Connecting the Unconnected

WHITE PAPER ON RURAL COVERAGE IN AFRICA

Contributed by Huawei
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African Digitalization Vision and National Broadband Plan

Connectivity has the potential to positively impact and transform people's lives and bring benefits in a number of areas, including health, education, financial services, transport, energy, agriculture etc.

Digital Access goes beyond just voice and internet connectivity. Digital Inclusivity touches the everyday lives of all people by meeting their basic needs in more intelligent ways though a proliferation of digital services such as eAgriculture, eEducation, eGoverment, eHealth and IOT services including Smart Security, Smart Metering and Smart Energy etc. Mobile finance has recently emerged for the unbanked populations by allowing easy and convenient access to the economic ecosystem.

The African Union Agenda 2063 has acknowledged the importance of Digital Inclusivity for African countries to bring the continent on par with the rest of the world as an information society. The vision seeks to achieve integrated e-economies where all governments, businesses and citizens have ready access to reliable and affordable ICT services by increasing broadband penetration by 10% at 2018, broadband connectivity by 20% [1].

Many African countries have embarked on their individual digital transformation journeys, having highlighted the importance of ICT access expansion to all parts of their countries. Some of these countries and the highlights of their national broadband plans are given below.

1) South Africa National Development Plan 2030

South Africa launched its National Development Plan 2030 in 2012 which expects to have ICT underpinning the development of a dynamic and connected information society and a vibrant knowledge economy that would be more inclusive and prosperous. It aims to create a seamless information infrastructure that would be universally available and accessible in order to meet the needs of citizens, business and the public sector, providing access to the creation and consumption of a wide range of converged services required for effective socio-economic participation [2].
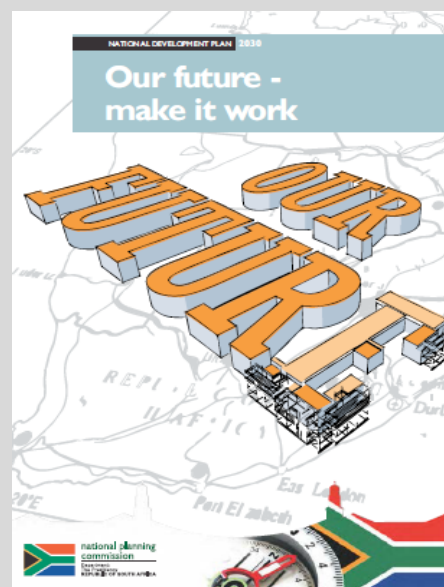
2) Nigeria Vision 20:2020

Vision 20:2020 policy for the ICT sector encourages research and development initiatives to facilitate and enhance local manufacture, capacity and content development in the key areas of ICT. The implementation of this policy would be driven mainly by private sector, promoting entrepreneurship, innovation and local capacity development. Government would serve as facilitator and catalyst for the projected economic growth. It is expected that the nation's ICT sector will not only meet domestic ICT needs but would enable Nigeria to exploit international market opportunities [3].

3) Kenya Vision 2030

Kenya's Vision 2030 seeks a prosperous and competitive ICT-driven society to improve the livelihood of all Kenyans by ensuring the availability of accessible, efficient, reliable, affordable and secure ICT services. ICT was identified as a key enabler for socio-economic transformation into a modern economy in which new knowledge plays a central role in boosting wealth creation, social welfare and international competiveness [4].
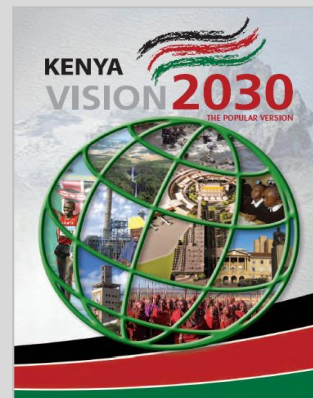
4) Malawi Vision 2020

