TeleGeography

African Network Geography Update

Patrick Christian

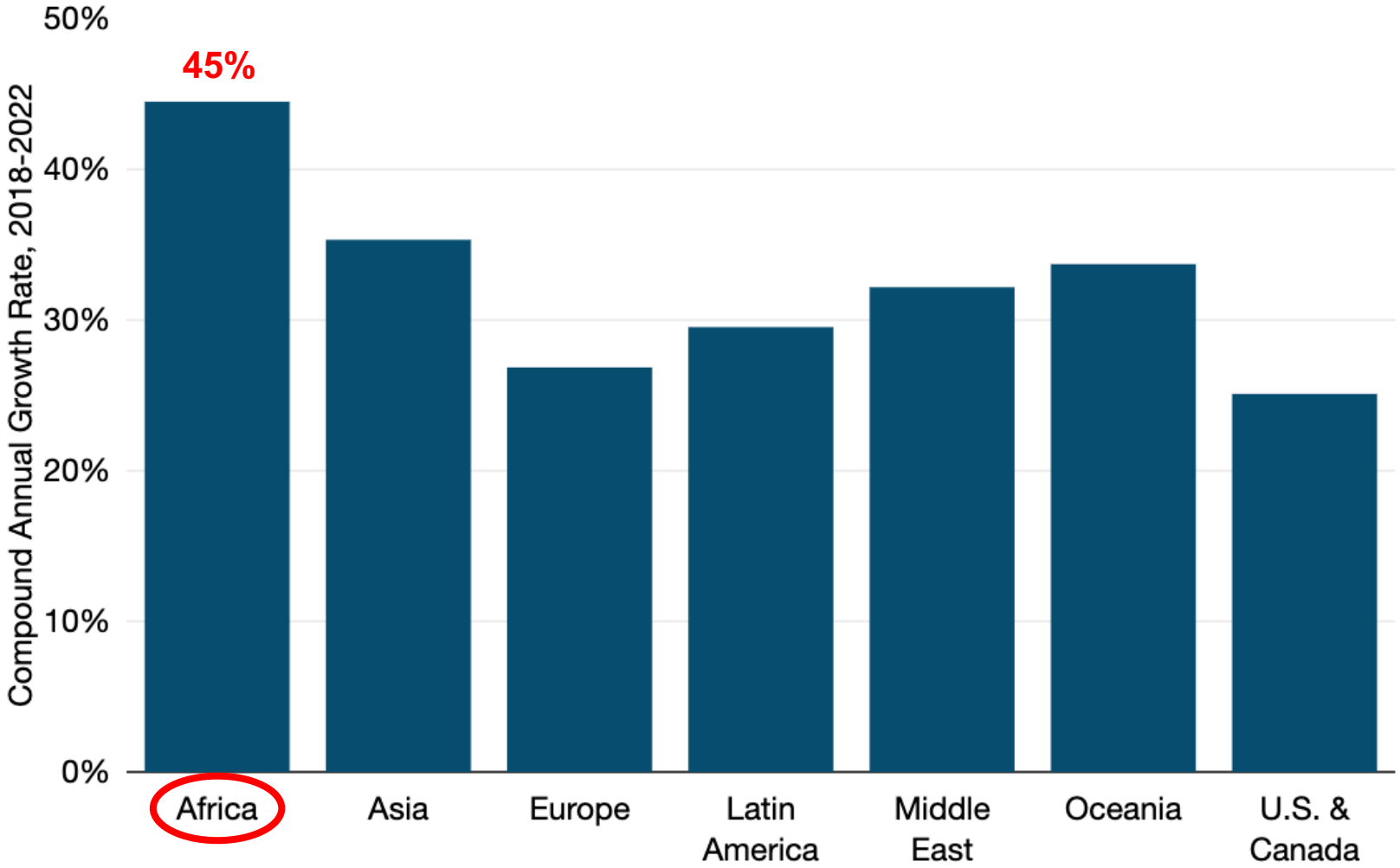
TERACO VIRTUAL TECHDAY
April 20, 2023

