# Policy Opportunities for CN Development in Africa

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# Impact of Communication Networks

**Malaria Journal**

BioMed Central

Research

Open Acc

## Role of information and communication networks in malaria survival

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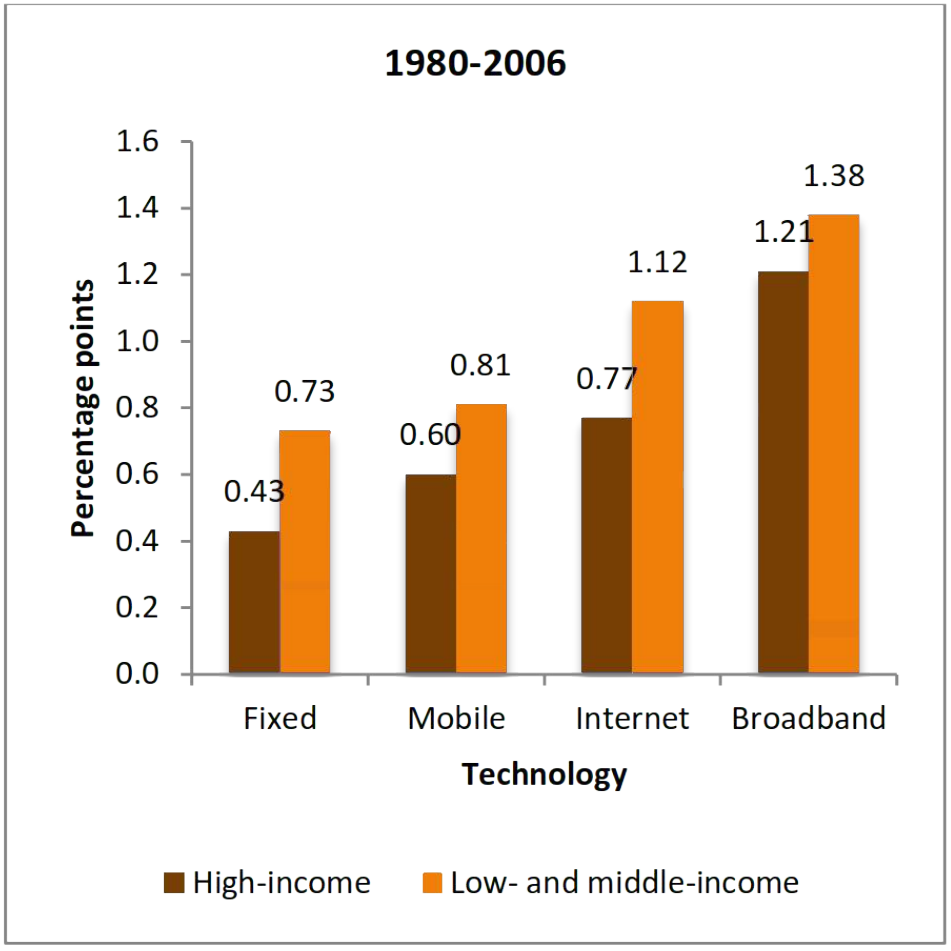
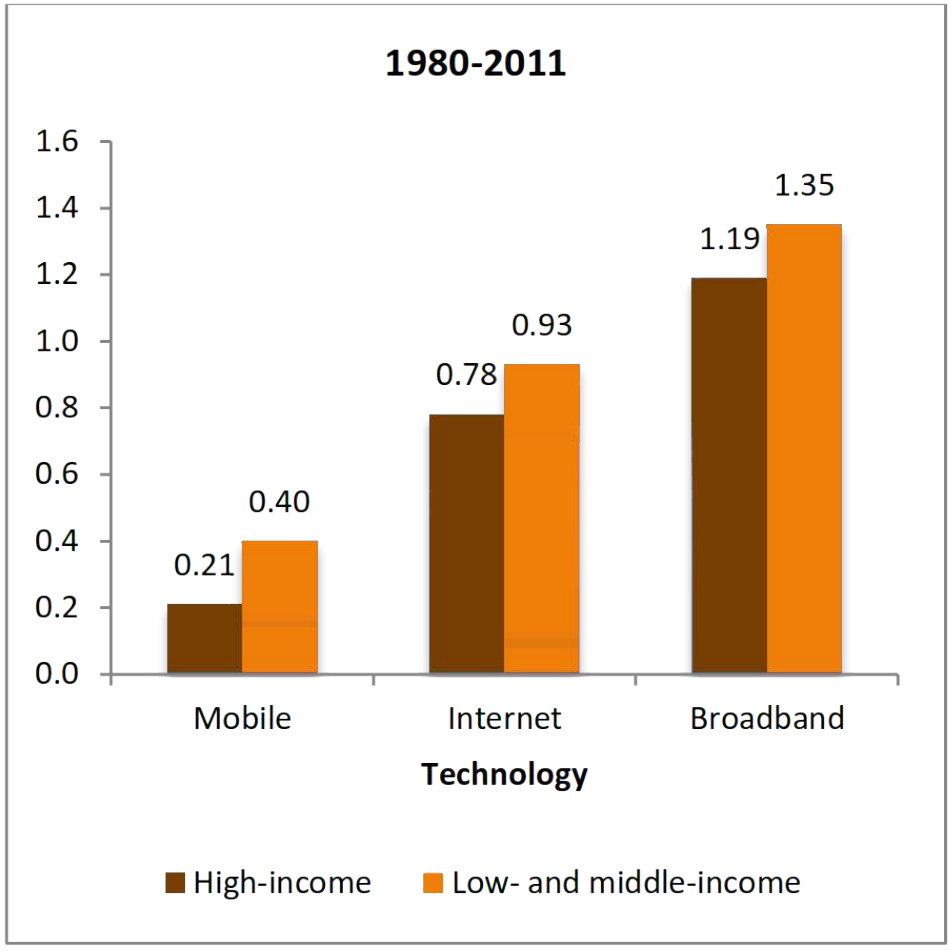
**Abstract**

**Background:** Quite often symptoms of malaria go unrecognized or untreated. According to the Multilateral Initiative on Malaria, 70% of the malaria cases that are treated at home are mismanaged. Up to 82% of all malaria episodes in sub-Saharan Africa are treated outside the formal health sector. Fast and appropriate diagnosis and treatment of malaria is extremely important in reducing morbidity and mortality.

**Simple proximity to communication networks decreases the chance of dying from Malaria**

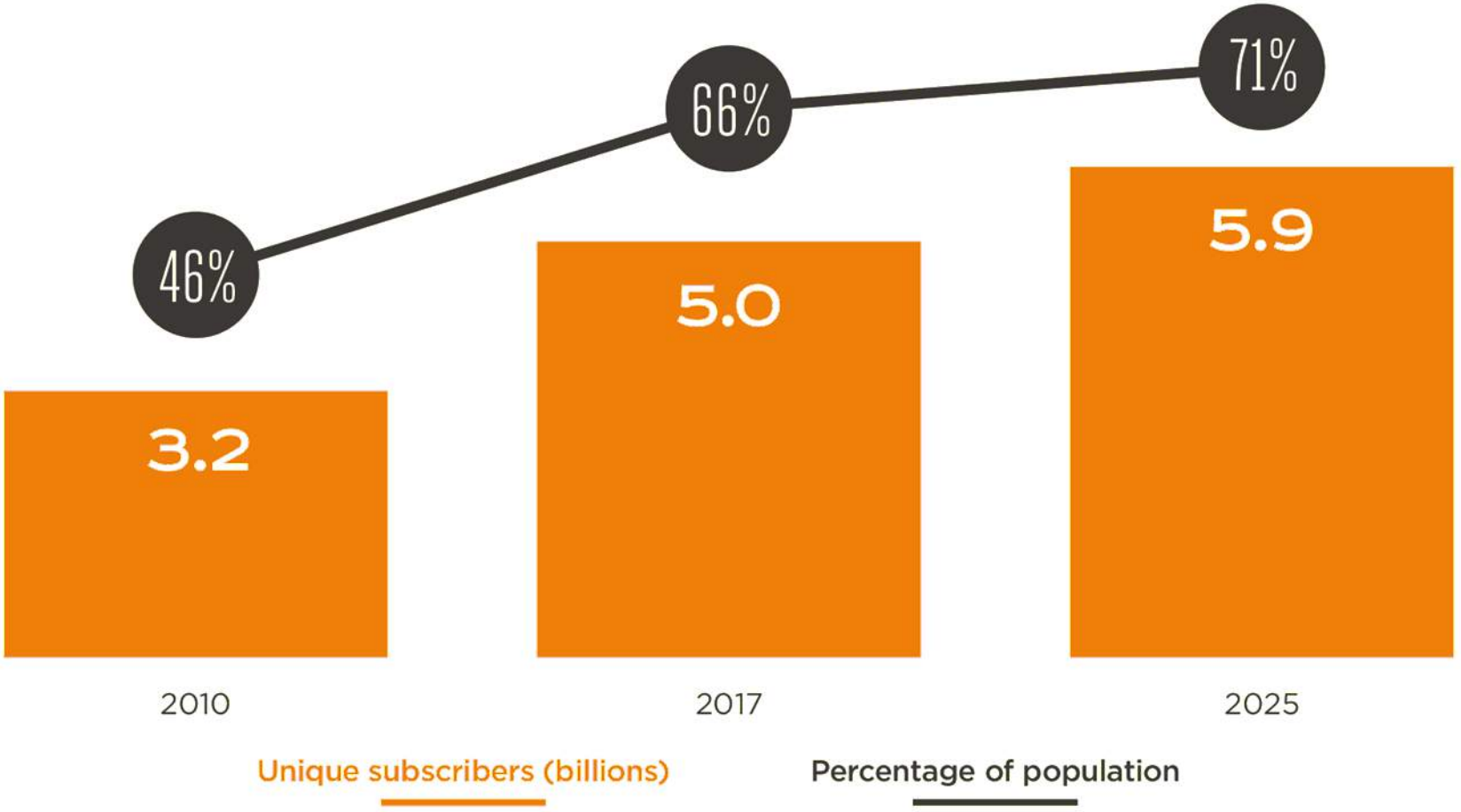
# Impact of ICTs on GDP



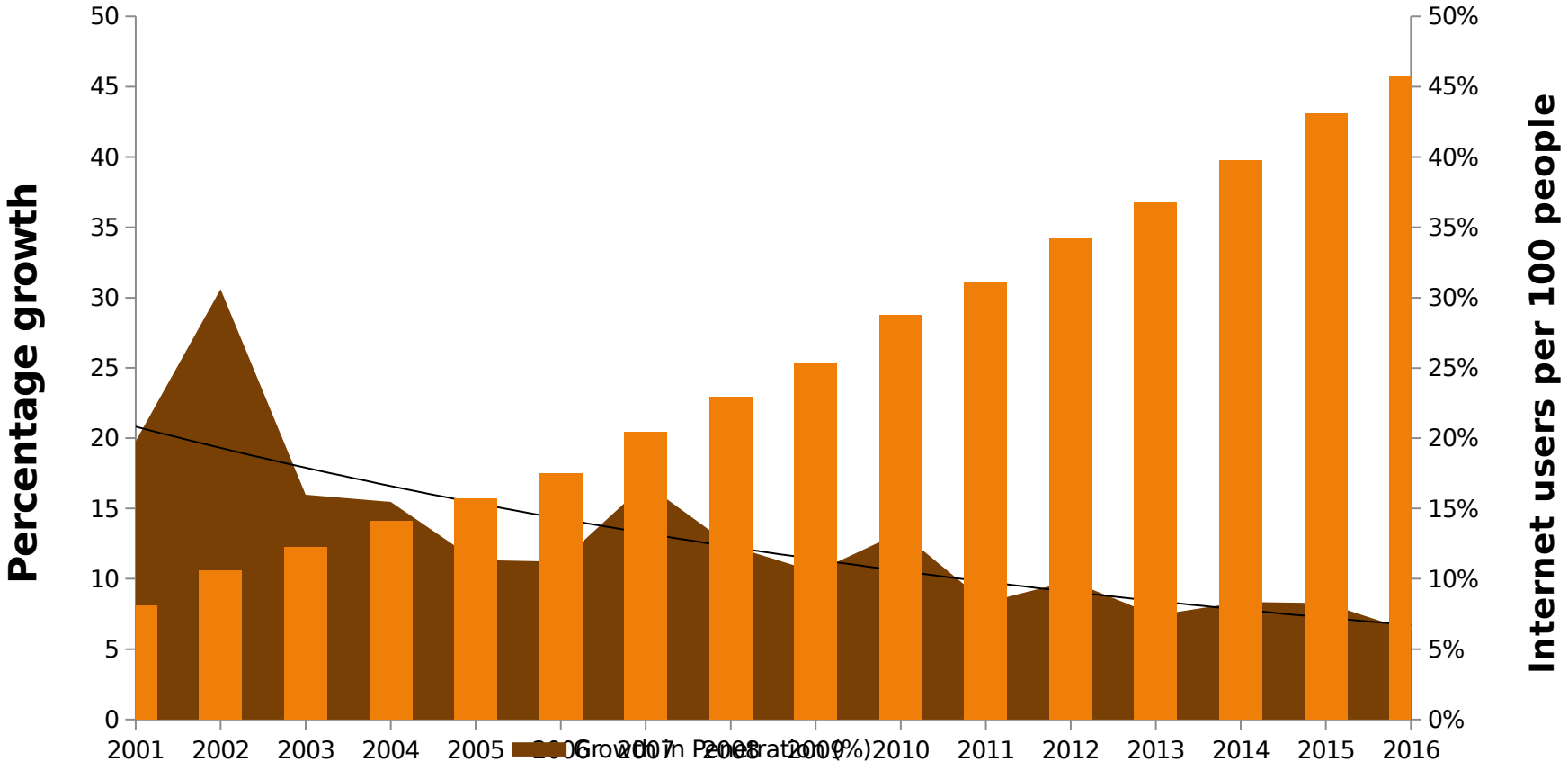

Source: Qiang et al. 2009 and Scott 2012.

