. CONCLUSIONS AND RECOMMENDATIONS

Extending broadband infrastructure to link all African capitals and major cities would serve as the foundation upon which broader connectivity could be achieved across the continent, including affordable and effective access networks and last-mile connections in urban, rural and remote areas.

To achieve the goal of ***interconnecting all African capitals and major cities with ICT broadband infrastructure and strengthen connectivity to the rest of the world by 2012***, the first steps have already been taken, including a general assessment of available information and enhanced coordination among regional and international partners. The following actions are still required:

1. Identify ongoing and planned projects, which aim to fill-in broadband infrastructure gaps particularly the routes which are unlikely to be built by the private-sector.
2. Develop strategies and plans, including feasibility studies and bankable project proposals to address remaining infrastructure gaps.
3. Encourage private-investment in backbone networks through improving the enabling environment, undertaking policy and regulatory reform;
4. Attract partners and secure financing to accelerate implementation of existing and planned projects;
5. Develop innovative PPP models to maximize the efficiency and effectiveness of public financing of backbone networks;
6. Foster the development of enabling environment aimed at attracting investment in the backbone infrastructure;
7. Harmonize policies and regulatory frameworks at sub-regional and continental levels;
8. Encourage human capacity-building for maintaining and ensuring sustainability of the established backbone infrastructure.
9. Enhance coordination of ICT infrastructure investment amongst donors and financial institutions.



Connect
Africa

ANNEX I: Review of current backbone network infrastructure in Africa

The following summarizes the broadband infrastructure status in Africa's sub-regions.

Western Africa: there are a number of regional fiber links that could constitute the first step towards creating a terrestrial regional network. Eleven African countries are connected together with access to the SAT3 cable. ECOWAS, together with ITU, identified 32 links as the second priority programme for the development of telecommunications (INTELCOM-II). Various parts of these links are in the process of being upgraded and parts are being overlaid. The total length of these lines amounts to 8,798 route kilometers. Another consortium is planning to build a 14,000-kilometre submarine optical fiber cable (Infinity-1) along the western coast of Africa, with direct links into Southern Europe and South Africa and 23 landings in African countries.

Eastern Africa: Eastern Africa is comparatively not well-placed in terms of regional connectivity. When realized, the EASSy submarine cable will likely change this situation. An optical fibre backbone is under construction connecting Kenya, Uganda and Rwanda, Burundi and Tanzania (EABs). There are also preliminary attempts to link by fiber Djibouti, Sudan and Ethiopia mainly through SEA-ME-WE cables (III & V) and EASSy. Regional backbone is particularly important for landlocked countries in providing access to submarine cable landing points.

Southern Africa: Southern Africa shows a better-developed pattern of intra-country connections coordinated by the Southern Africa Telecommunications Association (SATA). These have been built of the SRII initiative sponsored by SADC and the ITU. An update feasibility study of the SATA Backhaul Links is now funded by the NEPAD-Infrastructure Project Preparation Fund, managed by the African Development Bank. Apart from the regional SRII transmission links, SATA is also implementing the Intelligent Nodes project, which is an Internet Protocol (IP)-based platform for the region. The feasibility study for the Intelligent Nodes project was facilitated and funded by the ITU. South Africa, for example, now has a minimum of STM-4 (622 Mbps) links with Botswana, Lesotho, Namibia, Mozambique, Swaziland and Zimbabwe.

Central Africa: There is a lack of broadband infrastructure in this sub-region. Proposed projects include fiber optic cable between Libreville-Franceville-Lekoni-Oyo-Brazzaville and a Cameroon-Chad-Central African Republic to connect the countries to the SAT-3 landing station in Douala.

Northern Africa: Broadband inter-country links are almost not available. The Libya section of the Algiers - Tripoli link is microwave and needs to be upgraded. The Algiers-Zinder-Abuja trans-Sahara link is undergoing a detailed feasibility study. This link will provide many opportunities for upgrading connectivity in Northern Africa, as well as in Western Africa.

COMESA has promoted the COMTEL project, supported by the NEPAD-IPPF of AfDB and AFD/DBSA Project Preparation Facility. In some sub-regions, major operators have played a leading role in expanding links to neighboring countries. On a bilateral basis, South Africa's Telkom has established links to Botswana, Lesotho, Namibia, Mozambique, Swaziland and Zimbabwe.

There are significant disparities between different sub-regions in terms of current and projected activities. There have been a large number of initiatives by the telecommunication operators over recent years, with the national networks established by the operators being interconnected with neighboring networks. While there are a large number of projects at various stages of development, unfortunately, not all projects under consideration may come to fruition or will be completed in time.



Africa

ANNEX II: Current, planned and proposed Optical Fiber Networks in Africa