Malawi's Vision 2020 aims to create a well-developed information and communication system which is seen as being essential for the development of the country. Government will continue to implement ICT strategies that facilitate services, increase public efficiency and grant citizens access to public services. This will entail among other things, developing a reliable, fast, adaptive and robust national ICT infrastructure that feeds into international networks; improving efficiency in delivering postal services; and developing public online services [5].
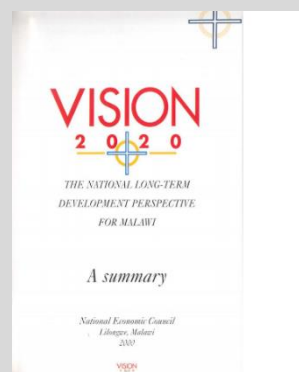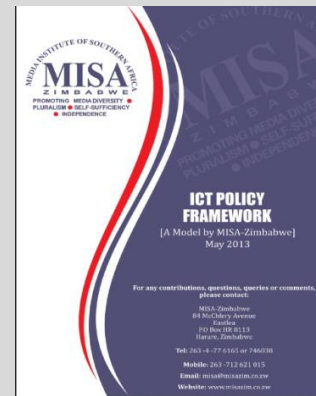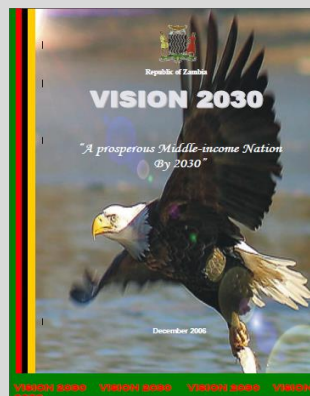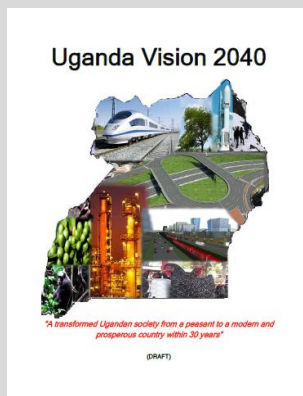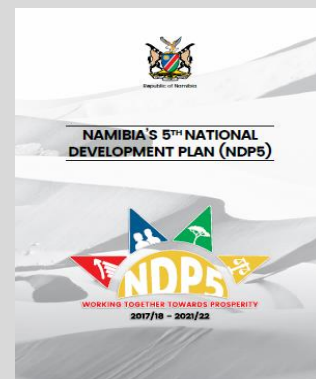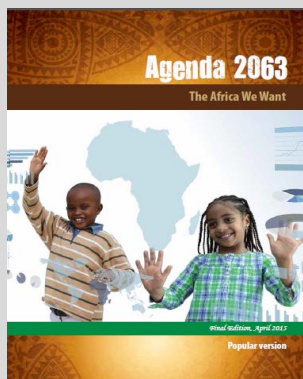
The implementation of Digital Inclusivity in the developing countries has penetrated the core of business operations and wellbeing of the people.

The advent of the new information technologies has opened the door for socio-economic development in African countries.

Challenges of Rural Digital Inclusivity

While all stakeholders include government, organizations, operators, venders, are aware of the positive impact that ICT and Digital Transformation can have on African society and its economy collectively, substantial challenges are experienced in expanding the reach and value of connectivity to all people in all countries in Africa.

With 683 million people (60% of total population) in rural area, The Rural Digital inclusivity takes the key role of Africa digitalization.

Urban and Rural Population (Millions)
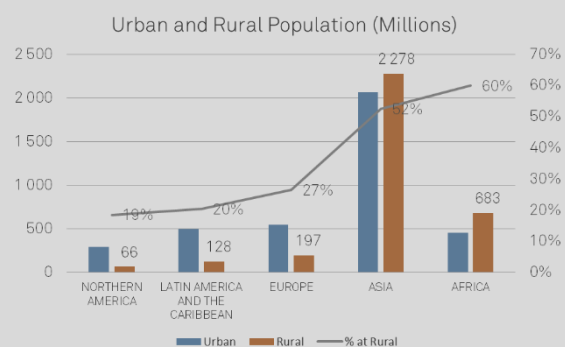
Source: United Nation World Urbanization Prospects

There are a number of unique challenges that Africa faces that results in rural areas lagging behind urban areas when it comes to the provision of and access to telecommunications services. Closely examining these challenges we can broadly group them into four main categories:

- **Political & Legal**: Inadequate or restrictive regulatory regimes and immoderate government intervention and lack of strategy for deploying Universal Service easy and convenient access to the economic ecosystem.