# Mobile Subscriber Growth Slowing

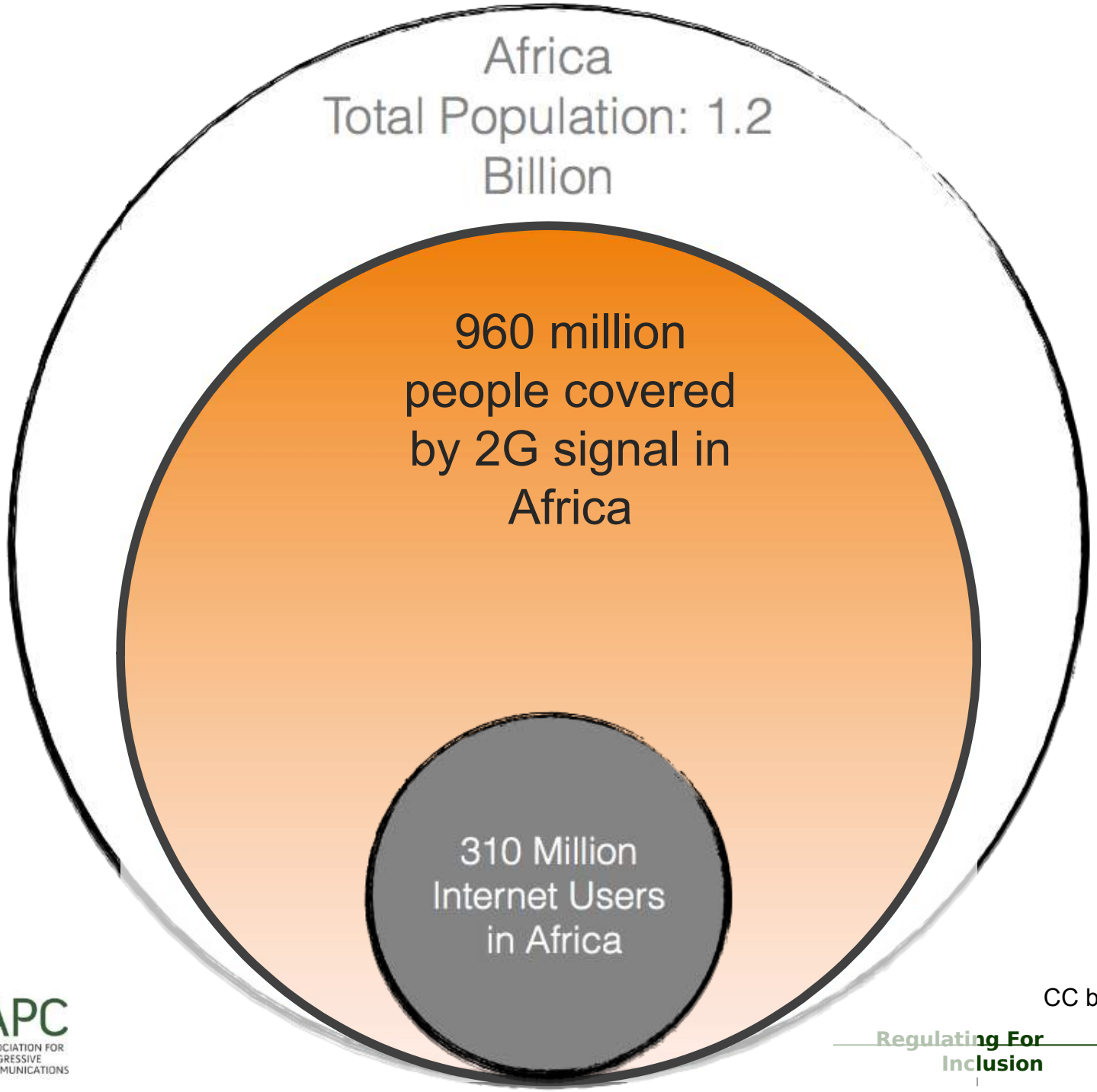



*Source: GSMA Intelligence*

# Internet Growth Slowing




*Source: ITU/World Bank/Richard Thanki*

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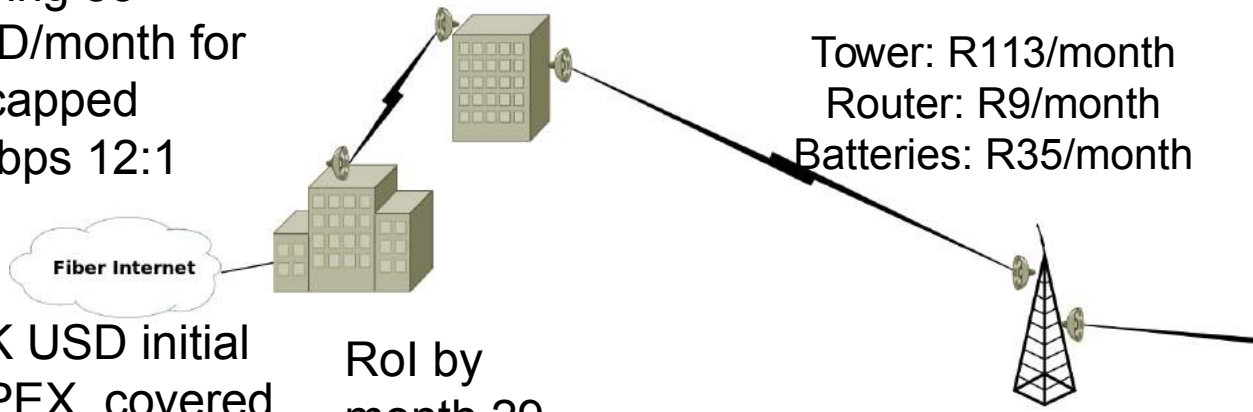
# Solutions?

Single paradigm: commercial large operators

# Non-commercial & cost-based models: Community Networks

Each user paying 83 USD/month for uncapped 5Mbps 12:1

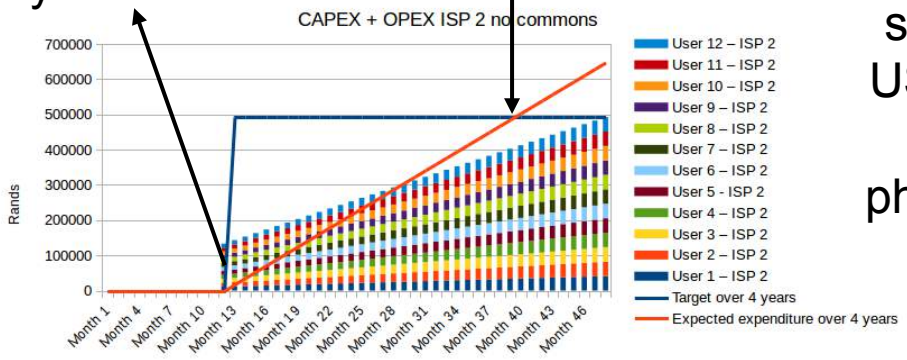



Tower: R113/month
Router: R9/month
Batteries: R35/month

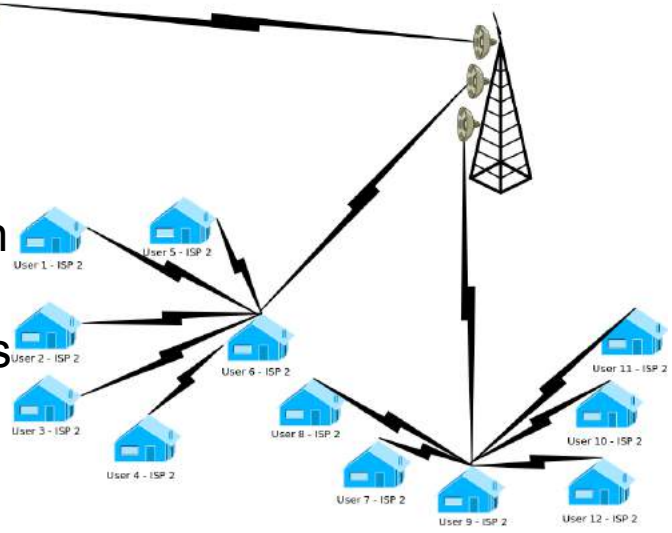
"Users share costs:
- equipment amortization
- maintenance
-internet gateway

9.7K USD initial CAPEX covered by users

RoI by month 29




Each "user" spending 110 USD/month on cap mobile phone services




Hotspot: 25 people spending 4.4 USD/month

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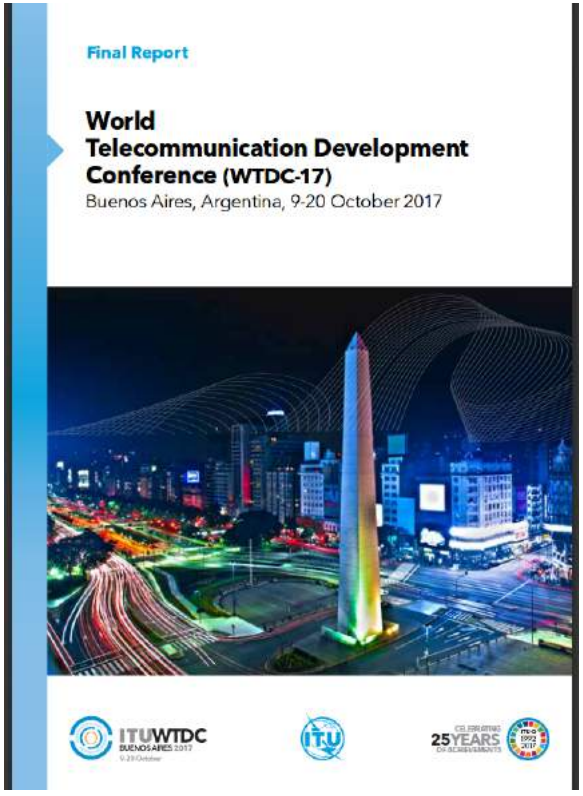
# RECOMMENDATION ITU-D 19

## Telecommunications for rural and remote areas




3 that community access to ICT facilities and services is particularly important in rural and remote areas: business models which can achieve financial and operational sustainability can be operated by local entrepreneurs supported by a variety of initiatives, and these facilities, where necessary, should also be supported by universal service funds as an essential component of rural communications;

6 that enhancing local technical expertise and adoption are important for successful implementation of ICT services and applications in rural and remote areas, and attention should thus be paid to training, exchange of information and sharing of maintenance facilities in order to achieve sustainability and viability;

10 that it is important to consider small and non-profit community operators, through appropriate regulatory measures that allow them to access basic infrastructure on fair terms, in order to provide broadband connectivity to users in rural and remote areas, taking advantage of technological advances;

11 that it is also important that administrations, in their radio-spectrum planning and licensing activities, consider mechanisms to facilitate the deployment of broadband services in rural and remote areas by small and non-profit community operators;

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# Licensing

- Requirements to get licensed
  - Business model, technical details
- Costs to get a licence
  - National, regional
- Compliance
  - Ongoing bureaucracy
  - Annual fees, contributions to USF
  - Tax return
- Spectrum fees

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**Certificate issued by the Commissioner of Companies & Intellectual Property Commission on Monday, March 17, 2014 at 13:43**

**Certificate of Registration**

**CR10**

Registration Number: **2014 / 002051 / 24**

Enterprise Name: **ZENZELENI TELECOMMUNICATIONS NETWORK PRIMARY CO-OPERATIVE LIMITED**

Companies and Intellectual Property Commission
a member of the dti group

**REPUBLIC OF SOUTH AFRICA**
**CO-OPERATIVES ACT, 2005**

## CERTIFICATE OF REGISTRATION OF A CO-OPERATIVE

(SECTION 7)

I hereby certify that

**ZENZELENI TELECOMMUNICATIONS NETWORK PRIMARY CO-OPERATIVE LIMITED**

was registered on

**5/2/2014**

under Section 7 of the Co-Operatives Act, 2005 (Act 14 of 2005),
with registration number

**2014 / 002051 / 24**

as a Primary Co-Operative with a limited liability.
Its constitution was also registered on the same date.

I further certify that

**ZENZELENI TELECOMMUNICATIONS NETWORK PRIMARY CO-OPERATIVE LIMITED**

is with effect from **5/2/2014** entitled to commence business.

---

**REGISTRAR OF CO-OPERATIVES**



Physical Address
*the dti* Campus - Block F
77 Meintjies Street
Sunnyside 0001

Postal Address: Co-operatives
Private Bag x237
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0001

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Contact Centre (International): +27 12 394 9500

ICASA

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**Licensing and Compliance**
**Tel: +27 11 566 3645**
**Fax: +27 11 566 3646**
**Email: ahlabioa@icasa.org.za**
**Ref: PECN/0018/2014/ECSLE/0003/2014**

**Masibulele Siya**
Zenzeleni Telecommunications Network
Primary Co-Operattive Limited
Mankosi Administrative area
Ward 26, Nyandeni Municipality
Eastern Cape

**Per email: jaysiya26@gmail.com**

Dear Masibulele Siya

**RE: APPLICATION FOR PECN AND ECS LICENCE EXEMPTIONS: ZENZELENI NETWORK**

1. We refer to your application received on 14 April 2014 for Private Electronic Communications Network Service (PECN) and Electronic Communications Service licence exemption.

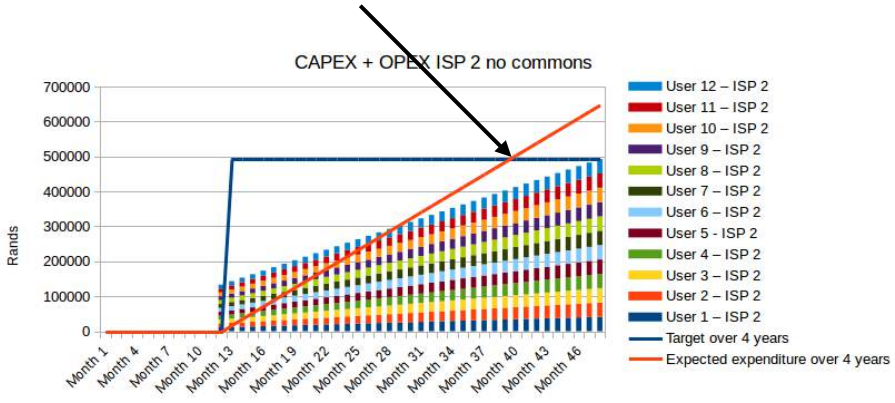
2. We advise that the Authority has granted Zenzeleni Telecommunications Network Primary Co-Operative Limited a licence exemption to construct, maintain and operate a PECN to be used principally for or integrally related to the internal operations of Zenzeleni Network.