What we'll cover

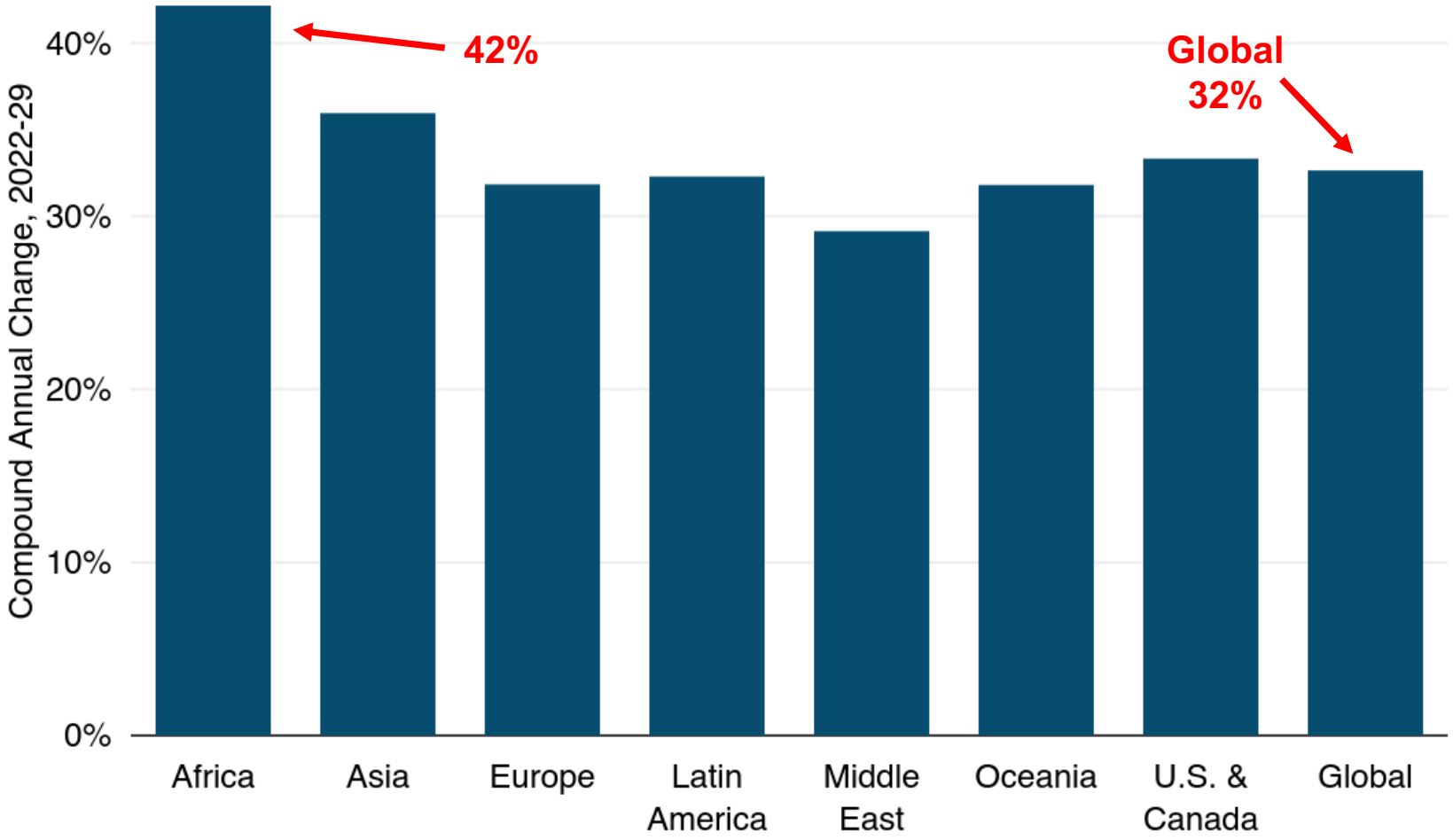
- **Global Bandwidth trends**
  - How is int'l bandwidth growing? What is driving demand?
