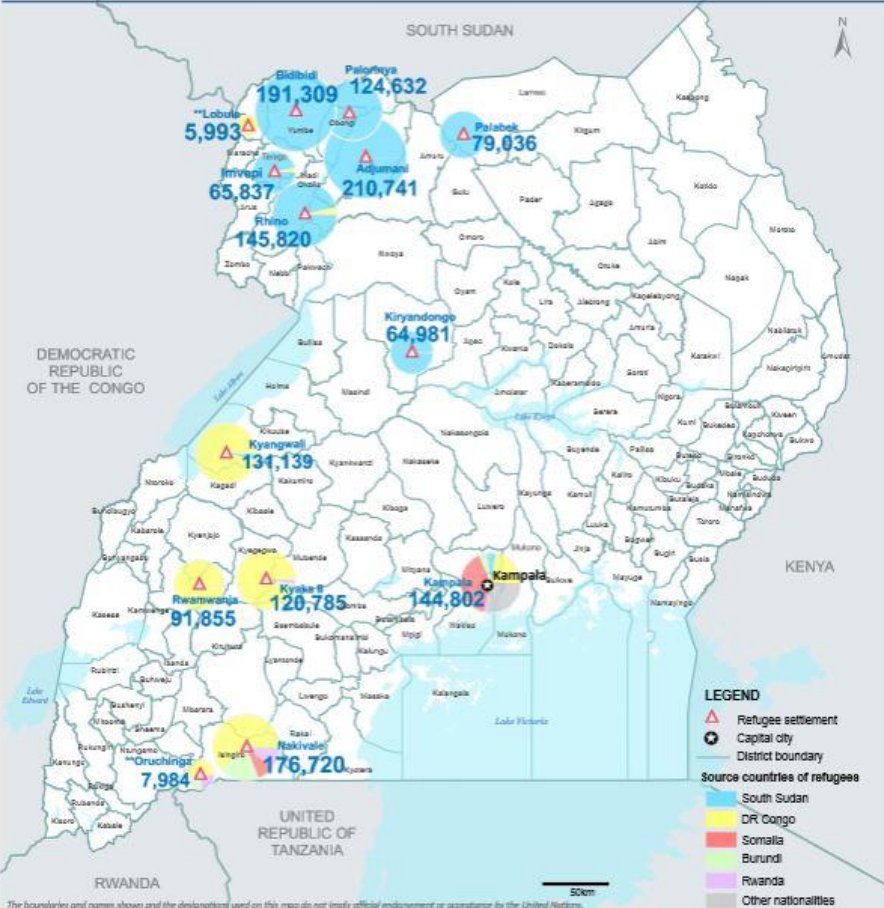
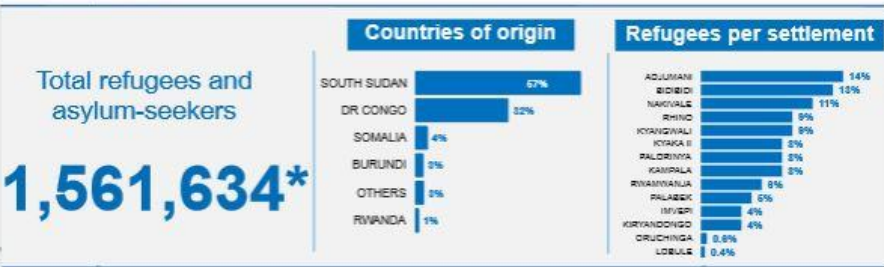




Refugees and Asylum-Seekers in Uganda

Uganda Refugee Response

30 June 2023

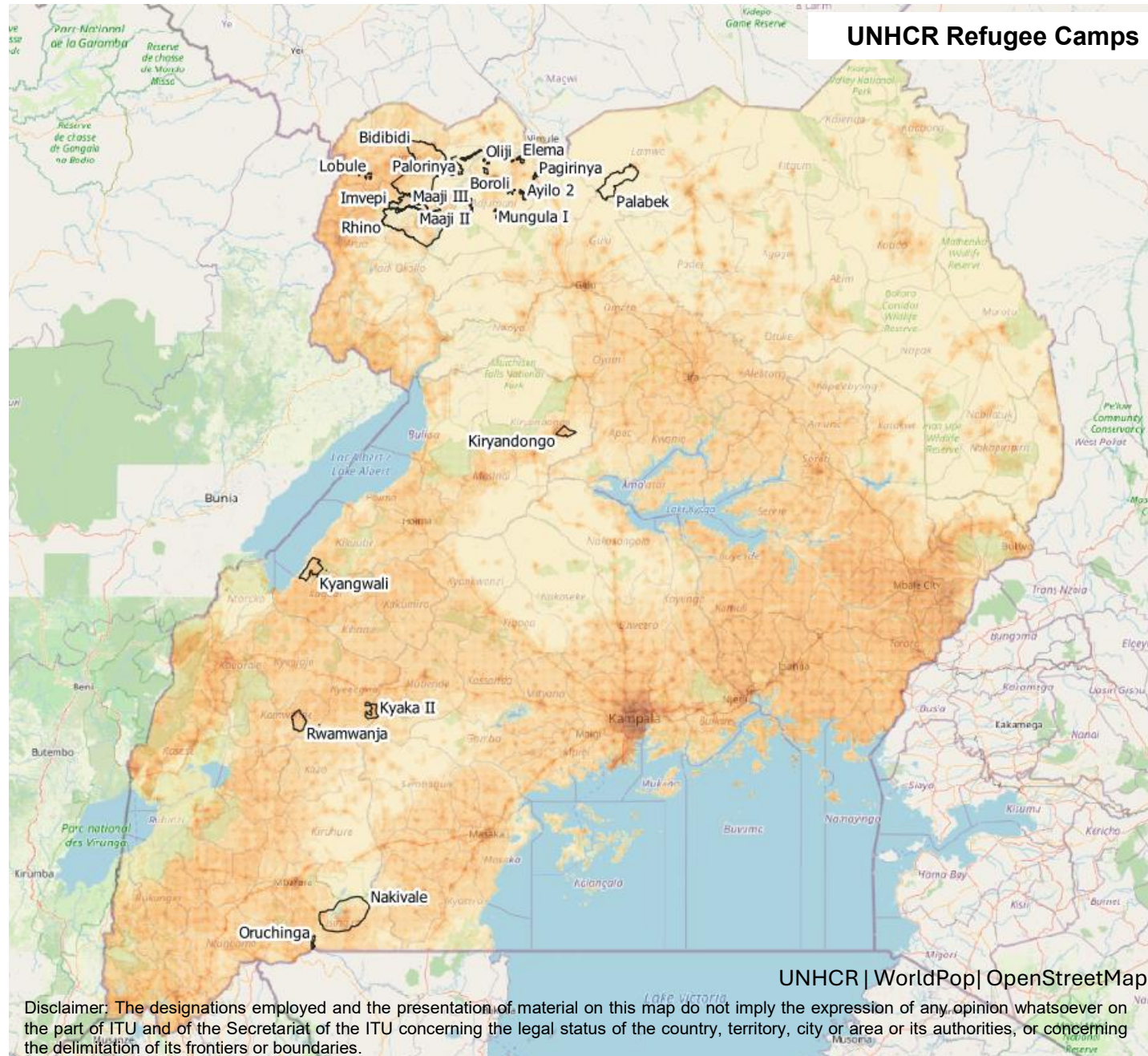
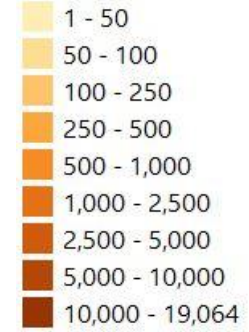


Key findings

Refugee camp connectivity assessment, Uganda

- There are 30 refugee camps in Uganda, with a total population of 1,561,634 as at 30 June 2023 (source: UNHCR). These refugees come from South Sudan (57%), DRC (32%), Somalia (4%), Burundi (3%) and Rwanda (1%). The population of these camps is increasing, with thousands more having moved to these camps in the last year.
- **Near ubiquitous 2G and 3G+ cellular coverage.** There is almost ubiquitous 2G and 3G+ mobile cellular coverage of these 30 refugee camps, with a few gaps. By comparing against 2G and 3G+ cellular coverage datasets, 99.6% of the area of these camps were covered by 2G networks, and 98.9% of the area was covered by 3G+ networks. 0.4% of the area of these camps was beyond the reach of networks (in Palabek camp only).
- **Only 44 people offline, beyond the reach of all fixed broadband, 2G and 3G+ networks.** The EW4All study identifies 79,963 people (0.2%) in Uganda are vulnerable to natural hazards as they cannot receive emergency notifications, because they live in places beyond the reach of fixed broadband, 2G and 3G+ networks. Within refugee camps, only three 1-km cells containing 44 people within the boundaries of refugee camps were found to be beyond the reach of all fixed broadband, 2G and 3G+ networks, a small area in the south west of Palabek refugee camp. So focus therefore is on connectivity performance rather than gaps.
- **Mobile ownership lower in refugee camps than national average.** As a whole, Uganda has 42.1m (86.5%) cellular subscriptions in 2023, and mobile ownership was 22.5m (45.6%). The number of fixed and mobile datapoints received per capita in refugee camps (113 datapoints/ 1,561,634 popn = 0.07 datapoints per thousand people per month) was significantly lower than for the whole of the Uganda (48,353 / 49,332,093 popn = 0.98 datapoints per thousand people per month). This was not because of low population density, since these refugee camps have a high (and increasing) population. The below average occurrence of Speedchecker, Ookla and Facebook datapoints compared to the average for Uganda suggests that there is a lower cellular subscription rate and mobile device ownership in refugee camps compared to the rest of Uganda.
- **Fixed broadband performance far below national average.** The performance of fixed broadband in refugee camps was only 25% of the national average in Uganda. Ookla fixed broadband saw average download speed of 8.3 Mbps compared to 34.2 Mbps, whilst Speedchecker test taken by mobile devices connected to wifi saw an average download speed of 11.4 Mbps compared to 45.1 Mbps. This could be due to the distance from the national long distance fibre optic backbone networks.
- **3G+ cellular performance in line with national average, although several camps below average.** The performance of 3G+ networks in refugee camps was in line with the national average (national average download speed of 18.6 Mbps), but below average results were received from several camps: Bidibidi (14.6 Mbps), Palabek (12.6 Mbps), Kyangwali (4.9 Mbps), Kiryandongo (4.5 Mbps), and Oruchinga (2.1 Mbps). However, due to the low number of results received, for a fully representative sample more test results need to be received to validate these preliminary findings.

Total population
(UNPD, Jan 2024)
49,332,093



UNHCR Refugee Camps

Summary

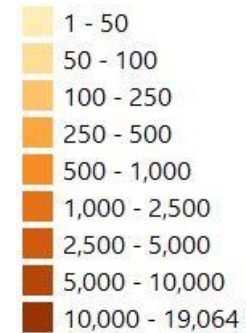
- There are 30 refugee camps in Uganda, with a total population of 1,561,634 as at 30 June 2023 (source: UNHCR). The boundaries of these camps were downloaded from UNHCR Site Map portal, and used to intersect connectivity measurement data.

