

February 2024

Factors Driving Africa's Internet Evolution

Lessons from Kenya



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LINX 121 Members Meeting

Inspiration



**The next big thing
will be a lot of small things.**



Bangladesh

- 1,717 ASNs assigned to Bangladesh
- As of June 2023, 479 ISPs operate at the division and district levels. Some 2,206 ISP businesses operate at the hyper-local level.
- Multiple IXP operators in the country
- Aggregate Peering Traffic >200Gb/s
- Mostly local traffic from entertainment and gaming
- No large CDNs peering in the market
- Internet resiliency index of 51%
- Strong technical community (BDNOG)

Globally Connected Infrastructure

The globally connected Internet is inclusive. It allows networks and users to interconnect without geographical restrictions. Increasing the connectivity of the Internet makes it more valuable to every participant, as a tool for communications, learning, commerce.

Networks Assigned

A measure of how many Internet networks are active here

1,717
Regional Rank: 4

594
Asia avg.

February 2000

February 2024

Addresses Assigned IPv6

A measure of how many Internet addresses are assigned here

47.7M
Regional Rank: 14

151.8M
Asia avg.

July 2006

February 2024

IPv6 Adoption

Enabling the Internet to support more users and more uses

11%
Regional Rank: 27

19%
Asia avg.

April 2020

January 2024

Internet Exchange Points

IXPs help strengthen local Internet connectivity, develop local Internet industry, improve competitiveness, and serve as a hub for technical activity

10
Regional Rank: 8

6
Asia avg.



Addresses Assigned IPv4

A measure of how many legacy addresses are assigned here

2.0M
Regional Rank: 19

17.6M
Asia avg.



Peering Networks

Peering networks help to keep Internet traffic local, provide faster connections, and improve the experience of the people relying on them

110
Regional Rank: 9

119
Asia avg.



Source: [Pulse.internetsociety.org](https://pulse.internetsociety.org)



Brazil

- 8,973 ASNs assigned to Brazil
- In 2022 46 % of the ISPs were micro-enterprises (1 – 9 staff) and 40% were medium-sized enterprises (10 – 49 staff)
- Aggregate Traffic in 2024 is above 31 Tbit/s (IX.BR)
- 56% Internet resiliency index
- Strong technical community and Internet institutions (CGI.BR)

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Some observations

- A large number of micro and medium ISPs
- Strong technical communities that support local capacity development
- Greater than 50% Internet Resilience Index
- Growing peering ecosystem
- Enabling policy and regulations



Source: Steve Song



Interconnection enablers

Market Reform

ISPs typically drive the development of an IXP. Basic market reform creates competing access networks, and is the first step toward creating the need for an IXP. The number of ISPs represents a lower limit on the number of connected networks at an IXP.

Long-Distance Connectivity

Terrestrial connectivity enables networks to connect to an IXP. International connectivity also is important to attract regional and global ISPs and international content providers to host content and become members of the IXP.

Content Regulations

In order to increase the amount of local content, a carrier-neutral data center is important, as is training for local content developers. Regulations, including privacy and data protection, also make an IXP attractive to content providers

IXP Policies

A liberal IXP membership policy as well as awareness and capacity building, help increase the number and variety of members, such as content providers, government, business, and other non-traditional networks.

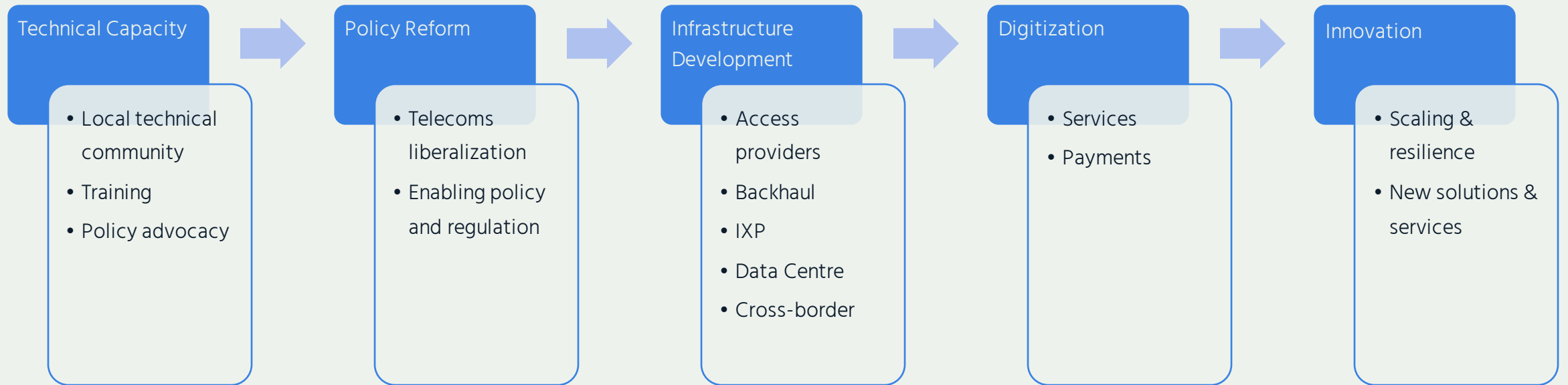
Member X Traffic

A high number and diversity of connected networks at an IXP indicate a healthy internet ecosystem, which in turn, drives the amount of localized traffic at the IXP, toward the goal of 80%.

