



**A Study into Communication
Services and Infrastructure across
the Country**

Dissemination Workshop

October 2015

Outline

Methodology

Infrastructure Assessment

Gap Analysis

Issues and Opportunities

Recommendations

Methodology

Baseline mapping data

- *UBOS provided latest Census based GIS files for district and sub-county boundaries*
- *Population data released much later, after actual Census*
- *Summarised figures at the subcounty level*
- *Relied on LandScan datasets for Uganda*
- *UCC provided broadcasting data including GIS location of broadcasting towers & signal coverage shape files for radio and DTT transmission*

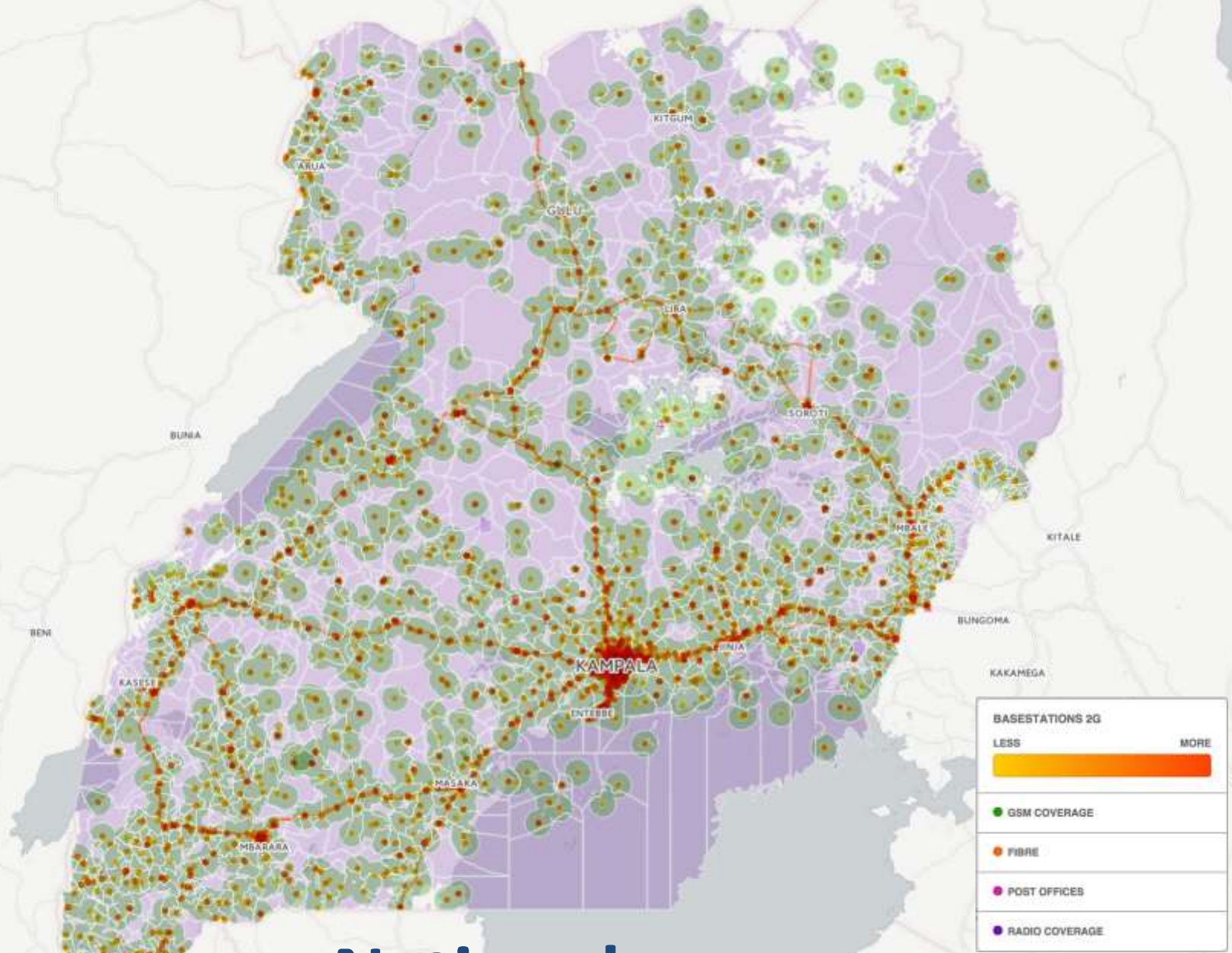
Determine GSM area coverage

- *Combine all base stations from different operators into one file*
- *Combine base station data with urban/rural classification from UBOS*
- *Create buffer around each base station based on model (3.5km urban; 8km rural) to predict approximate coverage*
- *Combine GSM area coverage file with subcounty boundary file from UBOS*
- *Determined geographical area coverage for GSM per subcounty or district*

Tools

- *Quantum GIS (QGIS), www.qgis.org*
- *CartoDB, www.cartodb.com*
 - <https://github.com/CartoDB/>
- *Microsoft excel*
- *LandScan data, www.ornl.gov/landscan*

Infrastructure Assessment

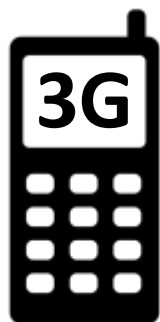
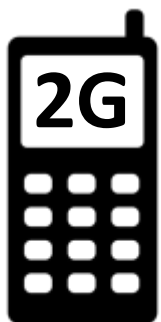
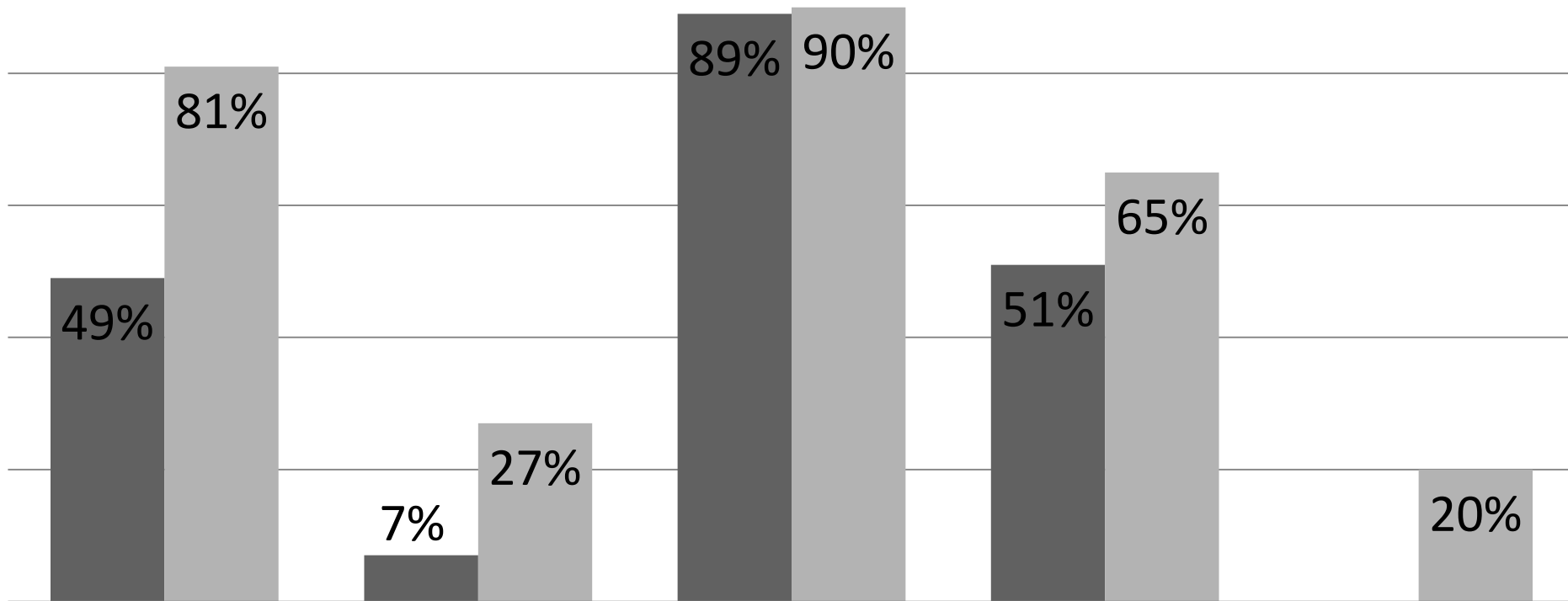