# Funding these initiatives

Cost is past down to the users

## Crowdsourced by users

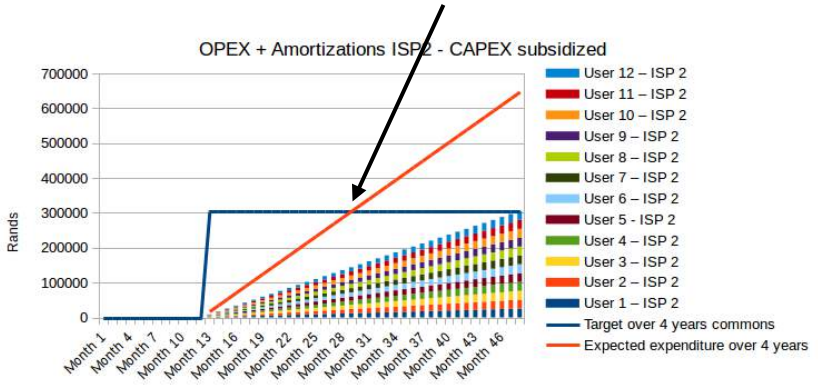
RoI by month 29




Each user paying 83 USD/month

## Subsidized CAPEX

RoI by month 17




Each user paying 51 USD/month

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# Universal Service and other Funds

| COUNTRY | YEAR OF MOST RECENT REPORT | ESTIMATED UNSPENT FUNDS (US$ MILLION) |
|---|---|---|
| BENIN | 2016 | 9.65 |
| BOTSWANA | 2016 | 14.02 |
| BURKINA FASO (currently inactive and preparing for disbursements) | 2016 | 77.71 |
| CÔTE D'IVOIRE | 2017 | 0.00 |
| GHANA | 2016 | 5.89 |
| KENYA | 2016 | 42.01 |
| LIBERIA (currently inactive and preparing for disbursements) | 2016 | 0.47 |
| MADAGASCAR | 2015 | 15.54 |
| MOZAMBIQUE | 2016 | 1.32 |
| NIGERIA | 2016 | 0.00 |
| RWANDA | 2016 | 0.00 |
| SOUTH AFRICA | 2016 | 10.00 |
| UGANDA | 2015 | 0.00 |
| **TOTAL** | | **176.6** |

Source: A4AI interviews with USAFs (2018), ECOWAS surveys (2017), and publicly available information.

**Community Networks** 12 March 2018

EN ES

## Internet Society and the OAS through CITEL sign an agreement to bring the Internet closer to rural areas of the Americas

**Buenos Aires, 12th of March 2018 –** The General Secretariat of the Organization of American States (OAS), through its Inter-American Telecommunication Commission (CITEL), and the Internet Society (ISOC), a global organization that promotes the development of the open Internet, signed a collaboration agreement to promote the creation of new community networks that provide access to rural and remote areas of the Americas.

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# Other public support

- Other departments involved
  - S&T, Industry, Rural Dev, Education…
- Endorsement
- Training ( vocational colleges)
- Interns
- Accessible Information
- Access to other resources (towers, fiber, spectrum)

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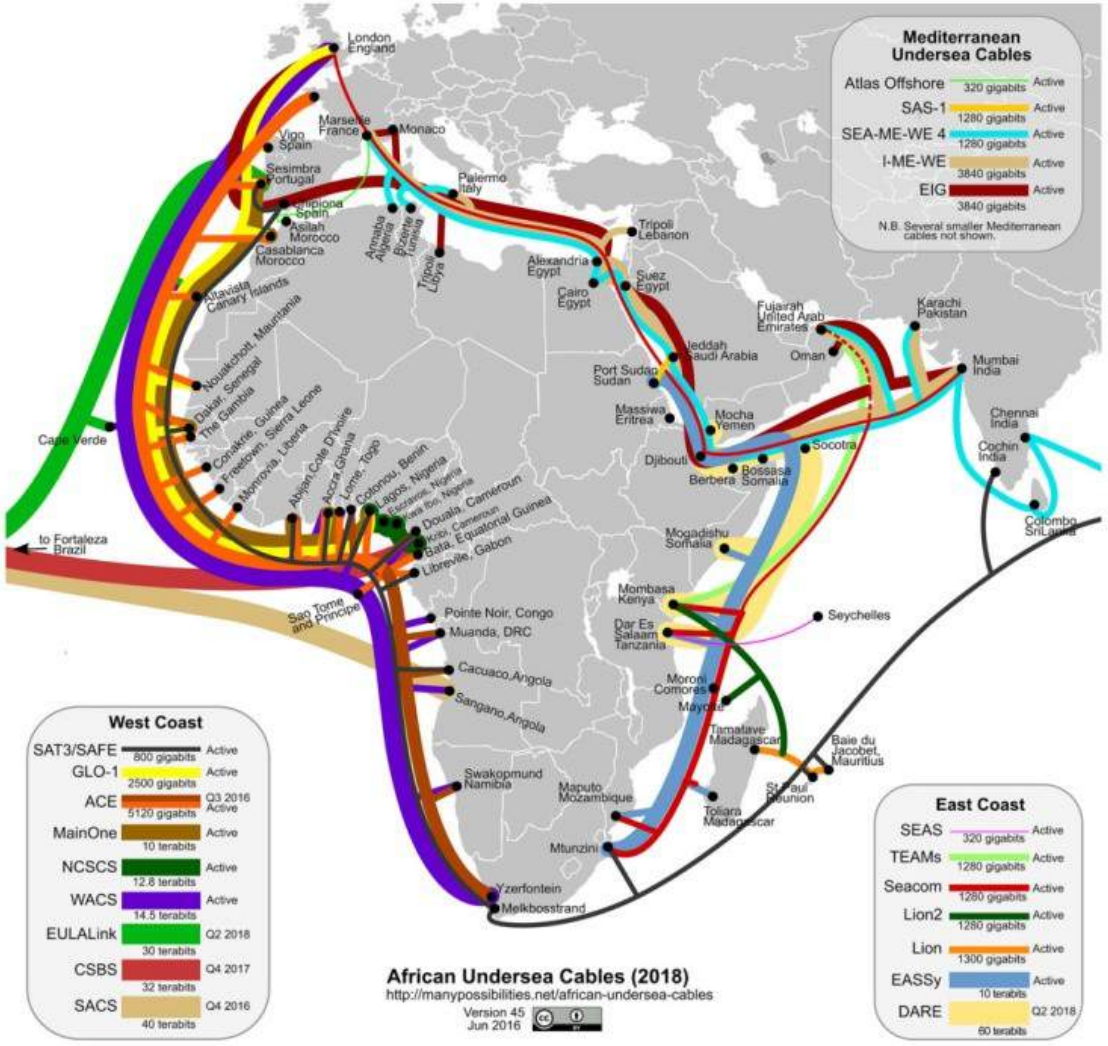
Opportunity

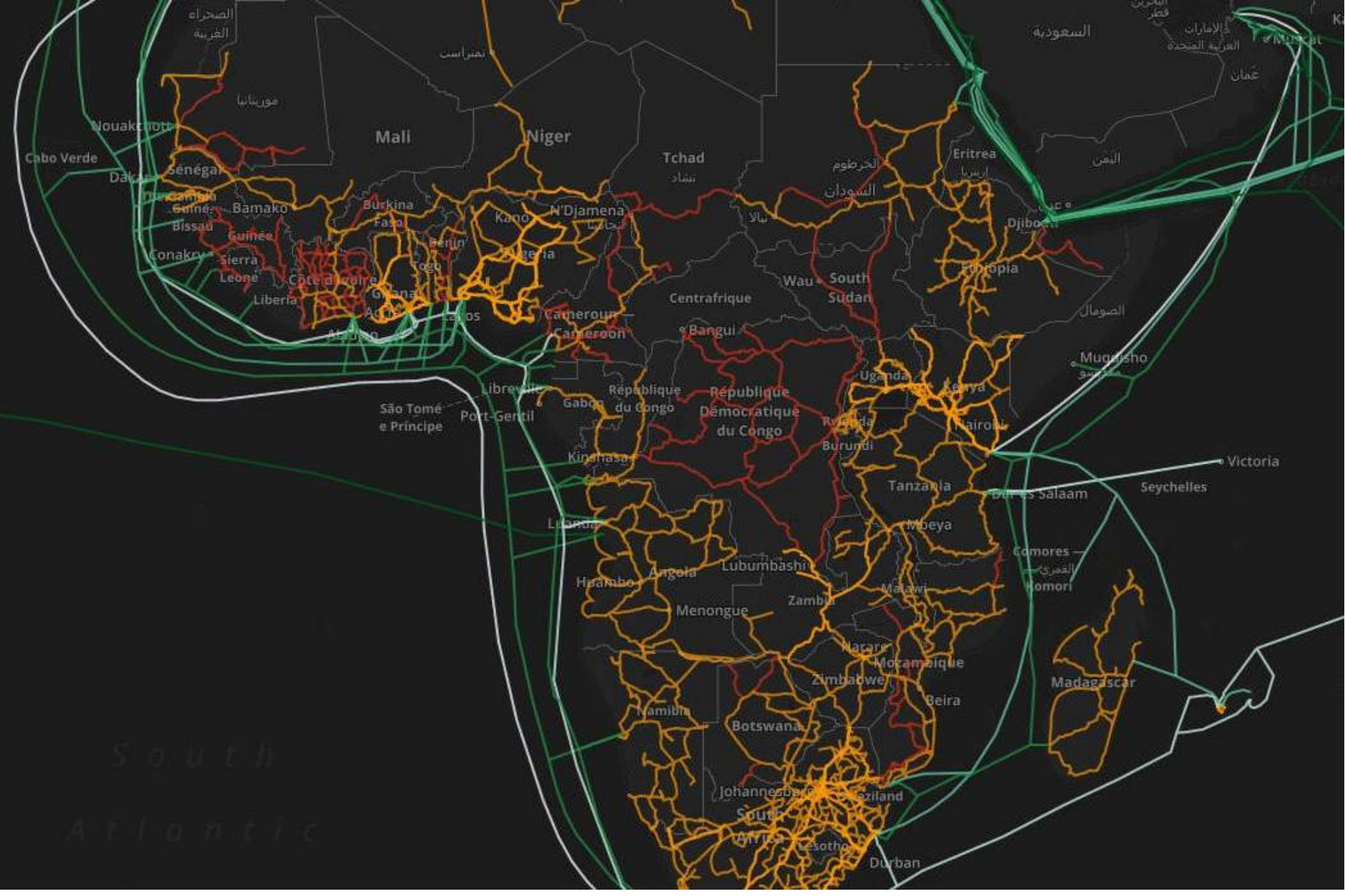
# FIBRE OPTIC INFRASTRUCTURE

# Impact of Fibre Optic Undersea Cables

**The growth of undersea fibre optic capacity has been a catalyst for change.**




CC by @stevesong

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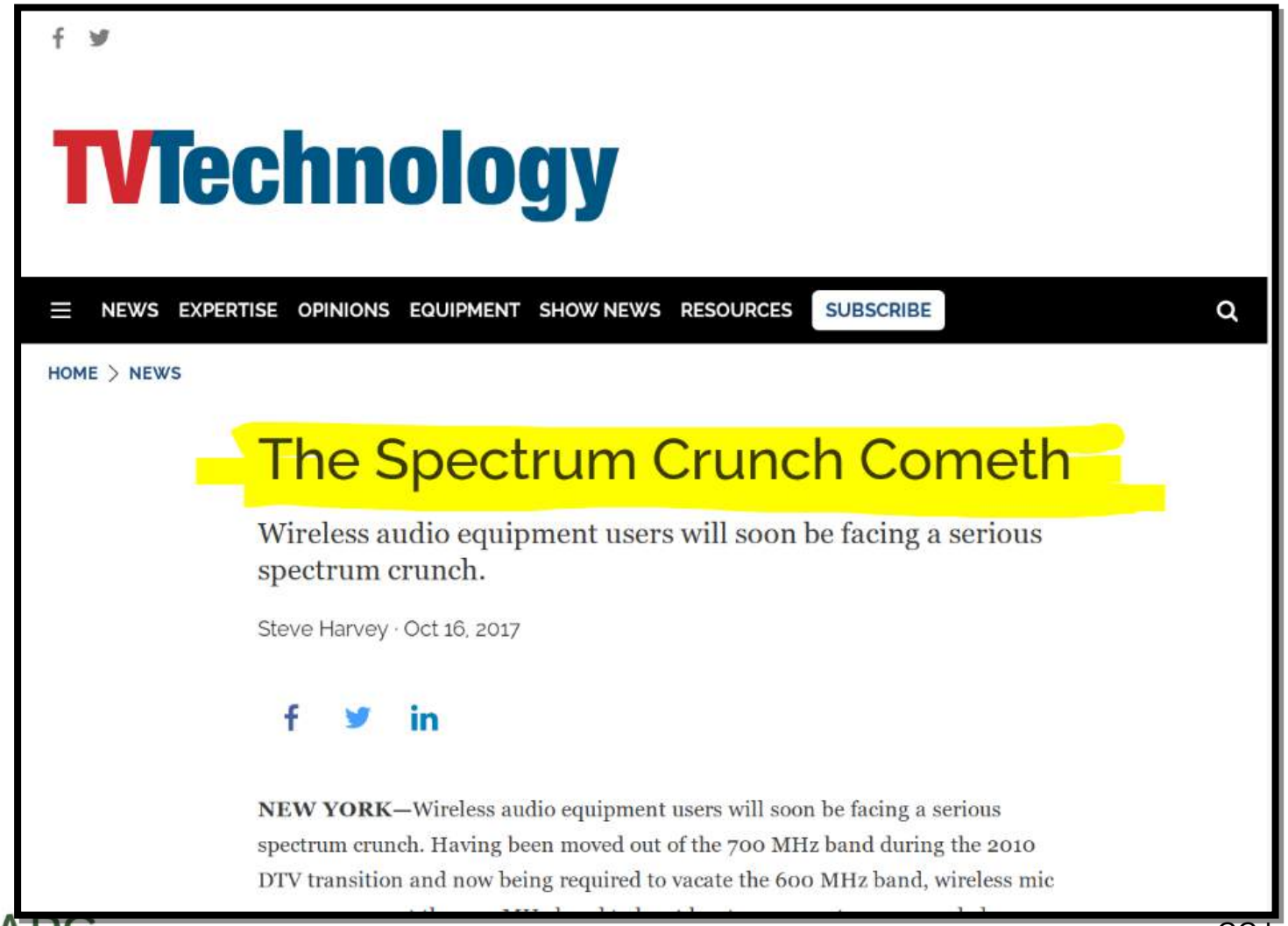
Challenge

# ACCESS TO SPECTRUM

# Access to Spectrum Has Become a Challenge for Regulators



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## The Spectrum Crunch Cometh

Wireless audio equipment users will soon be facing a serious spectrum crunch.

