



ITU Regional Workshop on *Organizational and Technical* *Aspects of Broadband* *Development*

Odessa, Ukraine, 27-29 September 2017

Technical Aspects of Broadband Networks Design and Construction
The ITU-McCaw Broadband Wireless Network Project for Africa
Opportunities & Challenges

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IEE/TND

International Telecommunication Union

Telecommunication Technologies and Network Development Division



Key Areas



Products and Services in Focus

Our work is carried out by various means, including symposia, workshops, conferences, seminars and expert advice as well as information sharing, creation of tools and training material, direct assistance, partnership, publications and events. Our priority areas are as follows:



Next-Generation Networks: assistance on planning, deployment, migration, interoperability, digitization and evolution of networks, network elements and applications

Broadband Networks (wired and wireless technologies including IMT): assistance with planning, implementation and development of national ICT broadband networks, including promoting IXPs

Rural communications: provision of information on access and backhaul technologies and source of power supply, latest technologies and best practice, implementation of projects on public community broadband access points

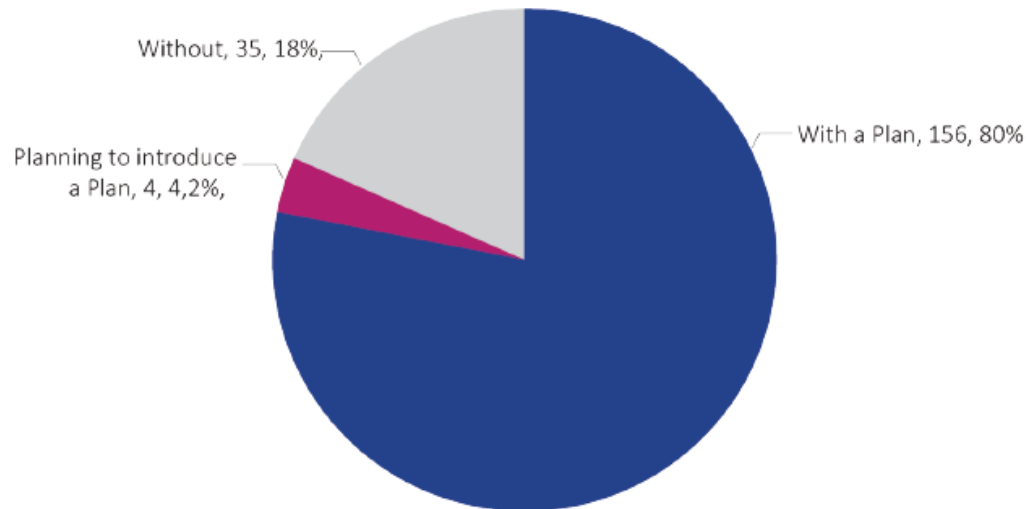
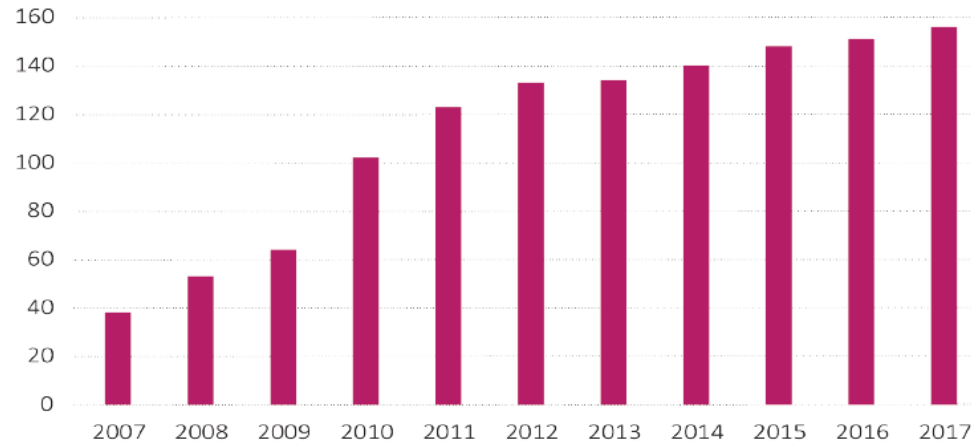
Conformance and interoperability (C&I): assistance on the establishment of national, regional or subregional C&I programmes, assessment and feasibility studies, providing information and training to technicians, policy-makers and businesses on C&I, providing guidelines on C&I

Bridging the Standardization Gap: Increasing the knowledge and capacity of developing countries for the effective application/implementation of standards developed by ITU

- **ITU Guidelines on Conformity and Interoperability:** Different Guidelines relating to best practice for planning and review of C&I regimes, Mutual Recognition Agreements, establishment of C&I Test Labs and others
- **ITU Trainings on C&I:** provision of trainings to enhance knowledge, increase awareness, promote experience sharing, present practical learning on standards, regulations, real lab experience and accreditation procedures; provision of Lecture on C&I Regimes; and C&I Testing Domains
- **ITU C&I Regional Assessment Studies/ Conformity Interoperability Programme:** to promote Harmonized C&I Programmes in collaboration with Regional Organizations
- **ITU Broadband, IPv6 and Internet Exchange Implementations:** to provide broadband connectivity free or low cost digital access for schools, hospitals, underserved populations; IXPs to reduce transmission costs, optimize Internet traffic, improve QoS
- **ITU Interactive Transmission Maps:** cutting-edge ICT-data mapping platform to take stock of national backbone connectivity and other key ICT metrics.