National coverage

Overview

■ % Area coverage

■ % Popn coverage



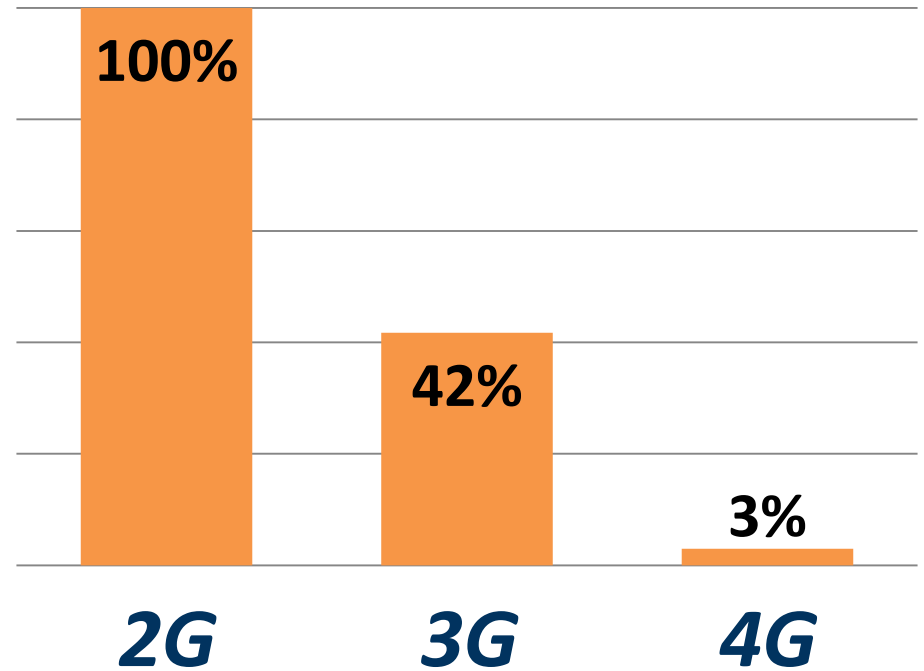
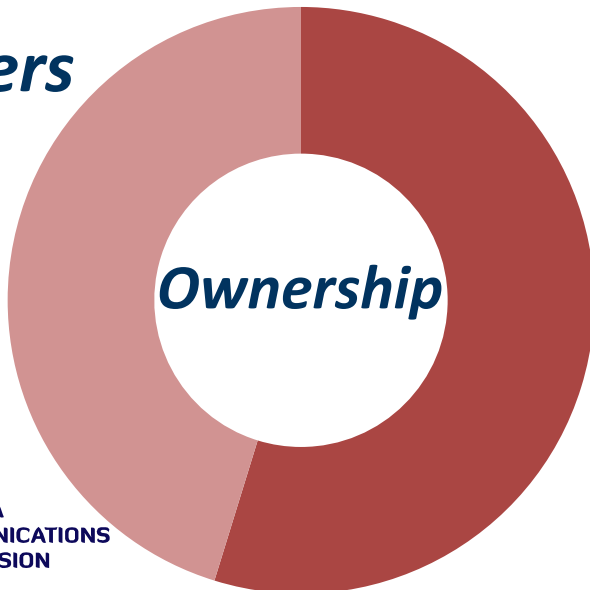
Mobile Base Stations

Towers are much easier to share or collocate. In reality, though major operators share very few

