NATIONAL COMMUNICATIONS AUTHORITY

Quality of Service (QoS) Monitoring of Cellular Mobile   Data Services-Upper West REGION

[July 2015]

[Communications for Development]

QUALITY OF SERVICE (QoS) MONITORING OF CELLULAR MOBILE DATA SERVICES IN UPPER WEST REGION, JULY 2015

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Background

In pursuance of obligations of the 3G Cellular Mobile Licence of Telecommunication Operators and National Broadband Policy targets, the consumer perspective of the quality of data services are tested to ensure the compliance of Operators to the obligations on service quality to the user.

The report is based on findings on quality of service in Wa, Upper West region in July 2015 for all Operators except for Expresso and Glo due to their technical challenges.

What we measure

As per the 3G Cellular Mobile licence obligations and the National Broadband policy, the QoS indicators and their respective threshold for compliance under assessment considering the user's perspective are as below;

- **Data Access Time (DAT)**
- **Data Access Success Rate (DASR)**
- **Data Drop Rate (DDR)**
- **Throughput**

Findings

The results for the localities tested during the period are as below:

a. Data Access Time

Data Access Time should be less than five seconds *(<5secs) in 100% of cases*.

Data Access Time is a measure of the time lapse in activating a PDP Context for data service.

$$\text{Data Access Time } [s] = Time(PDPContextAcceptMar\text{ker}) - Time(PDPContext\,\text{Re}\,questMar\text{ker})$$

$Time_{PDPContextAcceptMar\,\text{ker}}$ – Moment PDP Accept message is received,

$Time_{PDPContext\,\text{Re}\,questMar\,\text{ker}}$ – Moment PDP Request message is sent,

Table 1. Data Access Time, July 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel
JULY	Commercial Bank	2.4	**33.62**	**32.03**	2.73
JULY	UDS Campus	1.7	1.37	1.73	2.33
JULY	SSNIT Estate	1.73	2.25	**11.23**	3
JULY	In-Service	1.67	**32.17**	**30.95**	2.81
JULY	Teagber	1.69	**32.12**	1.17	2.84

REMARKS:

- ❖ MTN and Airtel were in compliance at the tested localities with the data access time threshold of less than five (5) seconds.

- ❖ Vodafone had excessive Data access delays at Wa Commercial Bank, In-Service Training Centre and Teagber localities.

- ❖ Tigo had excessive Data access delays at Wa Commercial Bank, SSNIT Estate and In-Service Training Centre.

b. Data Access Success Rate

Data Access Success Rate should be equal or better than ***ninety five per cent (95%).***

Data Access Success Rate is the probability of success in connecting to the public server.

$$PacketServiceSuccessRate[\%] = \frac{Number\,of\;successful\,PDP\,Context\,Activations}{Total\,number\,of\;PDP\,Context\,Activation\,requests} \times 100\%$$

Table 2. Data Access Success Rate, July 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel
JULY	Commercial Bank	100	100	**58**	**61**
JULY	UDS Campus	100	100	100	**65**
JULY	SSNIT Estate	100	100	100	**64**
JULY	In-Service	100	100	100	**68.42**
JULY	Teagber	100	100	100	80

REMARKS:

- ❖ MTN and Vodafone passed the Data Access Time obligation in all locations.

❖ Tigo had data access delays at Wa Commercial Bank.

❖ Airtel had data access delays at Wa Commercial Bank, UDS Campus, SSNIT Estate and In-Service Training Centre.

c. Data Drop Rate

Data Drop Rate should be equal or less than *one per cent (1%).*

Data Drop Rate is the probability to drop in connection to public server without end user's intervention

$$\text{Data Drop Rate}\,[\%] = \frac{\text{Number of aborted PDP context activations}}{\text{Total number of PDP Context Activation requests}} \times 100\%$$

Table 3. Data Drop Rate, July 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel
JULY	Commercial Bank	0	0	0	0
JULY	UDS Campus	0	0	0	0
JULY	SSNIT Estate	0	0	0	0
JULY	In-Service	0	0	0	0
JULY	Teagber	0	0	0	0

REMARKS:

❖ All operators were in compliance with the licence threshold of less than one percent (1%) in all the tested locations.

d. Throughput

Throughput is the rate of data transfer.