Policy Leadership in National Broadband Plans, 2007-2017

Growth in National Broadband Plans, 2007-2017 (top chart); Number of countries that have adopted a Plan or Strategy, planning to adopt or without (bottom chart).

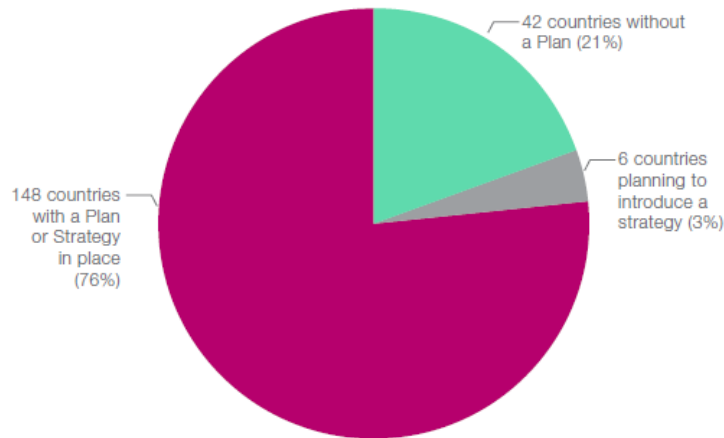
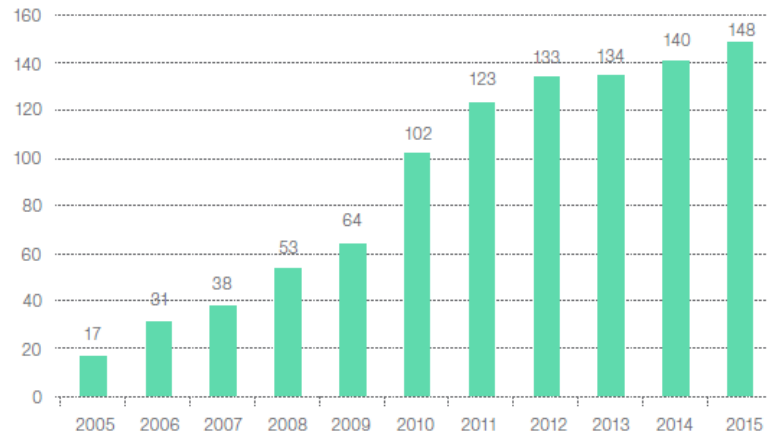


Source: ITU. Note: Bottom chart based on data for 195 countries. National Broadband Plan or strategy includes: a plan, strategy or policy specific to broadband; digital plan, agenda, strategy or policy; ICT plan, strategy, or policy; or a communication plan, strategy, or policy.