- **Economic**: Substantial economic disparities between urban and rural dwellers, low affordability, excessive taxes on consumers and the industry, insufficient and variable Universal Service Fund (USF) for rural development and inclusion, and high cost site acquisition and site deployment with low ROI plus long payback periods for carriers.

- **Environmental & Technological**: Scarcity of new technologies for cost savings in terms of network build and power utilization etc. despite high appetite in rural areas, inaccessibility of villages due to challenging terrain and lack of appropriate radio spectrum.

- **Socio-cultural**: Low literacy rates and ICT skills and low density rural areas. Language barrier as many platforms are not in local languages

Methods to accelerate Rural Digital Inclusivity

To achieve the Digital Inclusivity targets, it is important to expand the wireless coverage for rural areas and provide affordable ICT services to the low income population. All stakeholders in the ecosystem (governments, regulators, carriers, venders and NGOs etc.) need collaborate to find a feasible solution that considers government's policy, spectrum, taxation, carrier's universal service obligation, financial funding, vendor innovation, affordable handsets and services provision. This collaboration is important to generate comprehensive but low cost, sustainable solutions for rural network connectivity.

3.1 Progressive Broadband Standard and Continuous Government Monitors

To meet the Digitalization Vision, a long term plan for rural digital inclusivity need be clearly captured in the National Broadband Plan (NBP). To execute the NBP, a regulation PSM circle is suggested to archive:
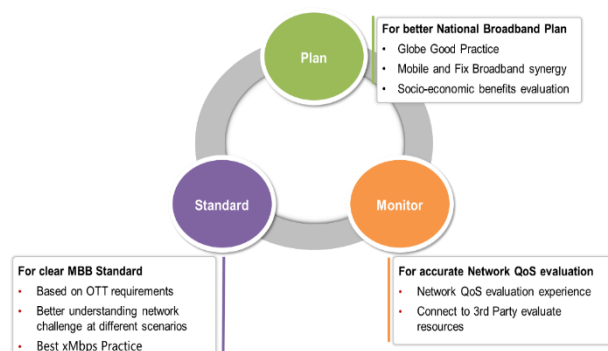

Figure: Regulation PSM Circle to execute the NBP

- **Better Plan:** Derived from Digitalization Vision, the Africa countries can define and update their NBP for more practicable by evaluating the socio-economic benefit and reference globe good practice.

- **Clear Standard:** Based on the service to be supported and OTT requirement, the rural coverage standard can be defined. This standard is also considering current network status and the difficult to provide service meet the standard.

- **Accurate Monitoring and Evaluation:** A set of parameters need to be produced from the standard and the government need to monitor those parameters to track the progress on rural coverage and find the gap,

challenge for another round of PSM circle.

For example: ARCEP France was created in 1996 as an independent agency in charge of regulating telecommunications in France. ARCEP is keep monitoring France four operator's network QoS about twice a year. Each time ARCEP will test 24K sample point for each operator's at different scenarios. The test results were published to:

1. Check the GAP between the national broadband plan and current status.

2. Check whether the QoS of operator's network meet the regulations.

3. Provide real network quality data to end users (individuals, public services and businesses)

3.2 Expand Funding Mechanism

To provide financial support for rural coverage, many countries run Universal Service Fund (USF) for subsiding the sites build at rural area. Governments can impose requirements or levies on operators, essentially directing them to pay the costs of providing Universal Access or Universal Service.

