Ookla®

Helping to measure, understand and improve connectivity experiences worldwide

Considerations for regulators for the assessment of QoS/QoE requirements for mobile services

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Ookla is the bridge between the consumer and the industry

As a leader in brand trust and recognition, Ookla provides public and private crowdsourced insights at a global scale, mobile drive test and capabilities, consumer engagement software, and Wi-Fi design and optimization products.

Consumer-Initiated Network Testing

600+ million
all time app installs

11+ million
daily tests

50+ billion
tests taken to date

15,000+
global testing servers

Consumer QoE Insights

radio network coverage, video, web browsing, gaming, teleconferencing, CDN/cloud performance, and more

hundreds of millions
of unique devices

billions
of daily samples

200+
countries

Incident Detection

190+ million
unique users

25+ million
monthly problem reports

13,000+
services monitored

45+
countries

Global Media Share

145,000+
articles published annually referencing Ookla brands

210+ billion
unique monthly impressions on publications citing Ookla data

57.2%
share of voice compared to other network intelligence providers

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Speedtest Global Index™

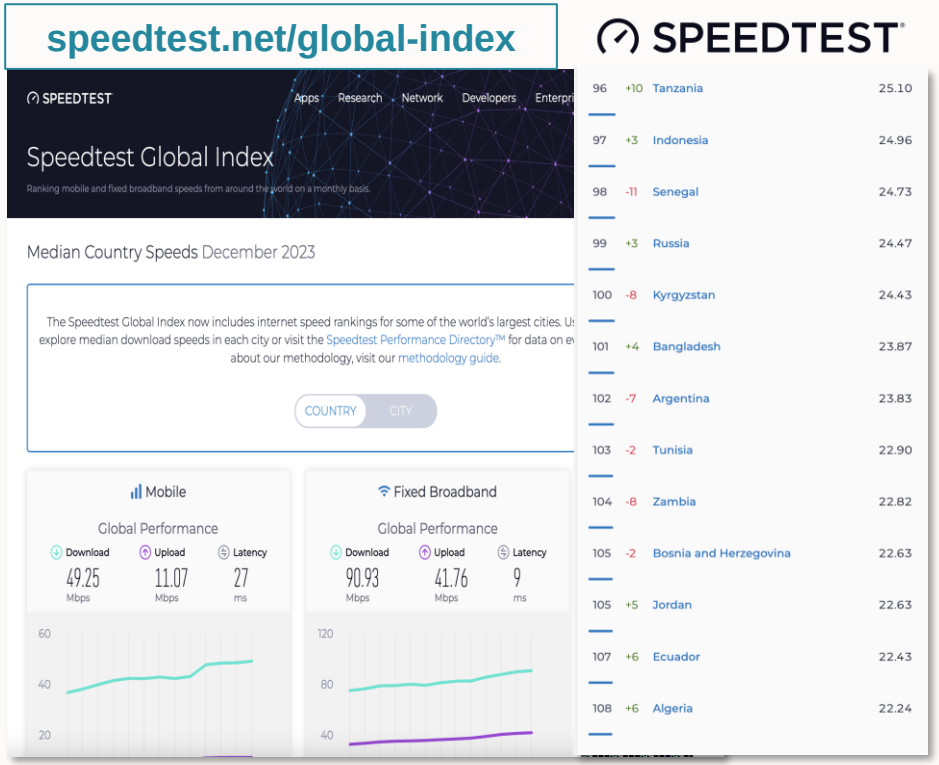
A ranking of mobile and fixed performance for countries around the world based on:

- Median Download Speed
- Median Upload Speed
- Latency

Track national and city-level speed trends based on the Global Index

Compare country and city performance against other countries and cities over time

See how a country or city has measured up to national speed targets based on the Global Index mean and median values



Network Disruption Management, Recovery and Resiliency

Incident detection, correlation & benchmarking, consumer engagement

Help to understand the impact that a natural disaster has had on connectivity:

- Earthquakes
- Fires
- Floods
- Hurricanes

Help to restore connectivity and ensure network resilience after disasters

Downdetector **Cell Analytics™**

Before *wildfires started*

After *wildfires started*

Trusted source for regulatory bodies around the world

United States

United Kingdom

Indonesia

Philippines

Malaysia

Jordan

Saudi Arabia

Ecuador

Mexico

Brazil

Colombia

United Arab Emirates

Singapore

Ookla believes that good connectivity should not be a privilege

Everything we do is focused on providing objective, accurate performance data and insights to improve **connectivity for all**