Broadband Plans : Policy Leadership



Number of Countries with National Broadband Plans, 2005-2015

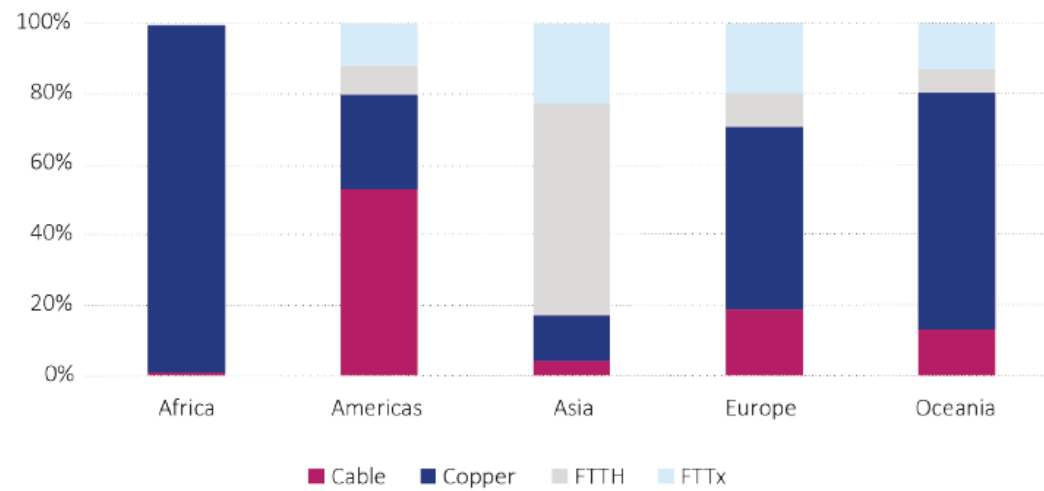
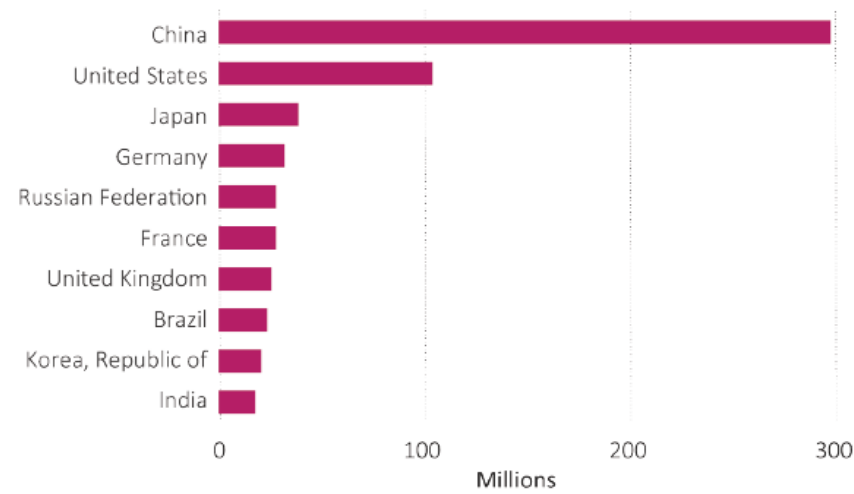


Broadband plans 2005-2015

Phase	1) Deployment	2) Adoption	3) Integration
Focus	Broadband network availability	Broadband access & capacity building for effective use	Broadband integration in economy and society
Examples	Optical fibre cable and wireless broadband access networks	Digital literacy programmes; community access projects & programmes	e-health, e-governance, e-education and e-commerce strategies
Indicators	Telecom indicators	Performance indicators	Outcome/impact measures

Global Fixed Broadband Subscribers, 2016

Distribution of fixed broadband subscriptions by region, 2016 (top); Evolution of fixed broadband subscriptions by technology, Q4 2014-Q4 2015 (bottom).



Source: Point Topic, available at: <http://point-topic.com/free-analysis/fixed-broadband-subscribers-q4-2016/>

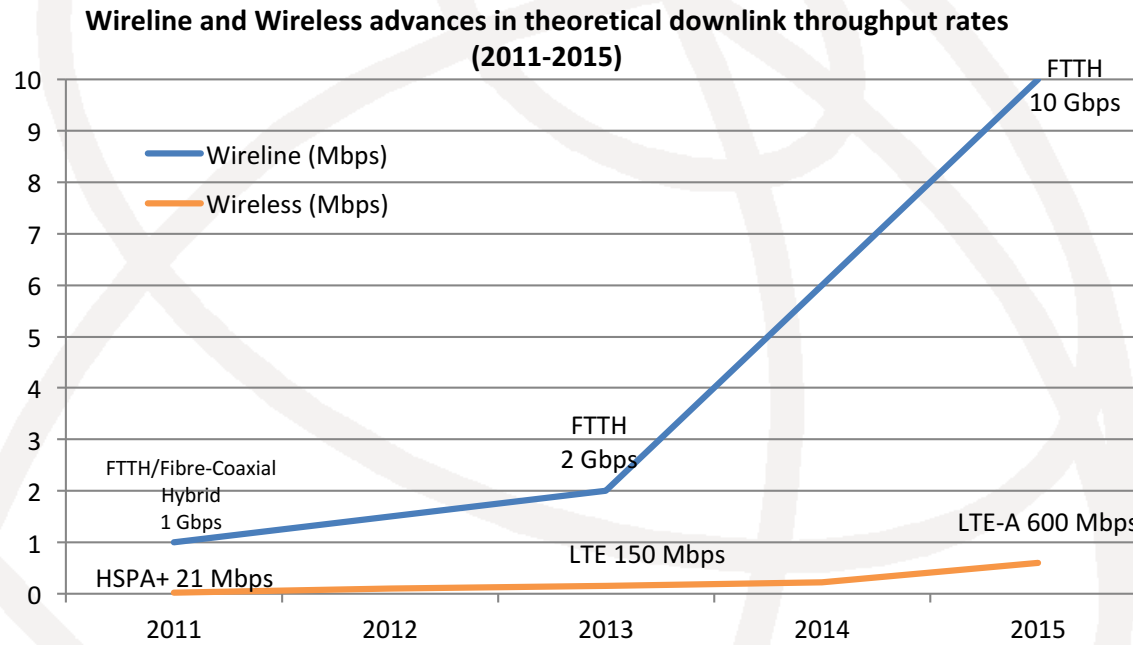
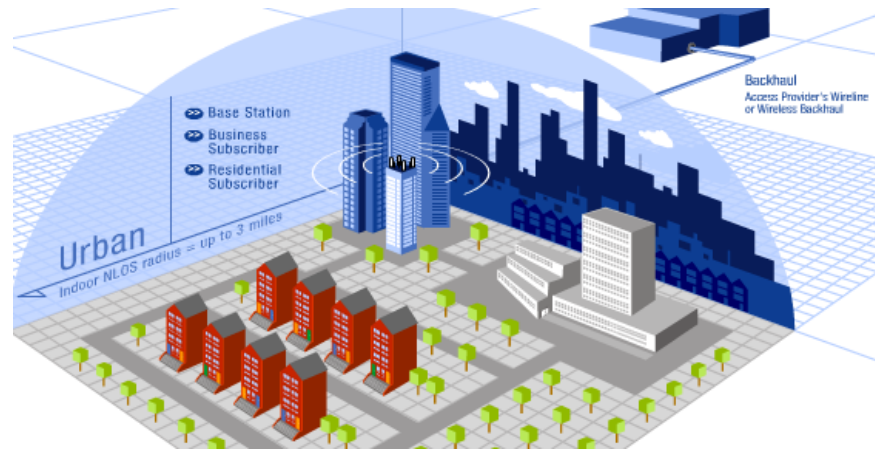