Total number of masts

3,849

Providers
45%

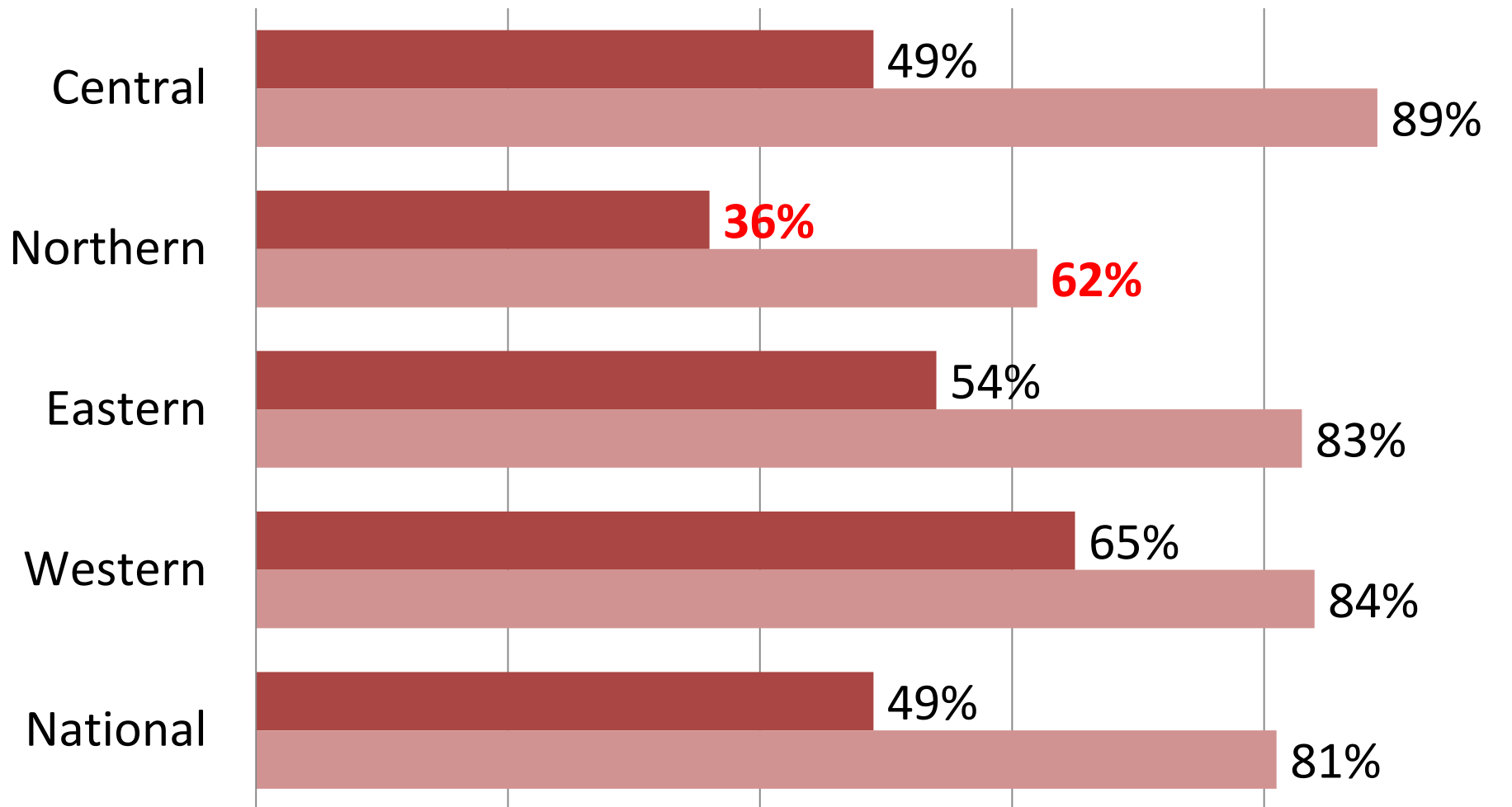


TowerCos
55%

Area: 49%
Population: 81%

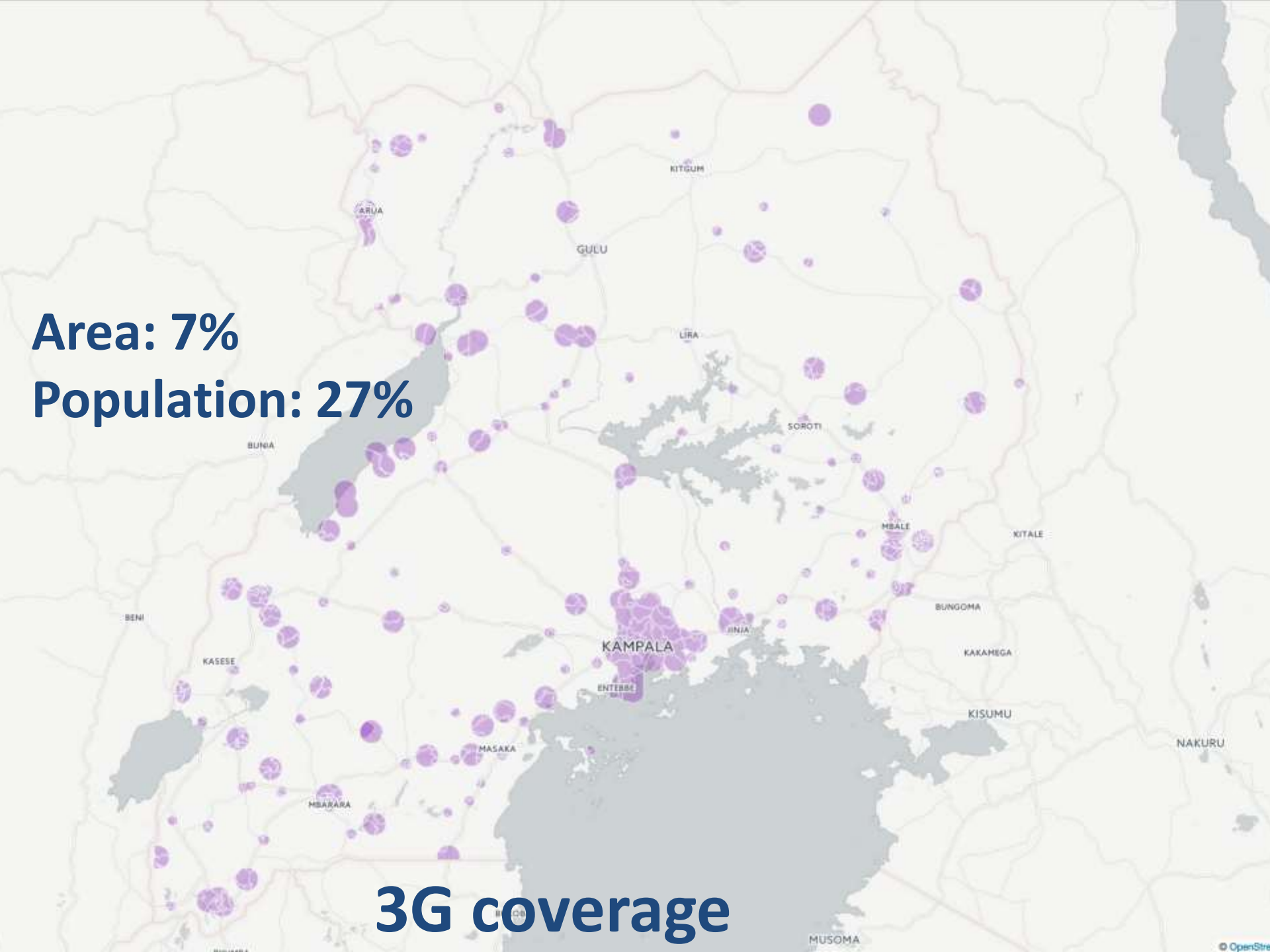
2G coverage

GSM 2G coverage

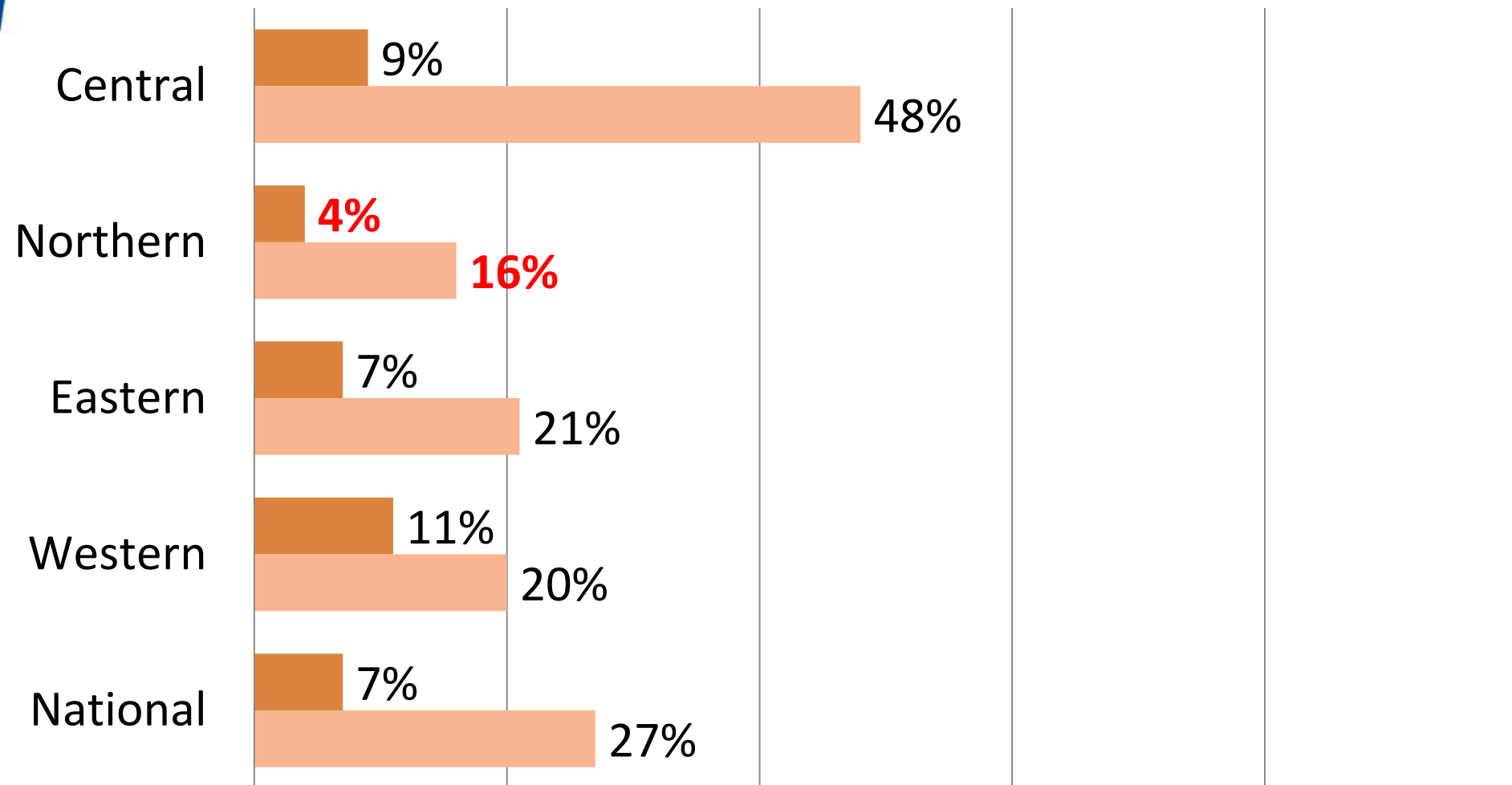


Area: 7%
Population: 27%

3G coverage



GSM 3G coverage



Fibre

Duplication of long-haul fibre along major road routes with metro networks in Kampala and Wakiso districts

Total fibre length (KM)

4,662

Ignores route duplication

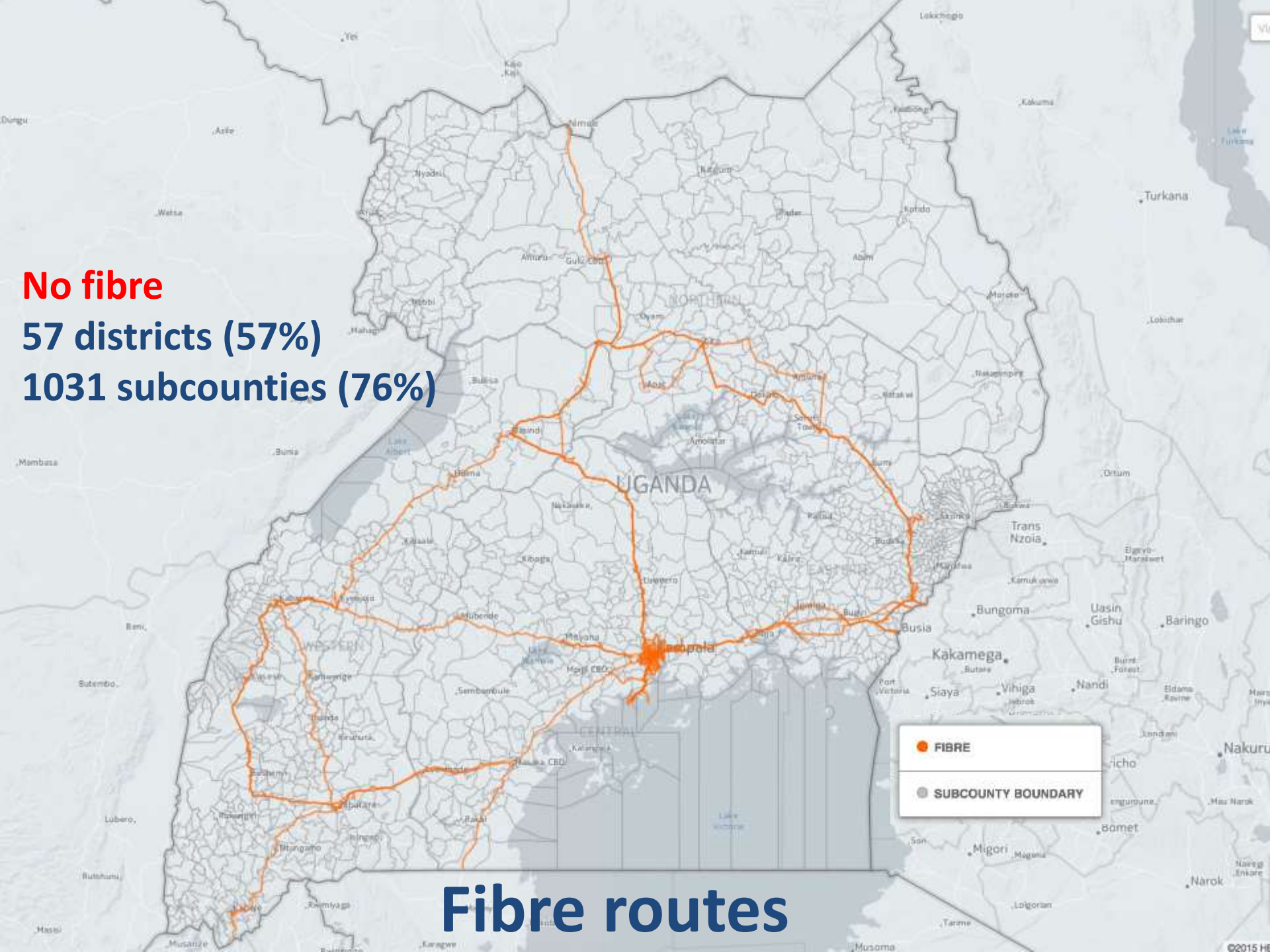
Route coverage (KM)