Steve Harvey · Oct 16, 2017

**NEW YORK**—Wireless audio equipment users will soon be facing a serious spectrum crunch. Having been moved out of the 700 MHz band during the 2010 DTV transition and now being required to vacate the 600 MHz band, wireless mic

# Spectrum Auctions: Not the whole answer?

| Country | Year | Spectrum | Price | #successful bidders |
|---|---|---|---|---|
| Nigeria | 2014 | 2.3GHz (30MHz) | $23,000,000 | 1 |
| Ghana | 2015 | 800MHz (20MHz) | $67,500,000 | 1 |
| Nigeria | 2016 | 2.6GHz (60MHz) | $96,000,000 | 1 |
| Mozambique | 2013 | 800MHz (10MHz) | $30,000.000 | 0 |

Source: Song, 2018 forthcoming

**Evidence that high spectrum spends result in:**

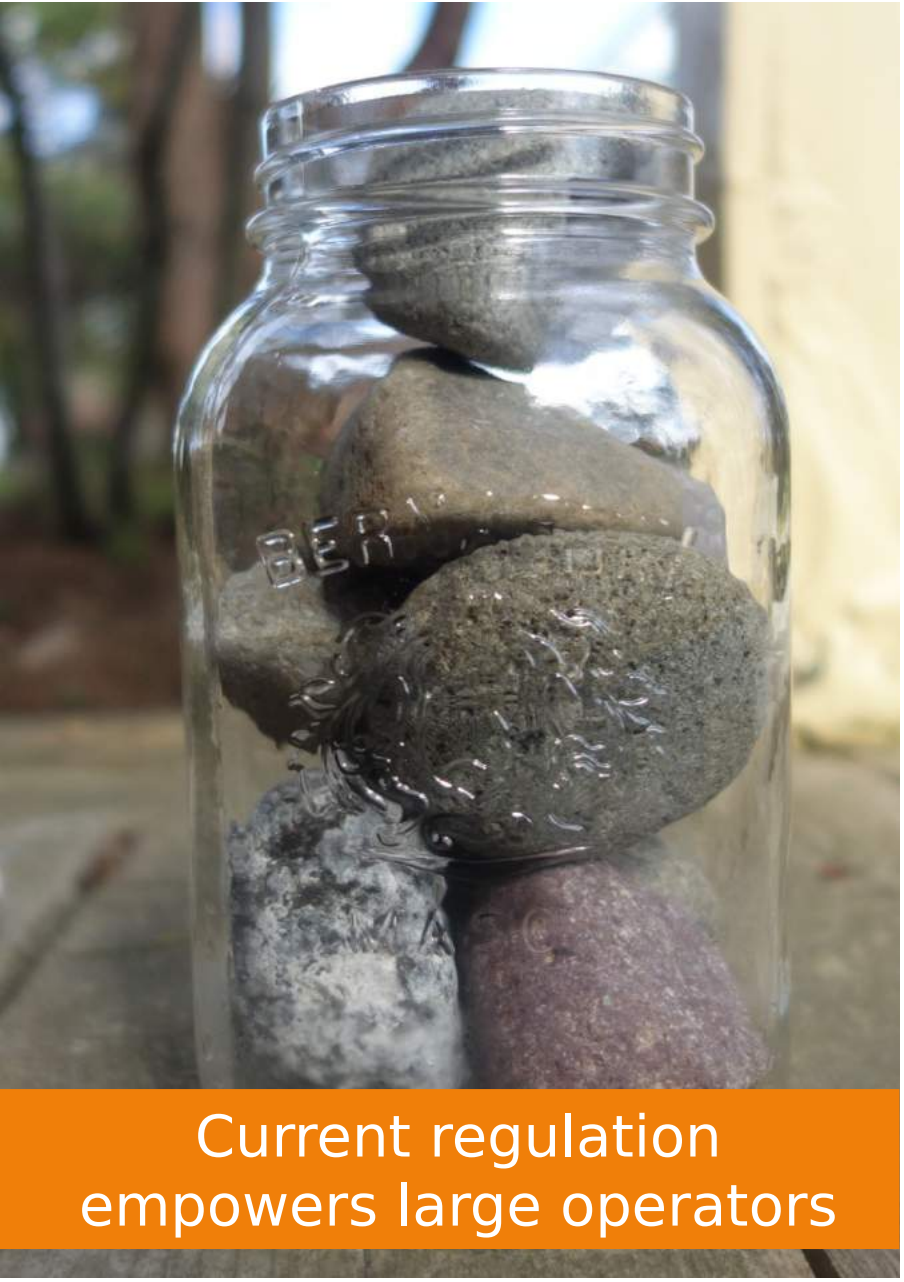
Lower quality networks and reduced take-up of mobile data services owing to reduced incentives for investment;

Higher consumer prices for mobile broadband data; and

Lost consumer welfare with a purchasing power of US$250bn across a group of countries where spectrum was priced above the global median.

Source: https://www.gsma.com/spectrum/wp-content/uploads/2017/02/Effective-Spectrum-Pricing-Full-Web.pdf

# Can We Look Beyond Auctions?



Current regulation empowers large operators

**Regulation ought to enable small-scale operators to address niche markets, geographies, and to stimulate access innovation.**

For Small Operators

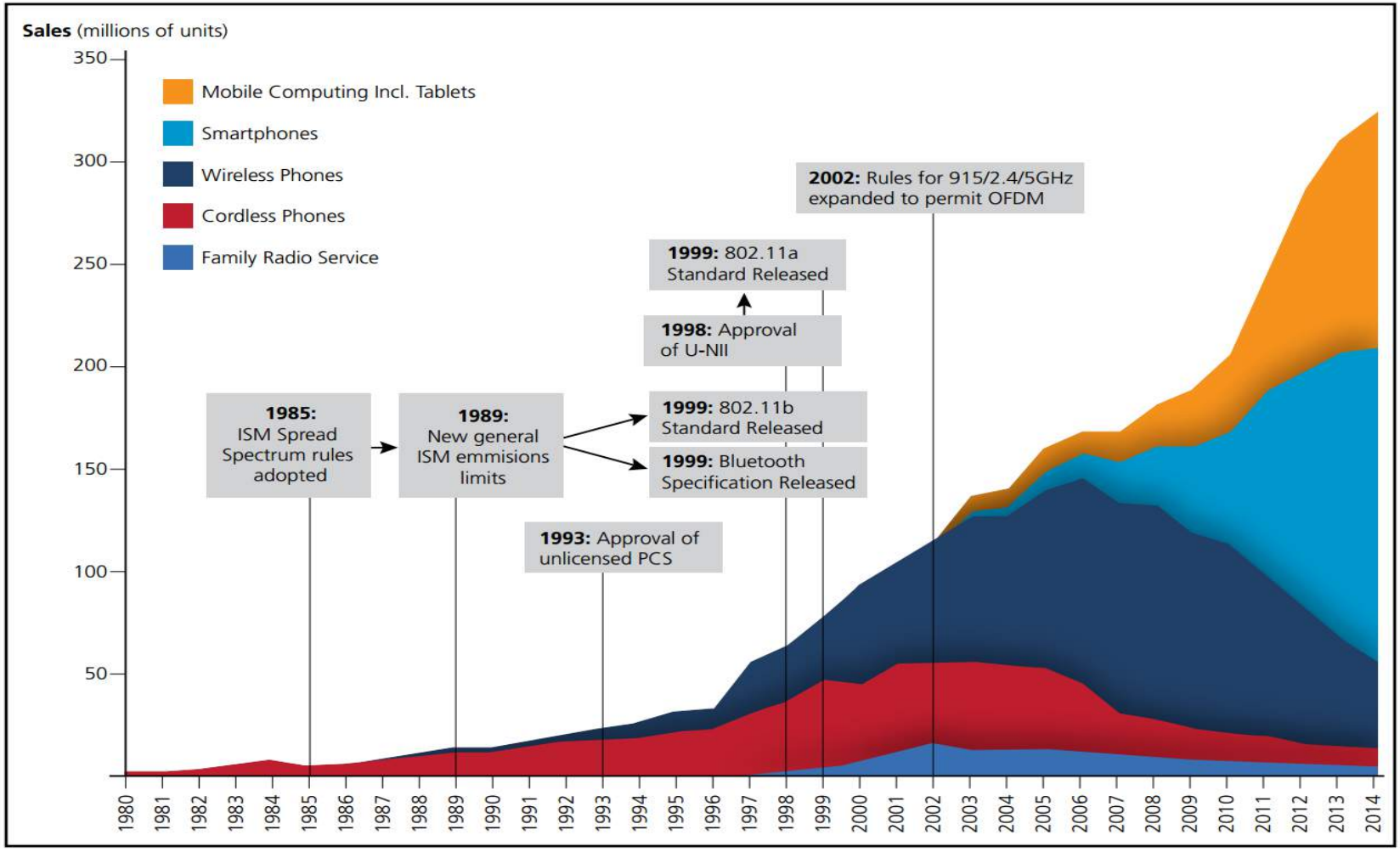
Even Subsistence Operators

Opportunity

# UNLICENSED SPECTRUM (WIFI)

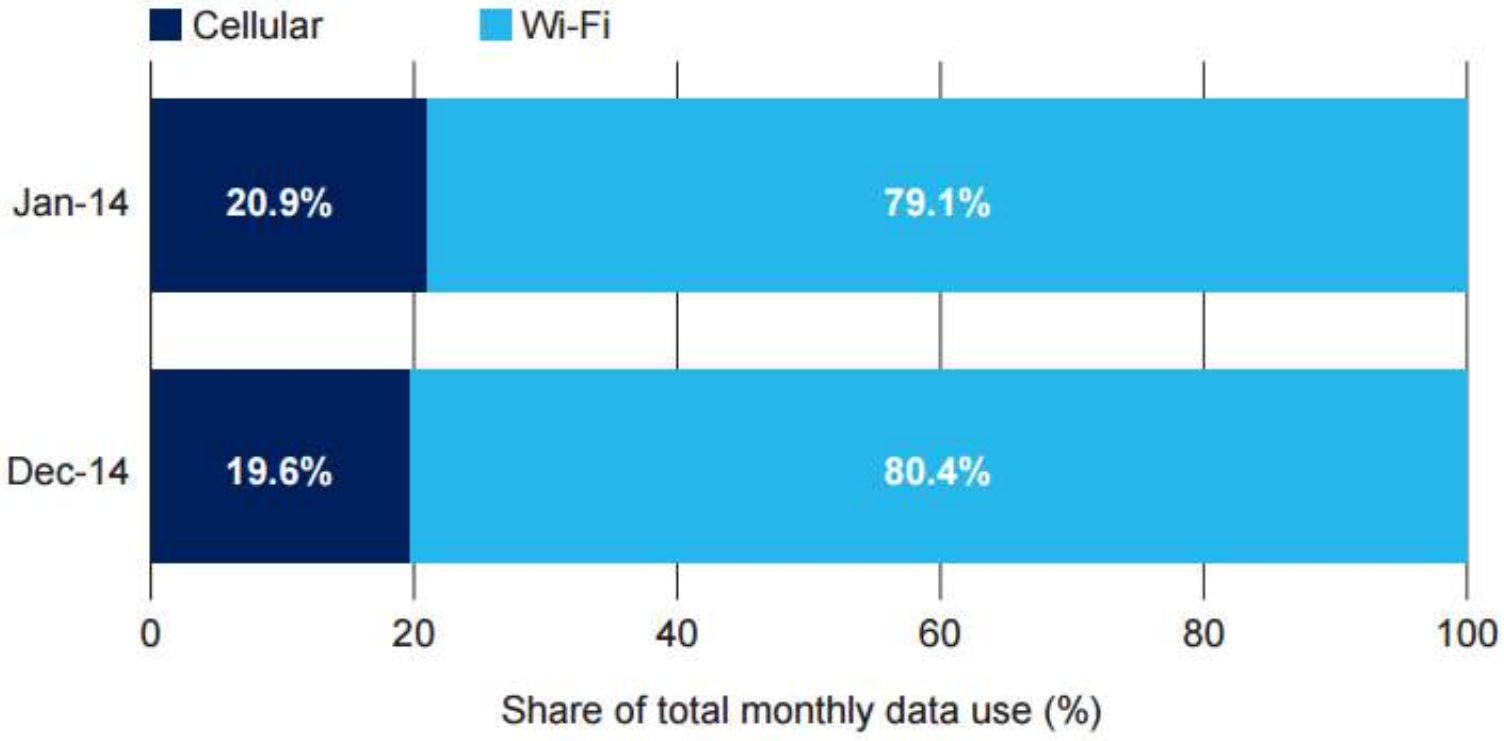
# Unlicensed Spectrum Growth

**Figure 1: Unlicensed Spectrum Milestones and Selected Device Categories – Growth Over Time**

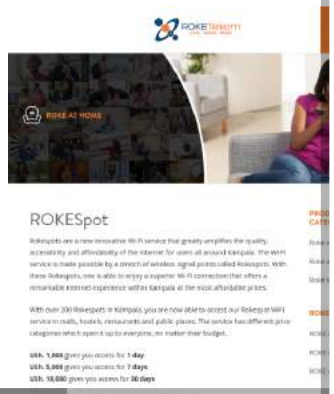


# Growth of Unlicensed Spectrum Use

**Figure 2: Global, cellular device users, cellular and Wi-Fi share of total monthly data use, January 2014 and December 2014**




*Source: Mobidia*









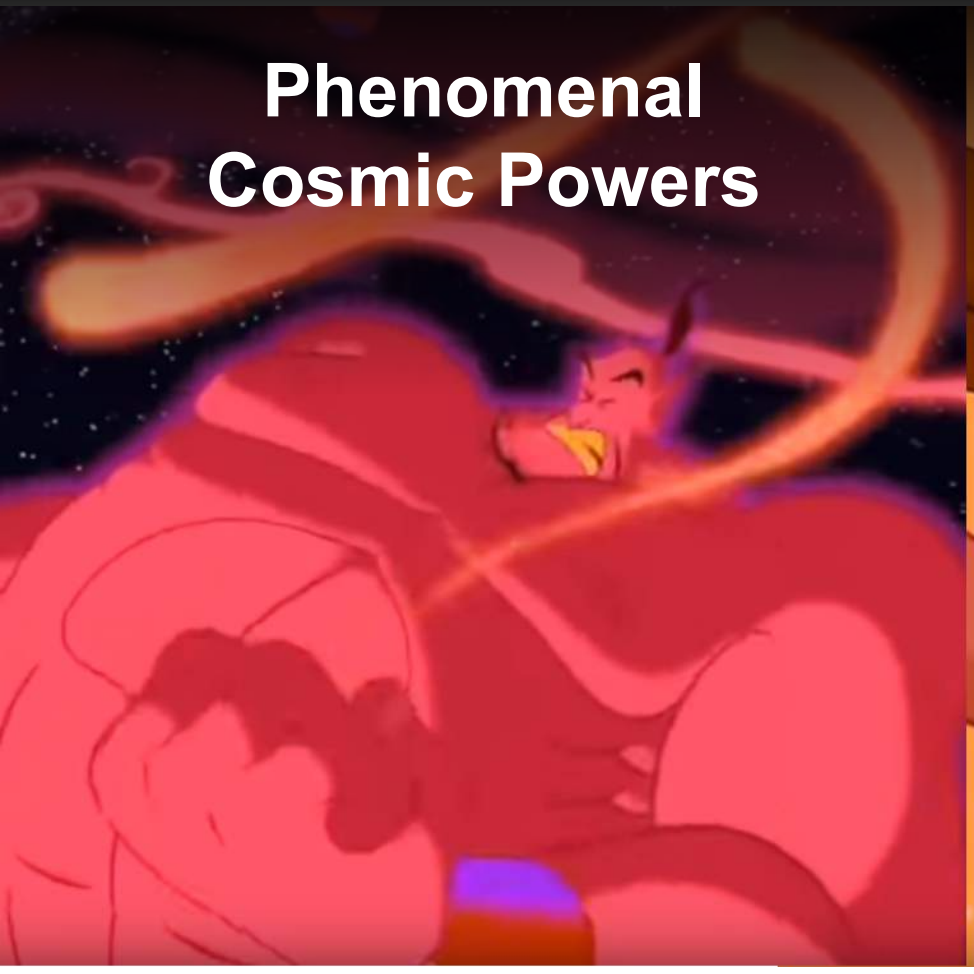





# WiFi

CC by @stevesong

# Unlicensed Spectrum Potential





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# FCC discussing expansion of the unlicensed bands

| Freq. (GHz) | Width (MHz) | U-NII Rules (Sec. 15.407) | Digital Modulation Rules (Sec. 15.247) |
|---|---|---|---|
| 5.15-5.25 | 100 | **U-NII-1**<br>50 mW max<br>indoor only | |
| 5.25-5.35 | 100 | **U-NII-2A**<br>250 mW max<br>DFS required *<br>TPC required * | |
| 5.35-5.47 | 120 | **U-NII-2B**<br>(new -- proposed) | |
| 5.47-5.725 | 255 | **U-NII-2C**<br>250 mW max<br>DFS required *<br>TPC required * | |
| 5.725-5.825 | 100 | **U-NII-3**<br>1W max<br>must cut back power at high point-to-point antenna gains | 1W max<br>no power penalty at high point-to-point antenna gains |
| 5.825-5.85 | 25 | **not U-NII**<br>(proposed expansion) | |
| 5.85-5.925 | 75 | **U-NII-4**<br>(new -- proposed) | |

* DFS: dynamic frequency selection required to detect and avoid certain federal radar systems.
* TPC: transmit power control required (for EIRP ≥500 mW) to minimize interference to certain other users.