As per the QoS Regulations and National Broadband Policy the minimum data transfer rate for 90% of data connections should be *1.00 Mbps*

The graphical presentation of throughput in the localities are as in the figures below:

Figure 1. FTP Downloads-July 2015, Commercial Bank, Wa

Throughput at Ghana Commercial Bank,Wa

	MTN	Vodafone	Tigo	Airtel
Throughput	0.95	0.78	0.7	0.19
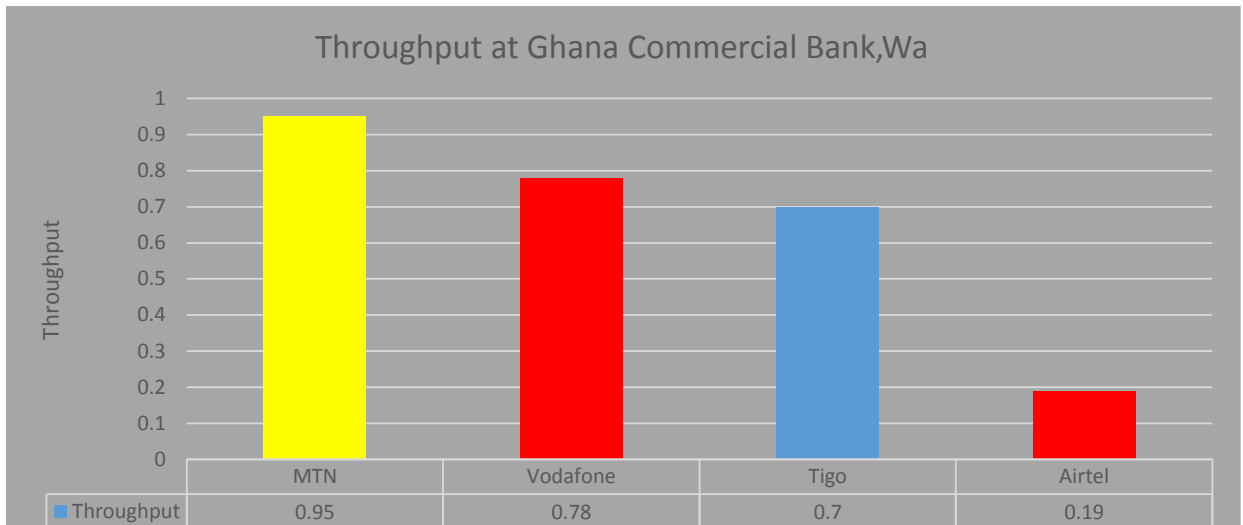
REMARK:

❖ All operators measured below the policy target of 1Mbps.