2,081

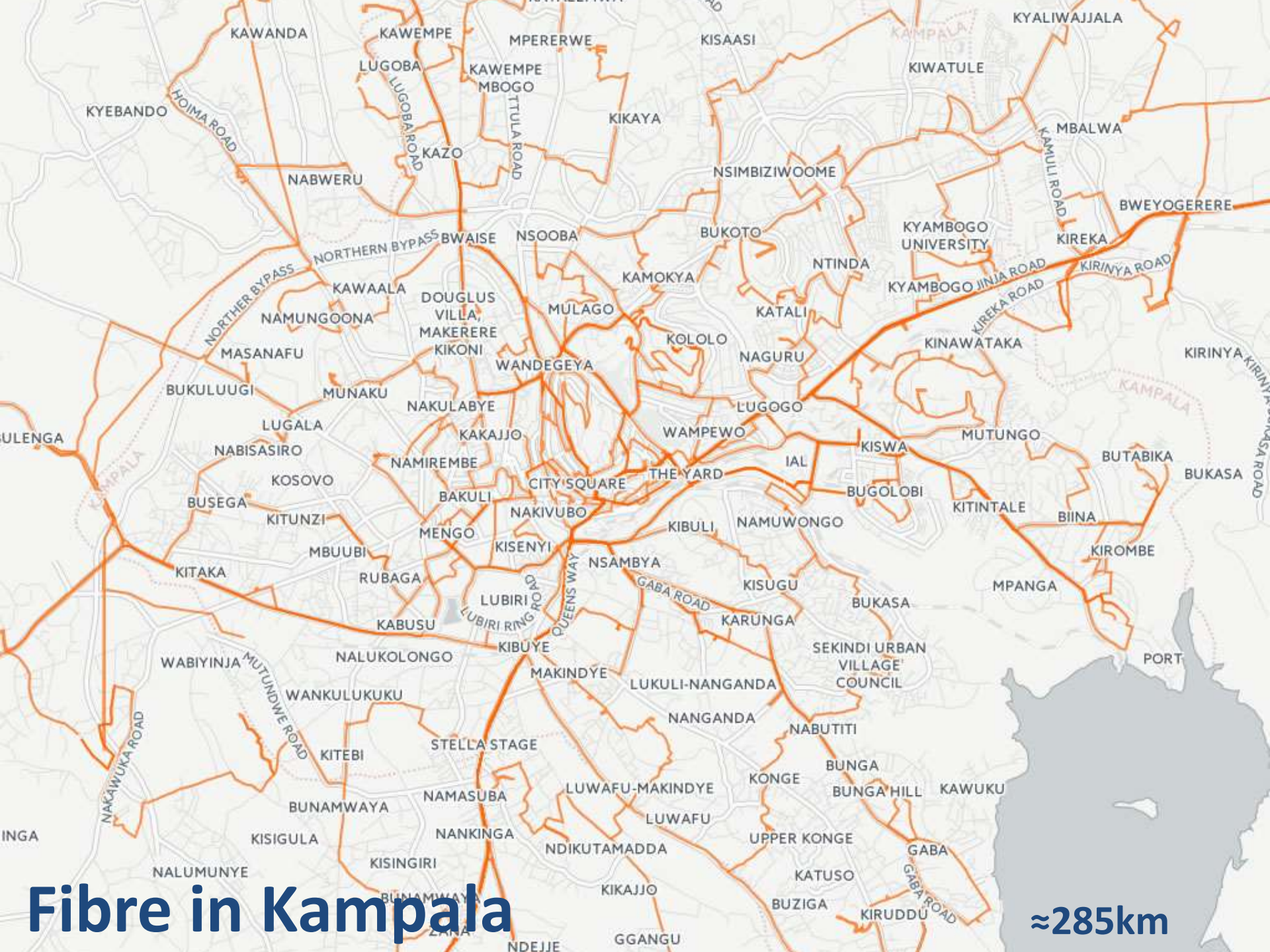
Exclude route duplication and metro networks

- *57 – districts have no fibre on their land (57%)*
- *1031 – subcounties in similar situation (76%)*
- *282km – size of Kampala’s metro fibre network*

No fibre
57 districts (57%)
1031 subcounties (76%)