Governments need not only turn to USF when looking for funding and investment opportunities. There are many other NGOs and International Organizations

who have committed to supporting Africa's development. In 2017, the World Bank announced a record $57 billion in financing for Sub-Saharan African countries over the next 3 years. In 2016, Japan announced $30 billion financial support for Africa and in 2015, China pledged $60 billion in development assistance to Africa, including $5 billion in grants and interest-free loans and $35 billion in concessional loans and export credits [6].
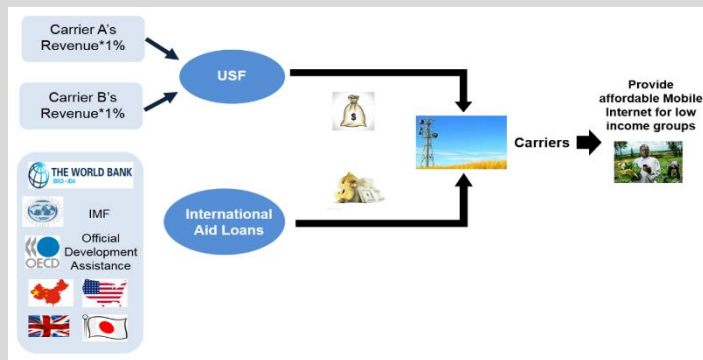
Figure: Funding Models for Rural Digital Inclusivity

3.3 Supportive Regulation and Tax

Besides provision of fund, regulators and policy-makers have three other ways to fast –track rural coverage and accelerate Rural Digital Inclusivity:

- **Spectrum Policy**: Coverage obligations must be integrated into spectrum auctions. The cost of coverage obligations need to be considered while set the start price of spectrum auction.

  In Germany, the 800/2100/2600 MHz (SMRA) auction restricted the use of 800 MHz blocks in urban areas until rural coverage obligations were fully met. The 800 MHz operators shared the rural rollout obligations.

- **Infrastructure Sharing**: Sharing existing essential infrastructure is crucial in expediting the Digital Inclusivity strategies at rural. Public infrastructure such as government buildings, roads, railways and ducts for utility services have the potential to reduce the cost of building the network. Such infrastructure and essential facilities sharing will be offered at cost-based rates. Infrastructure sharing can impact the reduction of capital investment

substantially with on-going operating cost reductions between 50% and 80% depending on market structure and the sharing model implemente6. This will ultimately serve to accelerate rural area network deployment in more sustainable ways.

- **Taxing Policy**: Governments have chosen to impose VAT, custom duties and sector-specific taxes on the mobile industry for consumers of mobile services in many Africa countries. These taxes impact on a range of inputs including the cost of imported network equipment, the cost of energy, backhaul capacity and site fees etc. Taxation through VAT, custom duties and sector-specific taxes on airtime and mobile devices, especially for low-priced handsets, could potentially reduce the affordability of mobile access for end-users in low-income groups who are predominantly found in rural areas. Eliminating or reducing taxes for carriers, service providers and consumers could positively impact Rural Digital Inclusivity.

3.4 Effective Rural Networking

Cost efficiency is the key of rural network. According to the population distribution and geographic feature, there exists three types of rural coverage mode: Targeted Coverage, Continuous Coverage and Wide Coverage:

- **Targeted Coverage**

  Provide coverage for isolated locations in sparsely distributed villages, which have no electricity grid and transmission network and whose population are limited (mainly less than 3000).

  The coverage distance ranges from 2 km to 4 km; the inter-site distance is dozens of kilometers usually; the coverage is not continuous between two sites.

- **Continuous Coverage**

  Coverage distance ranges from 4 km to 8 km, covering a single big village or several continuous small villages. There might be grid in this scenario.

- **Wide Coverage**

  Coverage distance ranges from 8 km to 15 km or even more, covering multiple villages near a town. The site capacity demand is large. Grid/DG and transmission are necessary.

Table 1: Rural Network Scenarios			
Scenario	**Targeted Coverage**	**Continuous Coverage**	**Wide Coverage**
Coverage Distance	2–4 km	4–8 km	8–15 km
Population	< 3000	3000–7000	> 7000
Site Height	9–18 m	12–30 m	> 30 m
Power Supply Mode	Preferably solar power	Preferably solar power	Preferably DG or grid hybrid power
Typical Solution	Cost efficient Site (e.g. Huawei RuralStar using Omni-antenna, solar and NLOS transmission)	Cost efficient Site(e.g. 2 sectors site, reducing antenna and RF)	Tower site (e.g. traditional site with coverage enhancement)

The advantages of three rural network solutions are:

- Wide coverage solutions use coverage enhanced technologies like nTnR to expand the coverage radius from 7 km to 10 km with the same tower height in rural areas. Thus, coverage doubles with the same TCO.
- Continuous coverage solutions use 2-sector 90-degree antennas to save equipment and energy.