Figure 2. FTP Downloads-July 2015, UDS campus, Wa

Throughput at UDS campus, Wa

	MTN	Vodafone	Tigo	Airtel
Throughput	1.62	0.57	1.42	0.15
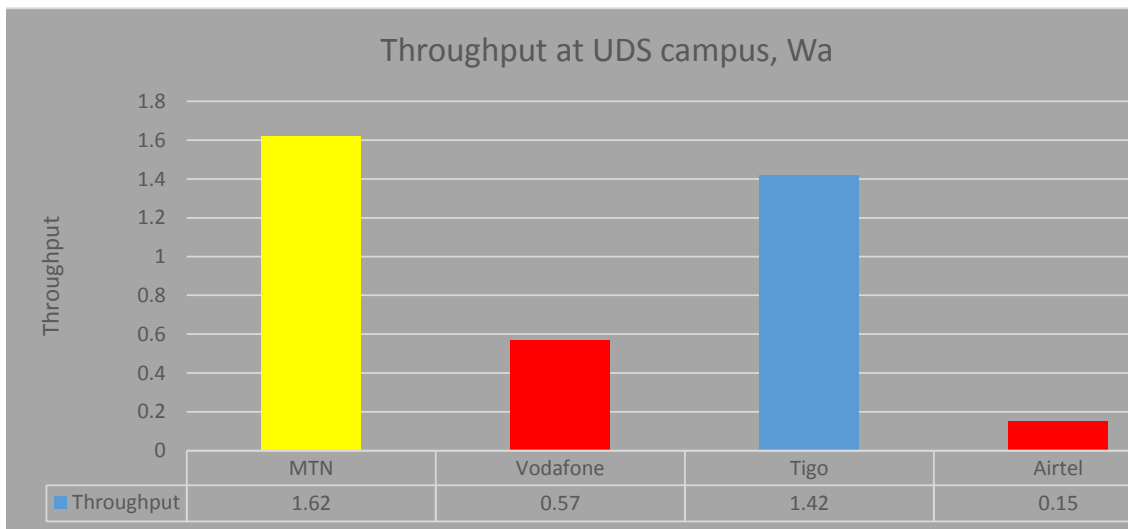
REMARKS:

❖ MTN and Tigo achieved the policy target of 1Mbps at UDS campus.

❖ Vodafone and Airtel measured below the policy target of 1Mbps.

Figure 3. FTP Downloads-July 2015, SSNIT Estate, Wa

Throughput at SSNIT Estate, Wa

	MTN	Vodafone	Tigo	Airtel
■ Throughput	1.04	0.39	0.16	0.11
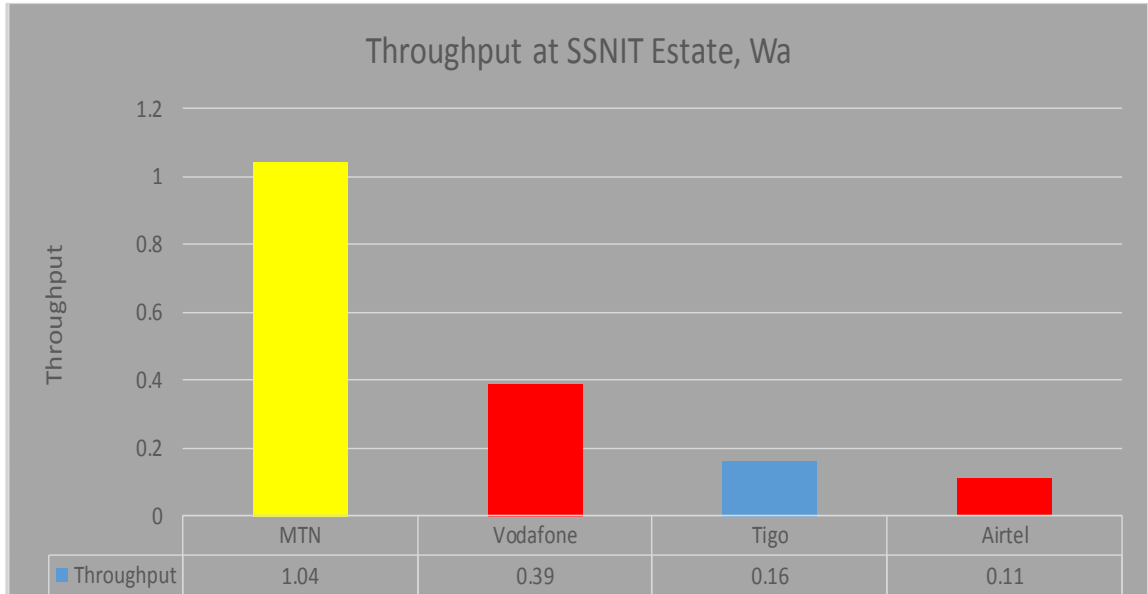
REMARKS:

❖ MTN achieved the policy target of 1Mbps at SSNIT Estate, Wa.