Figure 2: Wireline and Wireless advances in theoretical downlink throughput rates (2011-2015)

Broadband Wireless Implementation



Base Station
CLICK FOR DETAILED SPECS

URBAN Base Station

- NLOS (non line-of-sight) with consistent throughput to edge of cell
- Fully-integrated base station transceiver
- Reliable OFDM radio transmission
- Omnidirectional or sector applications
- Spectrally efficient, scalable, expandable
- Configurable TDD uplink/downlink capacity
- Least cost installation
- Standards-based network management SNMP and Web-based
- Dual redundant 48 volt DC power supply

BACK-HAUL

Outdoor Subscriber Unit

Indoor CPE
CLICK FOR DETAILED SPECS

URBAN Business

- Indoor, NLOS coverage up to 3 miles from base station
- Consistent throughout performance to edge of cell
- Configurable service levels (DoS) to support small and medium enterprises
- Plug-and-play subscriber unit (CPE) connects to computer or LAN through standard Ethernet port
- Self-installable subscriber unit – no truck rolls required
- Outdoor NLOS subscriber unit available

ITU-BDT ICT Infrastructure Projects

Broadband Wireless / Fixed Networks, IXPs etc



Broadband Wireless Network Project Implementation Team during the needs Assessment field Missions in Swaziland