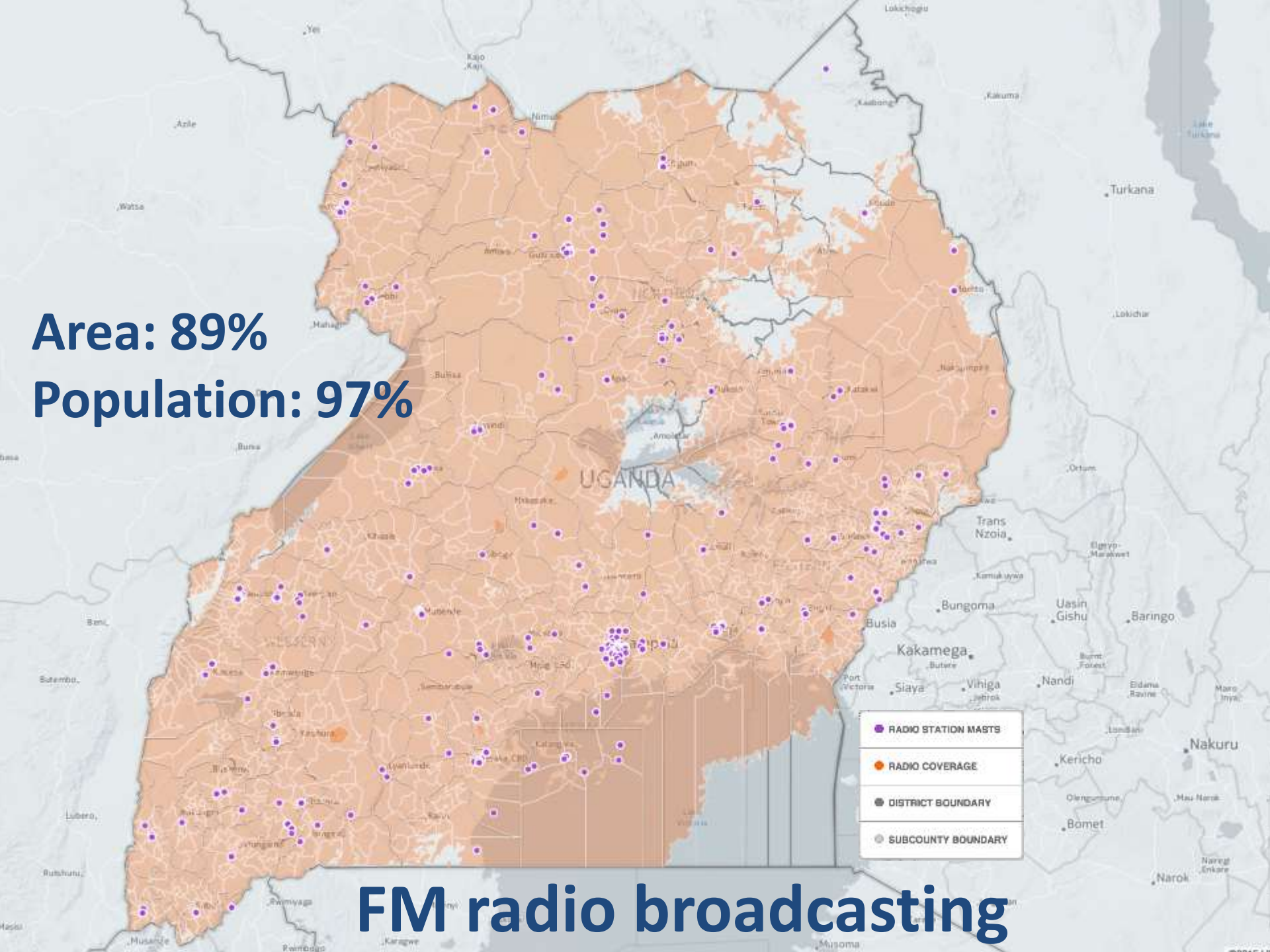
Fibre routes



Fibre in Kampala

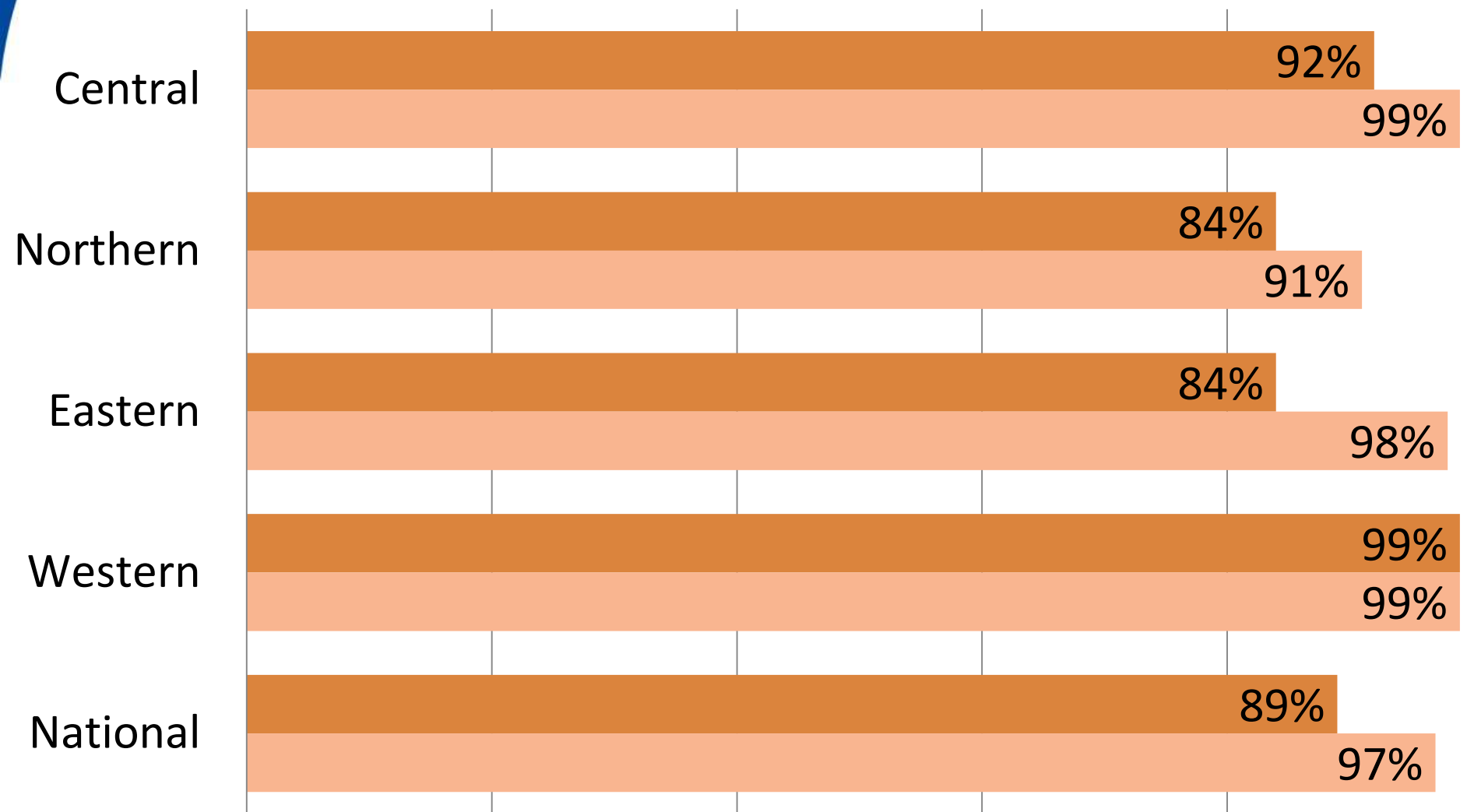
≈285km

Area: 89%
Population: 97%

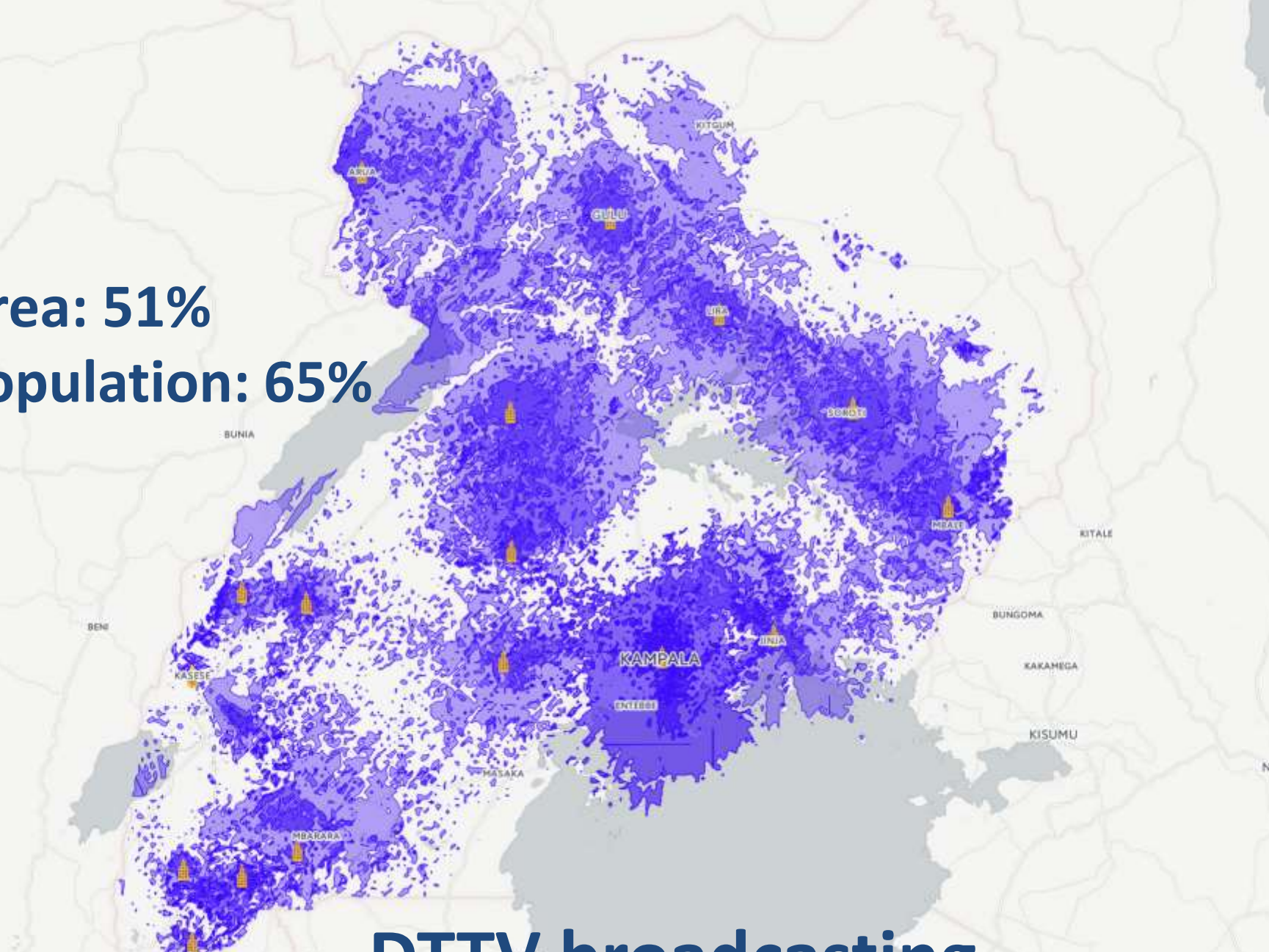


FM radio broadcasting

FM broadcasting coverage

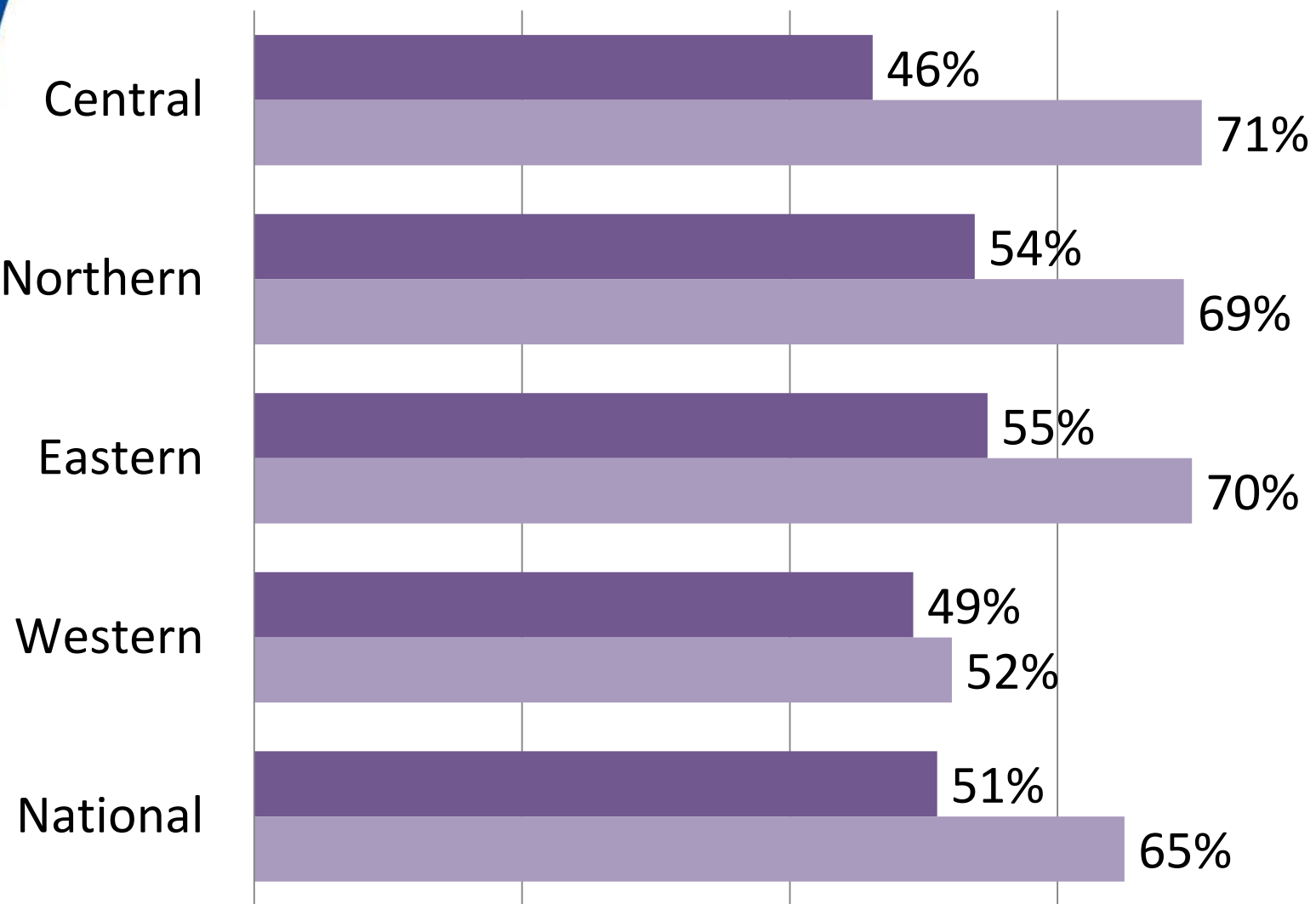


Area: 51%
Population: 65%

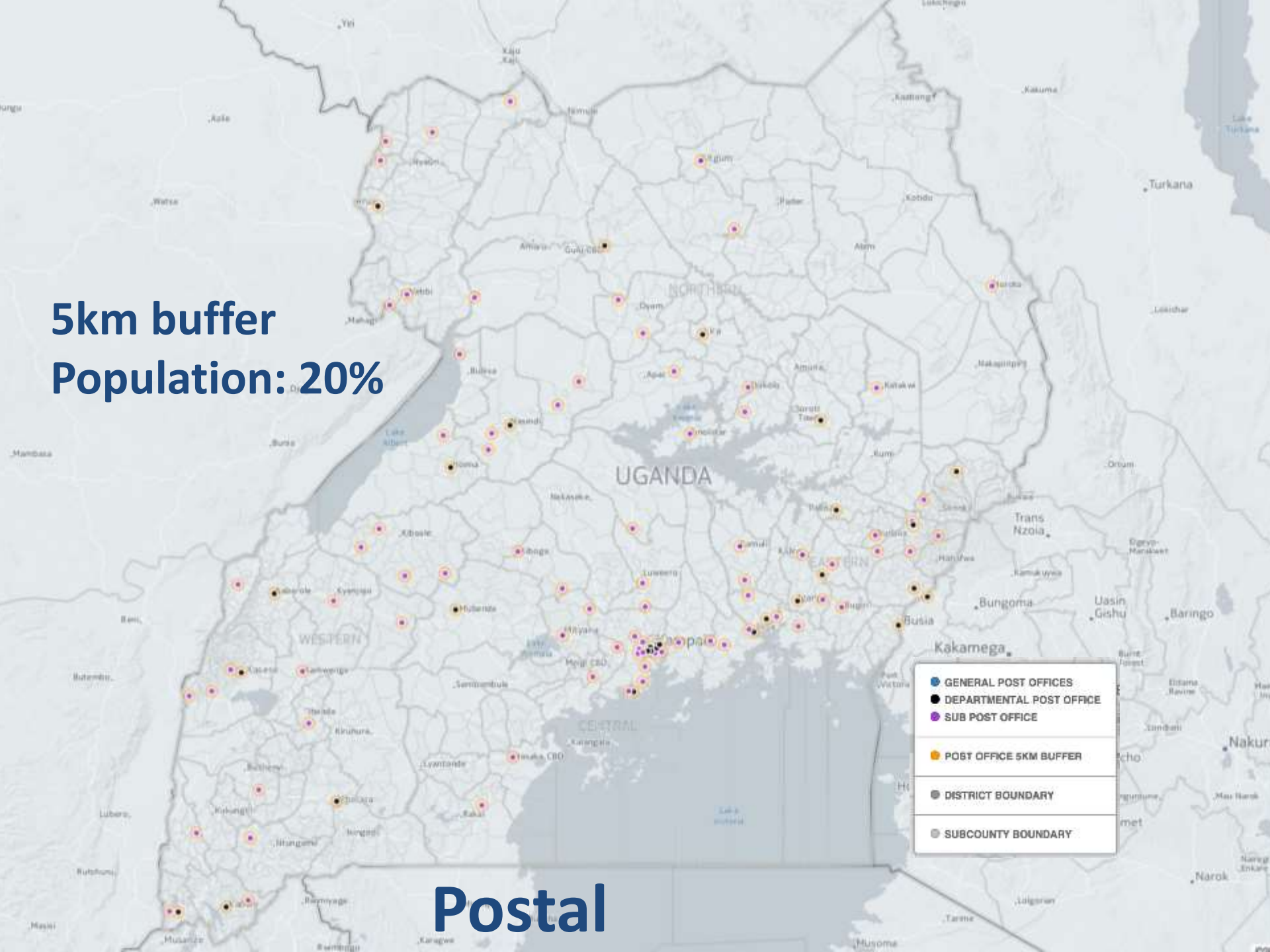


DTTV broadcasting