Source FCC 13-22

Additionally exploring expansion into 5.925-6.425 GHz and 6.425-7.125 GHz bands

Source Notice of Inquiry, GN Docket No. 17-183

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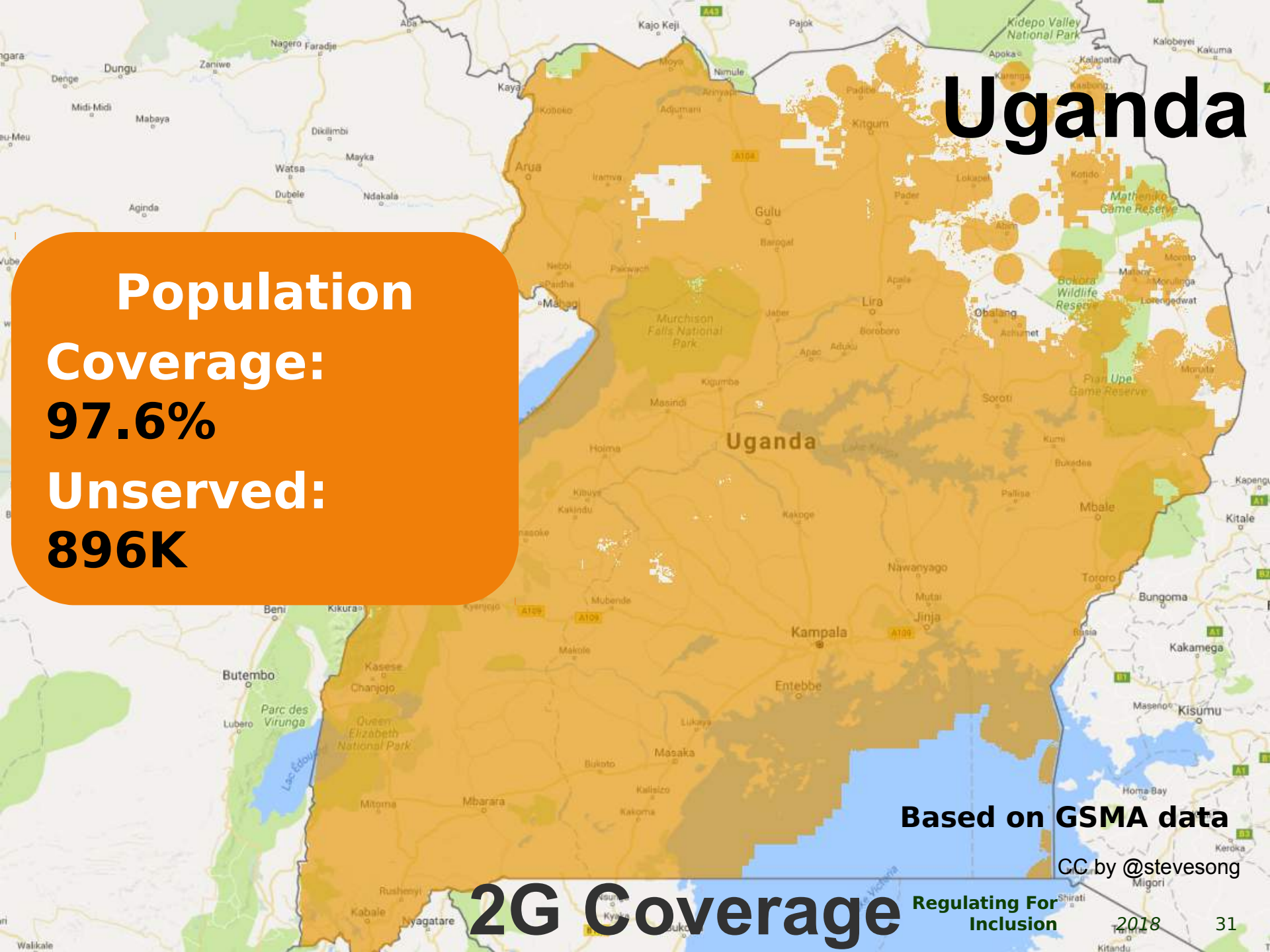
Opportunity

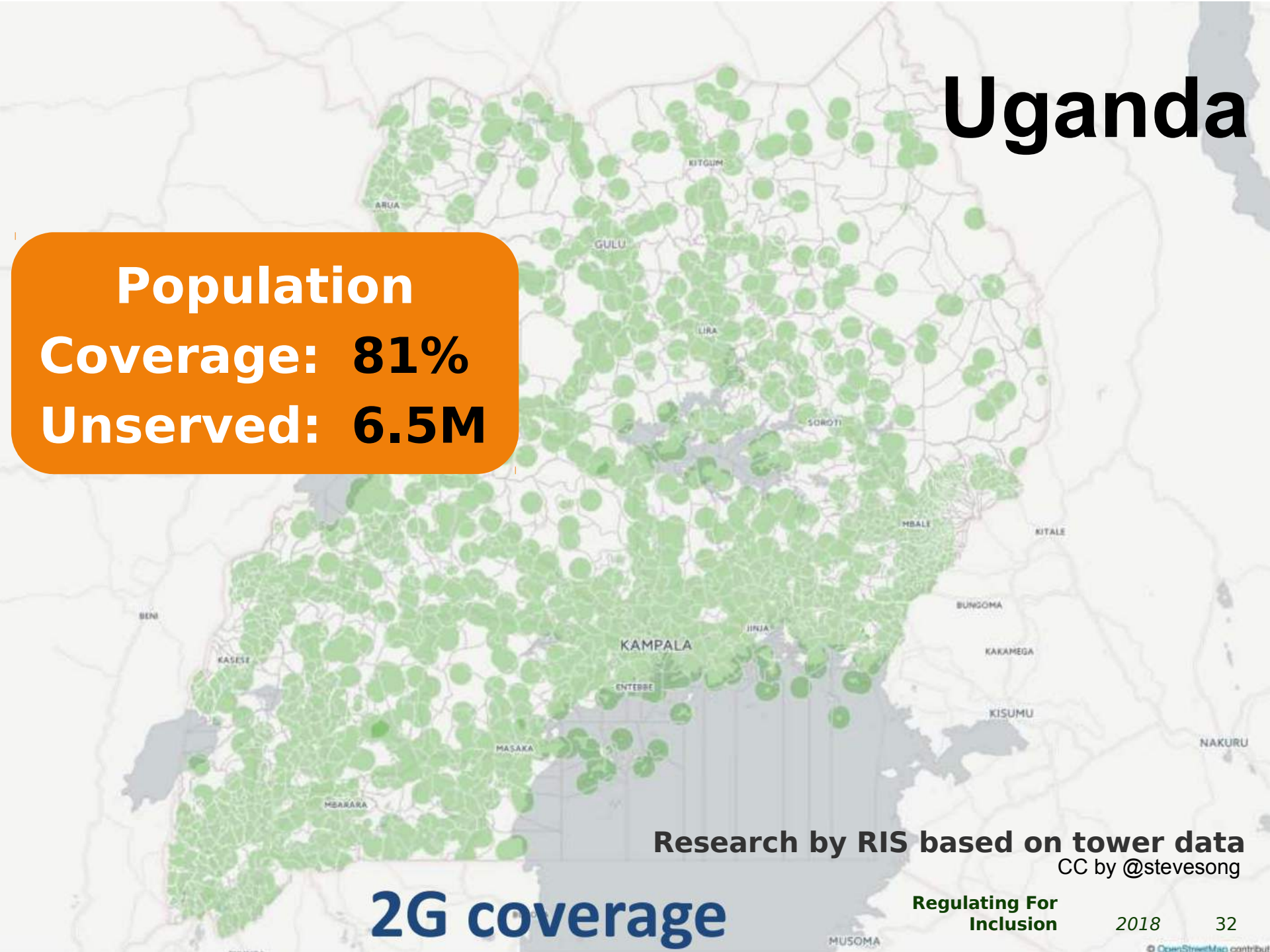
# LOW-COST GSM


Uganda
Population
Coverage:
97.6%
Unserved:
896K
Based on GSMA data
CC by @stevesong

# 2G Coverage

# Uganda

**Population Coverage: 81%**
**Unserved: 6.5M**




**Research by RIS based on tower data**

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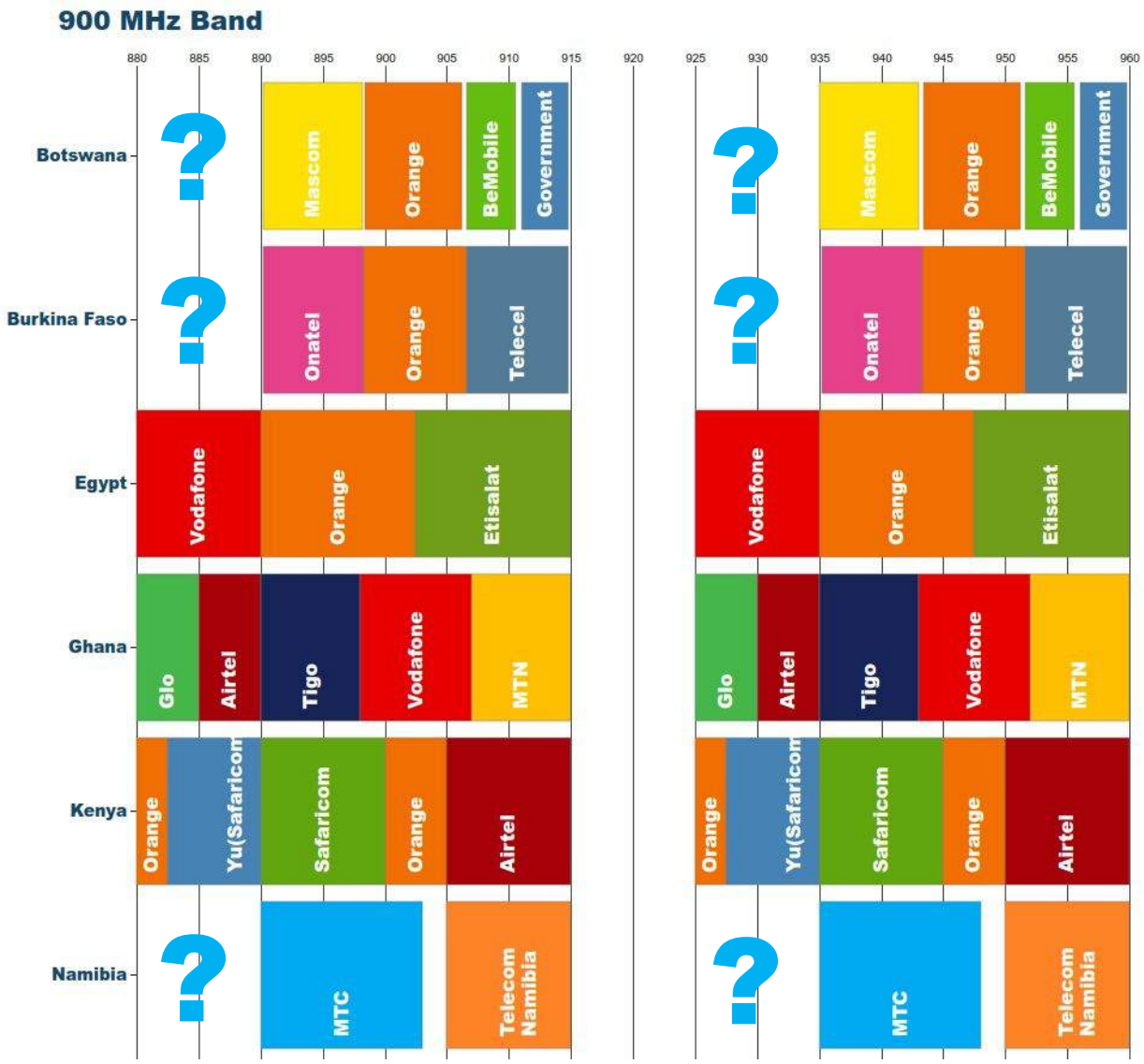
**2G coverage**