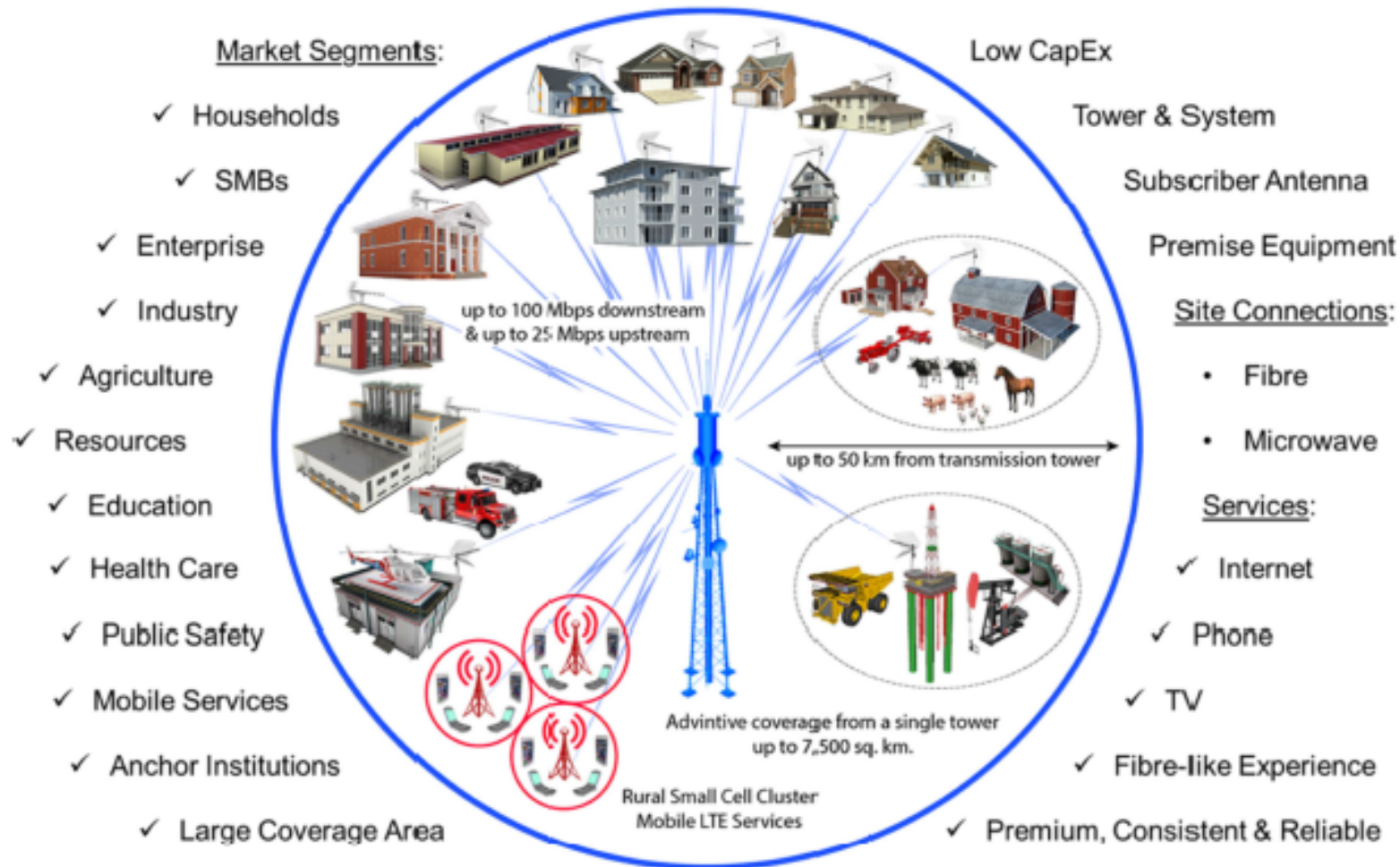


Broadband Wireless Network Installation in Burundi



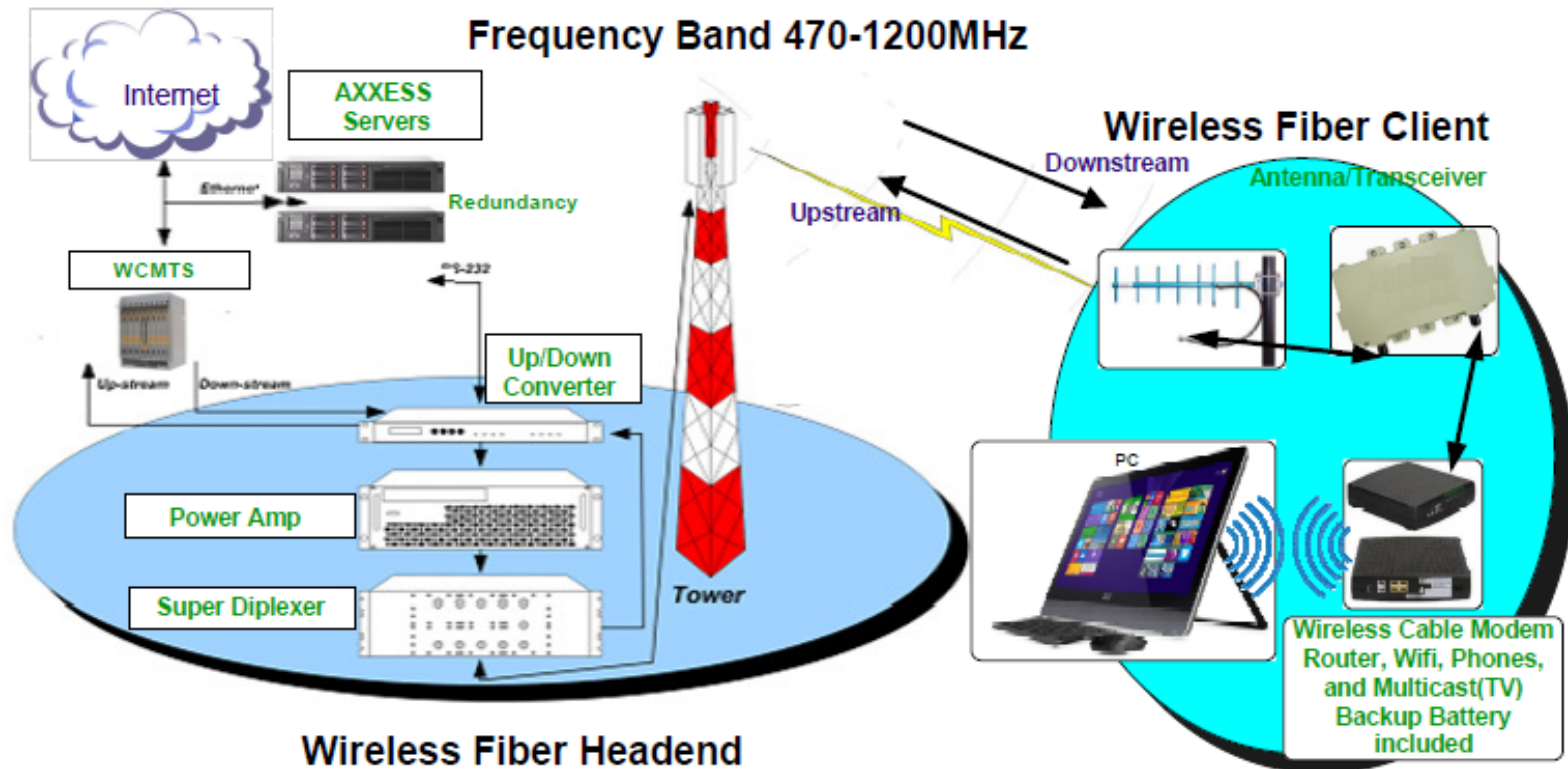
Alternative solutions

Wireless Fiber Target Market



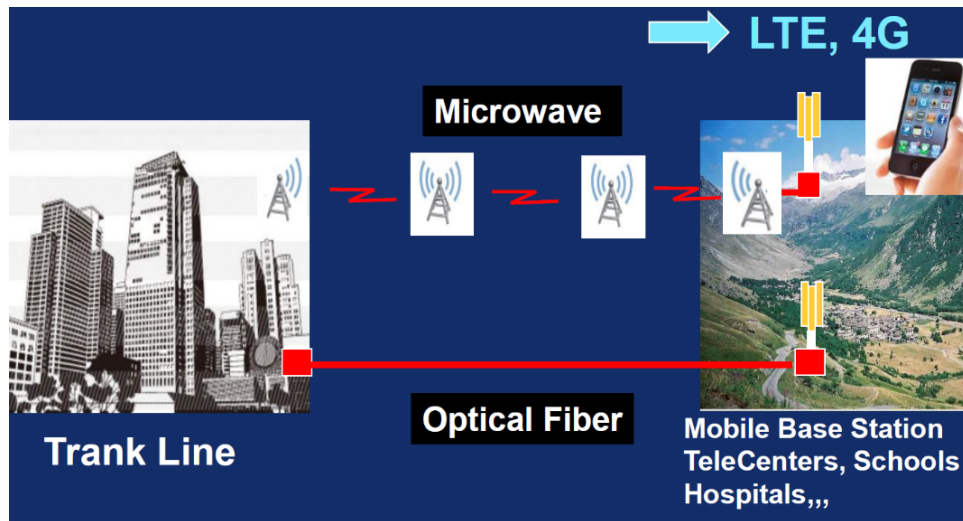
Alternative solutions

System Diagram



Quadruple Play: Internet, Phone(VoIP), TV(Multicast), and Midhaul

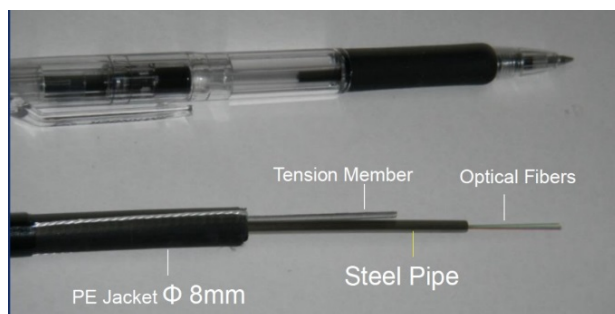
Main Challenge: Broadband "Backhaul" From Cities to Rural Areas