❖ Vodafone, Tigo and Airtel measured below the policy target of 1Mbps.

Figure 4. FTP Downloads-July 2015, Catholic In-service Training Centre
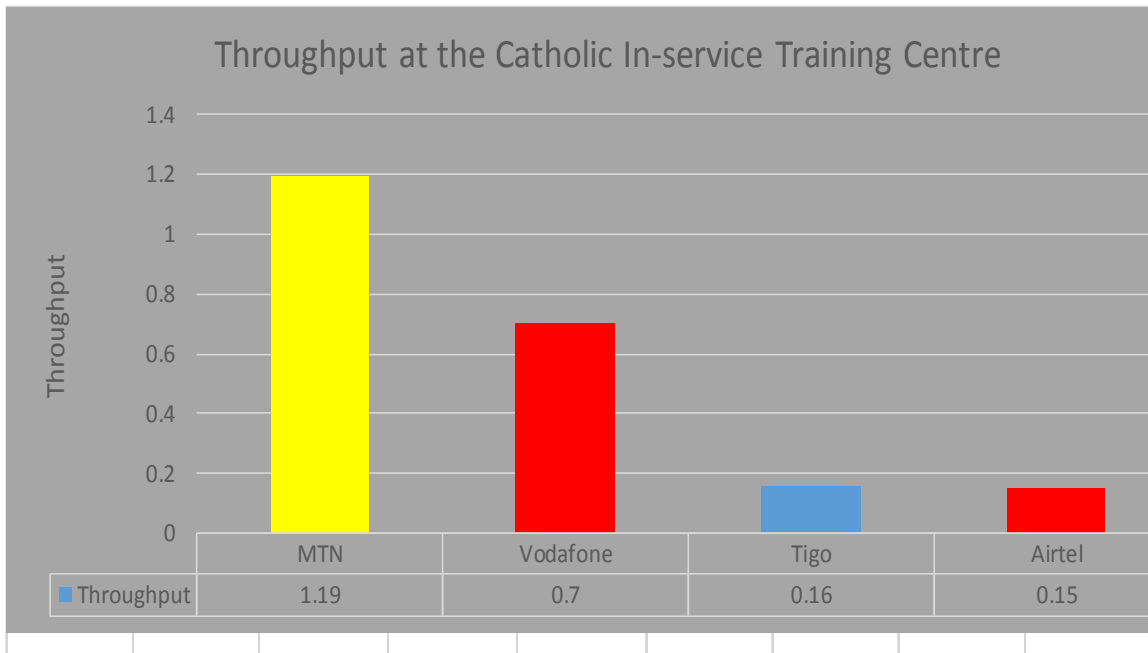
Throughput at the Catholic In-service Training Centre

	MTN	Vodafone	Tigo	Airtel
■ Throughput	1.19	0.7	0.16	0.15

REMARKS:

- ❖ MTN achieved the policy target of 1Mbps at Catholic In-service Training Centre.

- ❖ Vodafone, Tigo and Airtel measured below the policy target of 1Mbps.