Lessons from Kenya



The evolution path



Overview of Kenya

- 192 ASNs assigned to Kenya
- Over 1.1 M fixed data subscriptions
- Over 100k ccTLD domains
- Internet resilience Index of 41%
- 3 IXP operators in Kenya
- Competitive terrestrial backhaul and last-mile infrastructure operators
- Strong technical community
- Enabling policies and regulations anchored on the digital economy blueprint
- Wide adoption of digital payments - 96.5% (M-Pesa)

Globally Connected Infrastructure

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Networks Assigned

A measure of how many Internet networks are active here



Addresses Assigned IPv6

A measure of how many Internet addresses are assigned here



IPv6 Adoption

Enabling the Internet to support more users and more uses



Internet Exchange Points

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Addresses Assigned IPv4

A measure of how many legacy addresses are assigned here



Peering Networks

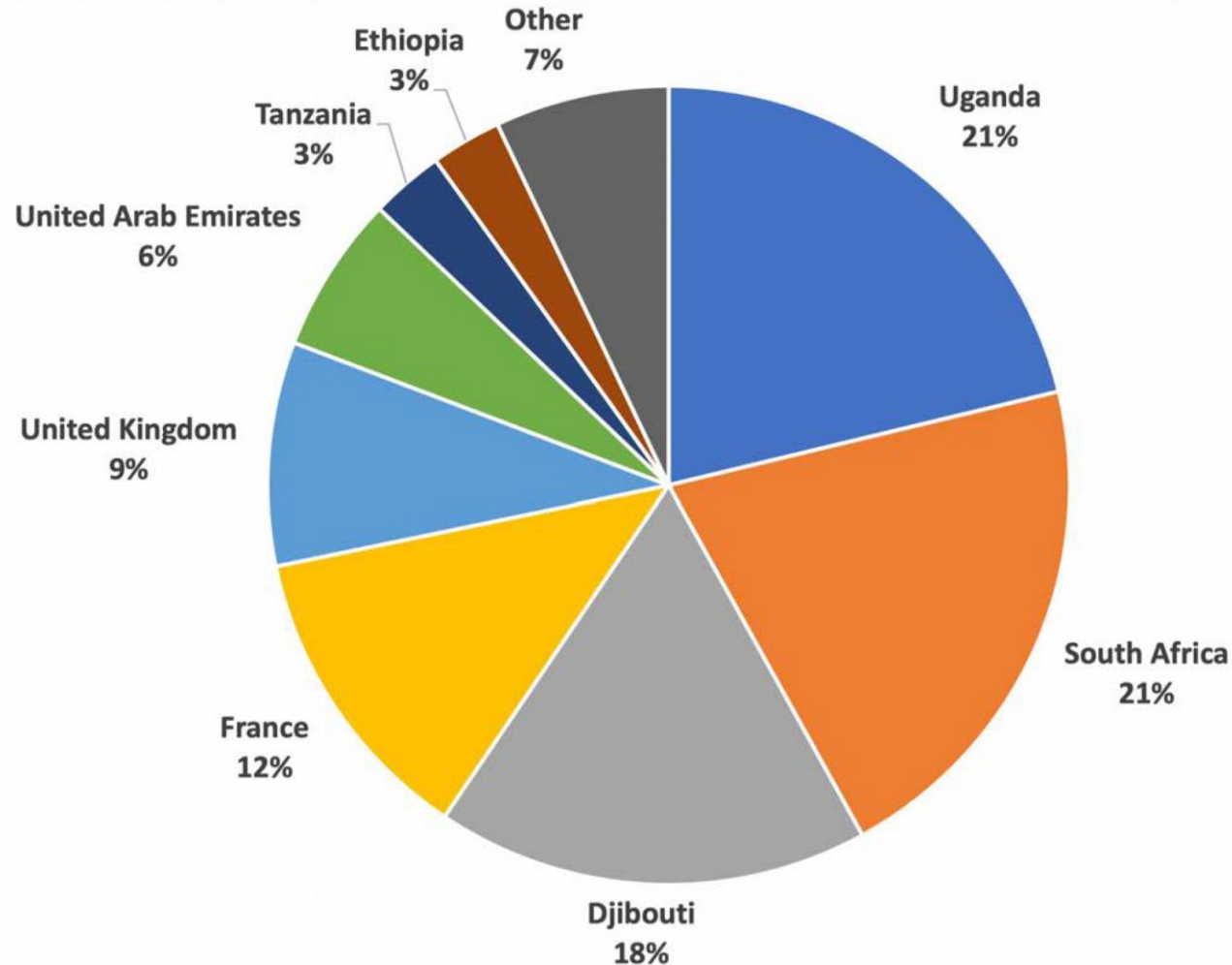
Peering networks help to keep Internet traffic local, provide faster connections, and improve the experience of the people relying on them



Source: [Pulse.internetsociety.org](https://pulse.internetsociety.org)



Int'l IP Capacity Connected to Kenya



- Largest share of int'l capacity connected to Uganda, ZA, and Djibouti so 3 top route are intra-African
- European routes account for less than a quarter of the int'l capacity

Factors accelerating the Internet evolution in Kenya

- Accessibility
 - Availability of Internet services
 - Affordable access
- Adoption
 - Digitization of services
 - Monetization of digital services



Source: VGG Connect (FB Page)

Accessibility:

Availability

- Enabling policy and regulation.
- Over 300 micro-ISPs offer fixed wired and wireless services (licensed and unlicensed).