  - Where are sub cables landing?
  - How fast are global prices falling
- African Bandwidth trends
  - Planned submarine systems
  - Capacity and pricing changes
- **Localized Content Growth**
  - Infrastructure growth – IXs, CDNs/PoPs then DC builds
  - Content provider ecosystems

Global Network Trends

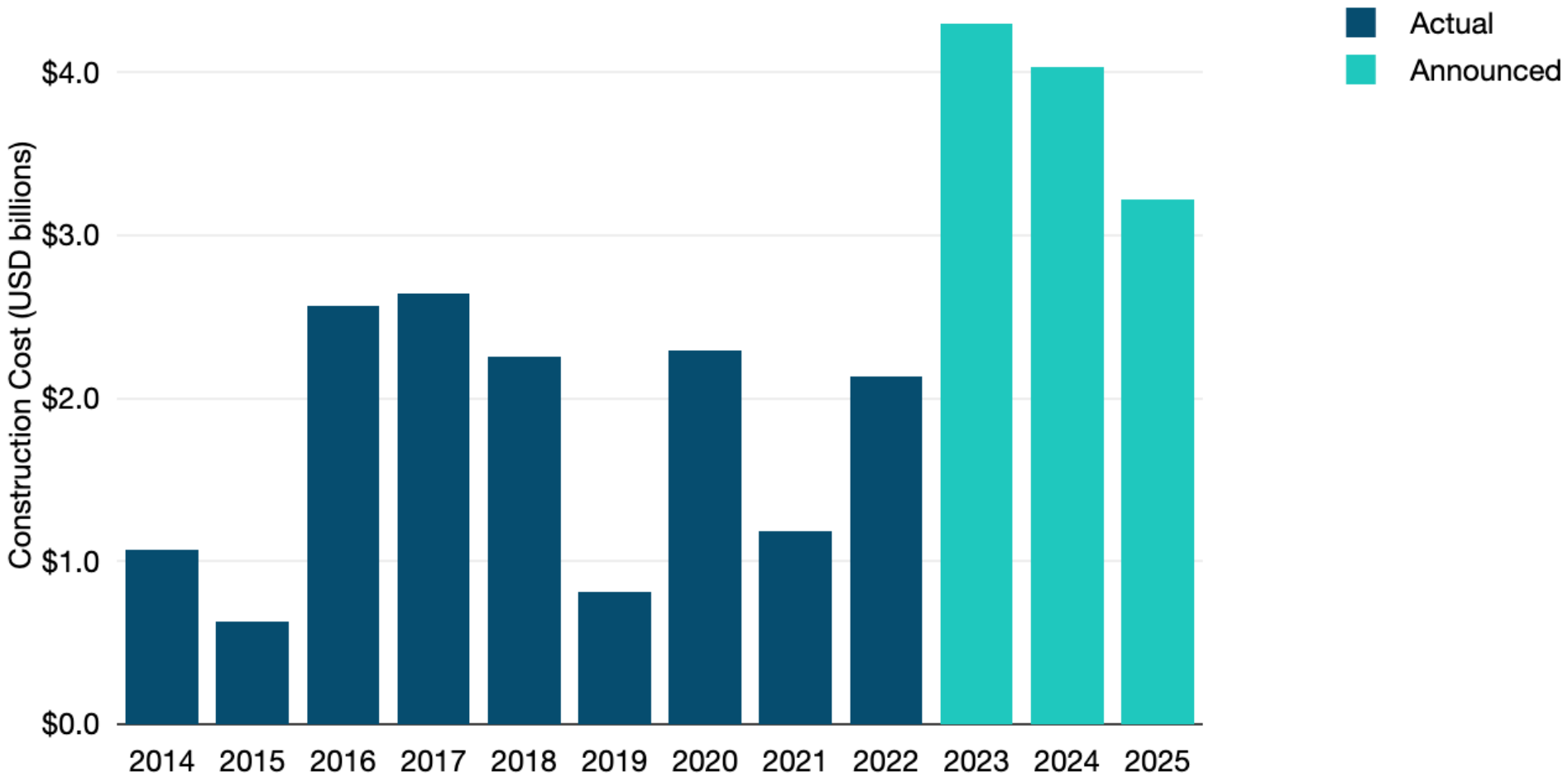
International IP bandwidth growth by region