UNHCR | WorldPop | OpenStreetMap

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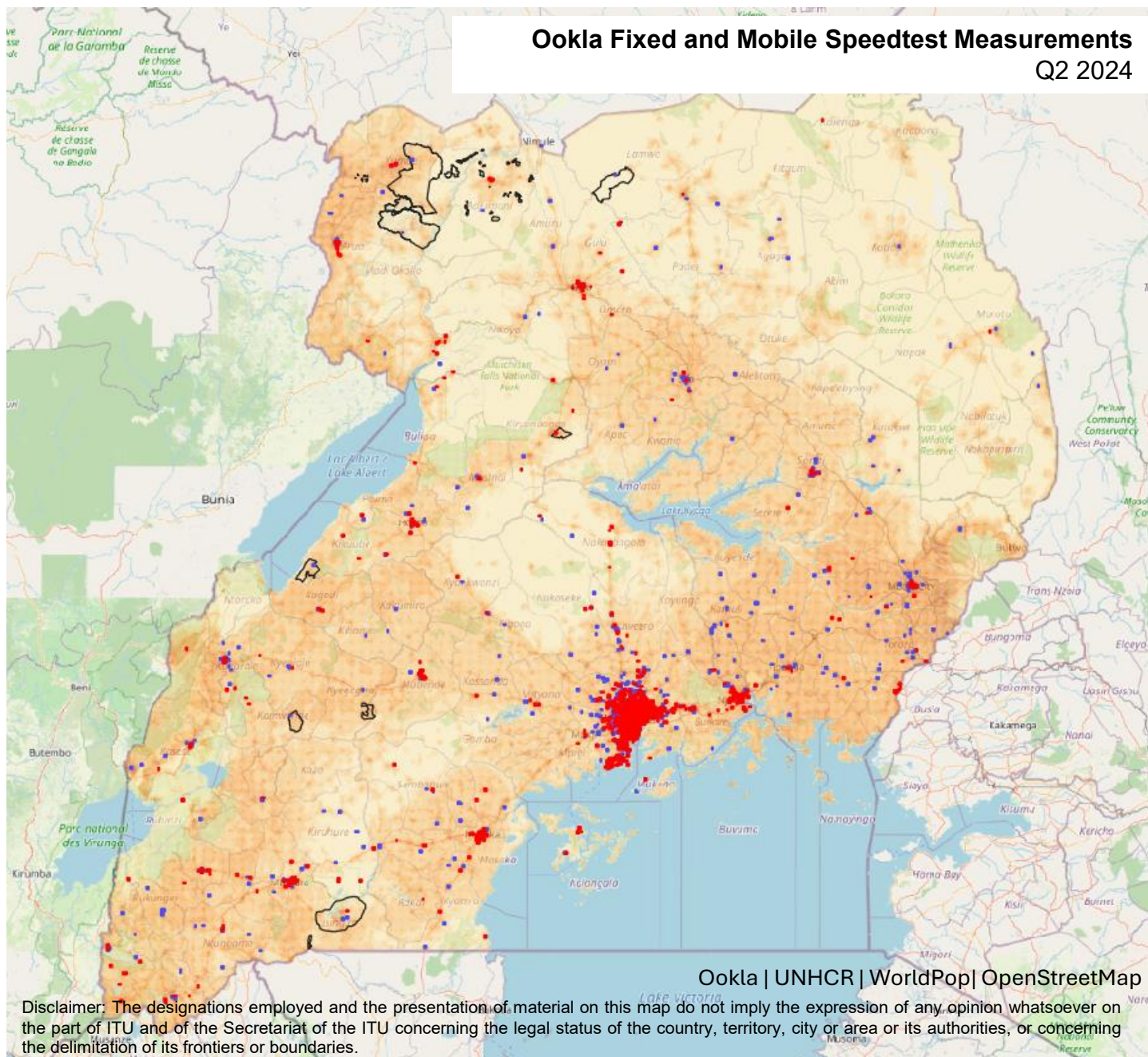
Ookla Fixed and Mobile Speedtest Measurements Q2 2024

Total population (UNPD, Jan 2024)
49,332,093



QoS measurement datapoint

- Fixed
- Mobile



Ookla | UNHCR | WorldPop | OpenStreetMap

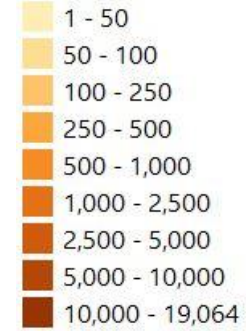
Disclaimer: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of ITU and of the Secretariat of the ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Summary

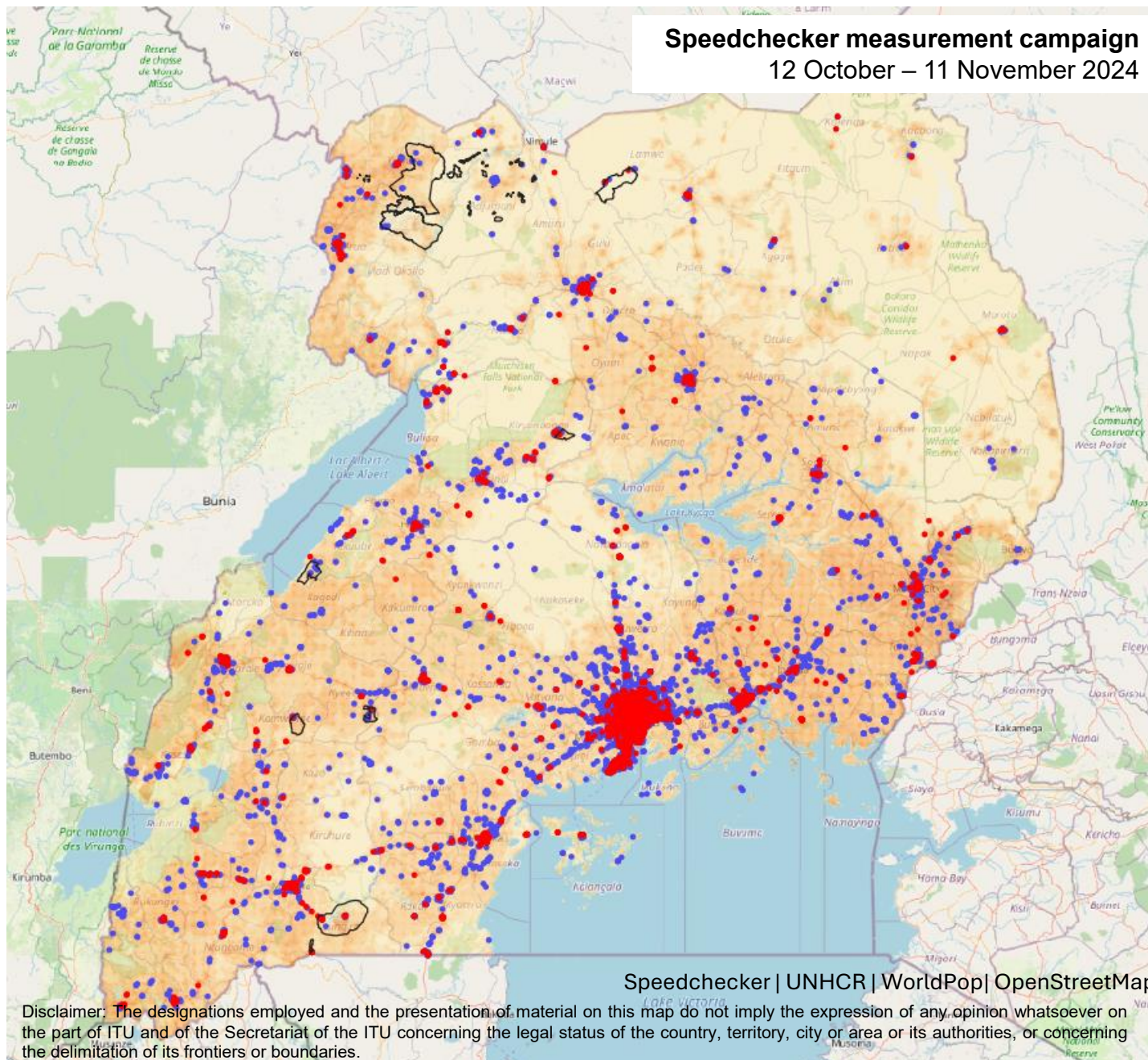
- There are 30 refugee camps in Uganda, with a total population of 1,561,634 as at 30 June 2023 (source: UNHCR). The boundaries of these camps were downloaded from UNHCR Site Map portal, and used to intersect connectivity measurement data.
- **Ookla Speedtest connectivity measurements.** Ookla for Good publish quarterly fixed and mobile SpeedTest results, since 2020. During the latest quarter available Q2 2024, Ookla received 16,150 SpeedTest results in Uganda, including 18 fixed and mobile datapoints from 6 refugee camps. No data was received from the other 24 camps.
- The average download speed for the whole of Uganda was 25.0 Mbps, upload speed was 15.7 Mbps, and latency was 38.5 Ms.

Speedchecker measurement campaign
12 October – 11 November 2024

Total population (UNPD, Jan 2024)
49,332,093



QoS measurement datapoint
• Fixed
• Mobile



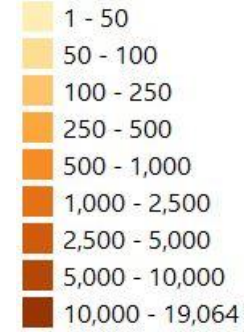
Speedchecker | UNHCR | WorldPop | OpenStreetMap

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- The average download speed for the whole of Uganda was 25.0 Mbps, upload speed was 15.7 Mbps, and latency was 38.5 Ms.
- **Speedchecker measurement campaign.** ITU conducted a Speedchecker connectivity measurement campaign for 1 month from 12 Oct – 11 Nov 2024. In total, 48,353 datapoints were received, around 2,000 datapoints per day.
- Of this total sample, there was a total of 113 mobile datapoints received from 30 refugee camps during this month. Datapoints were received from 11 camps, with no data received from 19 other camps.
- The next slide shows that for all Speedchecker datapoints in Uganda, the average download speed was 18.5 Mbps, upload speed was 9.4 Mbps, and latency was 53.2 Ms.