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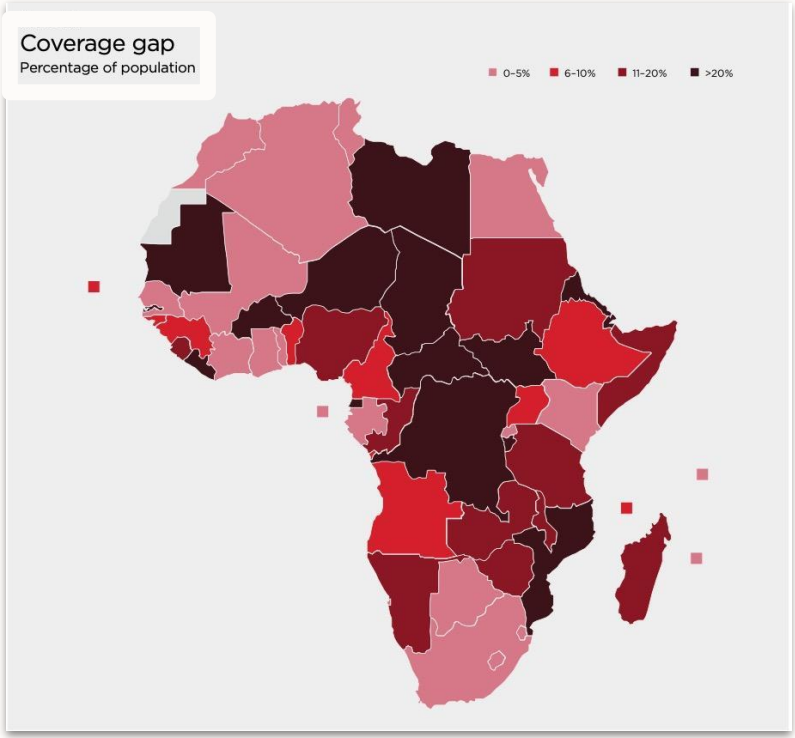
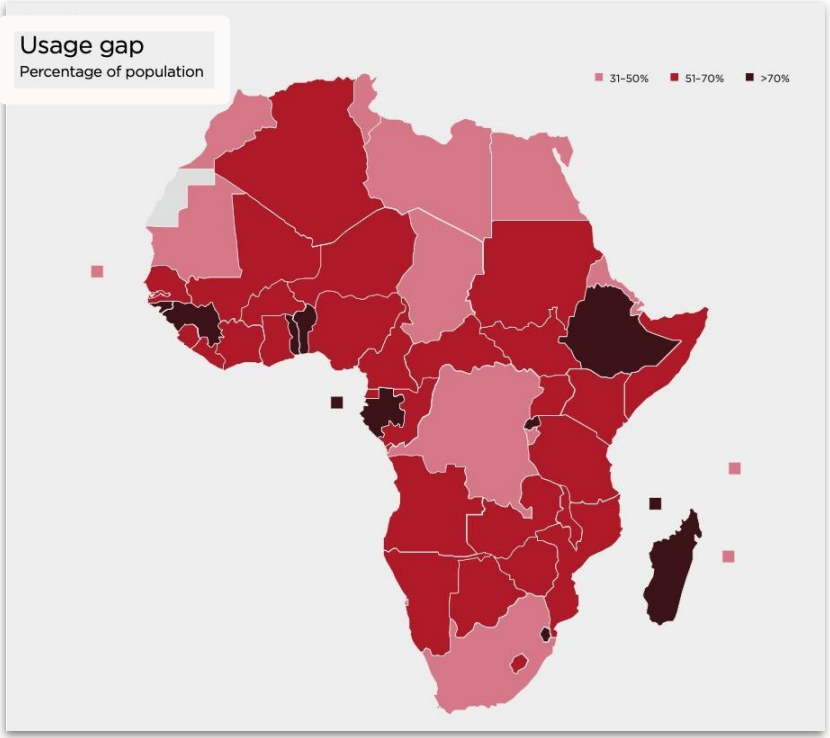
The connectivity gap remains significant in Africa