Affordability

- Low-cost deployments
- Competitive IP Transit providers
- Growing peering ecosystem – about 70% of IP traffic is exchanged locally (2020)



Source: PG Africa Internet (FB)

Adoption

OUR SERVICES

- REFLECTIVE NUMBER PLATES APPLICATION
- SMART DL APPLICATION
- BIRTH CERTIFICATE APPLICATION
- PSV, RSL, TSV, DRIVING ENDORSEMENT
- MARRIAGE REGISTRATION
- KENYA PASSPORT APPLICATION
- COMPANY REGISTRATION
- USA & UK VISA APPLICATION
- KRA RENTAL & ANNUAL RETURNS
- MOTOR VEHICLE TRANSFER

Logos: NITSA (Keep our roads safe), eCitizen (Fast, Secure, Convenient), BRS (BUSINESS REGISTRATION SERVICE - Doing Business Made Easier), VISA, UK Visas and Immigration

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Photo Courtesy: Braham Cyber, Kenya (FB page)

The two main factors that have influenced the adoption of digital services in Kenya are:

- Digitization of basic and essential services contributes to content relevance
 - Over 5,000 e-government services,
 - enterprise digitization, e-learning, e-health, media
- The ability to monetize digital services through digital payments infrastructure like M-Pesa, et al.
 - 70% of e-commerce payments are settled through mobile money platforms and other alternative payment methods (APMs)



Factors Driving Continental-level Progress

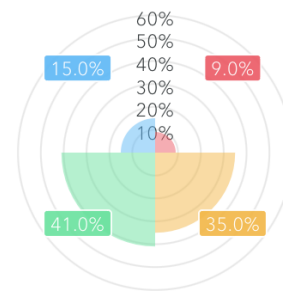


Policy Reforms

- Ongoing reforms at the national level. More countries in the region have liberalized market environments.
- Continental-level policy initiatives anchored on the African Union 2020 – 2030 Digital Transformation Strategy
 - Cross-border digital payments – The Pan African Payment and Settlement System (PAPSS)
 - Africa Continental Free Trade Area (AfCFTA)
 - Digital Single Market (DSM)
 - African Union Convention on Cyber Security and Personal Data Protection

Evolution of the generations of ICT regulation worldwide

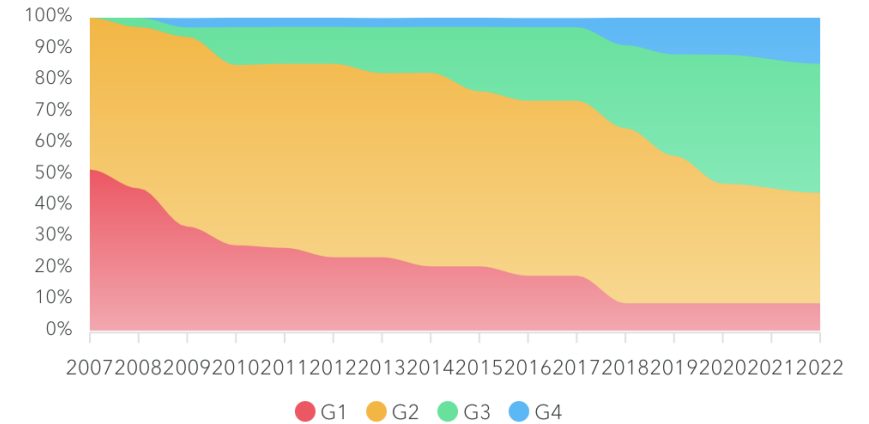
AFRICA, 2022



● G1 ● G2 ● G3 ● G4

Source: ITU

AFRICA, 2007 - 2022



● G1 ● G2 ● G3 ● G4

Source: ITU

Generations of regulation are based on ICT Regulatory Tracker scores:

G1 Command & control approach:	0 < 40
G2 Early open markets:	40 < 70
G3 Enabling investment & access:	70 < 85
G4 Integrated telecom regulation:	85 ≤ 100