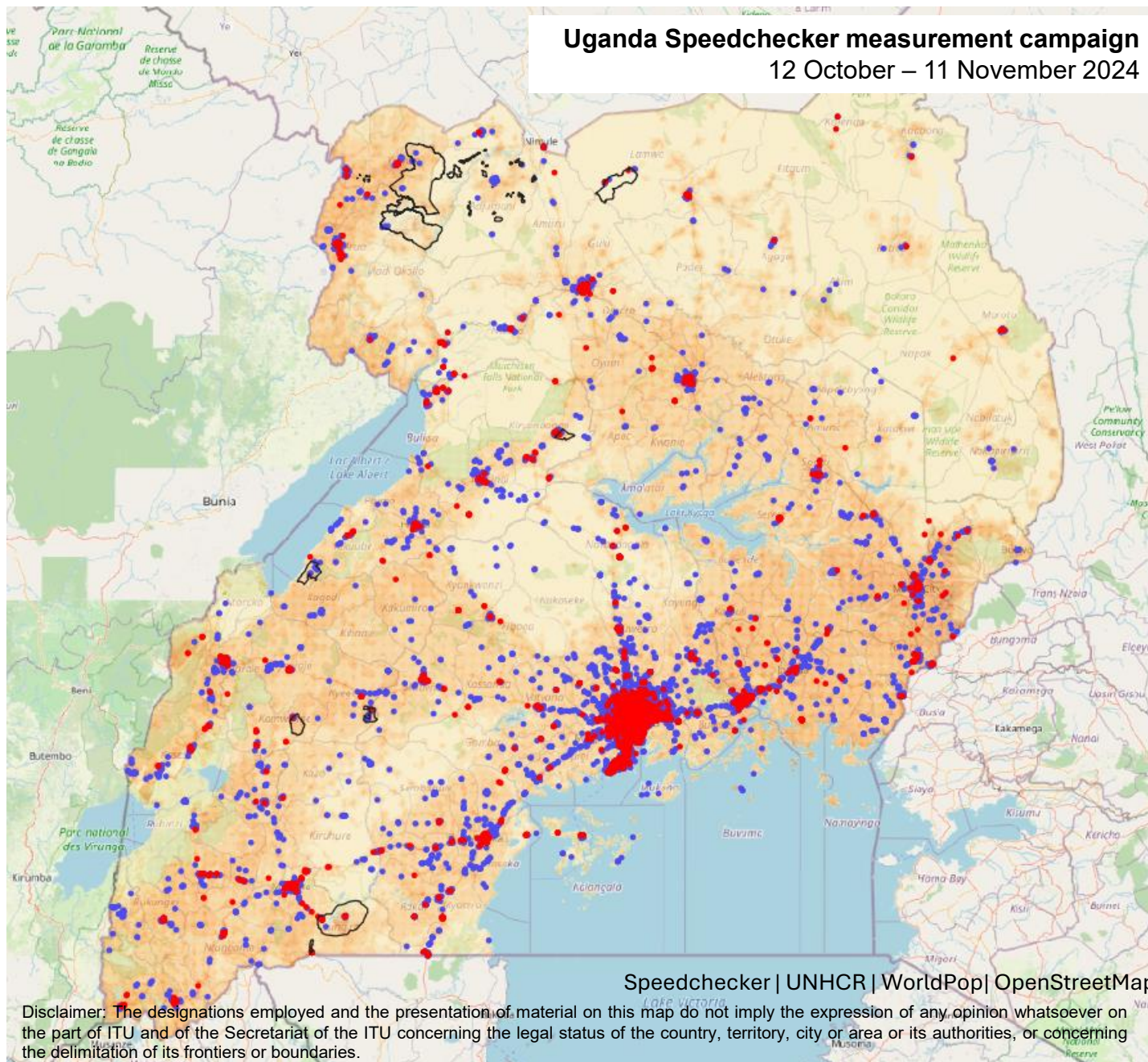
Uganda Speedchecker measurement campaign 12 October – 11 November 2024

Total population
(UNPD, Jan 2024)
49,332,093



QoS measurement
datapoint

- Fixed
- Mobile



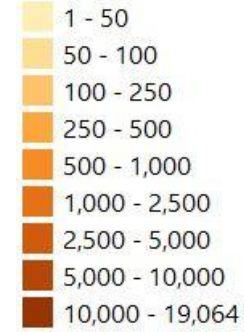
Speedchecker | UNHCR | WorldPop | OpenStreetMap

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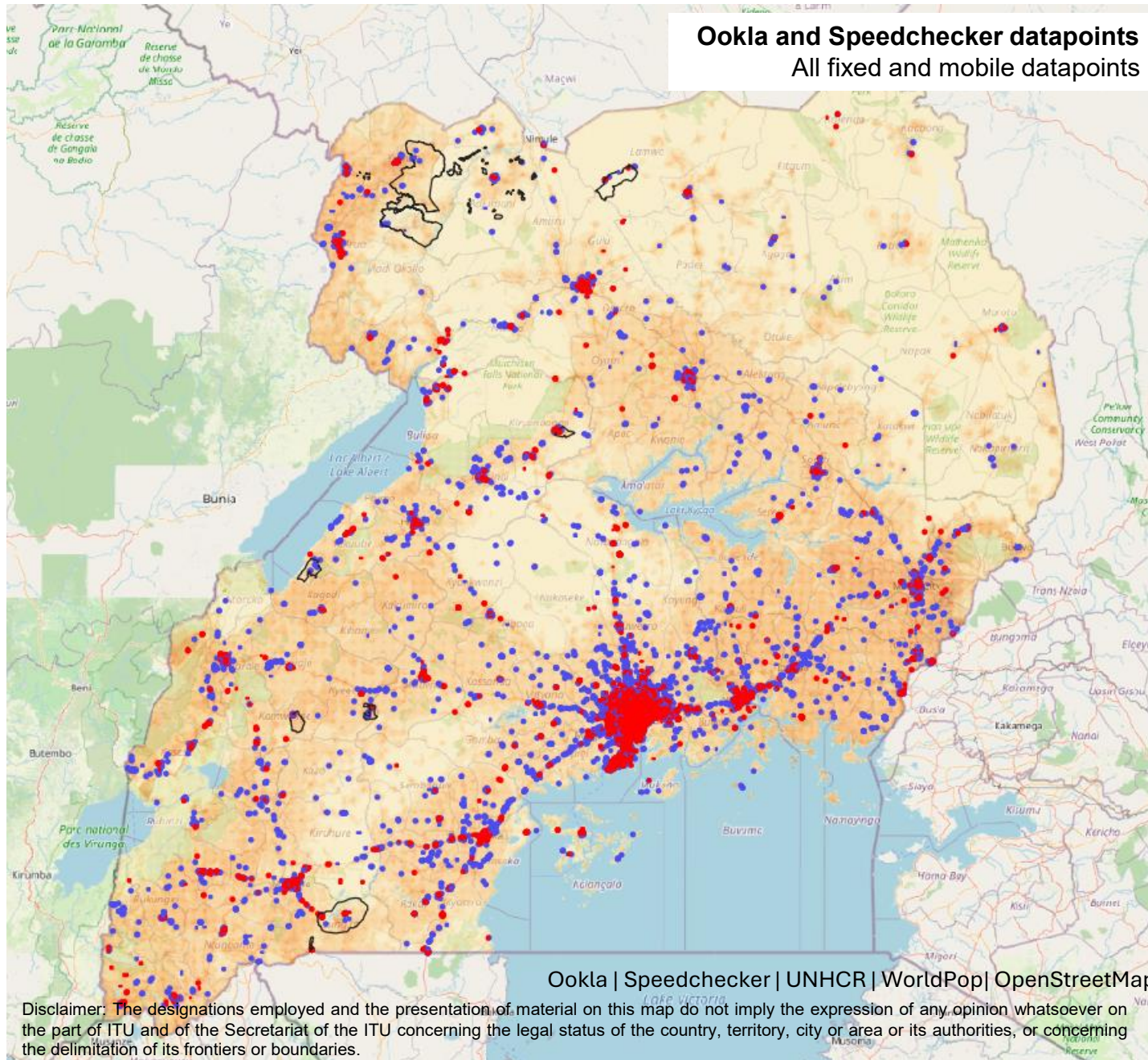
Results by network provider, ranked by download speed

| Network operator | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|---------------------------------|----------------|-----------------------|---------------------|--------------|
| makerere | 18 | 67.5 | 43.1 | 27.3 |
| gva-canalbox | 39 | 38.7 | 8.8 | 47.0 |
| sprint internet limited | 91 | 37.9 | 24.8 | 26.7 |
| nita | 89 | 26.7 | 23.1 | 52.2 |
| liquid intelligent technologies | 135 | 26.0 | 11.0 | 25.8 |
| cheetahnet | 83 | 25.9 | 28.9 | 37.4 |
| mtn uganda | 14,949 | 25.8 | 12.2 | 36.8 |
| bcs | 106 | 24.4 | 17.9 | 99.4 |
| gilat telecom ltd. | 74 | 22.8 | 19.1 | 34.2 |
| kampala-siti-cable | 1,020 | 19.3 | 16.0 | 26.8 |
| airtel uganda | 22,929 | 18.7 | 8.8 | 70.0 |
| simbanet | 209 | 15.2 | 11.4 | 23.2 |
| seacom | 20 | 14.7 | 33.9 | 24.7 |
| echotel-ug echotel | | | | |
| proprietary uganda | 39 | 14.2 | 11.9 | 25.7 |
| uganda telecom | 112 | 12.1 | 12.5 | 66.6 |
| sombha-solutions | 15 | 12.0 | 19.8 | 24.5 |
| renu | 186 | 11.9 | 11.7 | 60.5 |
| wananchi | 502 | 11.9 | 11.9 | 20.5 |
| skylogic s.p.a. | 5 | 11.5 | 3.6 | 639.0 |
| simbanet (u) limited | 29 | 11.4 | 9.5 | 16.9 |
| afriCell uganda ltd | 17 | 11.0 | 4.7 | 38.1 |
| datanet llc | 28 | 11.0 | 4.3 | 26.9 |
| bluecrane | 34 | 10.7 | 18.5 | 43.4 |
| savanna-fibre-limited | 159 | 10.4 | 8.5 | 27.8 |
| roke investments international | 142 | 9.7 | 11.0 | 43.3 |
| datanet-ug datanet llc | 2 | 9.5 | | 27.5 |
| internet-solutions-ke | 14 | 8.2 | 22.4 | 36.1 |
| east-africa-broadband-services | 21 | 5.6 | 11.1 | 31.3 |
| tangerine-ug | 7,284 | 4.0 | 3.8 | 42.5 |
| Grand Total | 48,353 | 18.5 | 9.4 | 53.2 |

Total population (UNPD, Jan 2024)
49,332,093



QoS measurement datapoint
• Fixed
• Mobile



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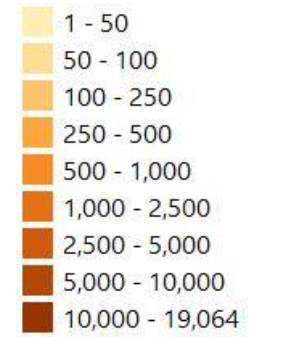
Speedchecker, average measurements, Q3 2024

| Refugee camp | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|------------------------|----------------|-----------------------|---------------------|--------------|
| Pagrinya | 1 | 61.2 | | 44.0 |
| Ramwanja | 7 | 39.9 | 2.0 | 50.4 |
| Rhino | 9 | 35.2 | 9.8 | 65.8 |
| Nyumanzi | 1 | 20.2 | | 112.0 |
| Nakivale | 49 | 18.8 | 6.3 | 73.2 |
| Kyaki II | 14 | 18.5 | 0.7 | 59.8 |
| Bidibidi | 8 | 14.6 | 4.6 | 75.8 |
| Palabek | 10 | 12.6 | 3.6 | 52.8 |
| Kyangwali | 7 | 4.9 | 2.4 | 49.3 |
| Kiryandongo | 6 | 4.5 | 11.3 | 77.3 |
| Oruchinga | 1 | 2.1 | | 64.0 |
| Subtotal refugee camps | 113 | 19.7 | 5.5 | 66.7 |
| Uganda total | 48,353 | 18.5 | 9.4 | 53.2 |