~200 million are not covered by an MBB network



~800 million do not subscribe to MBB service

Source: GSMA

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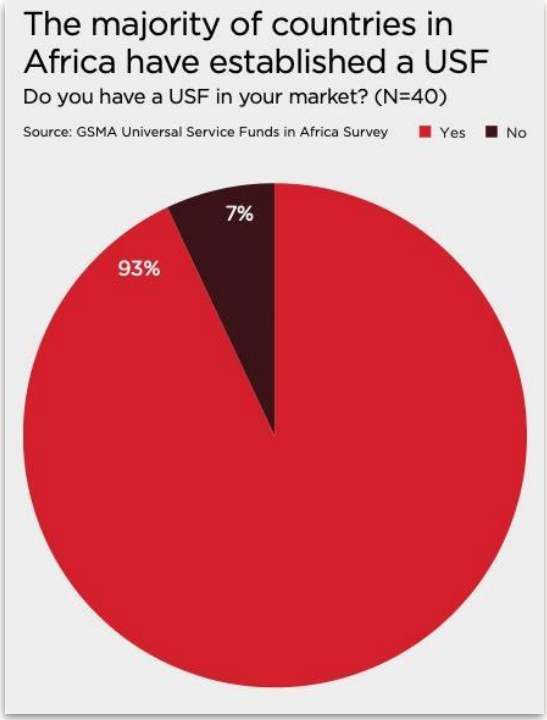
USF can serve as a tool to close the connectivity gap but lack of reliable data is a persistent problem



Source: GSMA

Challenges

- ➔ Lack of reliable data
- ➔ Lack of overall impact assessment

Recommendations

- ❑ Use a data-led approach to select USF projects
- ❑ Set clear and measurable targets for the USF

Regulators use Ookla data to inform their decisions and plans

Benchmarking Network Performance
Measure network development over time, benchmarked against other countries/regions

Assess Impact of Disasters on Connectivity
Restore connectivity and ensure network resilience

Prioritizing Connectivity Investment
Understand where infrastructure investments are needed

Assessing New Technology Deployment
Access historical network performance and coverage data to understand trends

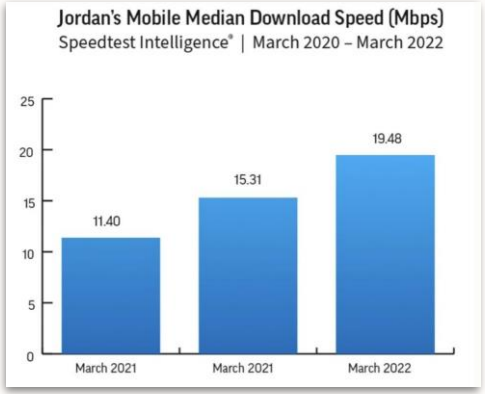
Monitoring Spectrum Deployment
Track the rollout and adoption of new spectrum

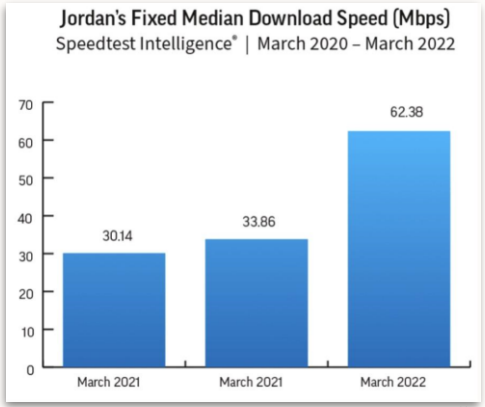
Oversee Consumer Protection Initiative
Effective complaints handling, Quality of Service Guarantees, etc.

Reliable and Resilient Connectivity in Jordan

- Early adopter of crowdsourced network intelligence
  - TRC Jordan helped inform the ITU-T efforts to standardize crowdsourcing (ITU SG12 E.806 and ITU SG12 E.812 recommendations)
- Network resiliency during the pandemic
  - Safely and remotely oversee all coverage and quality issues
  - Understand spectrum utilization post allocation
  - Consumer problem mitigation

➢ Achieved cost and time savings by integrating crowdsourced data
➢ 97% consumer problem mitigation
➢ Improved median download speed on fixed and mobile





Spectrum Policy Decisions in Saudi Arabia

- Digitalize the country using 5G and satellite broadband for economic growth and national connectivity
    - Part of Vision 2030 to create a thriving digital economy in the coming decade
- Required insights to develop progressive spectrum policy and three-year roadmap
- Spectrum utilization and performance assessments to see where investments had been made within bands

- ➢ Evidence-based approach to spectrum assignment
- ➢ Ambitious spectrum release plan to become a ITU Region 1 (EMEA) leader in spectrum policies, fostering innovation and commercial opportunities