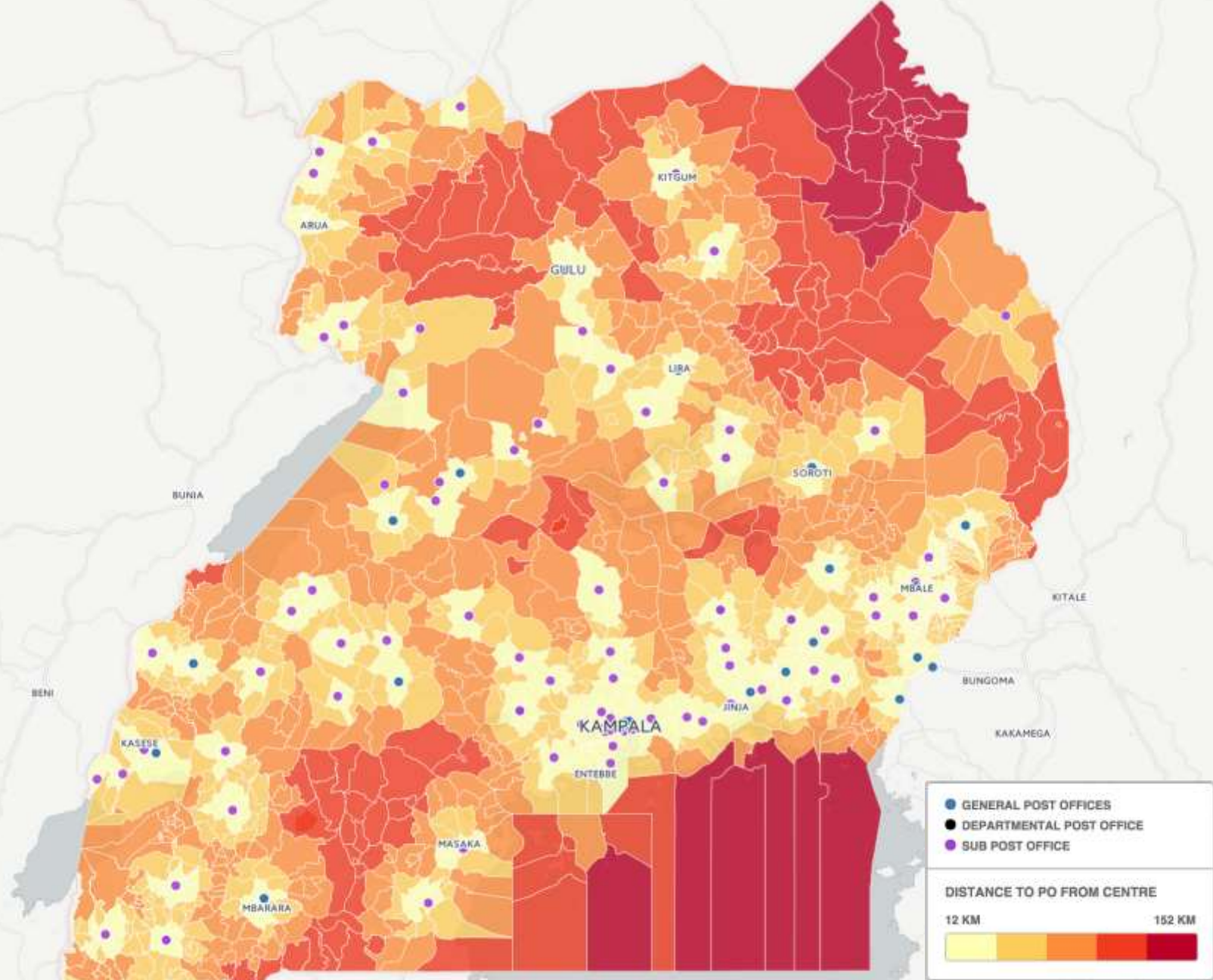
DTT broadcasting coverage



5km buffer
Population: 20%



Postal



Postal distance

Postal coverage

Table 9: Posta Uganda coverage by region

Region	No. of Post Office locations	Districts with local PO	Districts without local PO
Central	36	12	12
Northern	19	16	14
Eastern	30	20	12
Western	32	19	7
Total	117	67	45