# Spectrum Availability

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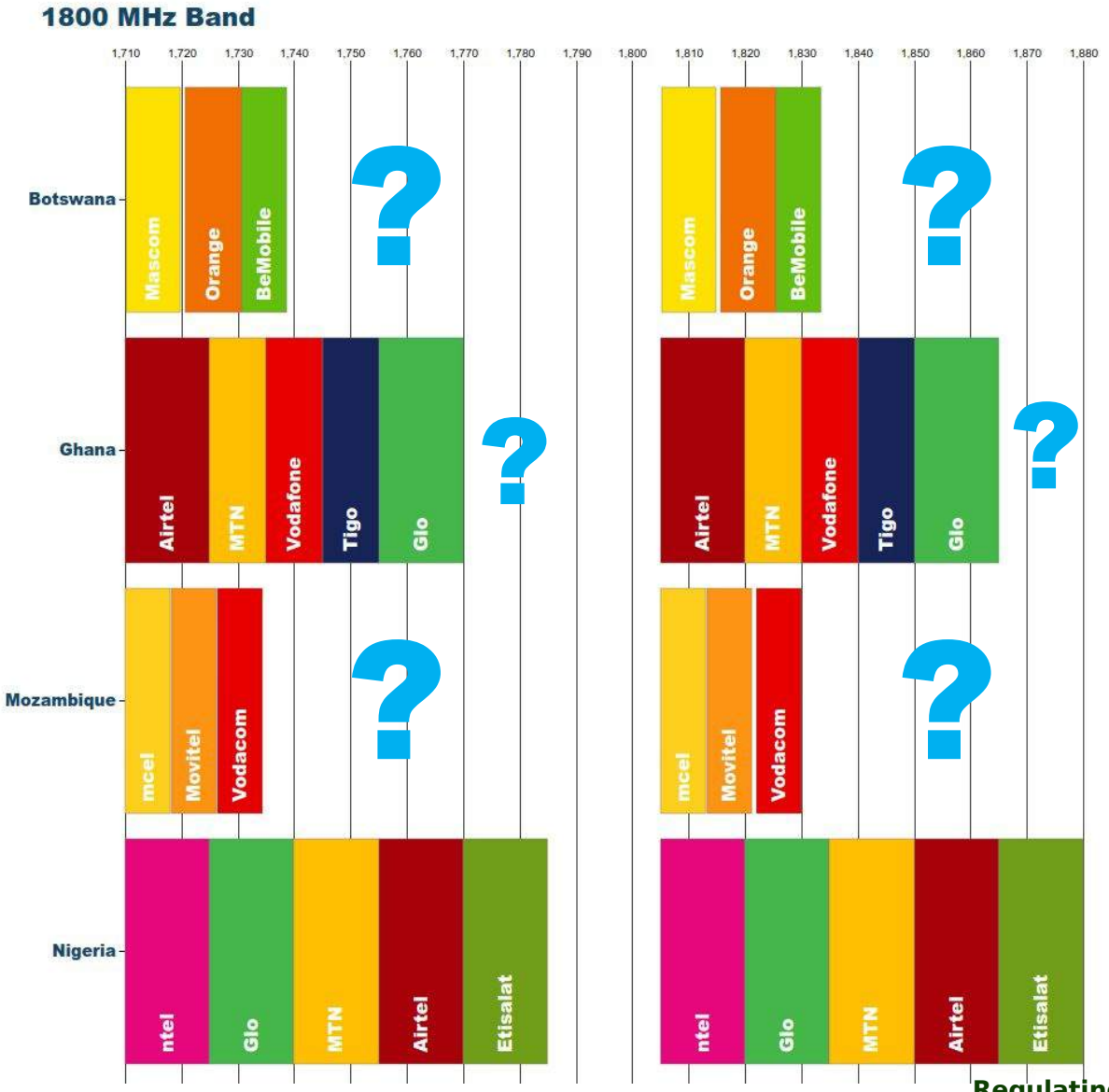
# Spectrum Assignments

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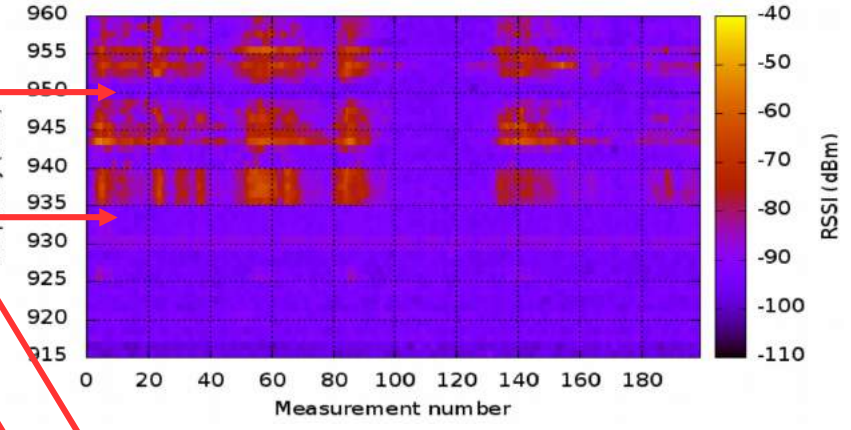
# Monitoring Spectrum Use

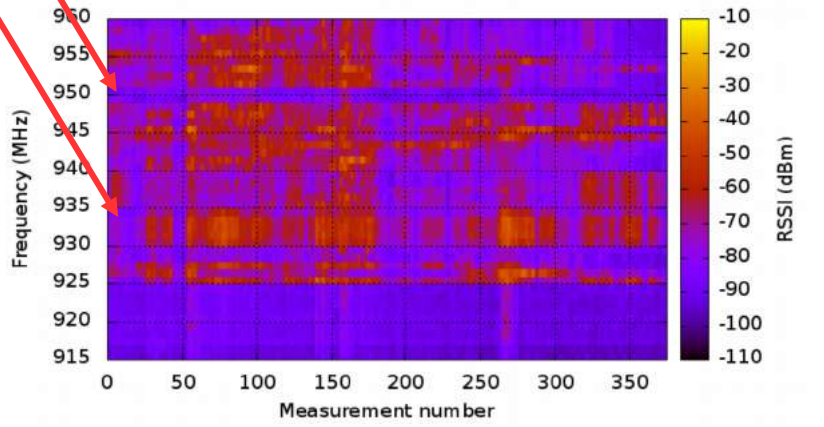
4km measurement / rural Eastern Cape


1.4 MHz empty all over!

10 MHz empty in deep rural!




80km measurement / along the N2 (EC)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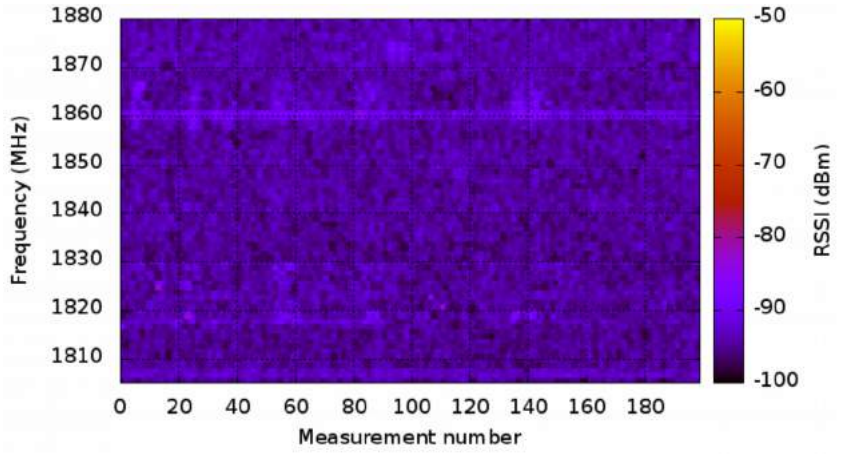
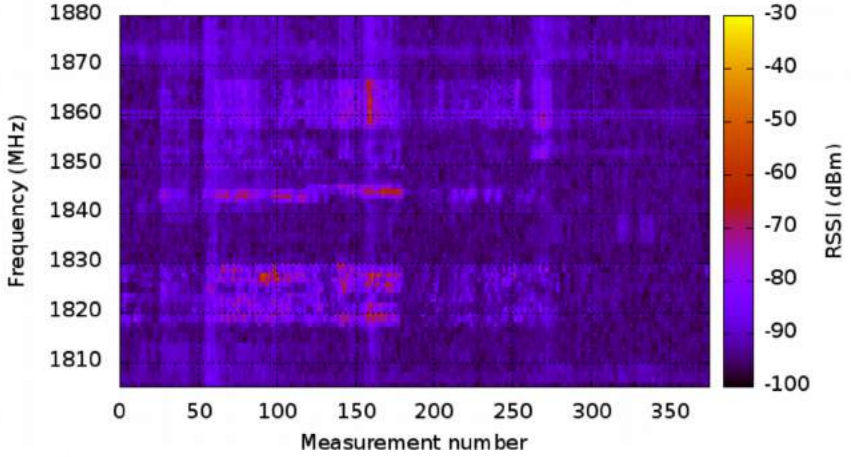
# Monitoring Spectrum Use

4km measurement / rural Eastern Cape




80km measurement / along the N2 (EC)

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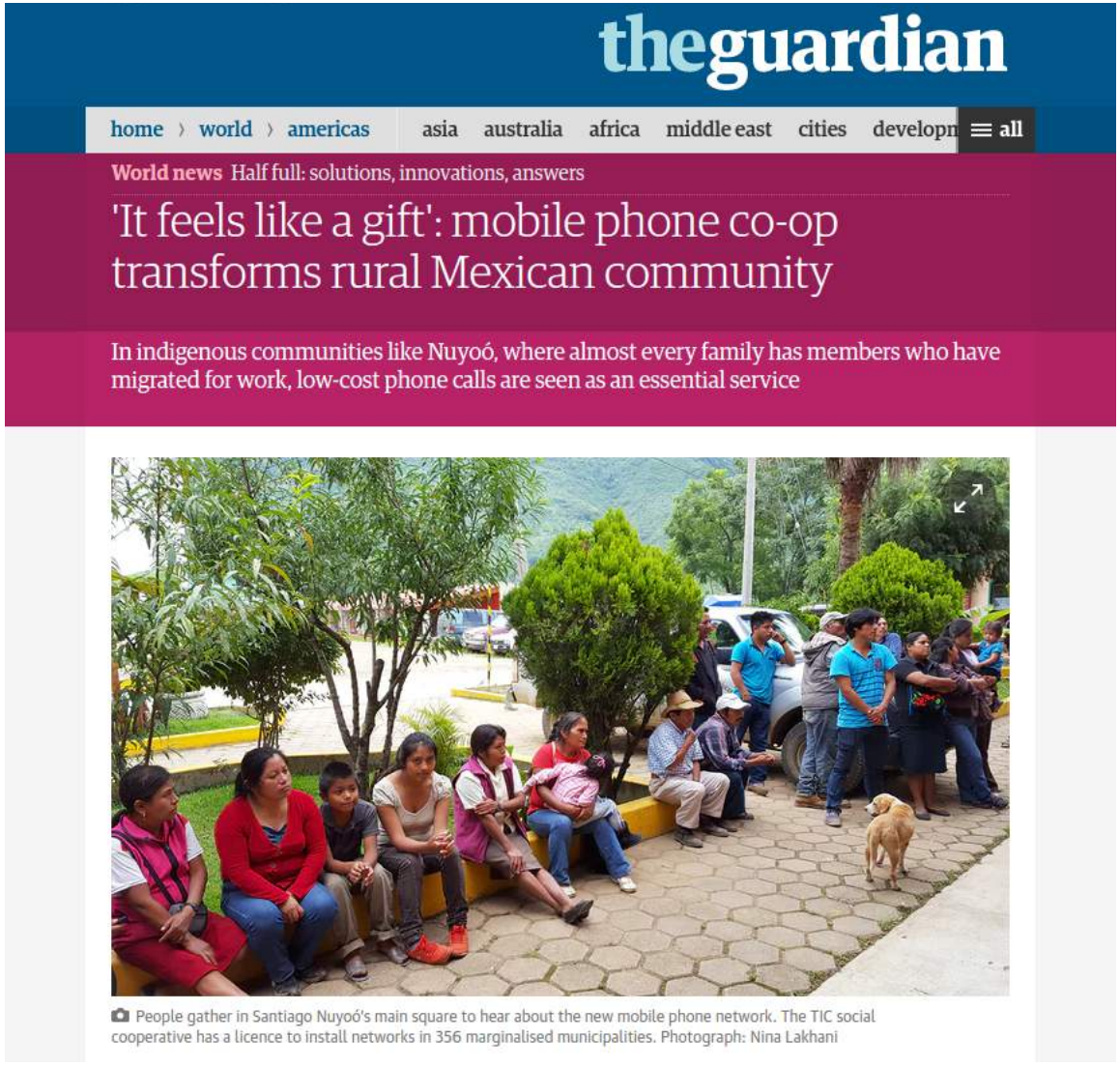
# Innovative uses of Spectrum



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World news Half full: solutions, innovations, answers

'It feels like a gift': mobile phone co-op transforms rural Mexican community

In indigenous communities like Nuyoó, where almost every family has members who have migrated for work, low-cost phone calls are seen as an essential service

People gather in Santiago Nuyoó's main square to hear about the new mobile phone network. The TIC social cooperative has a licence to install networks in 356 marginalised municipalities. Photograph: Nina Lakhani

Mexico – In 2015 IFETEL set aside 2x5MHz in the 850MHz band for Social Purpose Licencees.