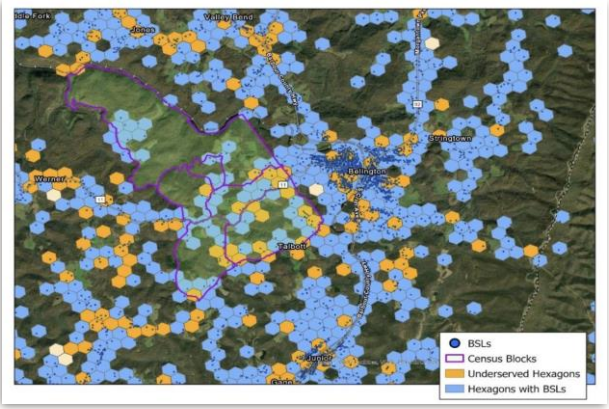
CITC Spectrum Planning Roadmap

	2019	2020	2021	2022 & Beyond
5G spectrum available to Saudi operators	~ 200 MHz* (FR1)	~ 200 MHz (FR1)	~ 300 MHz (FR1)	~ 300 MHz (FR1), ~ 1000 MHz (FR2)
5G bandwidth capabilities of commercially available 5G devices	100 MHz (FR1)	100 MHz (FR1)	200 MHz (FR1)	300 MHz (FR1), 1000 MHz (FR2)
Examples of 5G-capable devices/modems	Huawei Mate 20 X 5G (HiSilicon Balong 5000), Samsung Galaxy Note 10+ 5G (Exynos 5100), ZTE Axon 10 Pro 5G (Qualcomm X50)	Apple iPhone 12 (Qualcomm X55), Samsung Galaxy S20 Ultra 5G (Exynos 990)	Huawei CPE Pro 2 (HiSilicon Balong 5000), Samsung Galaxy Fold 3 5G (Qualcomm X60)	Qualcomm X65

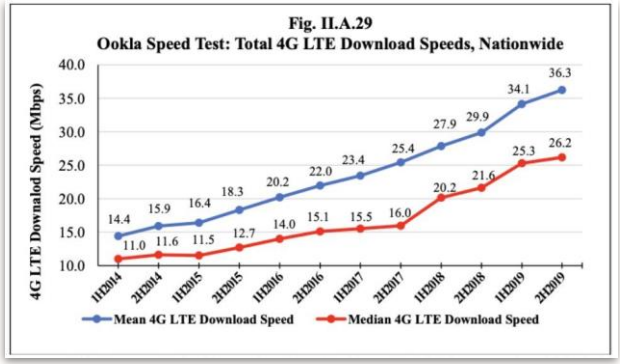
** Since 2019, stc: 200 MHz (n40, n78); Mobily: 200 MHz (n41, n78); Zain: 190 MHz (n41, n78). Zain implemented 5G CA for their n41 and n78 5G carriers.*

Broadband Infrastructure Expansion in the U.S.A.

- Broadband Equity, Access, and Deployment (BEAD) Program with $42.45 billion to expand high-speed internet
- Required a map as accurate and representative as possible to distribute funding and QoS/QoE data for compliance monitoring
- Required by Congress to include crowdsourced data in determining underserved and unserved areas



- ➢ Evaluated 10 years of fixed and mobile speed data to establish historical performance benchmarks
- ➢ Produced a ‘National Broadband Availability Map’ that identifies ‘areas of need’
- ➢ Leverages mobile network coverage and RF network quality data for compliance monitoring



African NRA

Stimulate Competition and Improve QoS

- Access comprehensive performance data from a neutral third-party provider
- Consider publicising the performance of all players on its website/social media to increase transparency and accountability
- Identify unserved or underserved communities for nationwide infrastructure improvement
- Pinpoint areas where spectrum efficiency can be improved

➢ Benchmark MNOs and ISPs on network speed, coverage, readiness for 5G, 4G band usage, home Wi-Fi quality, etc.

➢ Identification of unserved areas and early 5G deployments sites

➢ Educate the public on network performance and incentivize operators to improve services and make them more accessible

Examples of reports published by UK and Saudi regulators on operators' network performance

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Ookla for Good™

Providing data, analysis, and content to organizations that improve people's lives through internet accessibility. We partner with organizations whose goals align with ours to provide unbiased information about the state of networks worldwide.

OOKLA for good™

- Open data initiatives
- Content and analysis for reports
- Connectivity mapping
- And more

Thank you

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