Low cost optical cable Solution

Optical Cable for Multi-Form
Installation

Metal Pipe + Tension Member

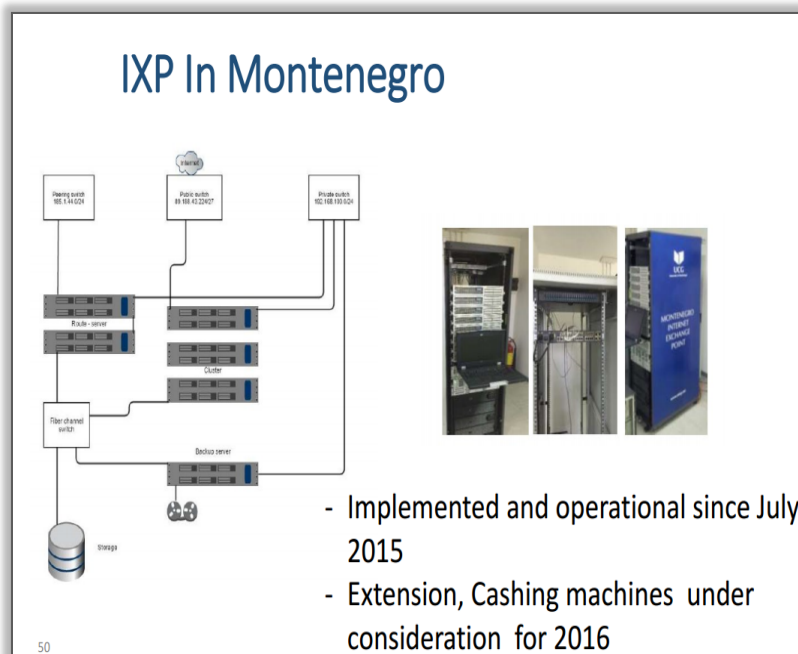


Projects for sustainable development

APT Project in Bhutan, March 2013
4-day construction for 1.2 km



Internet Exchange Points (IXPs)



- New Internet Exchange Points (IXPs) to reduce latency, and cut transit costs.
- According to Packet Clearing House, 24 more countries established a new IXP over the twelve months between mid-2016 and mid-2017 (of which 11 were African).
- By mid-2017, 119 ITU Member States now have IXPs, compared with 76 ITU Member States which do not.
- The total number of IXPs in ITU Member States globally is 471.

Internet Exchange Points (IXPs)

- The EU as a whole has 145 IXPs.
- Eight countries have more than ten national IXPs, including: U.S. (84), Brazil (27), Russia (21) Argentina and Germany (20), Australia (18), France and Japan (16).
- 29 African countries have IXPs by mid-2017, nearly twice as many as the 15 African countries which had an IXP back in 2008
- The growth of IXPs in Africa over the last year is remarkable :
 - Benin, Botswana, Burkina Faso, Côte d'Ivoire, Rep. of Congo, Madagascar, Malawi, Mozambique, Rwanda, Sudan and Zimbabwe all established an IXP over the last twelve months to mid-2017.

ITU Interactive Transmission Maps

Broadband Transmission Capacity Indicators

Underneath the map is a database, containing records of each individual link. The following indicators are either compiled or calculated from this database:

Indicator 1: **Transmission network length (Route kilometres)**

Indicator 2: **Node locations**

Indicator 3: **Equipment type of terrestrial transmission network**

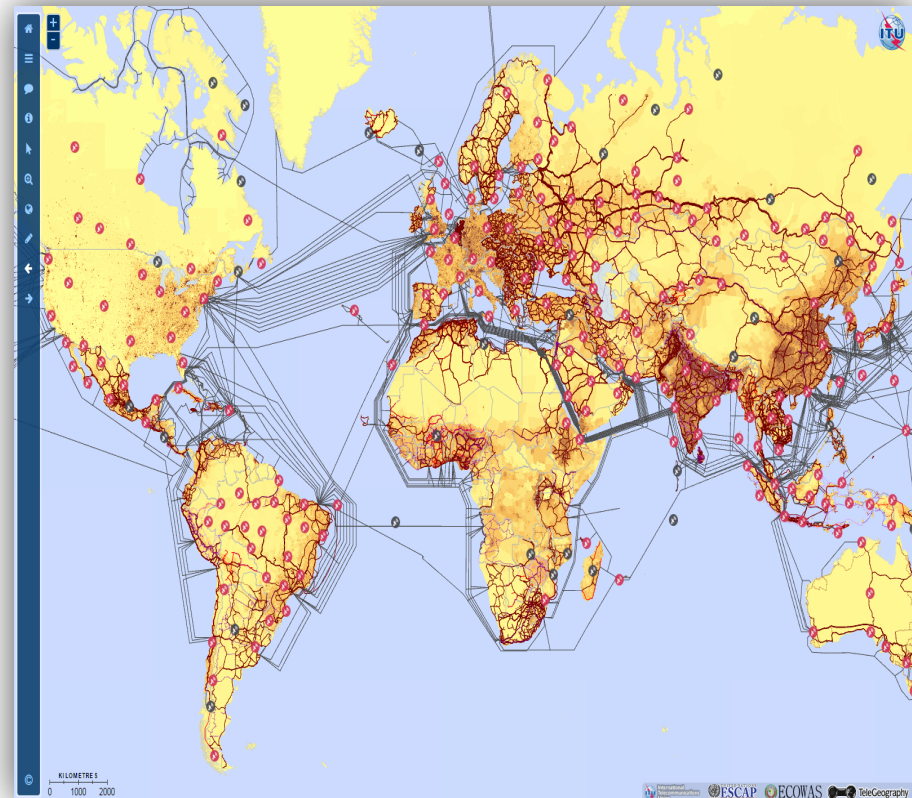
Indicator 4: **Network capacity (bit rate)**