Figure 5. FTP Downloads-July 2015, Teagber
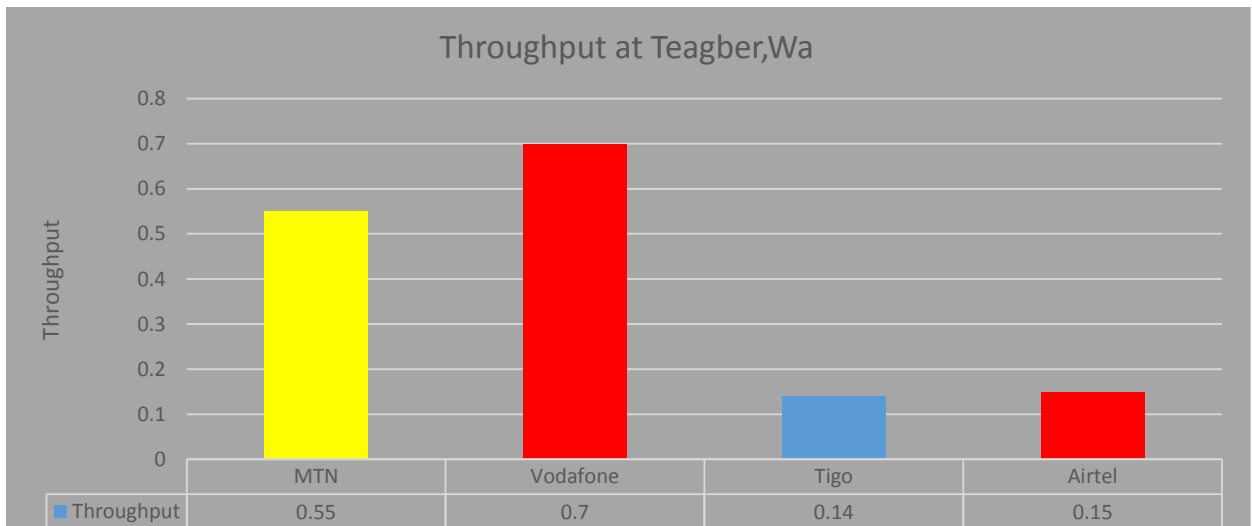
REMARK:

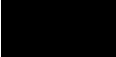- ❖ All operators measured below the policy target of 1Mbps at Teagber, Wa.

REMEDIES

- ❖ The NCA has notified Operators of publication of these findings and directed all Operators to improve their performance by December 2015.

COVERAGE SIGNAL STRENGTH

The Maps below show the coverage level in suburbs of Wa where monitoring was performed. The coverage map is a combination of both 2G and 3G network signal strength. In each plot is a legend to indicate definitions of signal strength and quality range attain by operators during measurement.

Coverage levels in green falls in the rage of -85dBm and above are considered good. Those between -85 and -95dBm are considered fair and are indicated in yellow. The red samples represent poor coverage in the range of -95 to -110dBm. The black samples represent areas with no coverage.
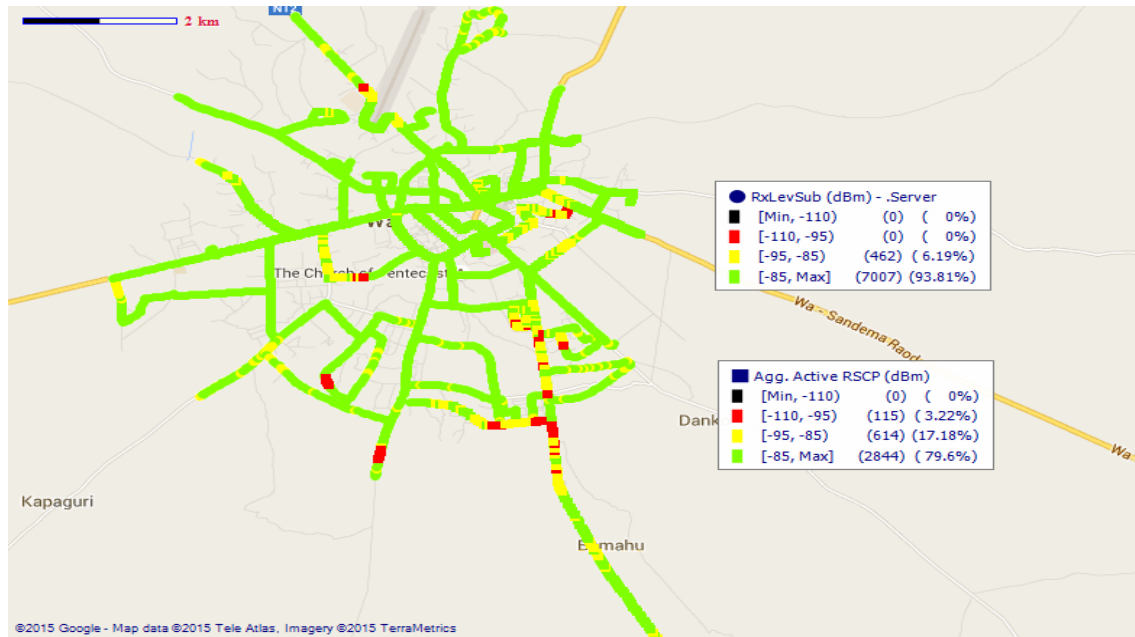
Coverage Legend