- Targeted coverage solutions use self-backhaul to replace satellite or microwave; the big iron tower can be replaced by lower pole; with low-power equipment is used, the total site power consumption can be reduced to around 210W, diesels can be replaced by solar battery, CAPEX and OPEX for power supply are reduced.

All solutions should support GSM, UMTS, and LTE.

3.5 Active Fostering of Rural Digital Applications and Usage

Expanding the range of services to meet the basic requirements of people living and working in rural areas is essential to achieving the Digital Inclusivity objectives.

Eligible services can include:

1. Basic telephony services to local, national and international destinations.
2. Internet access service for individual subscribers at adequate speed for individual users
3. Access to emergency services (as required).

Solutions can be accessed that impact basic service delivery in many sectors reaching many more people previously separated from the urban centers and corridors by distance and terrain. These include:

- **e-Education:**

Rural areas often struggle to achieve the same educational standards as more densely populated urban regions. For example, rural schools are ten times less likely to offer advanced courses. Perhaps as a result of these limited course offerings, rural students are less likely than their urban and suburban counterparts to attend college after high school graduation. eLearning courses are proving a viable and popular way to fill gaps for rural students across the country. Since then the eLearning sector has seen substantial growth with improving coverage and connectivity in rural areas boosting numbers of distance learning students.

- **e-Health**

The challenges in rural areas in Africa is manifest in the obvious geographic factors including isolation and small dispersed populations, limited public transport and road infrastructure with the resultant, long and costly trips to hospitals. Significant difficulties are, additionally, experienced in recruiting qualified and experienced personnel in rural health care services. This is compounded by the increasing centralization of specialist secondary care services and the increase in the proportion of elderly citizens relative to the total population. ICT applications can improve health care delivery and service reach by facilitating remote consultations, diagnosis and

treatments. ICT applications make it possible to remotely train and up skill rural health workers by connecting them real time with highly qualified physicians from major cities. Lastly, ICT tools have proven their efficiency in disease prevention and responses, for example, the health message broadcast system employed during epidemic outbreaks.

- **e-Governance**

Rural e-Governance applications has, in the recent past, demonstrated the value of ICT in reaching the poorest of citizens in the furthest of villages in different countries. ICT solutions foster and underpin empowerment and participation by making government processes more efficient and accessible for the public, for example, with process ranging from birth registration to voter registration. ICT enables, if not encourages, communication and information sharing among people and organizations and within the governments.

- **Mobile money**

Mobile money is a powerful tool to employ to allow low income people to access basic financial services while wireless network coverage becomes the foundation to providing Mobile Money and similar services to the rural areas. Digital Transformation allows for financial services to be provided to rural dwellers by reducing cost as a barrier to entry for this unbanked group of people. Mobile money enables rural economy development and growth and can aid in reducing extreme poverty, for example, access to M-Pesa has assisted 194,000 households in Kenya to break though the poverty line since its inception in 2007.

Additionally, over 500,000 household solar power kits were sold and purchased using mobile money in Kenya, Uganda and Tanzania by April 2017. Mobile Money use has generated obviously positive effects in providing service for rural communities and boosting Digital Inclusivity.

Summary

ICT has been able to break though the barriers of distance, terrain and time, taking mobile communications into areas that were previously unreachable. The final frontier would be to reach all people in the remotest of rural villages in the least developed countries.

To accelerate Rural Digital Inclusivity, this whitepaper suggest:

- Progressive Broadband Standard Requirements and Continuous Monitoring & Evaluation
- Expand Funding Mechanism
- Supportive regulation and Tax
- Effective Rural Networking
- Active Fostering of Rural Digital Applications and Usage

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African Telecommunication Union

…promoting development of info-communication in Africa

Nairobi, Kenya

http://atu-uat.org/