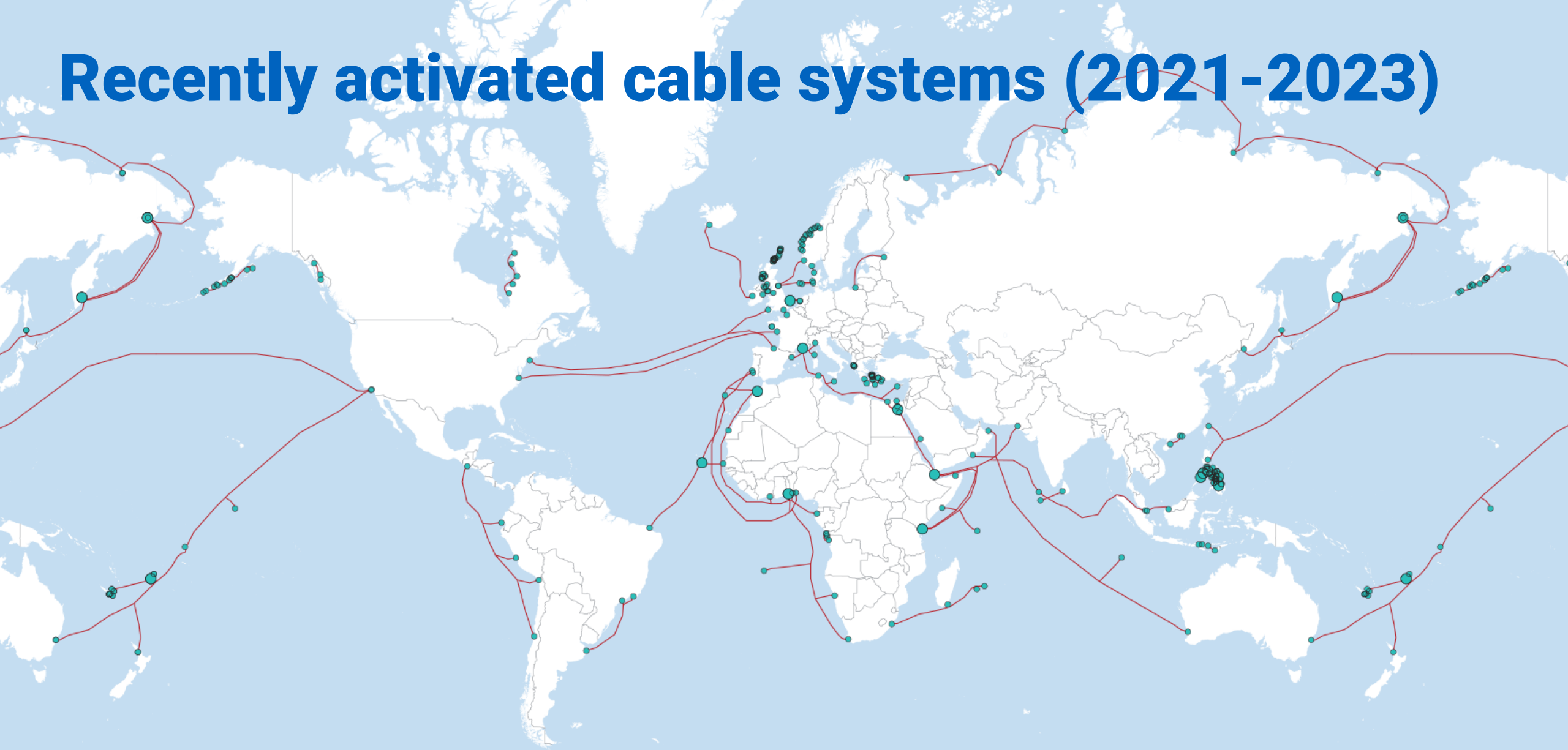
Forecasted bandwidth growth by region



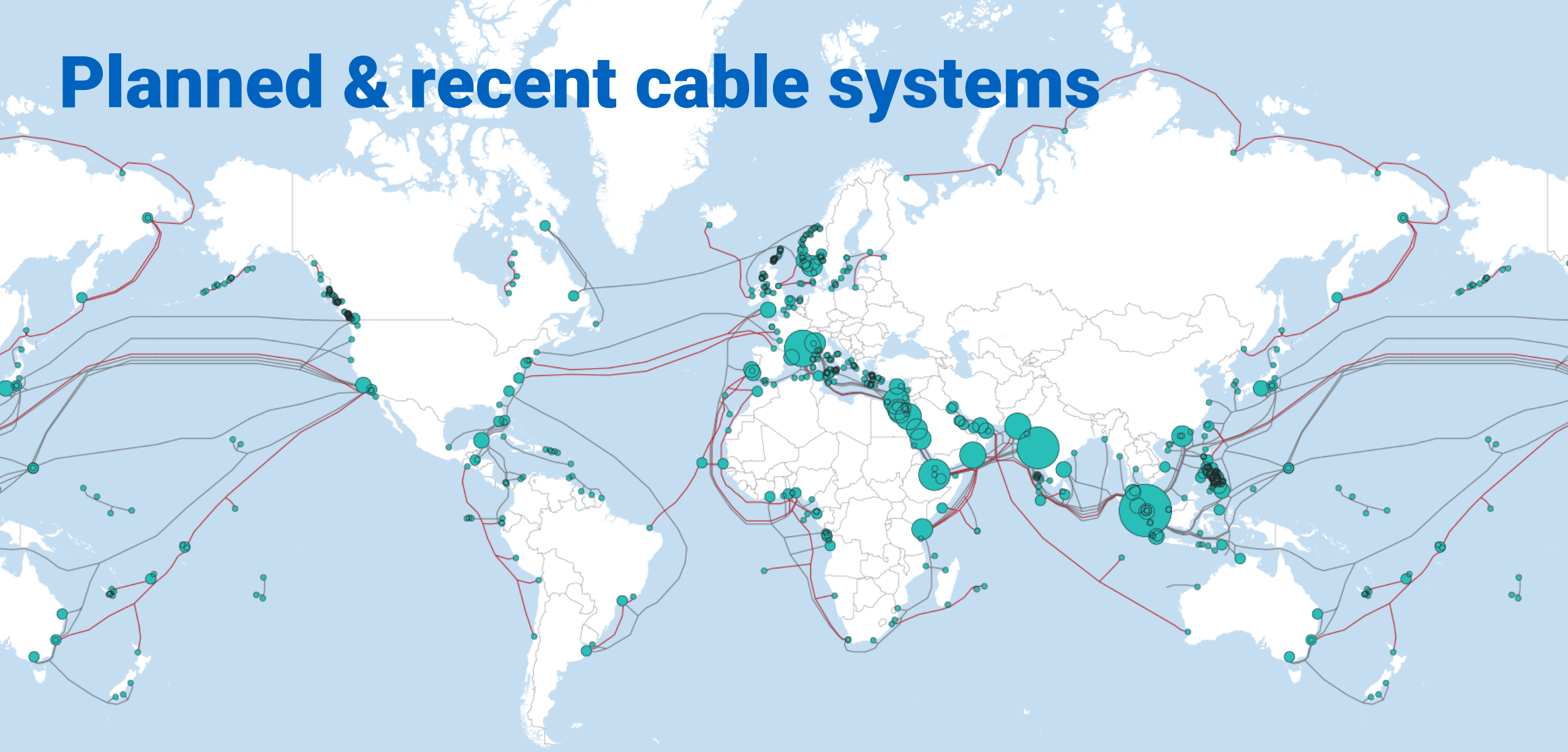
Submarine cable investment