Ookla, average SpeedTests, Q2 2024

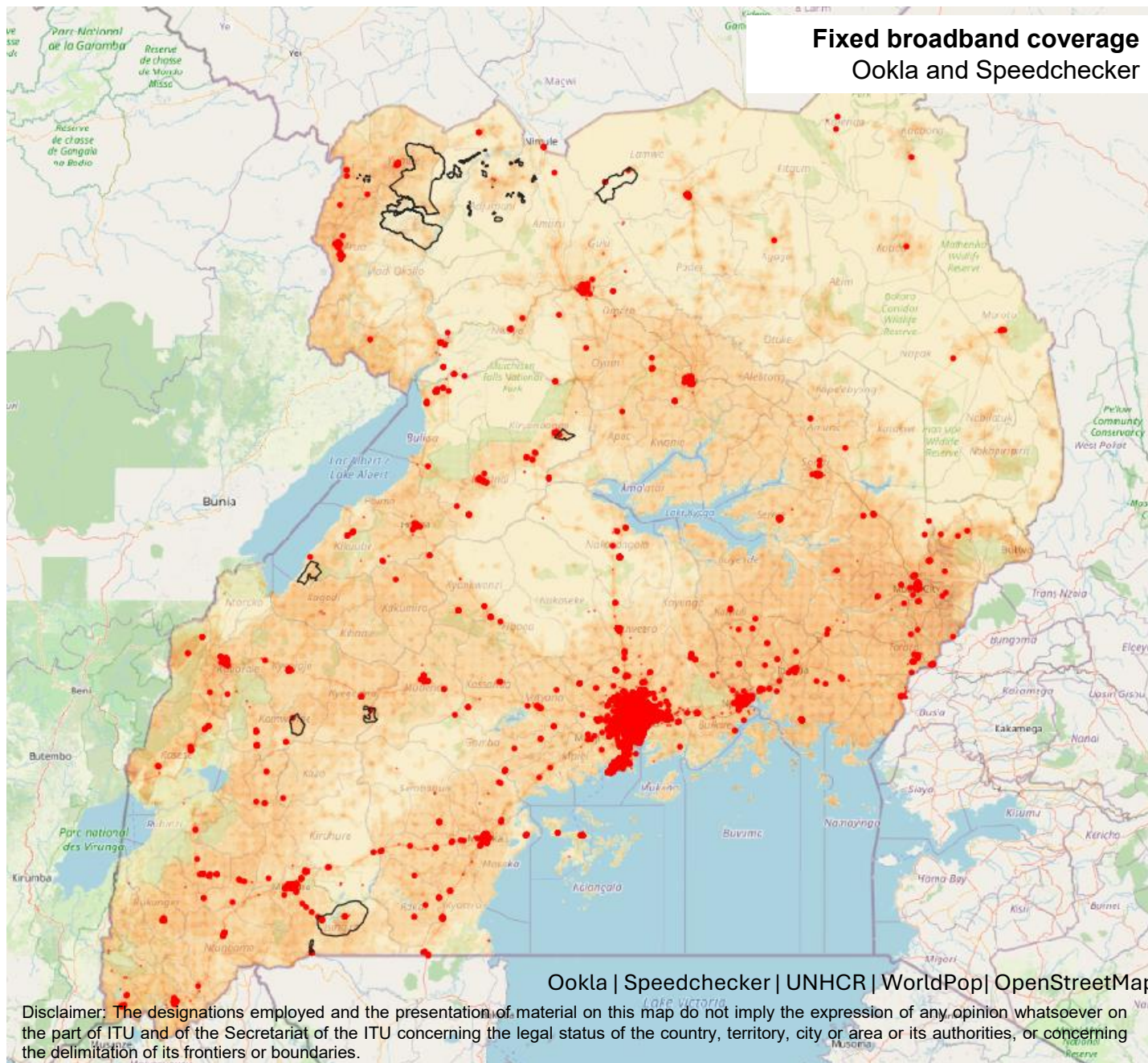
| Refugee camp | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|------------------------|----------------|-----------------------|---------------------|--------------|
| Bidibidi | 6 | 3.8 | 1.4 | 47.0 |
| Kiryandongo | 2 | 15.9 | 15.4 | 12.0 |
| Kyangwali | 2 | 3.9 | 4.9 | 27.0 |
| Nakivale | 6 | 9.7 | 2.7 | 25.5 |
| Ramwanja | 1 | 10.7 | 1.8 | 29.0 |
| Rhino | 1 | 46.0 | 24.3 | 23.0 |
| Subtotal refugee camps | 18 | 12.3 | 6.0 | 28.7 |
| Uganda total | 16,150 | 25.0 | 15.7 | 38.5 |

Total population (UNPD, Jan 2024)
49,332,093



QoS measurement datapoint

- Fixed (Red dot)
- Mobile (Blue dot)

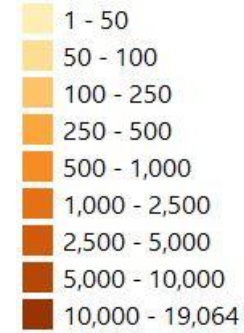


Fixed broadband coverage

The coverage of fixed broadband datapoints received in refugee camps was much below the national average.

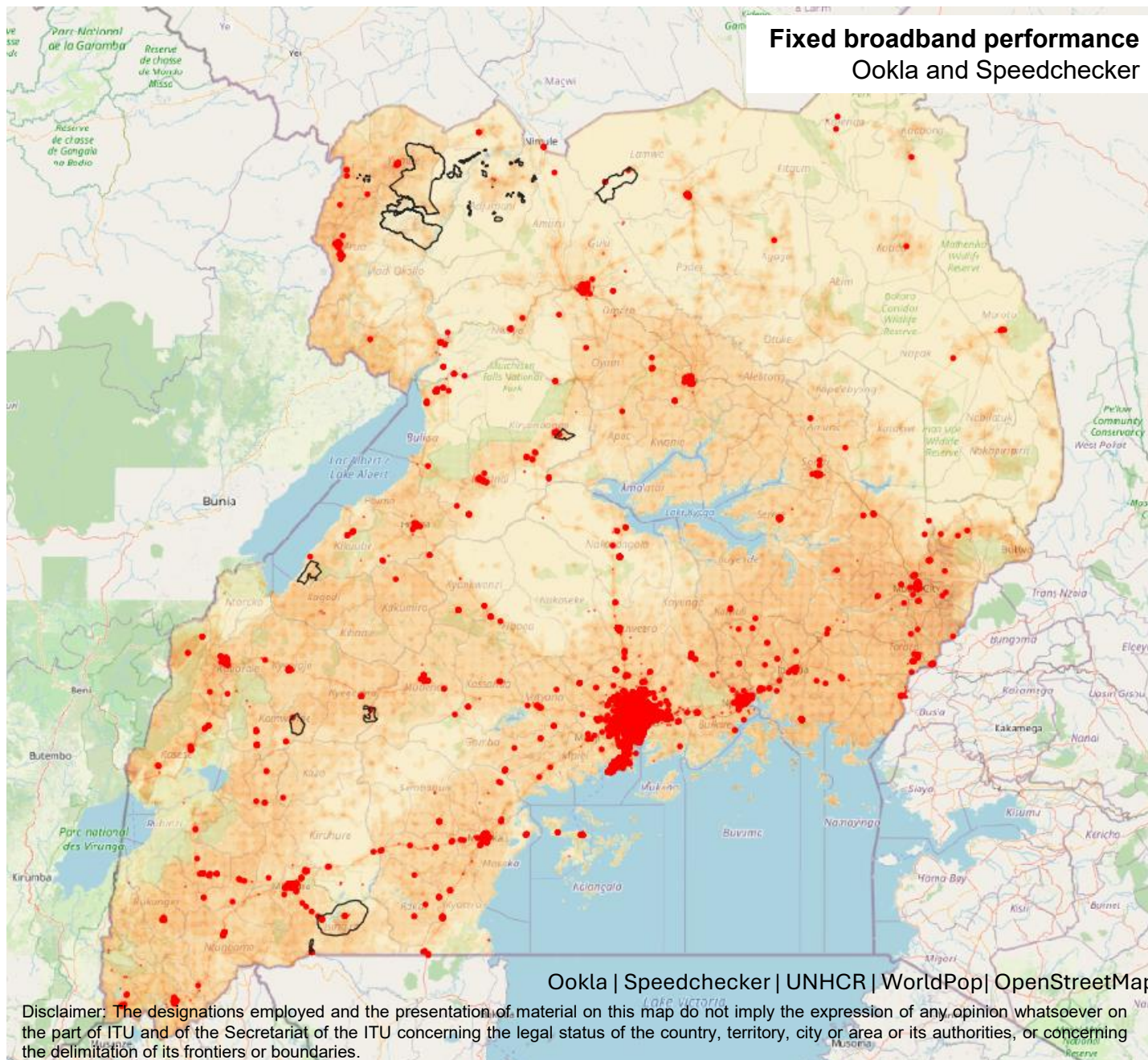
| Refugee camp | Speed checker % area | Ookla % area | Speed checker % popn | Ookla % popn |
|------------------------|----------------------|--------------|----------------------|--------------|
| Agojo | 0.0% | 0.0% | 0.0% | 0.0% |
| Alere II | 0.0% | 0.0% | 0.0% | 0.0% |
| Ayilo 1 | 0.0% | 0.0% | 0.0% | 0.0% |
| Ayilo 2 | 0.0% | 0.0% | 0.0% | 0.0% |
| Baratuku | 0.0% | 0.0% | 0.0% | 0.0% |
| Bidibidi | 0.0% | 0.0% | 0.0% | 0.0% |
| Boroli | 0.0% | 0.0% | 0.0% | 0.0% |
| Elema | 0.0% | 0.0% | 0.0% | 0.0% |
| Imvepi | 0.0% | 0.0% | 0.0% | 0.0% |
| Kiryandongo | 2.8% | 5.6% | 6.1% | 11.9% |
| Kyaka II | 1.2% | 0.0% | 2.0% | 0.0% |
| Kyangwali | 0.0% | 0.0% | 0.0% | 0.0% |
| Lobule | 0.0% | 0.0% | 0.0% | 0.0% |
| Maaji I | 0.0% | 0.0% | 0.0% | 0.0% |
| Maaji II | 0.0% | 0.0% | 0.0% | 0.0% |
| Maaji III | 0.0% | 0.0% | 0.0% | 0.0% |
| Mirieyi | 0.0% | 0.0% | 0.0% | 0.0% |
| Mungula 2 | 0.0% | 0.0% | 0.0% | 0.0% |
| Mungula I | 0.0% | 0.0% | 0.0% | 0.0% |
| Nakivale | 0.5% | 0.3% | 3.2% | 0.5% |
| Nymanzi | 0.0% | 0.0% | 0.0% | 0.0% |
| Oliji | 0.0% | 0.0% | 0.0% | 0.0% |
| Olua 1 | 0.0% | 0.0% | 0.0% | 0.0% |
| Olua 2 | 0.0% | 0.0% | 0.0% | 0.0% |
| Oruchinga | 0.0% | 0.0% | 0.0% | 0.0% |
| Pagirinya | 0.0% | 0.0% | 0.0% | 0.0% |
| Palabek | 0.6% | 0.0% | 0.7% | 0.0% |
| Palorinya | 0.0% | 0.0% | 0.0% | 0.0% |
| Rhino | 0.0% | 0.0% | 0.0% | 0.0% |
| Rwamwanja | 0.9% | 0.0% | 1.8% | 0.0% |
| Subtotal refugee camps | 0.3% | 0.2% | 1.3% | 0.6% |
| Uganda total | 0.5% | 0.7% | 15.5% | 17.9% |

Total population
(UNPD, Jan 2024)
49,332,093



QoS measurement
datapoint

- Fixed
- Mobile



Fixed broadband connectivity

There was a total of 37 datapoints received from 8 refugee camps during this period, including 21 Speedchecker datapoints in 5 camps and 16 Ookla datapoints in 4 camps.

The performance of fixed broadband in refugee camps was only about 25% of the average for Uganda. Ookla fixed broadband saw average download speed of 8.3 Mbps compared to 34.2 Mbps, whilst Speedchecker tests taken by mobile devices connected to wifi saw an average download speed of 11.4 Mbps compared to 45.1 Mbps.