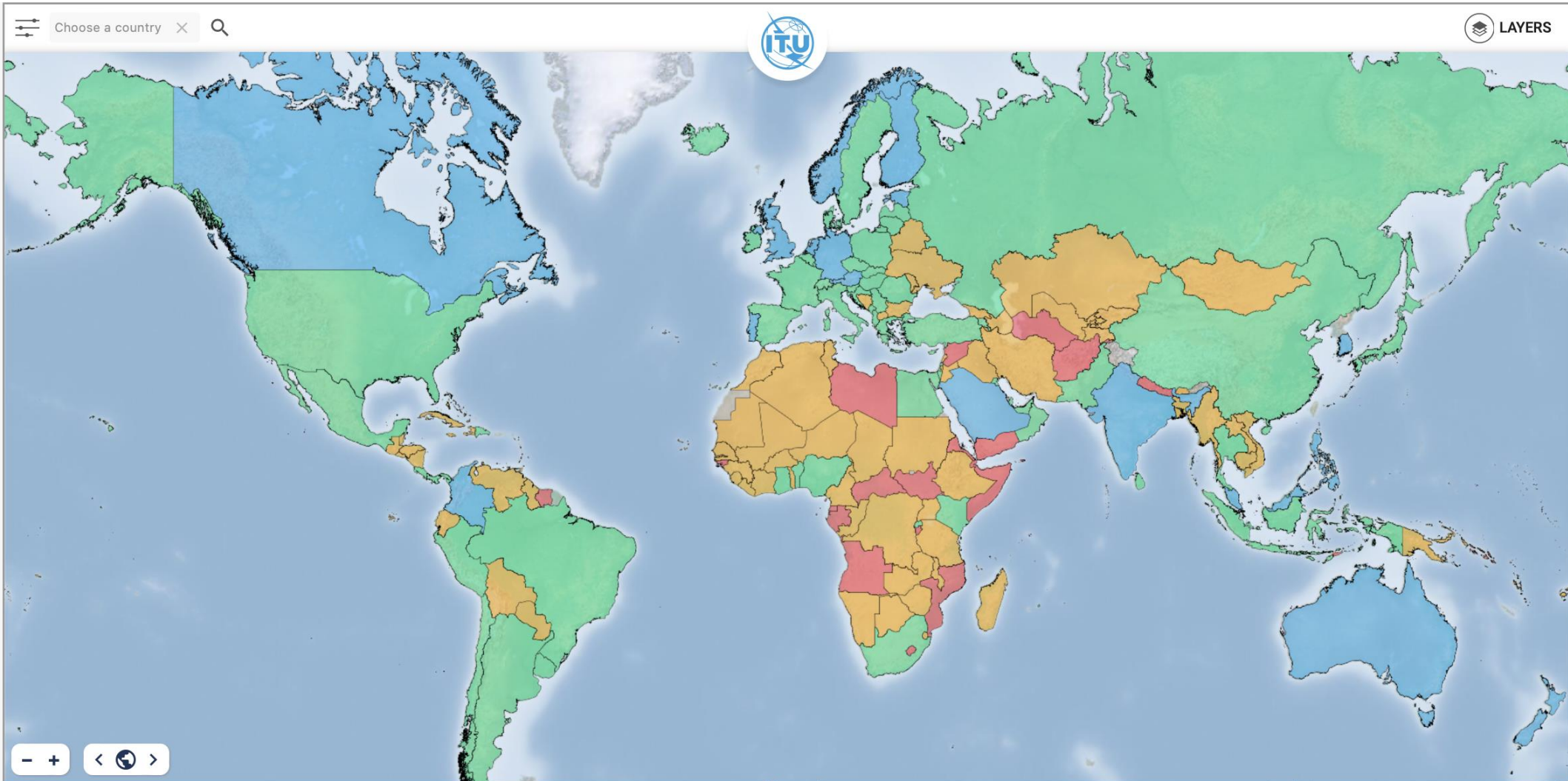
Source: ITU Regulatory Tracker



G5 Benchmark 2023

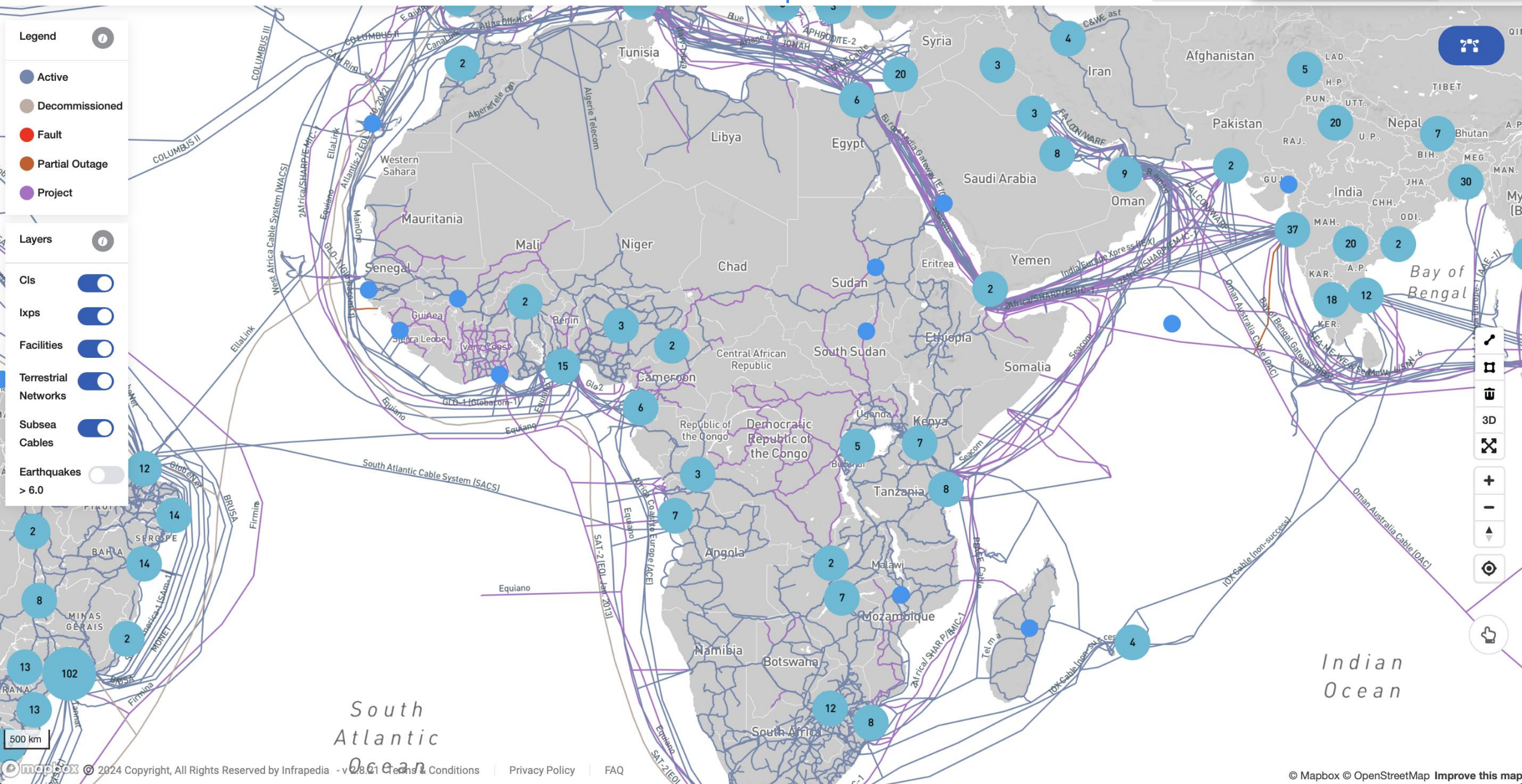
Legend:

- Limited 0 < 30
- Transitioning 30 < 60
- Advanced 60 < 80
- Leading 80 ≤ 100



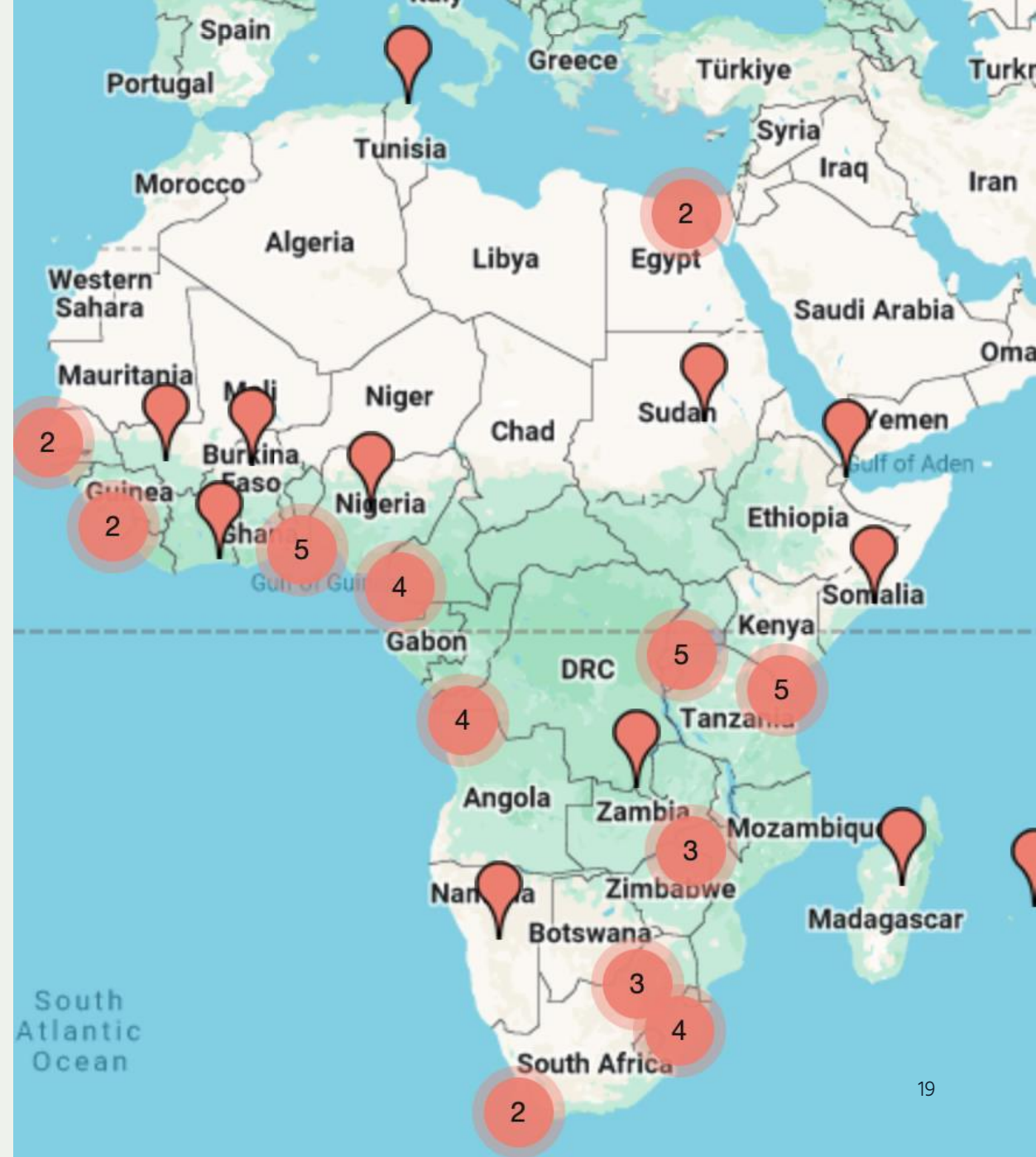


Infrastructure Development

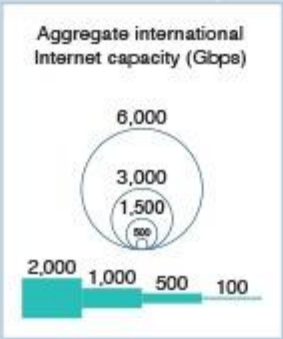
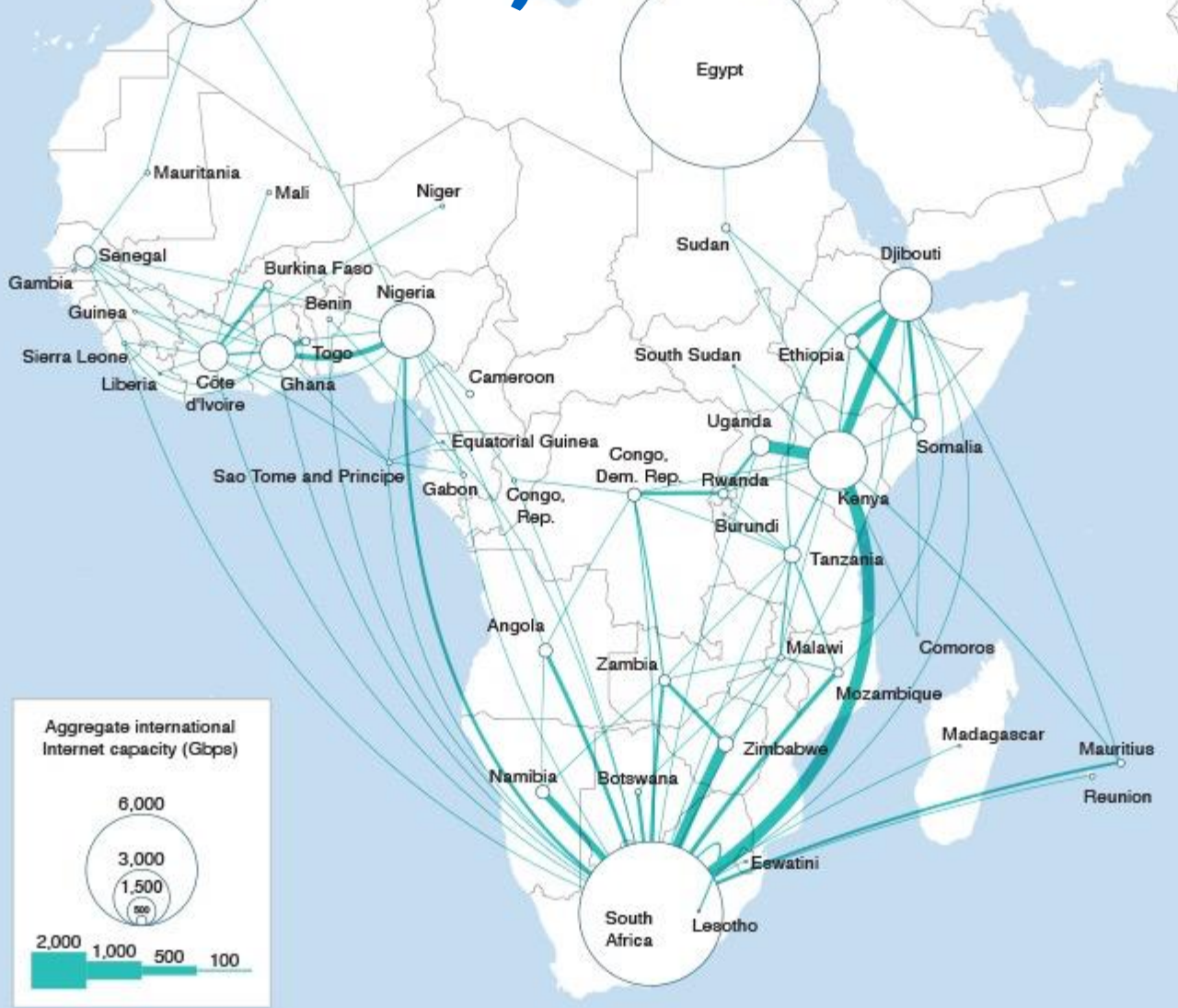


IXPs in Africa

- 53 active IXPs located in 47 cities in 36 countries (Af-IX)
- Over 1700 networks connected to the IXPs (AF-IX)
- 4.32Tb/s of traffic exchanged across the measured IXPs (PCH)



Intra-African Routes, 2023



Impact of digitization in Africa



Africa is leading the world with APMs with 67% of the transaction volume of mobile money accounts (Beyond Borders)

According to McKinsey Africa's electronic payments markets are expected to grow by 152% from 2020 – 2025.