With 2x2 MHz Rhizomatica has enabled 20 communities to provide themselves with voice services

SMMEs like Zenzeleni already have ECS and ECNS exemption, “only” a spectrum licence (exemption) needed

From 22% to 3% of disposable income

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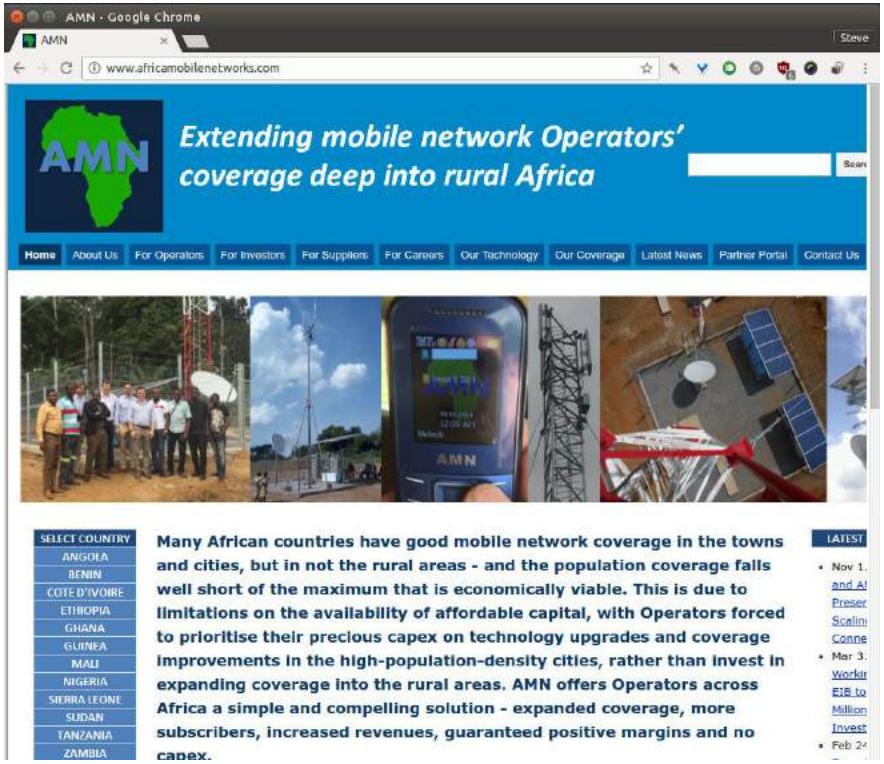
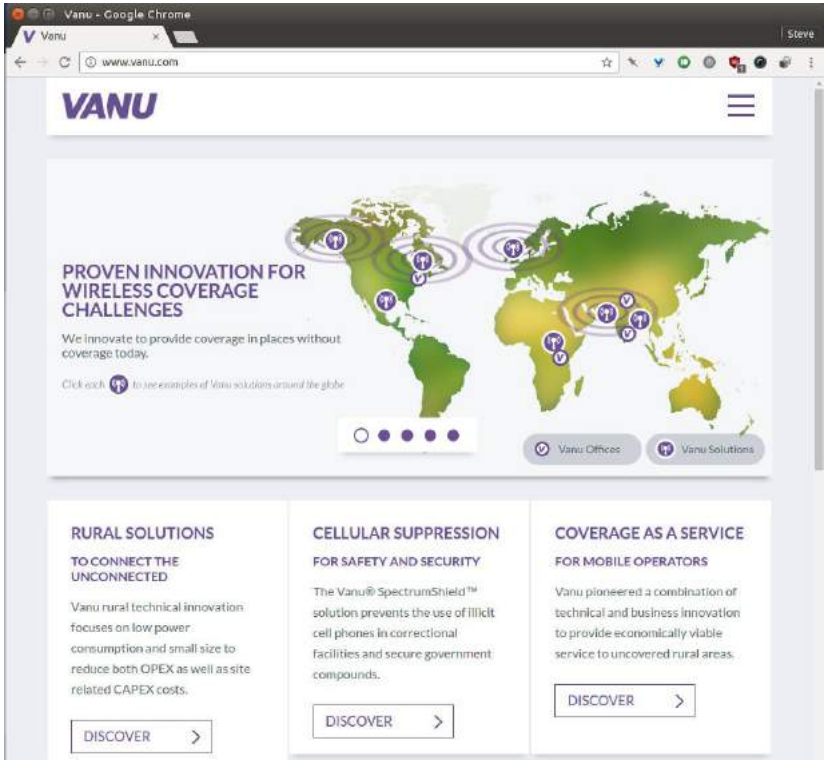
# Other models



Opportunity

# DYNAMIC SPECTRUM

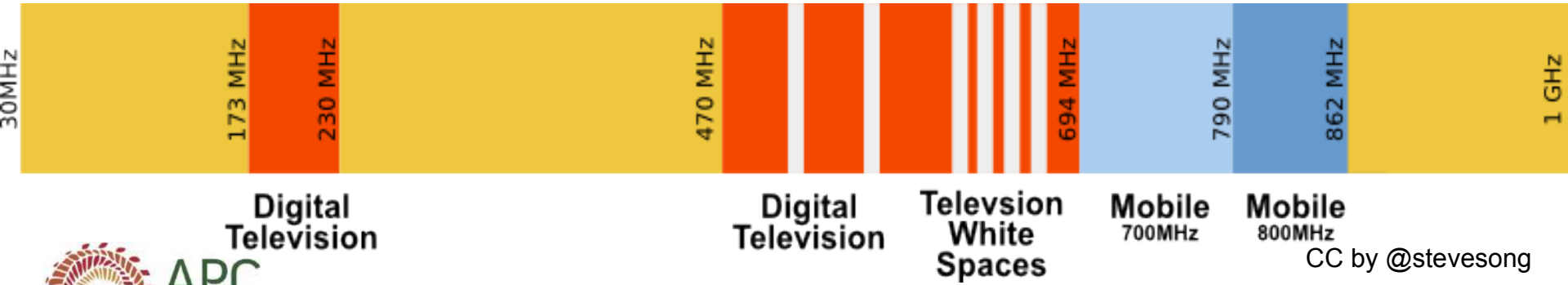
# Television White Spaces

Allows for the dynamic re-use of spectrum without interfering with the primary spectrum holder

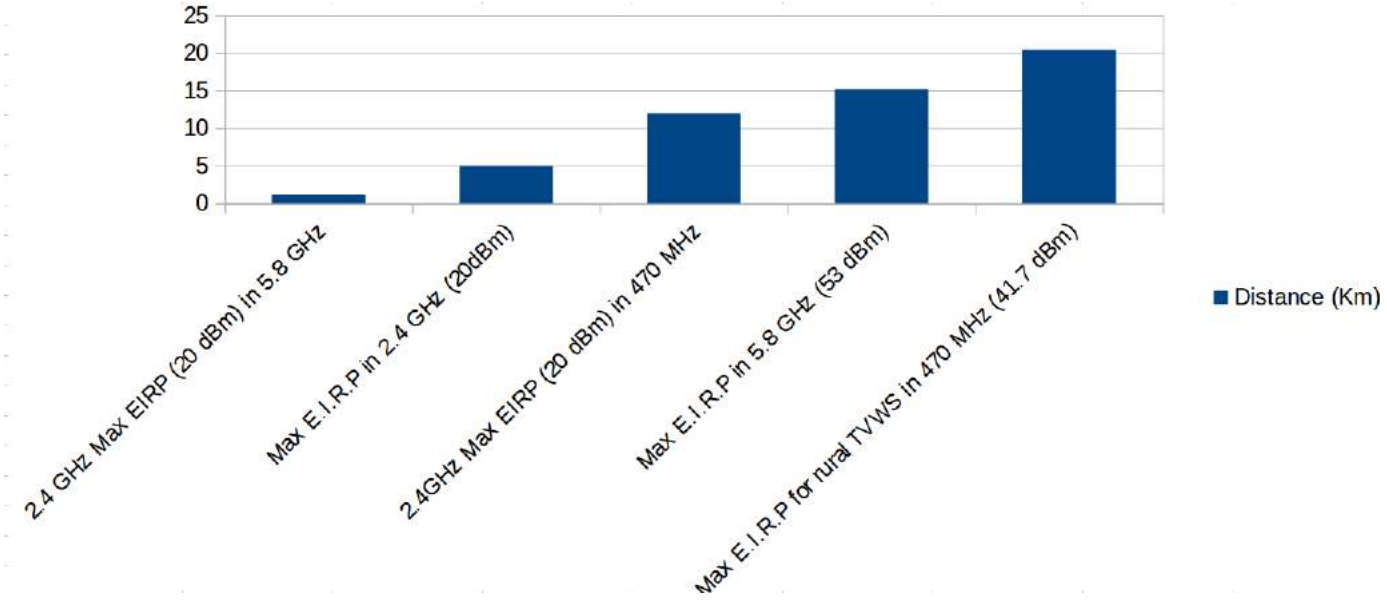
Ideal for rural access

Low television spectrum occupancy in Africa

No re-allocation of spectrum required



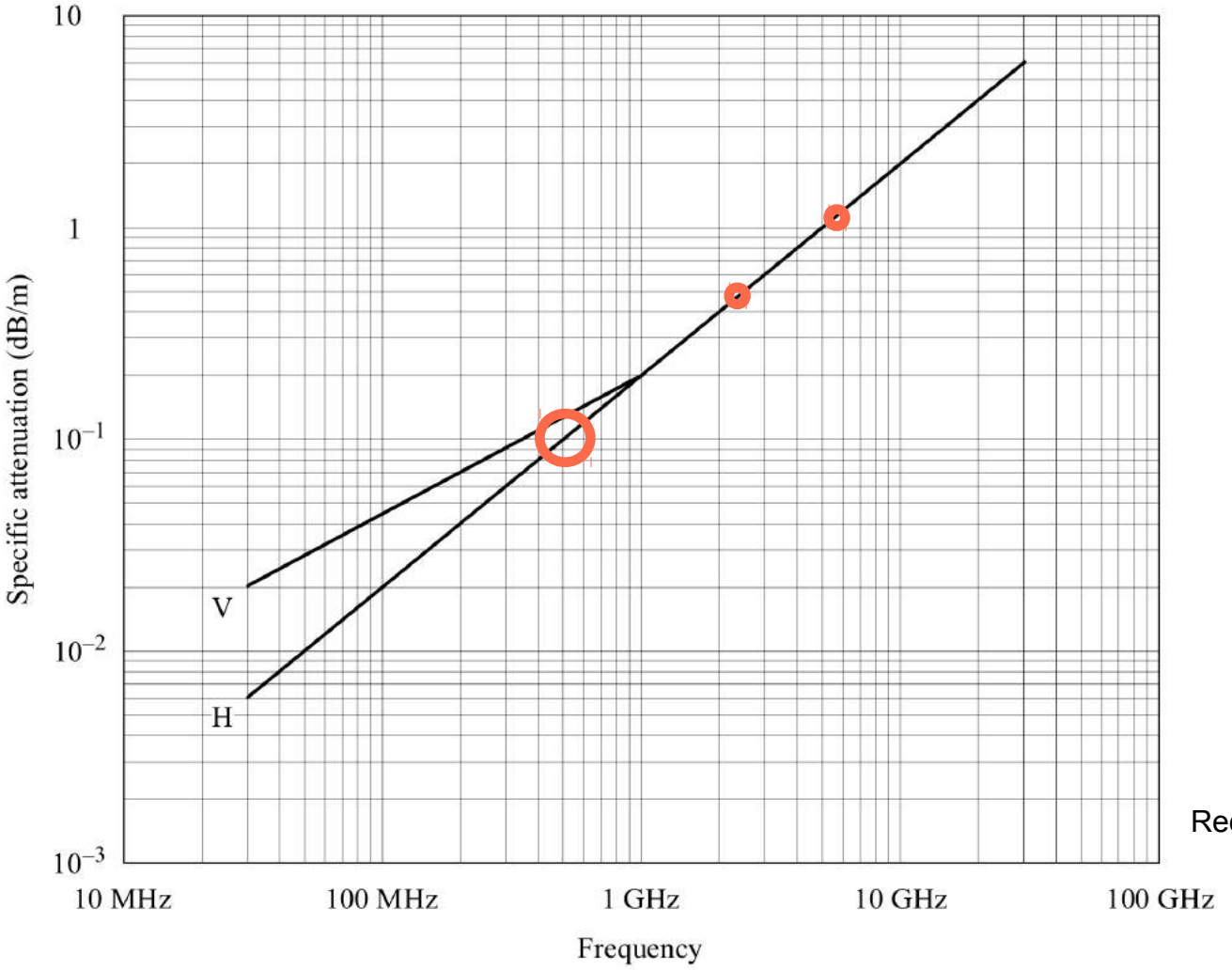
# Free Space Loss




In the same conditions, a link at 470 MHz is 11.5 Km longer than a link at 5.8 GHz and 7.5 Km longer than a link at 2.4 GHz

In real conditions in South Africa, a link at 470 MHz is 15.5 Km longer than a link at 2.4 GHz and 5.5 Km longer than a link at 5.8 GHz

# Radio Attenuation in Vegetation

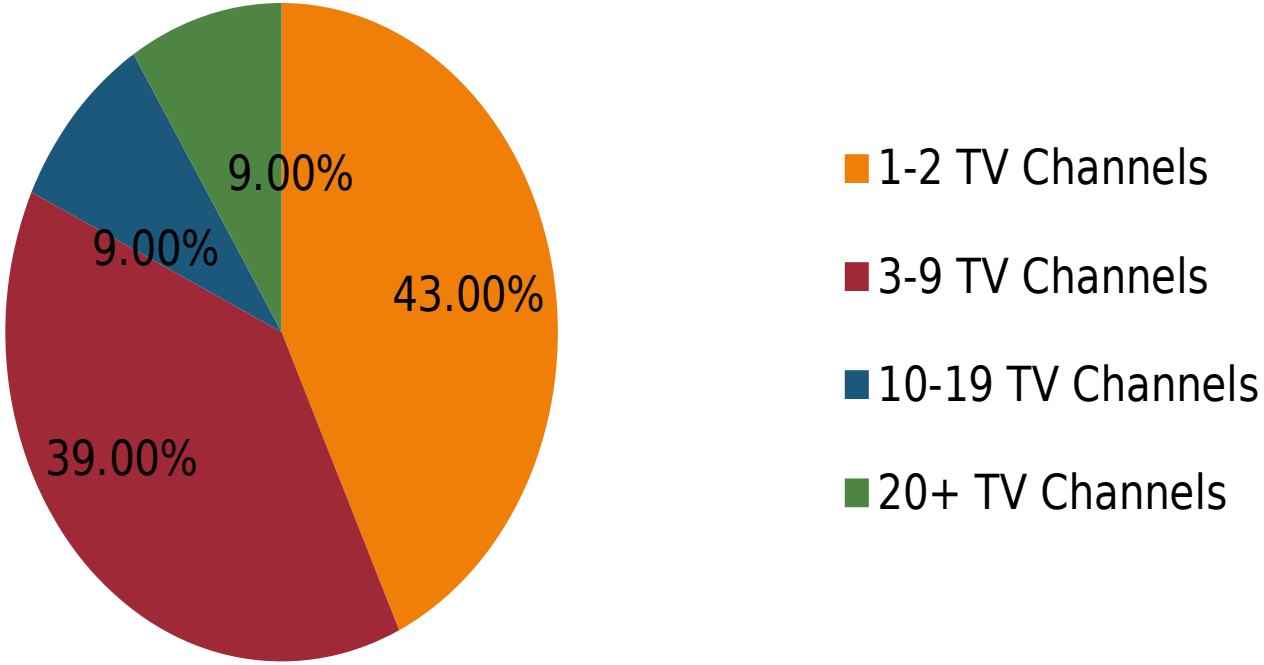



Rec. ITU-R P.833-7

4 times less attenuation in 470 MHz compared to 2.4 GHz, 16 times less compared to 5.8 GHz

# UHF Spectrum Occupancy in Africa

## Television Spectrum Occupancy in African Countries in 2012




**Source: Balancing Act**
Presentation to African Telecommunications Union (ATU) Digital Migration Summit (May 2014)
http://www.atu-uat.org/index.php/download-categories/category/10-afriswog-events?download=299:session-3-ppt-1-balancing-act-presentation