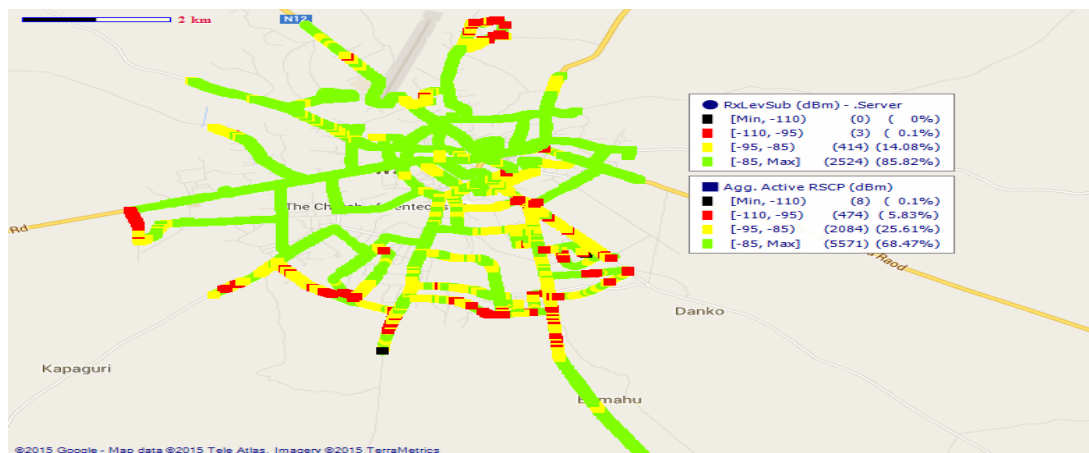| Colour	Area Coverage Rating
	Good Coverage Areas
	Fair Coverage Areas
	Poor Coverage Areas
	Non-Existent Coverage Areas

MTN

Figure 6. Wa Coverage Map

Remarks: Good network coverage across Wa with few scattered spots of bad coverage around SSNIT Estates which require improvement.