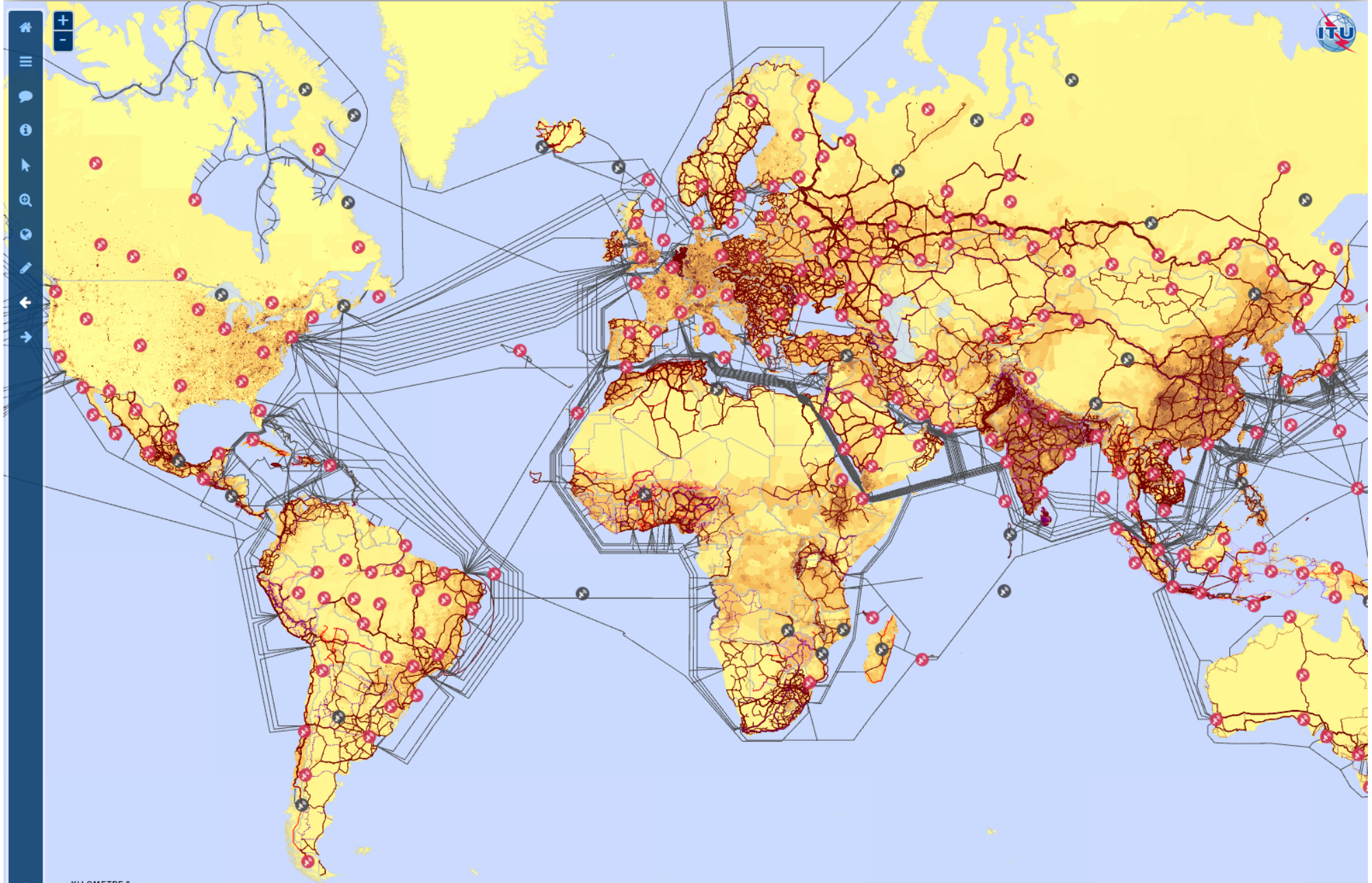
Indicator 5: **Number of optical fibres within the cable**

Indicator 6: **Operational status of the transmission network**

Indicator 7a: **Percentage of population within reach of transmission networks**

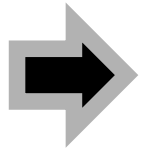
Indicator 7b: **Percentage of area within reach of transmission networks**





Map navigation controls including zoom in (+), zoom out (-), home, search, and other navigation icons.

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Conclusions

- **New wireless networks to fill the gaps (e.g. 5G / IMT 2020)**
- **Innovative Optical Cable: Thin, light, long, robust for multi-form installation**
- **Public-private partnership and project funds has shown a way to engage multi-stakeholders to achieve the same goal: driven by the SDGs, with special attention to SDG 9.a**

Towards an effective implementation of SDGs

- SDG 9.a:

Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States

Thank you for your Attention