# Dynamic Spectrum in Africa

## 2012 – 2018

**Africa countries leading the world in deployments**

**Opportunity to use fallow UHF spectrum to connect under-served communities**

**Progress in 2018**

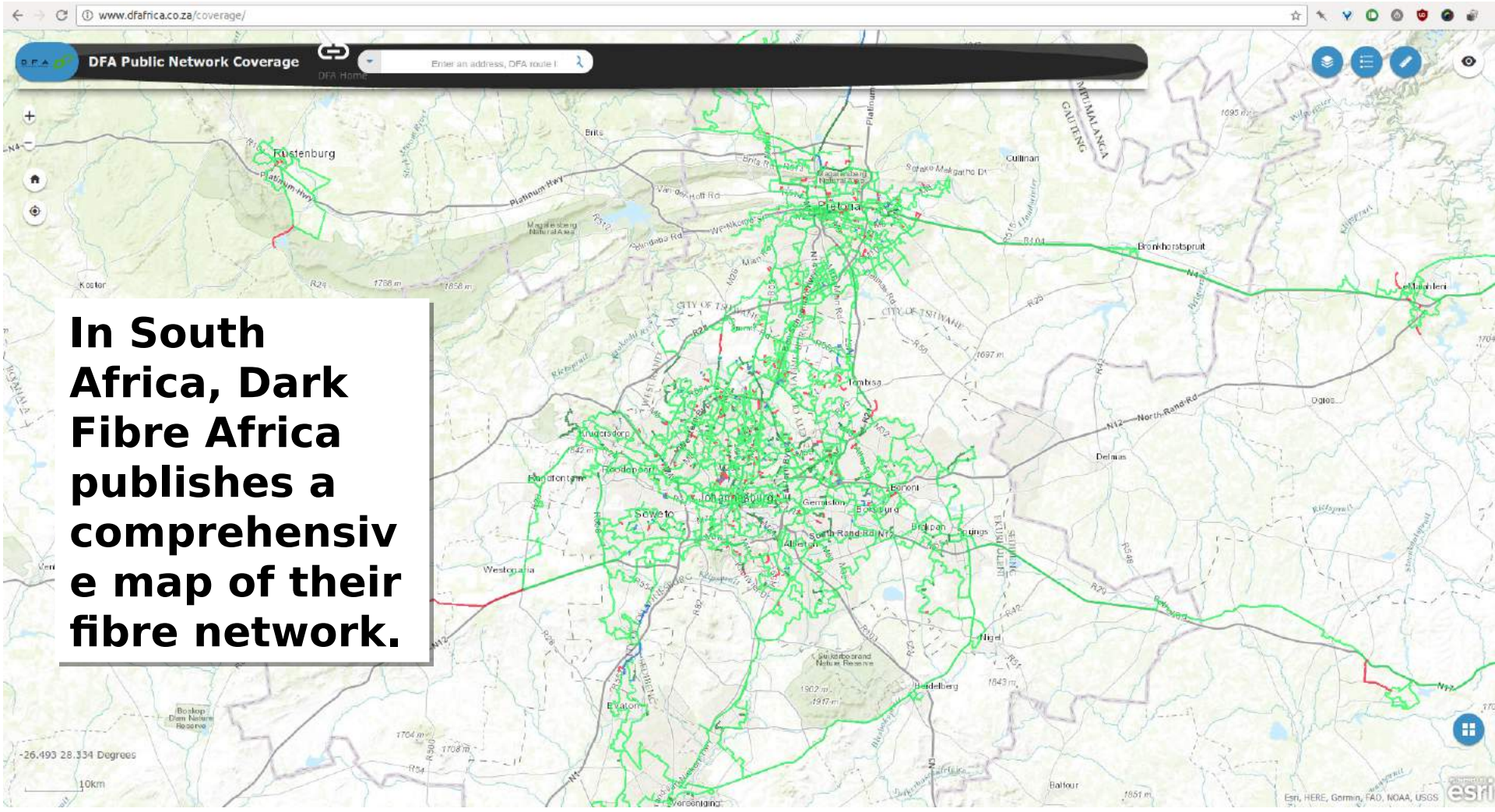
- ✓ **Mozambique**
- ✓ **South Africa**



APC
ASSOCIATION FOR PROGRESSIVE COMMUNICATIONS

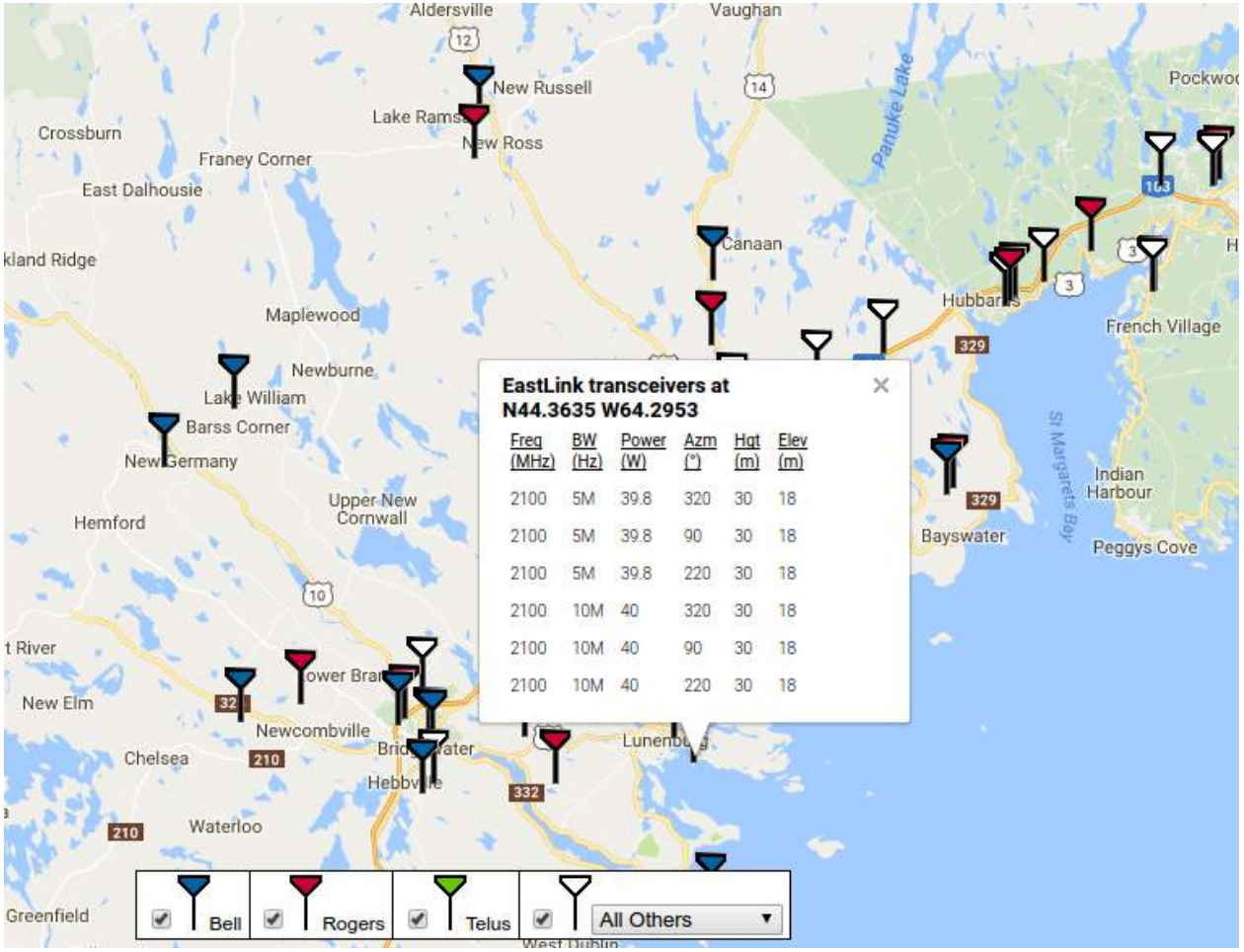
# The Case for Open Telecom Data

# Good Practice




**In South Africa, Dark Fibre Africa publishes a comprehensive map of their fibre network.**

# Good Practice




- Operator
- Location
- Frequency
- Height
- Power

# Good Practice

**LIST OF ACCESS FREQUENCIES ASSIGNED TO OPERATORS**

**A. MOBILE WIRELESS ACCESS**

## Kenya

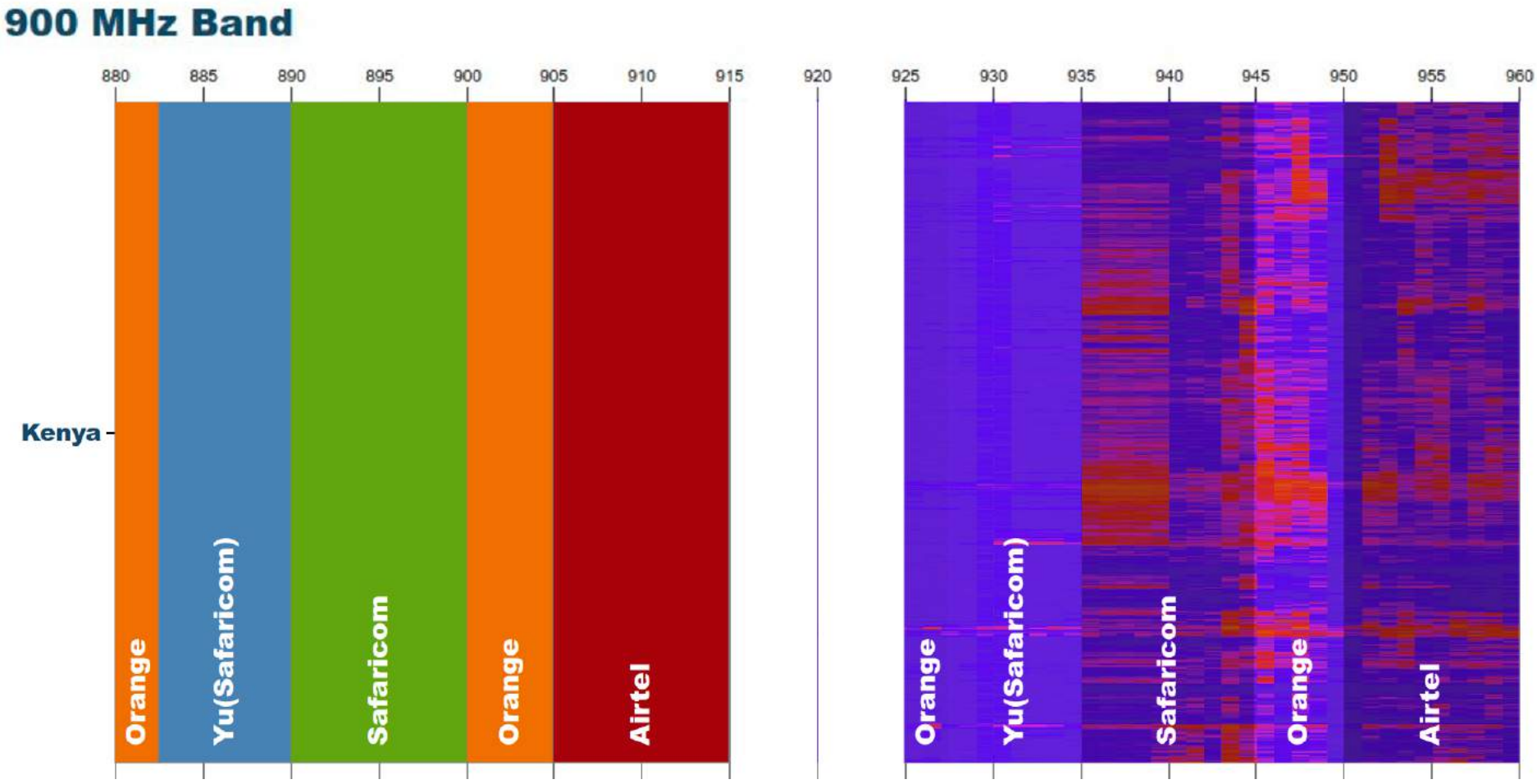
| Frequency Band | Amount of Spectrum | Assigned Operator |
|---|---|---|
| 800 MHz | 5MHz paired | Telkom Kenya Limited<br>P.O. Box 30301-00100<br>NAIROBI |
| 900 MHz | 10MHz paired | Safaricom Limited<br>P.O. Box 46350-00100<br>NAIROBI |
| 900 MHz | 10MHz paired | Celtel Kenya Limited<br>P.O. Box 73146-00200<br>NAIROBI |
| 900MHz | 7.5MHz paired | Telkom Kenya Limited<br>P.O. Box 30301-00100<br>NAIROBI |
| 900MHz | 7.5MHz paired | Essar Telecom Kenya Limited<br>P.O. Box 45742-00100<br>NAIROBI |
| 1800MHz | 10MHz paired | Safaricom Limited<br>P.O. Box 46350-00100<br>NAIROBI |
| 1800MHz | 10MHz paired | Celtel Kenya Limited<br>P.O. Box 73146-00200<br>NAIROBI |
| 1800MHz | 10MHz paired | Telkom Kenya Limited<br>P.O. Box 30301-00100<br>NAIROBI |
| 1800MHz | 10MHz paired | Essar Telecom Kenya Limited<br>P.O. Box 45742-00100<br>NAIROBI |
| 2100MHz | 10MHz paired | Safaricom Limited<br>P.O. Box 46350-00100<br>NAIROBI |
| 2100MHz | 10MHz paired | Celtel Kenya Limited<br>P.O. Box 73146-00200<br>NAIROBI |
| 2100MHz | 10MHz paired | Telkom Kenya Limited<br>P.O. Box 30301-00100<br>NAIROBI |

## Nigeria

**1800MHz BAND-GSM**

| OPERATOR | MTEL | GLO | MTN | AIRTEL | ETISALAT |
|---|---|---|---|---|---|
| Tx FREQUENCY | 1805-1820 | 1820-1835 | 1835-1850 | 1850-1865 | 1865-1880 |
| Rx FREQUENCY | 1710-1725 | 1725-1740 | 1740-1755 | 1755-1770 | 1770-1785 |
| STATES | | | | | |
| LAGOS | M-TEL | GLO | MTN | AIRTEL | ETISALAT |
| OGUN | | | | | |
| ONDO | | | | | |
| OSUN | | | | | |
| EKITI | | | | | |
| OYO | | | | | |
| KWARA | | | | | |
| EDO | | | | | |
| DELTA | | | | | |
| RIVERS | | | | | |
| BAYELSA | | | | | |
| AKWA IBOM | | | | | |
| CROSS RIVER | | | | | |
| EBONYI | | | | | |
| ABIA | | | | | |
| IMO | | | | | |
| ANAMBRA | | | | | |
| ENUGU | | | | | |
| BENUE | | | | | |
| KOGI | | | | | |
| NIGER | | | | | |
| ABUJA | | | | | |
| NASSARAWA | | | | | |
| TARABA | | | | | |
| PLATEAU | | | | | |
| BAUCHI | | | | | |
| GOMBE | | | | | |
| ADAMAWA | | | | | |
| BORNO | | | | | |
| YOBE | | | | | |
| JIGAWA | | | | | |
| KANO | | | | | |
| KADUNA | | | | | |
| KATSINA | | | | | |
| ZAMFARA | | | | | |
| KEBBI | | | | | |
| SOKOTO | | | | | |

# Monitoring Spectrum Use



# CN friendly regulatory and policy frameworks?

**Let’s answer that question together**