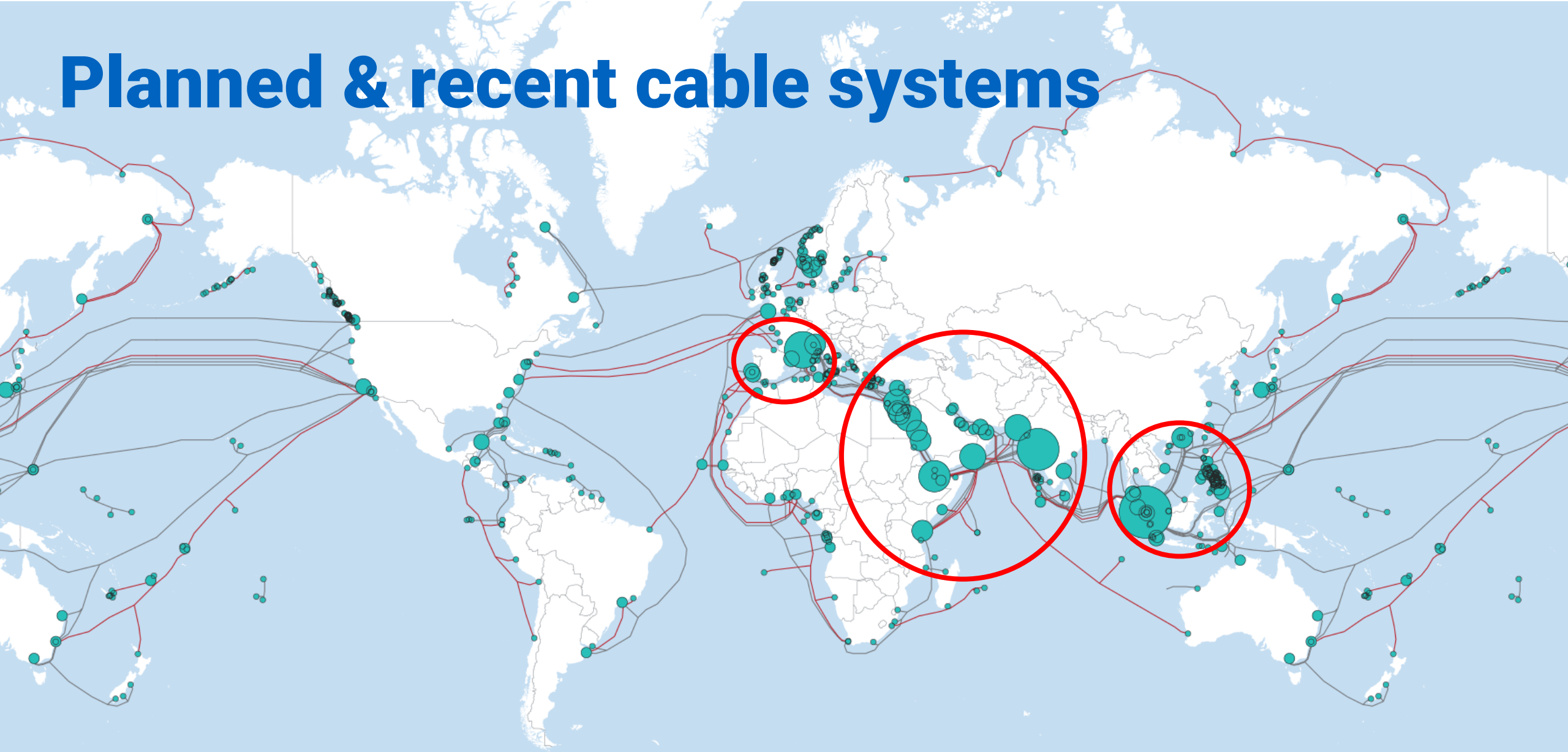
Recently activated cable systems (2021-2023)



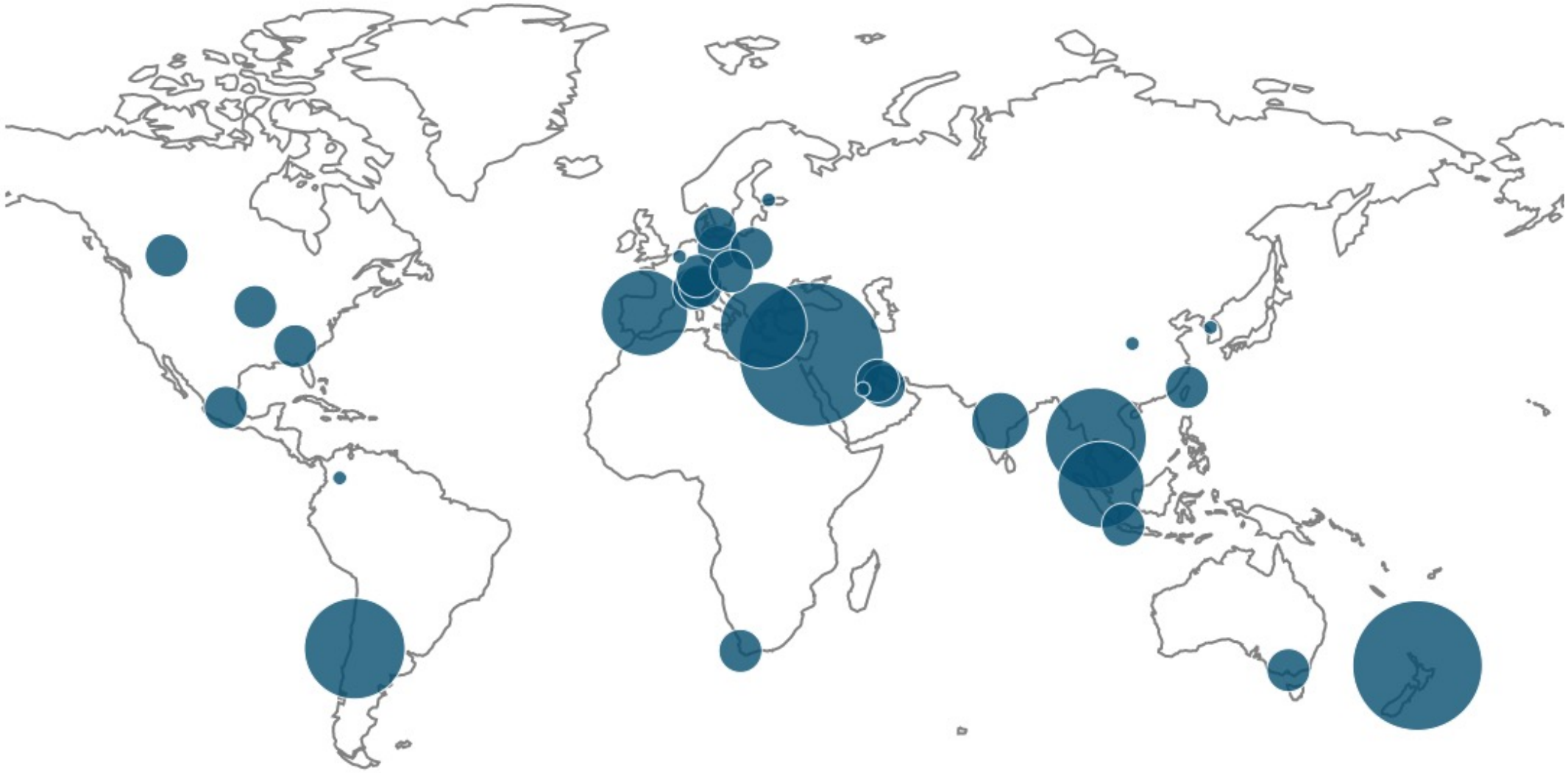