Speedchecker, average fixed measurements, Q3 2024

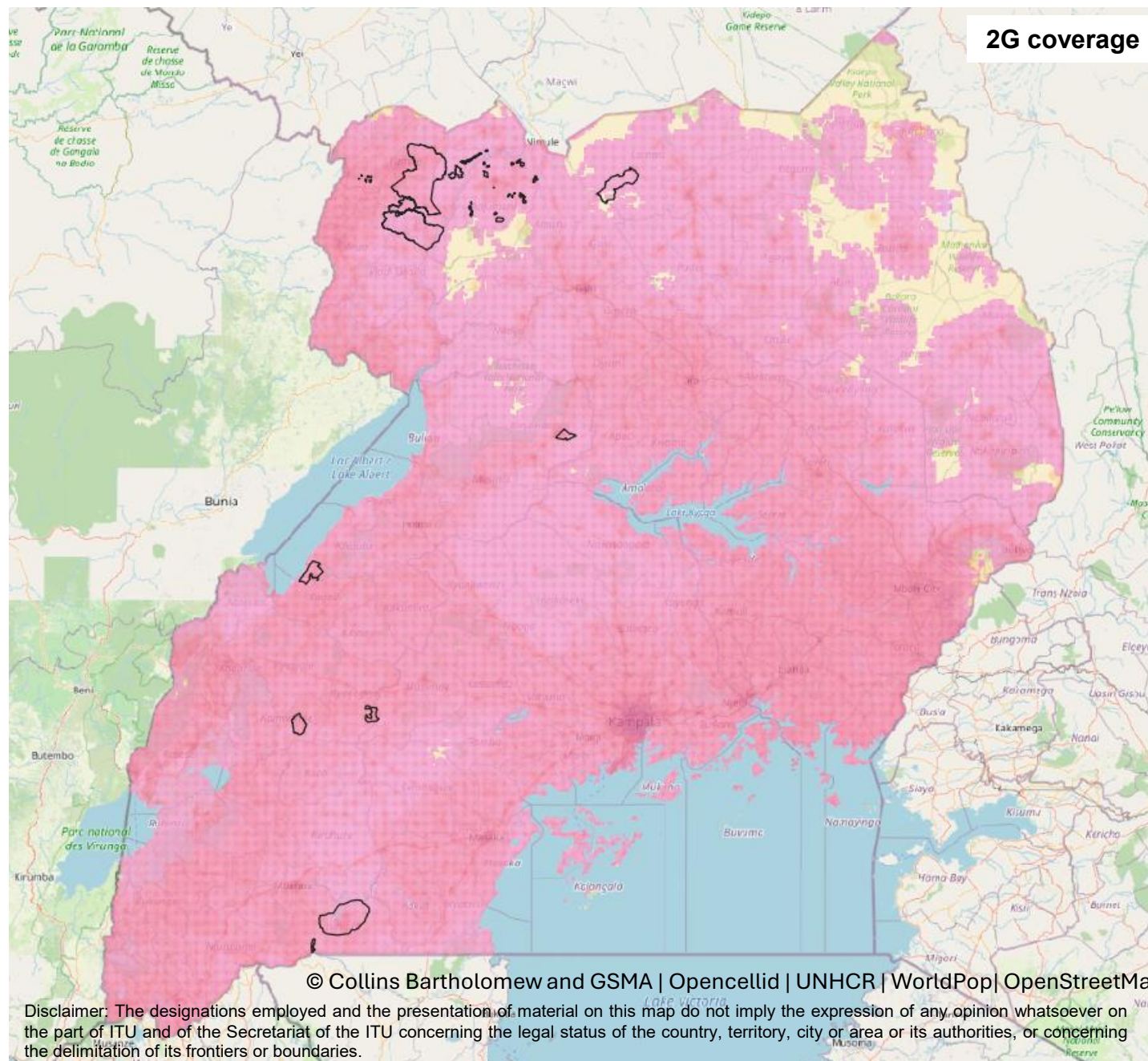
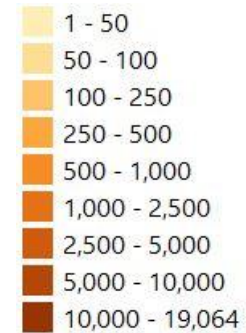
| Refugee camp | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|------------------------|----------------|-----------------------|---------------------|--------------|
| Kyaki II | 2 | 34.5 | | 107.0 |
| Nakivale | 12 | 10.4 | 4.7 | 106.3 |
| Ramwanja | 1 | 6.1 | | 93.0 |
| Palabek | 5 | 3.8 | 3.9 | 61.8 |
| Kiryandongo | 1 | 2.4 | | 102.0 |
| Subtotal refugee camps | 21 | 11.4 | 4.4 | 94.9 |
| Uganda total | 8,693 | 45.1 | 12.7 | 15.4 |

Ookla, average fixed SpeedTests, Q2 2024

| Refugee camp | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|------------------------|----------------|-----------------------|---------------------|--------------|
| Kiryandongo | 2 | 15.9 | 15.4 | 12.0 |
| Nakivale | 6 | 9.7 | 2.7 | 25.5 |
| Kyangwali | 2 | 3.9 | 4.9 | 27.0 |
| Bidibidi | 6 | 3.8 | 1.4 | 47.0 |
| Subtotal refugee camps | 16 | 8.3 | 6.1 | 27.9 |
| Uganda total | 4,522 | 34.2 | 15.7 | 42.1 |

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Total population
(UNPD, Jan 2024)
49,332,093



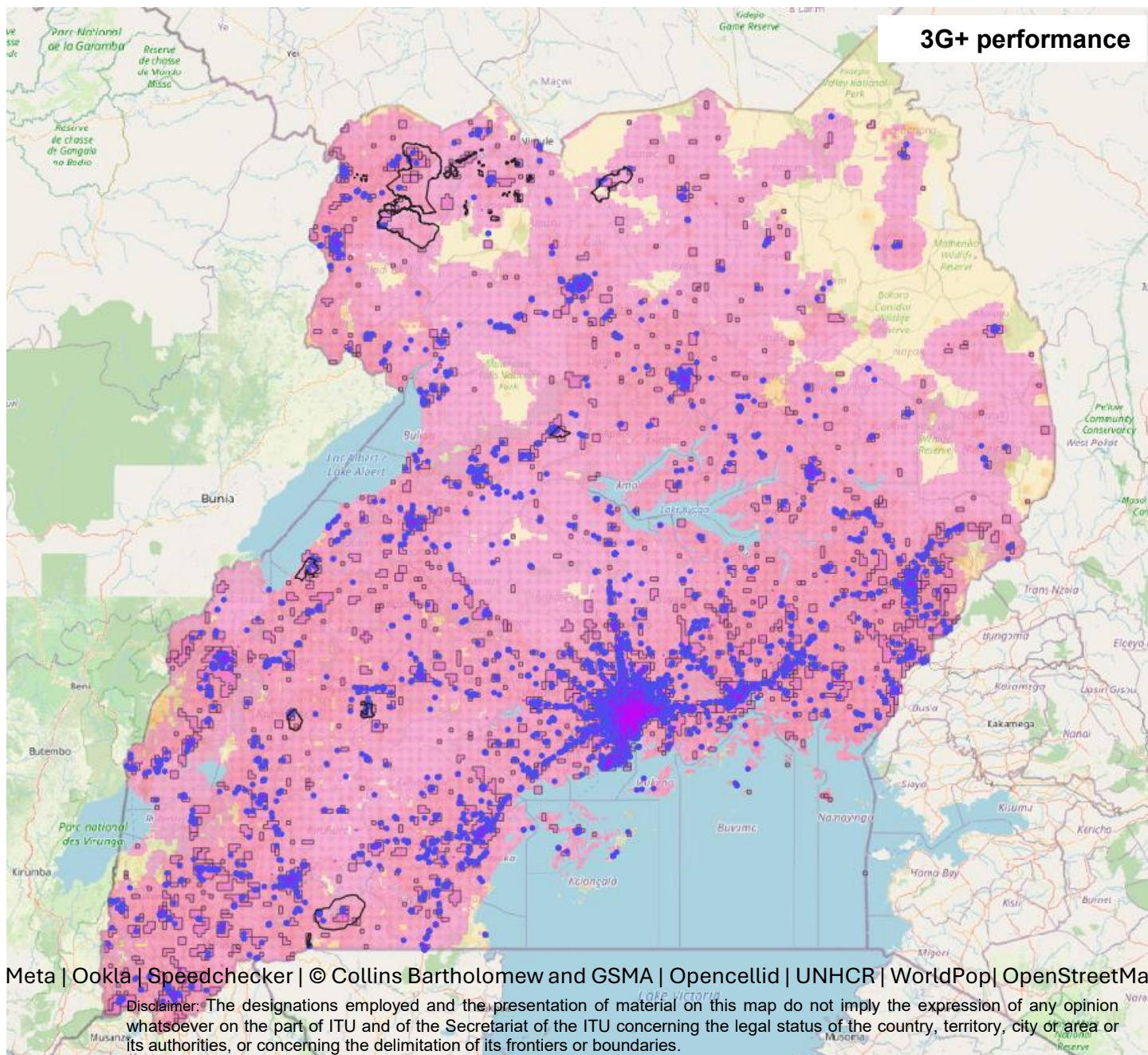
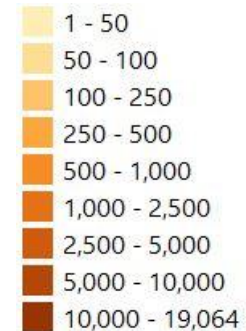
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2G and 3G+ cellular connectivity

By comparing against 2G and 3G+ cellular coverage datasets, there was 99.6% coverage of 2G networks in refugee camps, and 98.9% coverage of 3G+ networks. Only 0.4% of the area was beyond the reach of networks.

| Refugee camp | cellular coverage % | 2G coverage % | 3G coverage % | Offline % |
|-----------------|---------------------|---------------|---------------|-------------|
| Agojo | 100.0% | 100.0% | 100.0% | 0.0% |
| Alere II | 100.0% | 100.0% | 100.0% | 0.0% |
| Ayilo 1 | 100.0% | 100.0% | 100.0% | 0.0% |
| Ayilo 2 | 100.0% | 100.0% | 100.0% | 0.0% |
| Baratuku | 100.0% | 100.0% | 100.0% | 0.0% |
| Bidibidi | 100.0% | 100.0% | 99.7% | 0.0% |
| Boroli | 100.0% | 100.0% | 100.0% | 0.0% |
| Elema | 100.0% | 100.0% | 100.0% | 0.0% |
| Imvepi | 100.0% | 100.0% | 100.0% | 0.0% |
| Kiryandongo | 100.0% | 100.0% | 100.0% | 0.0% |
| Kyaka II | 100.0% | 100.0% | 100.0% | 0.0% |
| Kyangwali | 100.0% | 100.0% | 98.7% | 0.0% |
| Lobule | 100.0% | 100.0% | 100.0% | 0.0% |
| Maaji I | 100.0% | 100.0% | 100.0% | 0.0% |
| Maaji II | 100.0% | 100.0% | 100.0% | 0.0% |
| Maaji III | 100.0% | 100.0% | 100.0% | 0.0% |
| Mirieyi | 100.0% | 100.0% | 100.0% | 0.0% |
| Mungula 2 | 100.0% | 100.0% | 100.0% | 0.0% |
| Mungula I | 100.0% | 100.0% | 100.0% | 0.0% |
| Nakivale | 100.0% | 100.0% | 100.0% | 0.0% |
| Nyumanzi | 100.0% | 100.0% | 100.0% | 0.0% |
| Oliji | 100.0% | 100.0% | 100.0% | 0.0% |
| Olua 1 | 100.0% | 100.0% | 100.0% | 0.0% |
| Olua 2 | 100.0% | 100.0% | 100.0% | 0.0% |
| Oruchinga | 100.0% | 100.0% | 95.7% | 0.0% |
| Pagirinya | 100.0% | 100.0% | 100.0% | 0.0% |
| Palabek | 95.8% | 87.7% | 86.1% | 4.2% |
| Palorinya | 100.0% | 100.0% | 100.0% | 0.0% |
| Rhino | 100.0% | 100.0% | 97.9% | 0.0% |
| Rwamwanja | 100.0% | 100.0% | 99.1% | 0.0% |
| Subtotal | 99.6% | 98.9% | 98.1% | 0.4% |

Total population
(UNPD, Jan 2024)
49,332,093



3G+ performance

3G+ cellular connectivity performance

There was a total of 128 mobile datapoints received from 11 refugee camps during this period, including 113 Speedchecker datapoints in 11 camps and 15 Ookla datapoints in 5 camps.