Conservative numbers show the number of e-commerce users in Africa is expected to reach 187M by 2028.



Opportunity Area: Small & Micro ISPs



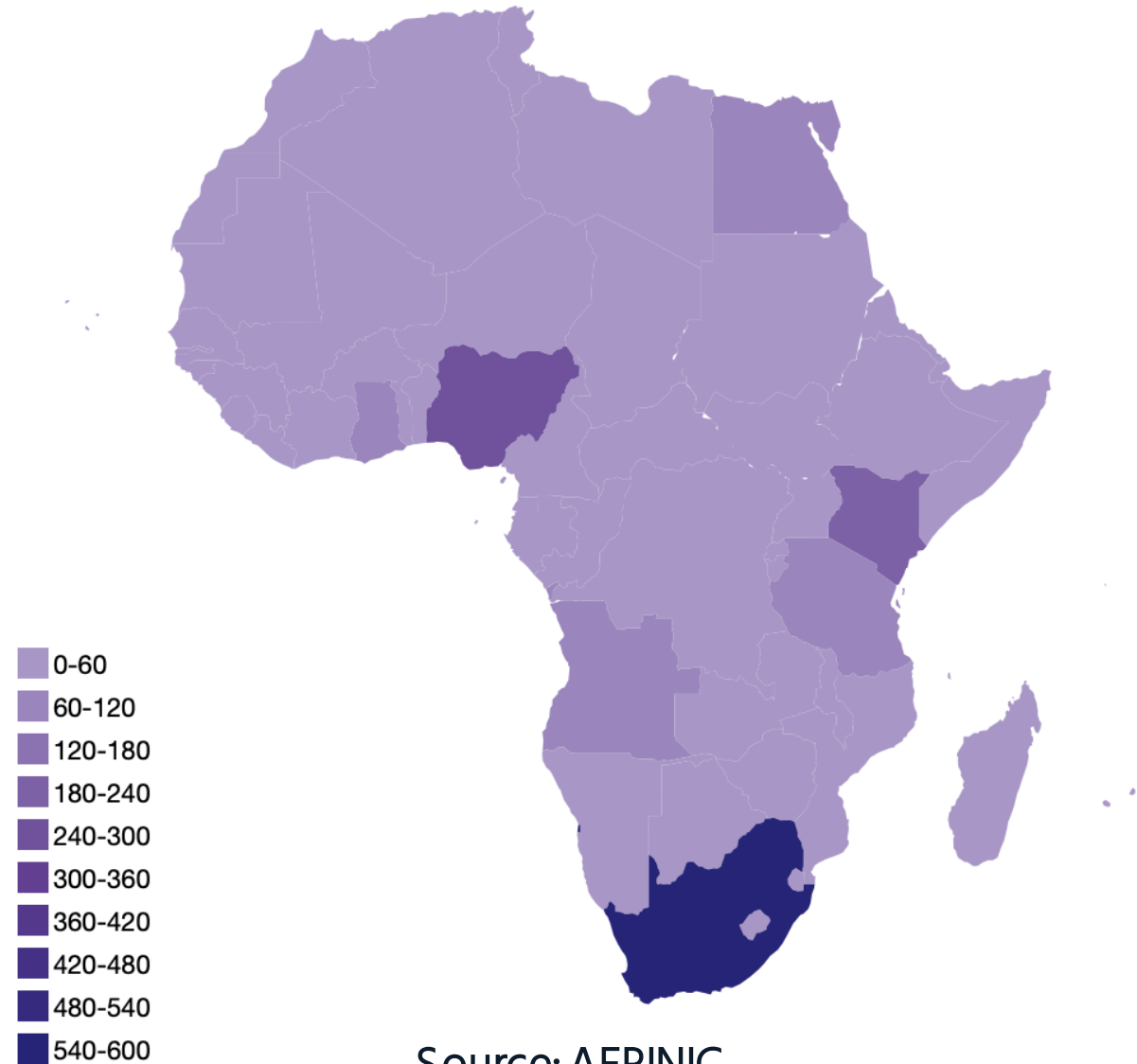
Fixed-broadband Internet accounted for more than 80% of global Internet traffic in 2022. However, only 1 in 100 people in low-income countries have a fixed broadband subscription due to high prices and lack of infrastructure.