Table 10: Average linear distance from centre of subcounty to nearest Postal location

Average distance (KM)	Sub Counties		
	Number	Percent	Cumulative
0 - 4.99	18	1.38%	1.38%
5 - 9.99	128	9.79%	11.16%
10 - 14.99	253	19.34%	30.50%
15 - 19.99	228	17.43%	47.94%
20 - 29.99	284	21.71%	69.65%
30 - 39.99	177	13.53%	83.18%
40 - 49.99	80	6.12%	89.30%
50+	140	10.70%	100.00%
Total	1,308	100.00%	

Gap Analysis

Overview

The Gap Analysis takes Uganda's Vision 2040 aspirations as main point of reference

- 1. What communication infrastructure and services must be put in place both as pre-requisites and co-requisites to enable the achievement of Uganda's aspirations?***
- 2. What is currently available?***
 - Incorporates plans for medium term (2-5 years)*
- 3. What is the Gap?***

Vision 2040

Uganda aspires to be “A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years”

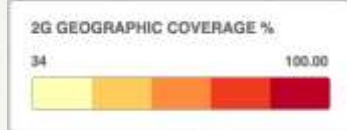
- 1. Infrastructure (energy, transport, water, oil and gas, and ICT);***
- 2. Science, Technology, Engineering and Innovation (STEI);***
- 3. Land use and management;***
- 4. Urbanisation; human resource; and peace, security and defence***

Inferred communication requirements

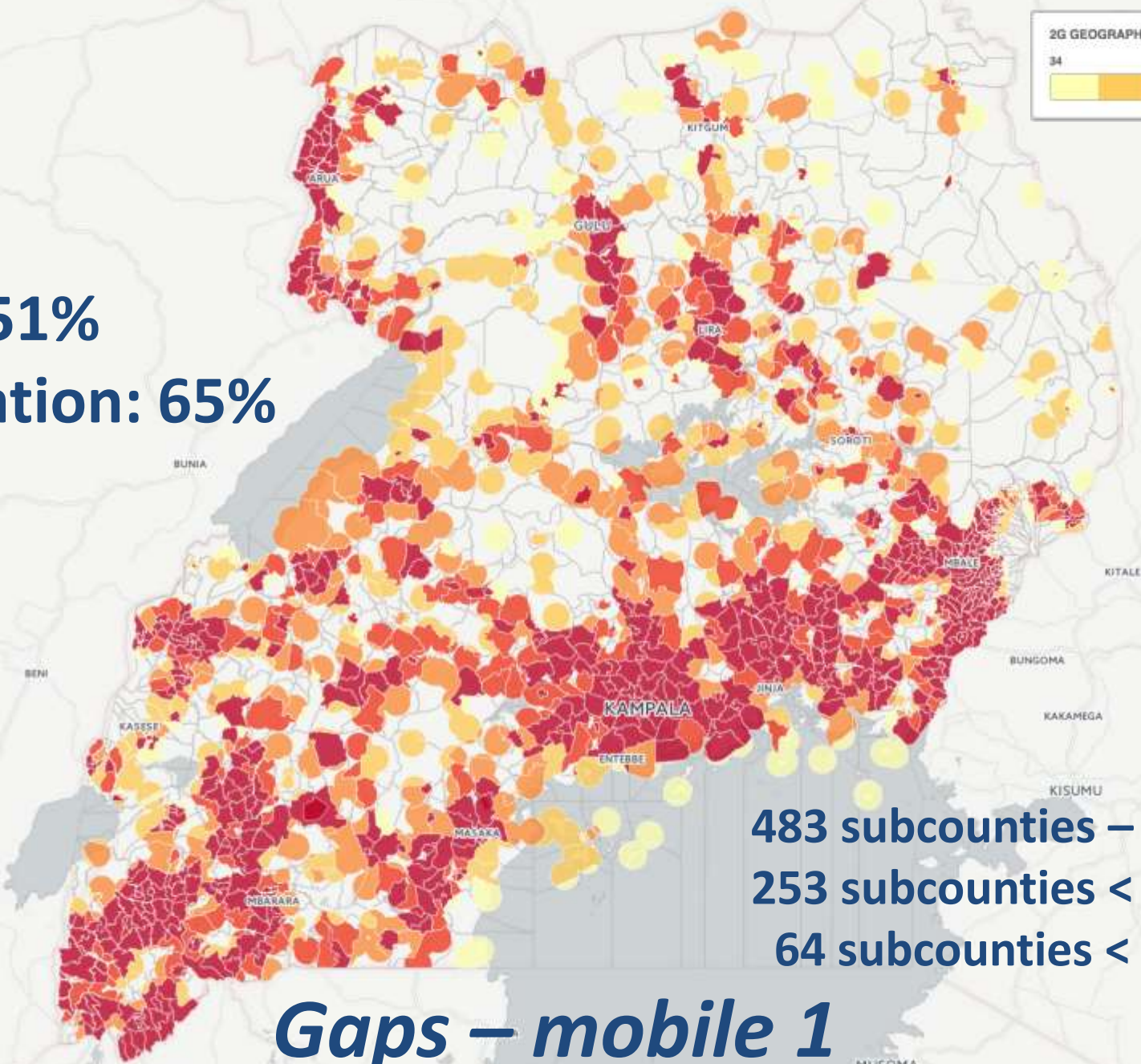
- *Self-evident that for fundamentals to be achieved, there is a very strong implicit assumption of efficiency of communications at the national, regional, and global levels*
- *Table 37 scrutinizes Vision 2040 core projects along with inferred communication requirements necessary for their support*
- *Table 38 benchmarks DNBS targets to comparatives from other sources/locations*

Desired state of infrastructure

- *Digital transmission platforms are capable of, and have increasingly become exclusive for all electronic services and applications*
- *Cheap and ubiquitous means of communication remain relevant*
 - *FM broadcast radio – inclusion*
 - *Postal and courier – complete e-commerce delivery chain*
- *Table 39 presents our recommended targets that form basis for Gap Analysis and should not be presumed to be national targets*



Area: 51%
Population: 65%

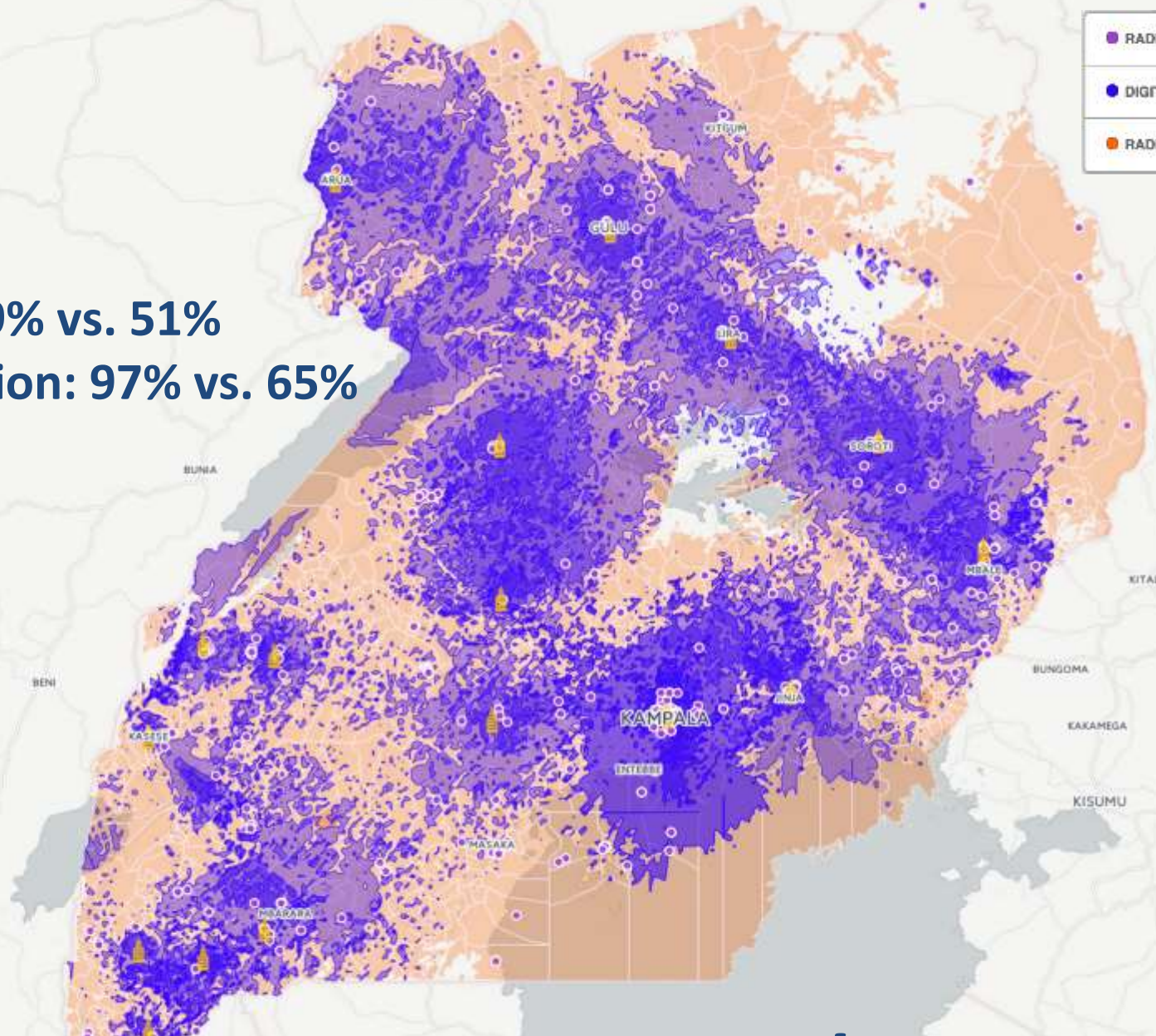


483 subcounties – 100%
253 subcounties < 50%
64 subcounties < 10%

Gaps – mobile 1



Area: 89% vs. 51%
Population: 97% vs. 65%



Gaps – FM and DTT 1

Gaps – FM and DTT broadcasting 3

50 subcounties have area coverage below 50% for FM radio. Of these, 17 are below 10% (Table below)