Speedchecker, average mobile measurements, Q3 2024

| Refugee camp | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|------------------------|----------------|-----------------------|---------------------|--------------|
| Pagrinya | 1 | 61.2 | | 44.0 |
| Ramwanja | 7 | 39.9 | 2.0 | 50.4 |
| Rhino | 9 | 35.2 | 9.8 | 65.8 |
| Nyumanzi | 1 | 20.2 | | 112.0 |
| Nakivale | 49 | 18.8 | 6.3 | 73.2 |
| Kyaki II | 14 | 18.5 | 0.7 | 59.8 |
| Bidibidi | 8 | 14.6 | 4.6 | 75.8 |
| Palabek | 10 | 12.6 | 3.6 | 52.8 |
| Kyangwali | 7 | 4.9 | 2.4 | 49.3 |
| Kiryandongo | 6 | 4.5 | 11.3 | 77.3 |
| Oruchinga | 1 | 2.1 | | 64.0 |
| Subtotal refugee camps | 113 | 21.1 | 5.1 | 65.9 |
| Uganda total | 46,923 | 18.6 | 9.4 | 53.7 |

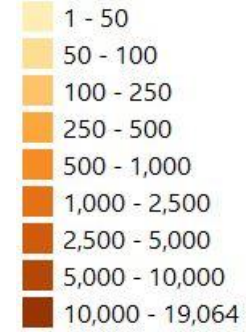
Ookla, average mobile SpeedTests, Q2 2024

| Refugee camp | Count of tests | Download speed (Mbps) | Upload speed (Mbps) | Latency (Ms) |
|------------------------|----------------|-----------------------|---------------------|--------------|
| Rhino | 1 | 46.0 | 24.3 | 23.0 |
| Ramwanja | 1 | 10.7 | 1.8 | 29.0 |
| Nakivale | 5 | 9.9 | 1.4 | 24.0 |
| Kyangwali | 2 | 3.9 | 4.9 | 27.0 |
| Bidibidi | 6 | 3.8 | 1.4 | 47.0 |
| Subtotal refugee camps | 15 | 12.2 | 4.8 | 30.6 |

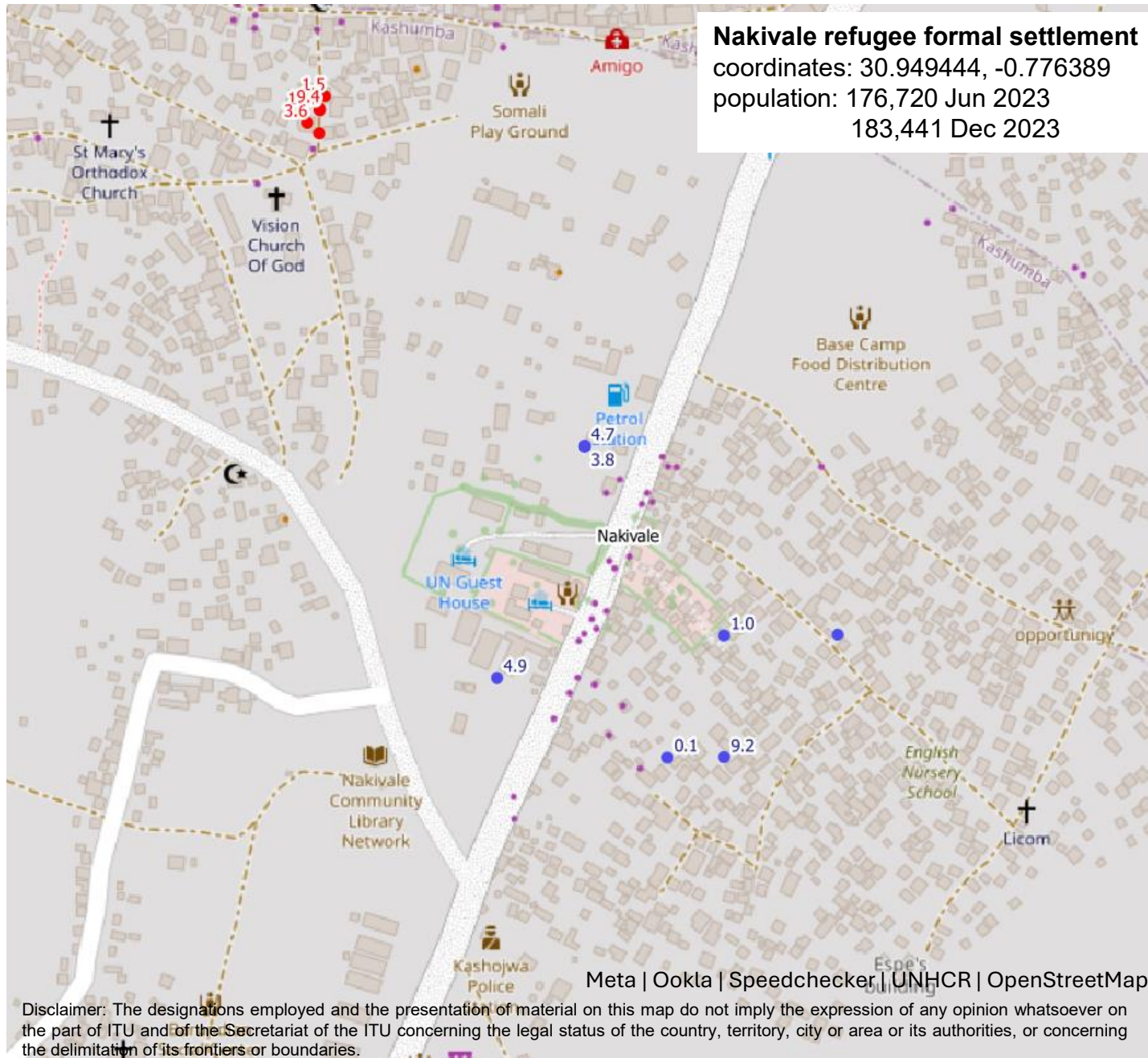
Meta | Ookla | Speedchecker | © Collins Bartholomew and GSMA | Opencellid | UNHCR | WorldPop | OpenStreetMap

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Total population (UNPD, Jan 2024)
49,332,093



- Speedchecker
- Fixed
 - Mobile
 - Ookla fixed
 - Ookla mobile



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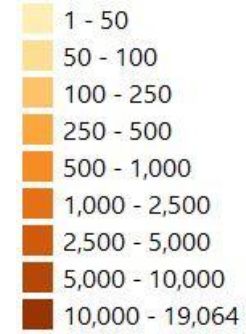
Speedchecker, 49 tests (results in map view shown)

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Platform | ISP | Connection |
|-----------------|---------------|--------------|----------|---------------|------------|
| 9.2 | | 55.0 | Android | mtn uganda | cellular |
| 5.2 | | 74.0 | Android | mtn uganda | cellular |
| 4.9 | | 52.0 | Android | mtn uganda | cellular |
| 4.7 | | 41.0 | Android | mtn uganda | cellular |
| 4.6 | | 85.0 | Android | mtn uganda | cellular |
| 3.8 | | 50.0 | Android | mtn uganda | cellular |
| 2.2 | | 49.0 | Android | mtn uganda | cellular |
| 1.0 | | 61.0 | Android | mtn uganda | cellular |
| 0.1 | 1.6 | 64.0 | Android | mtn uganda | cellular |
| | 3.2 | 59.0 | Android | mtn uganda | cellular |
| 10.0 | | 35.0 | Android | cheetahnet | wifi |
| 9.4 | | 28.0 | Android | cheetahnet | wifi |
| 3.6 | | 83.0 | Android | airtel uganda | wifi |
| 1.5 | | 545.0 | Android | cheetahnet | wifi |
| | 2.6 | 102.0 | Android | airtel uganda | wifi |

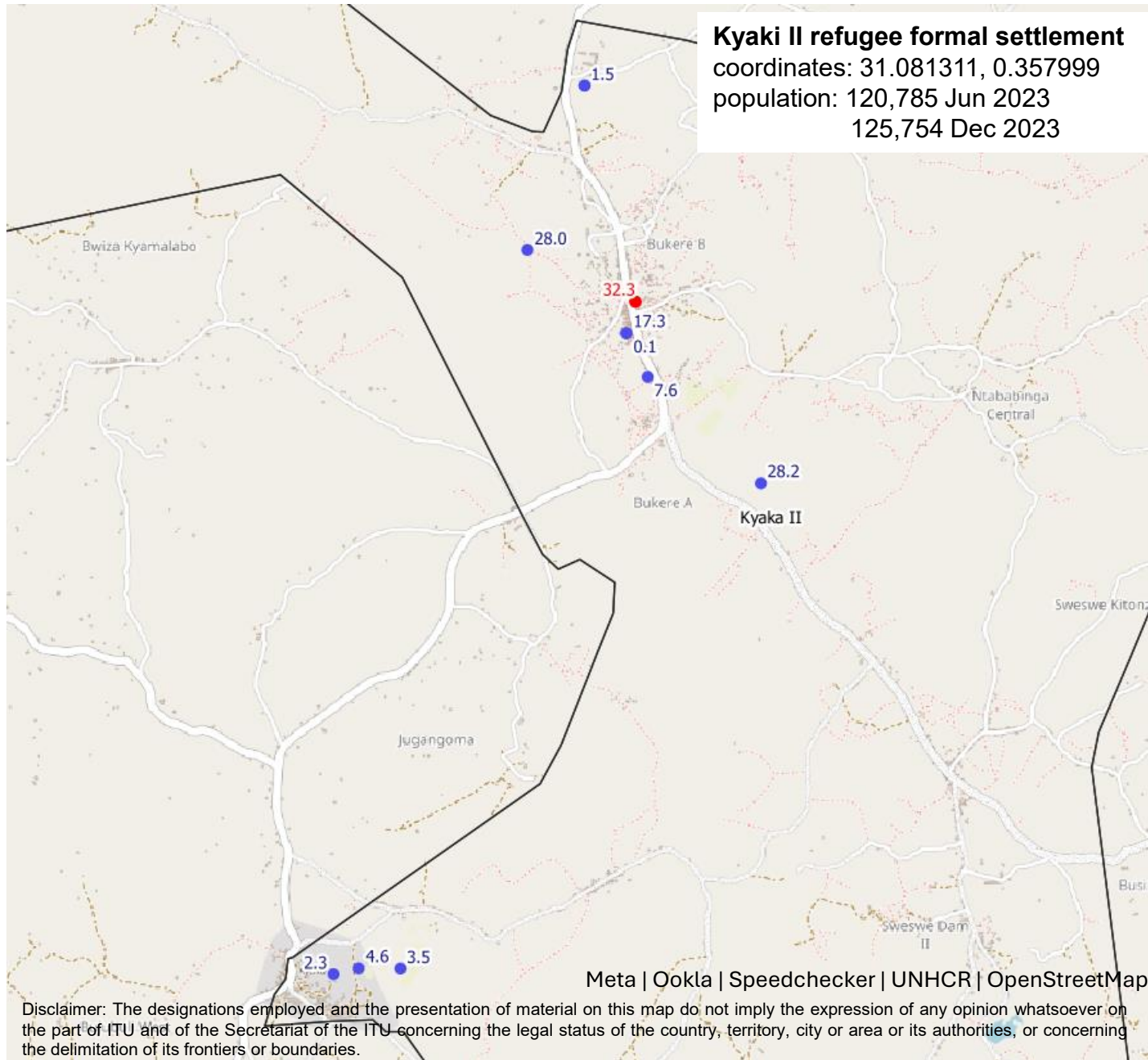
Ookla, 6 tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Count of tests | Platform | Connection | Camp |
|-----------------|---------------|--------------|----------------|----------|------------|----------|
| 15.1 | 1.6 | 26.0 | 2 | Ookla | mobile | Nakivale |
| 3.8 | 1.8 | 18.0 | 1 | Ookla | mobile | Nakivale |
| 10.8 | 0.9 | 28.0 | 2 | Ookla | mobile | Nakivale |
| 8.9 | 6.7 | 30.0 | 1 | Ookla | fixed | Nakivale |