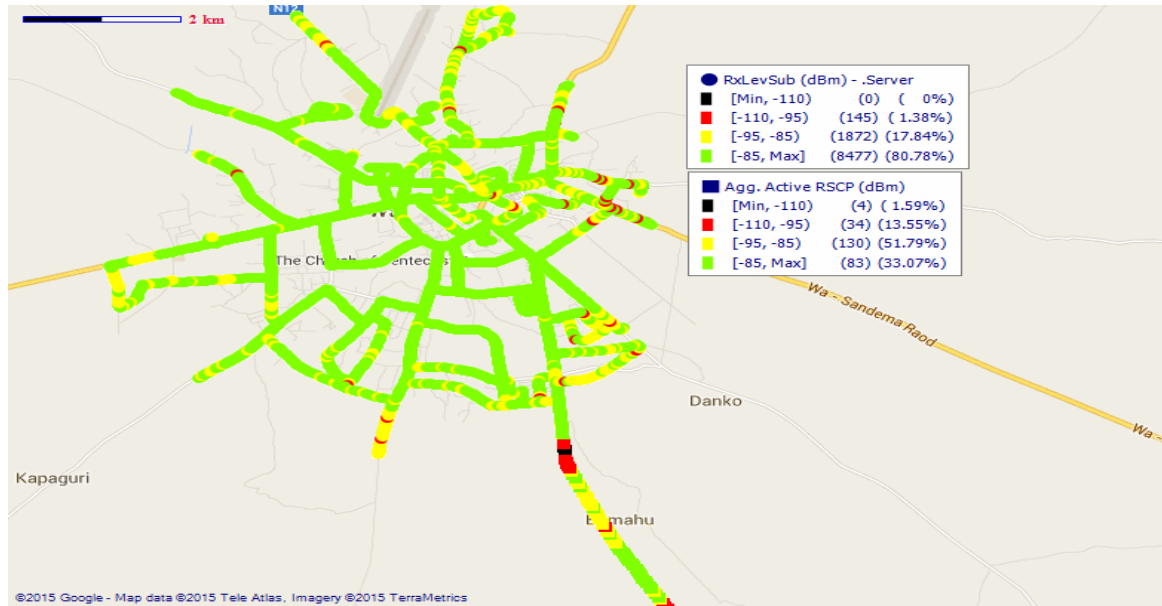**VODAFONE**

Figure 7. Wa Coverage Map

Remarks: Good coverage at the central areas of Wa with poor coverage at the southern part and around the Airstrip which require improvements.
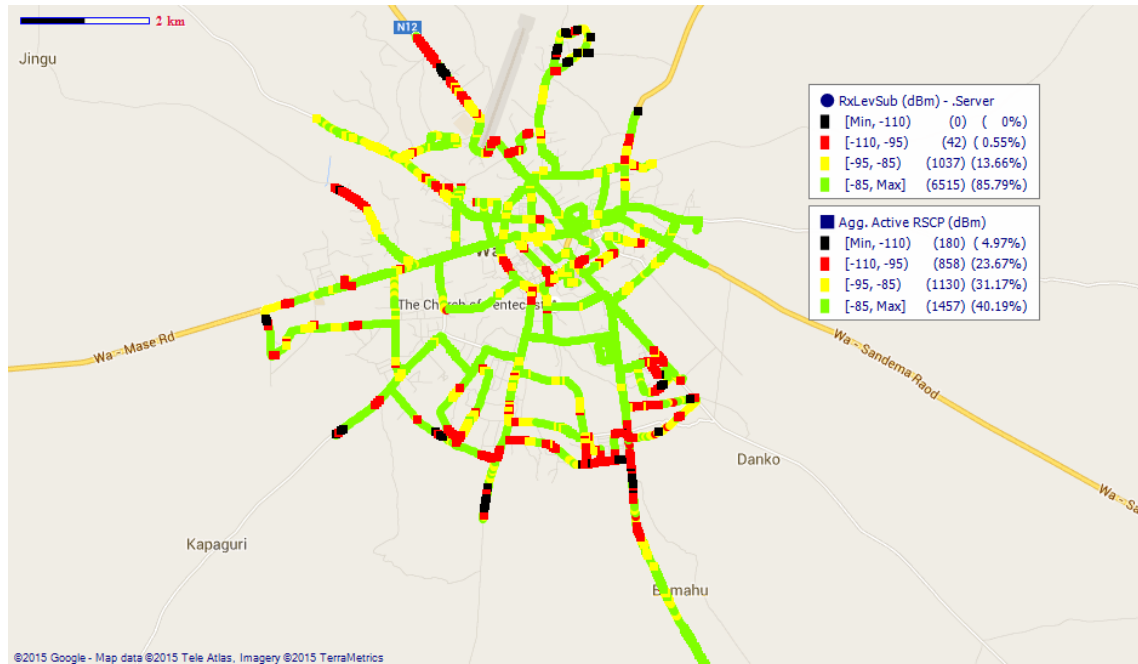
TIGO

Figure 8. Wa Coverage Map

Remarks: Good 2G coverage across Wa, yet major 3G coverage improvements required especially at the University of Development Studies Campus.

AIRTEL

Figure 9. Wa Coverage Map

Remarks: Good 2G network coverage in central parts of Wa. Areas around SSNIT Estates and the Airstrip need major 2G and 3G coverage improvement.