Source: ITU 2023 Facts and Figures



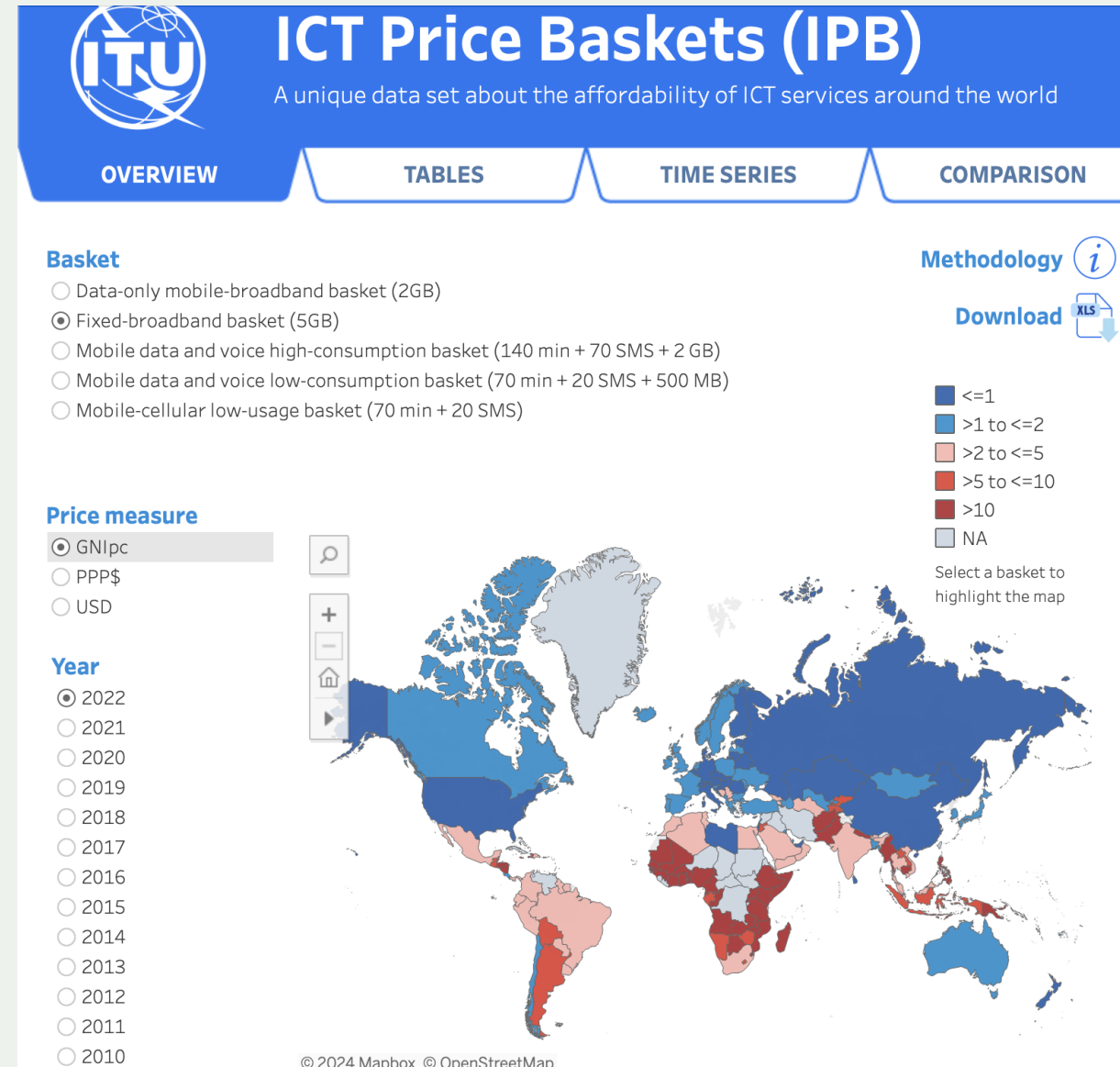
Accessibility: Availability

- Only **2,436 ASNs** are allocated in Africa
- **47% of ASNs** assigned to ISPs
- Comparing the number of ISPs in Africa with Brazil and Bangladesh, it is clear that more could be done to increase the number of small/micro ISPs.



Accessibility: Availability and Affordability

- Last-mile availability and affordability remains a major challenge in Africa
- The region needs uncapped and affordable fixed access to get to the innovation stage of the evolution path
- The traditional Internet access models cannot provide universal affordable uncapped capacity to foster innovation.



Thank you

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References

- Brazil ICT Providers 2022
- ITU G5 Benchmark - <https://app.gen5.digital/benchmark/map>
- ITU ICT Regulatory Tracker - <https://app.gen5.digital/tracker/charts>
- Rise of e-commerce in Africa - <https://www.trade.gov/rise-ecommerce-africa>
- Alternative Payment Methods - <https://blog.ebanx.com/en/alternative-payment-methods/>
- McKinsey & Co - The Future of Payments in Africa -
- World Bank – From Connectivity to Services: Digital Transformation in Africa -
- Africa Union Malabo Convention -
- African Union Digital Transformation Strategy for Africa 2020 – 2030
- PCH IXP Directory - <https://www.pch.net/ixp/dir>
- Digitizing MSMEs to build long-term financial well-being in Nigeria and Kenya
- ITU ICT Price Basket