Total population (UNPD, Jan 2024)
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- Speedchecker
- Fixed
 - Mobile
 - Ookla fixed
 - Ookla mobile



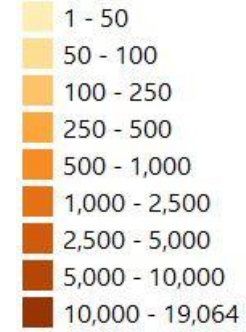
Speedchecker, 14 tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Platform | ISP | Connection |
|-----------------|---------------|--------------|----------|---------------|------------|
| 77.9 | | 40.0 | Android | mtn uganda | cellular |
| 36.7 | | 112.0 | Android | airtel uganda | wifi |
| 32.3 | | 102.0 | Android | airtel uganda | wifi |
| 28.2 | | 41.0 | iOS | mtn uganda | cellular |
| 28.0 | | 35.0 | Android | mtn uganda | cellular |
| 17.3 | | 36.0 | Android | mtn uganda | cellular |
| 7.6 | | 37.0 | Android | mtn uganda | cellular |
| 4.6 | | 61.0 | Android | mtn uganda | cellular |
| 3.5 | | 134.0 | Android | mtn uganda | cellular |
| 2.3 | | 61.0 | Android | mtn uganda | cellular |
| 1.5 | | 42.0 | Android | mtn uganda | cellular |
| 0.6 | | 66.0 | Android | mtn uganda | cellular |
| 0.1 | | 40.0 | Android | mtn uganda | cellular |
| | 0.7 | 30.0 | Android | mtn uganda | cellular |

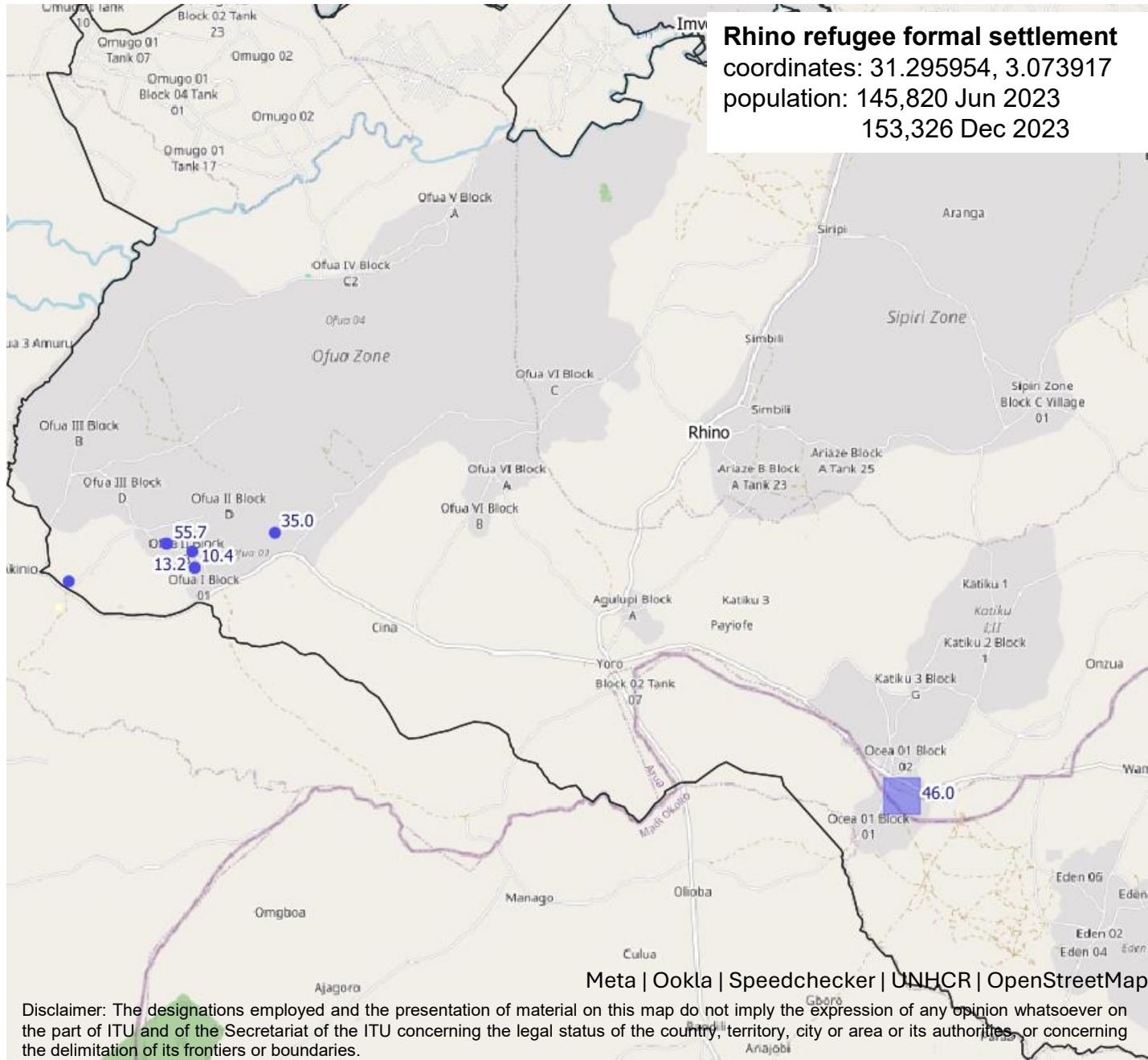
Ookla, no tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Count of tests | Platform | Connection | Camp |
|-----------------|---------------|--------------|----------------|----------|------------|------|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Total population (UNPD, Jan 2024)
49,332,093



- Speedchecker
- Fixed
 - Mobile
 - Ookla fixed
 - Ookla mobile



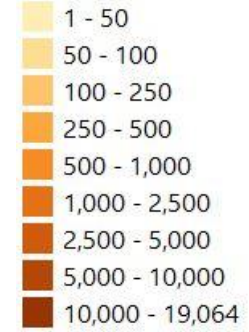
Speedchecker, 9 tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Platform | ISP | Connection |
|-----------------|---------------|--------------|----------|---------------|------------|
| 55.7 | | 52.0 | Android | airtel uganda | cellular |
| 53.6 | | 37.0 | Android | mtn uganda | Unknown |
| 43.3 | | 47.0 | Android | mtn uganda | Unknown |
| 35.0 | | 57.0 | Android | airtel uganda | cellular |
| 13.2 | | 38.0 | Android | mtn uganda | cellular |
| 10.5 | | 100.0 | Android | mtn uganda | cellular |
| | 8.7 | 112.0 | Android | airtel uganda | cellular |
| | 19.8 | 104.0 | Android | mtn uganda | cellular |
| | 0.8 | 45.0 | Android | mtn uganda | cellular |

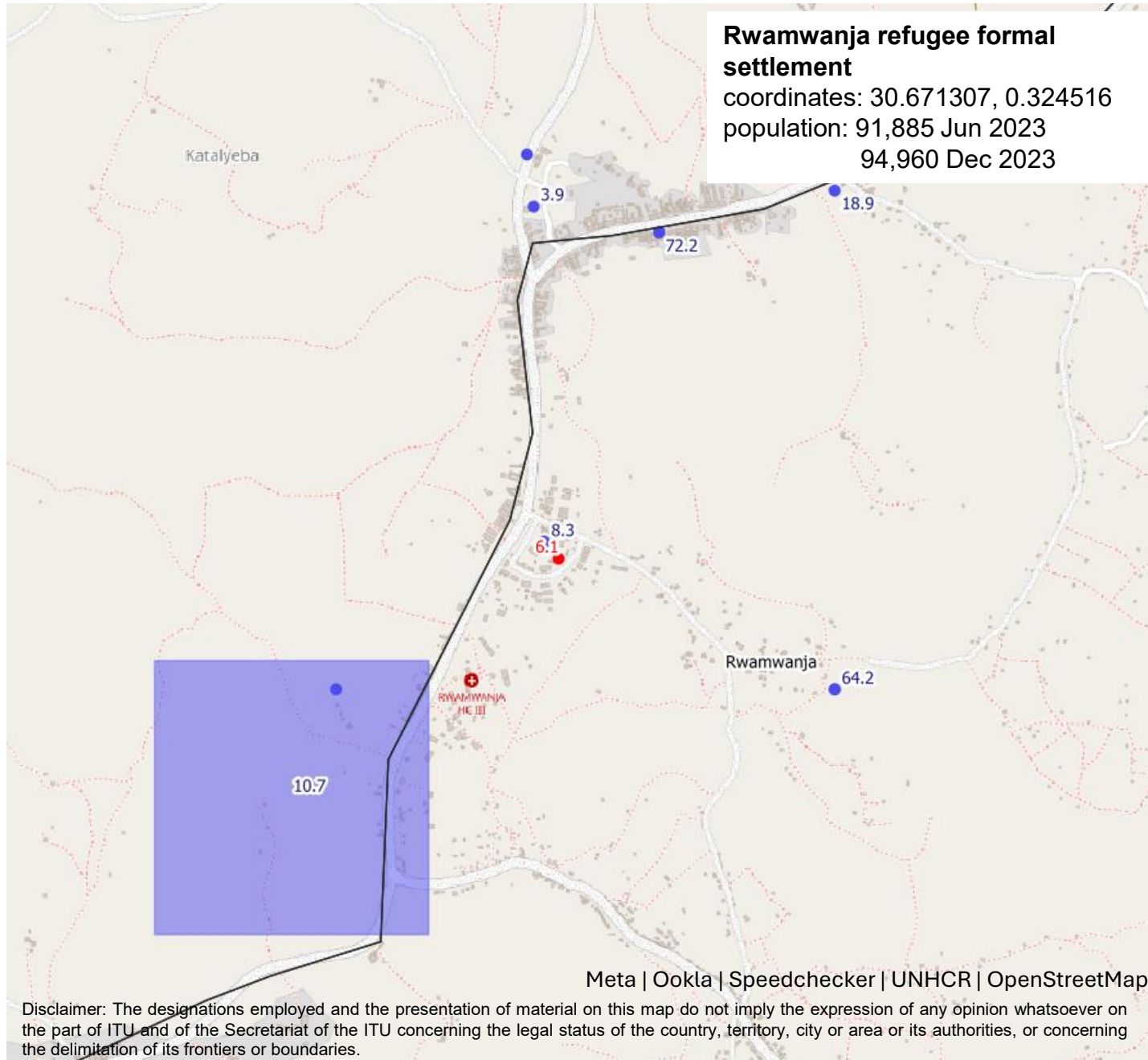
Ookla, 1 test

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Count of tests | Platform | Connection | Camp |
|-----------------|---------------|--------------|----------------|----------|------------|-------|
| 46.01 | 24.29 | 23 | 1 | Ookla | mobile | Rhino |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Total population
(UNPD, Jan 2024)
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- Speedchecker
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 - Mobile
- Ookla fixed
- Ookla mobile