DISTRICT	COUNTY	SUBCOUNTY	Area (KM ²)	Area Covered (KM ²)	% Area Covered
KAABONG	DODOTH	LOLELIA	652	0.84	0.13%
AMOLATAR	KIOGA	AGIKDAK	58	0.23	0.39%
AMOLATAR	KIOGA	AGWINGIRI	218	1.8	0.80%
AMOLATAR	KIOGA	AKWON	49	0.47	0.96%
OTUKE	OTUKE	ORUM	74	0.73	0.98%
KAABONG	DODOTH	SIDOK	543	5.4	0.99%
AMOLATAR	KIOGA	AWELO	93	1.2	1.3%
DOKOLO	DOKOLO	ADEKNINO	101	2.3	2.3%
OTUKE	OTUKE	OLILM	260	10	3.9%
OTUKE	OTUKE	OTUKE TOWN COUNCIL	65	2.6	4.1%
NAKASONGOLA	BURULI	KALUNGI	325	16	4.9%
AMOLATAR	KIOGA	APUTI	127	6.7	5.3%
OTUKE	OTUKE	OGOR	271	15	5.4%
OTUKE	OTUKE	OGWETTE	261	17	6.4%
KOTIDO	JIE	RENGEN	628	42	6.7%
MOROTO	MATHENIKO	TAPAC	593	52	8.7%
BUKWO	KONGASIS	KORTEK	10	0.92	9.0%

Gaps – Internet access 1

- ***Considered 3G as minimum for decent Internet access speeds***
- ***Of 3,949 base stations across country, 1,605 (42%) are 3G enabled and 114 (3%) are 4G***
- ***National 3G population coverage is 27%, while 3G area coverage a meagre 7%***
- ***4,700 km of fibre, most of this is route duplication, reducing to just over 2,100 km***
- ***Wi-Fi is predominantly urban with largest deployment planned at 300 sites in 2.4/2.5 unlicensed spectrum (over 50% completed)***

Gaps – Internet access 4

- ***1045 subcounties (77%) do not have any fibre traversing any of their boundaries***
- ***Of 612 subcounties with 3G coverage, 384 of them do not have any fibre to support data backhaul, implying limited access speeds***
- ***Of 339 subcounties with 30% or more 3G population coverage, 181 do not currently have any fibre to support data backhaul***
- ***As a minimum, each district should be connected to fibre in short to medium term (by 2020), and each subcounty should be connected by 2025***

Gaps – Global Internet infrastructure

- ***As minimum, Uganda will require a national virtual cable landing station with cable routes through Kenya and Tanzania to Indian Ocean by 2020***
- ***Eliminate major suppressing factors for internet use to meet Vision 2040 aspirations***
- ***A conservative initial exponential growth estimate would put requirements at minimum 100Gbps by 2020, and more likely greater than 200Gbps***
- ***Minimum capacity along each route (100% redundancy) should therefore be at least 100Gbps by 2020 and 200Gbps by 2025 for the public***

Gaps – National postal codes

- ***National Postcode and Addressing pilot led by MoICT wasn't inclusive nor successfully completed***
- ***KCCA has some funding to map different infrastructure within Kampala under KIIDP-2***
- ***Need for more collaboration and synergies to implement postal codes and addressing that will help more MDAs***
- ***Support applications like delivery chain for goods in e-commerce, insurance underwriting, flood determination and identify and label underground public utility infrastructure e.g. fibre***

Gaps – Summary

- ***Evidence of an increasing digital divide in the country that is inconsistent with both the principle of national equity and the achievement of Vision 2040 aspiration***
 - ***A North-South divide: north has less access to infrastructure due to sparse population, distance from core networks***
 - ***A rural-urban divide: driven mainly by economics-rural areas that are impoverished, even if closer to the core, are not attractive because of the much lower revenue***
- ***These divides are very reason why Rural Communications Development policy/Fund were developed***

Issues and Opportunities

Overview

- *As part of data collection process, team met with and interviewed representatives of key licensed operators licensed by UCC*
- *Interviews were designed to serve multiple purposes that included:*
 - *Assessing current market environment from perspective of operators*
 - *Appreciating operator challenges in deploying and managing ICT infrastructure across the country*
 - *Explaining motivation of the study to encourage better response to RFI and to obtain up-to-date information on reach of operator networks and services as well as their plans for further expansion*

Operational

- *Operators indicated that they avoid investing in new infrastructure because of high capital operational and maintenance costs required to do this well*
- *Permissions and right of way – need to visit several agencies for permission and clearances*
- *Coordination of works to minimise infrastructure damage and to provide new opportunities*
- *Lack of last mile connectivity, making it expensive for small providers to deliver services to consumers*
- *Poor support infrastructure, especially in rural areas making it difficult to access or support ICT infrastructure*

Licensing and regulations

- *Challenges persist despite new licensing regime*
- *Pricing and processes – large providers stifle infrastructure sharing requests from small players*
- *TowerCos are playing an important role, but need to be monitored to ensure transparent pricing for all*
- *Infrastructure vandalism and damage still a big issue that needs addressing through multiple channels*
- *Smaller providers felt licensing structure was unfair to them because it is national in nature and yet their operations tend to be localised in particular areas*
- *Take into account increasing role of MVNOs and how to better manage their relationship with their host*

Recommendations

National infrastructure gaps & issues

- *Challenge is to ensure totality of national geographic coverage of all ICT infrastructure so that all citizens can access all services wherever they are located*
- *The key barriers to this have been identified as*
 - *Absence of power—a challenge that UCC cannot address alone, but needs to collaboratively work with multiple agencies to prioritise areas where this is a major barrier to infrastructure rollout*
 - *Cost of infrastructure—especially in low economic viability areas through multiple fronts like infrastructure sharing, better coordination of works, and punitive measures to deter vandalism and damage*

Service gaps & issues 1

- *FM radio does not have total national coverage. Intervention can be addressed under current RCDF provisions and DTTV rollout*
- *Mobile coverage (2G) is still far from ubiquitous, marginalising a very significant part of population. Addressing cost of infrastructure and absence of power issues will greatly help in this regard*
- *Internet access coverage is still very limited and will require strategic regulatory intervention through infrastructure licensing, policy and regulatory incentives or PPP collaborations to improve coverage*

Service gaps & issues 2

- *Develop strategy to operationalise a national addressing and postal code system that also captures geo spatial locations (e.g. lat/long) in an openly published national coordinate system*
- *Include all relevant and important stakeholders*
- *Who should take the lead: within the digital realm, UCC is responsible for the development of numbering plans as well as number allocations*
- *We interpret the postal licensing role of UCC to embody establishment of postal codes as a licensing mechanism that is availed to licensed providers*

Service gaps & issues 3

- *Address national licensing, market segmentation and structure challenges faced by small providers or providers in emerging segments like MVNOs by exercising UCC mandate*
- *Issues around last mile connectivity as an impediment to service provision to end-users can be addressed as part of the infrastructure sharing decisions that UCC will need to take*

Service gaps & issues 4

- *A fundamental challenge is the absence of a national level policy and institutional arrangements for protection of critical infrastructure – infrastructure that, if damaged or knocked out would have serious impact on security, national economic security, national public health and safety, or any combination of these*
- *UCC and NITA-U, as main custodians of both national policy and national cyber-infrastructure, need to get the Ministry of ICT to raise to national priority the matter of critical national infrastructure as a matter of national security*

International connectivity gaps & issues

- ***Address policy and regulatory issues of a Virtual Cable Landing Station (VCLS) to avoid ad hoc approaches that would be complex to streamline once operational***
- ***Explore alternative routes for international connectivity, but take into account monopoly and sustainability issues***
- ***Access to alternative satellites along with a hub based in Uganda is not a commercially attractive proposition. This must be addressed, starting at government level, as a matter of national security. The Ministry of ICT should champion this at policy level so that public funding can be planned and deployed***

National broadband strategy

- ***This is a major on-going initiative under the Ministry of ICT***
- ***Discussion of this strategy is outside the scope of this report. It is however mentioned here because it is the next level, consolidating, along with other input, the recommendations made in this report for addressing the national communications infrastructure and service gaps***
- ***This baseline of the current status of infrastructure and services will be critical inputs to the National Broadband Strategy***

Discussion