Speedchecker, 7 tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Platform | ISP | Connection |
|-----------------|---------------|--------------|----------|---------------|------------|
| 72.2 | | 37.0 | Android | mtn uganda | cellular |
| 69.7 | | 31.0 | Android | mtn uganda | cellular |
| 64.2 | | 27.0 | Android | airtel uganda | cellular |
| 18.9 | | 39.0 | Android | mtn uganda | cellular |
| 8.3 | | 38.0 | Android | mtn uganda | cellular |
| 6.1 | | 93.0 | Android | airtel uganda | wifi |
| | 2.0 | 88.0 | Android | airtel uganda | cellular |

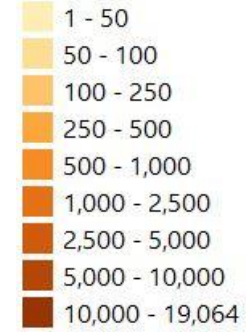
Ookla, no tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Count of tests | Platform | Connection | Camp |
|-----------------|---------------|--------------|----------------|----------|------------|------|
| | | | | | | |
| | | | | | | |
| | | | | | | |
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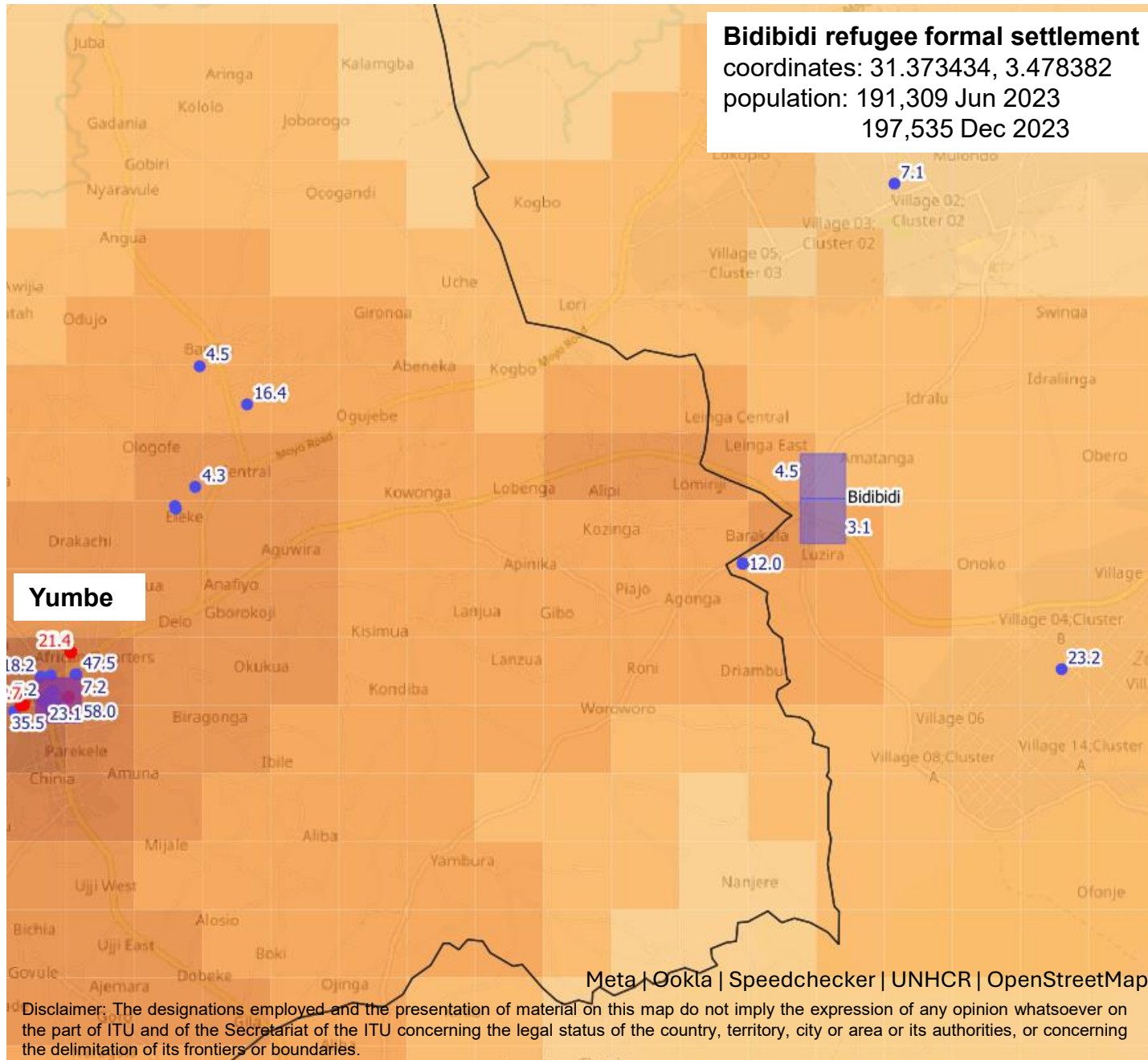
Meta | Ookla | Speedchecker | UNHCR | OpenStreetMap

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Speedchecker, 8 tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Platform | ISP | Connection |
|-----------------|---------------|--------------|----------|---------------|------------|
| | 5.4 | 113.0 | Android | airtel uganda | cellular |
| | 5.7 | 106.0 | Android | airtel uganda | cellular |
| 23.2 | | 103.0 | Android | airtel uganda | cellular |
| 34.7 | | 90.0 | Android | airtel uganda | cellular |
| 3.4 | | 53.0 | Android | mtn uganda | cellular |
| 7.1 | 6.6 | 44.0 | Android | mtn uganda | cellular |
| 7.2 | 0.7 | 46.0 | Android | mtn uganda | cellular |
| 12.0 | | 51.0 | Android | mtn uganda | cellular |

Ookla, 6 tests

| Download (Mbps) | Upload (Mbps) | Latency (Ms) | Count of tests | Platform | Connection | Camp |
|-----------------|---------------|--------------|----------------|----------|------------|----------|
| 4.5 | 1.4 | 45 | 5 | Ookla | Mobile | Bidibidi |
| 3.1 | 1.4 | 49 | 1 | Ookla | Mobile | Bidibidi |
| | | | | | | |
| | | | | | | |

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Recommendations

- Run a long term Speedchecker measurement campaign in the background focussed only on refugee camps, to pick up crowd-sourced datapoints. This will be inexpensive.
- Expand scope of Ookla Speedtest to include all historic data since 2020, continue to update quarterly. This might show change in bandwidth over time.
- Coordinate with refugee camp managers to routinely collect connectivity datapoints through the available measurement platforms:
 - Periodically run Ookla Speedtests from different fixed and mobile devices at different locations around the camps. These results will be published in the quarterly Ookla for Good datasets, which are ingested quarterly into the ITU DCM database.
 - Download the Speedchecker app from the link on the DCM website, and periodically run tests from different locations around the camps. This will automatically add results every month into the ITU DCM database.
- Work with Ericsson Response team and deploy field test equipment for detailed road testing in and around refugee camps. This can be used to establish standard connectivity measurements and more detailed technical tests of signal strength for reporting to providers. The results will automatically be ingested into the ITU DCM database (work in progress).
- Quarterly and annual reporting of results to UNHCR and refugee camps.

The screenshot shows the Disaster Connectivity Map (DCM) website interface. The browser address bar displays 'https://dcm.itu.int'. The main map area shows a geographical view of Uganda with various locations marked, including Hoima, Kikuube, and Kagadi. The map is overlaid with a grid and colored data points representing connectivity measurements. Logos for ITU, GSMA, and etc are visible on the map. A sidebar on the left contains an 'About' section with the following text:

About

To download the SpeedChecker app to your smartphone:

Downloading the [Speedchecker Android app](#) from the button below will automatically add your test measurement data to the DCM, provided that you opt-in to allow accurate location, phone access and share your test data permissions in the app settings. These permissions can be turned off at any time to prevent test measurements being sent.

SPEEDCHECKER

SpeedChecker anonymizes the results and all reports are built on aggregated data which does not reveal user identity or compromises user's privacy. Test results are displayed in the DCM to a maximum resolution of 100 square metre grid cell per hour. Alternatively, no test measurement data will be sent to the DCM if the Speedchecker app is downloaded from these generic links at the [Google Play \(for Android\)](#), or [App store \(for IOS\)](#).

The app should not incur additional telephony charges to run tests if your phone's Internet connection is connected to a wifi network. If your phone is connected to a mobile data service (2G, 3G, 4G, 5G network), the amount of data used to run the tests will be deducted from your monthly data allowance using a local sim card, and will incur international mobile data roaming charges using foreign sim cards. You should check the mobile data costs with your local and foreign network operators before running these tests.

SpeedChecker Data Collection Methodology

Data is collected from end user devices running Android and iOS systems. SpeedChecker partners

At the bottom of the page, there is a footer with the following text: Leaflet | Data © OpenStreetMap contributors, SpeedChecker, SpeedChecker | Ookla | Meta | M-Lab | netBravo, © Collins Bartholomew Ltd and GSMA (2020) | Masae Analytics | CloudRF | OpenCellID

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The DCM uses multiple sources for network infrastructure, cellular coverage and connectivity measurements. These sources include the ITU Transmission Map, GSMA and CollinsBartholomew Ltd cellular coverage maps, Opencellid, Meta for Good, Measurement Lab (M-Lab), netBravo, Ookla for Good, and Speedchecker. The infrastructure and coverage data has been validated by ITU Member States and supplied by Mobile Network Operators, and is then augmented with updated and real-time crowd-sourced connectivity data from a number of data sources.

A number of ground truth tests have also been carried out to compare DCM results to connectivity levels observed on the ground, including by first responders. The connectivity levels, availability and gaps displayed in the DCM reflect the availability of these data sources and may in certain cases not provide the full connectivity picture. To further improve the quality and reliability of the DCM, we continue to engage with different partners to identify new data sources and AI applications that could be used to further improve the quality and reliability of the information shown in the DCM.

We would invite Member States, Mobile Network Operators, and other partners to review and validate the findings of the connectivity assessment, identify any gaps that might exist in the input data, and help us to improve the accuracy of the results.