Planned & recent cable systems



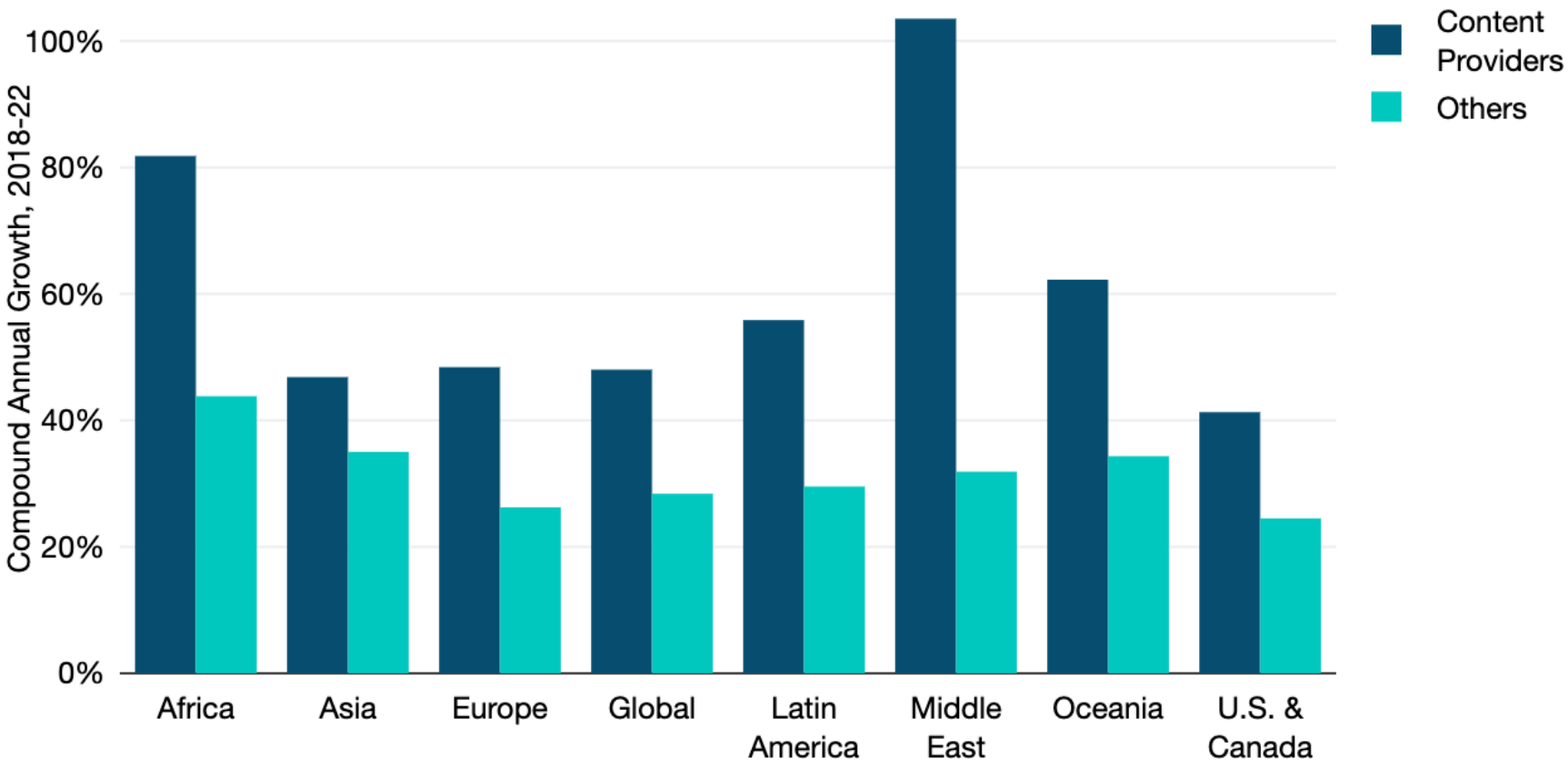
Planned & recent cable systems



Planned cloud data centers

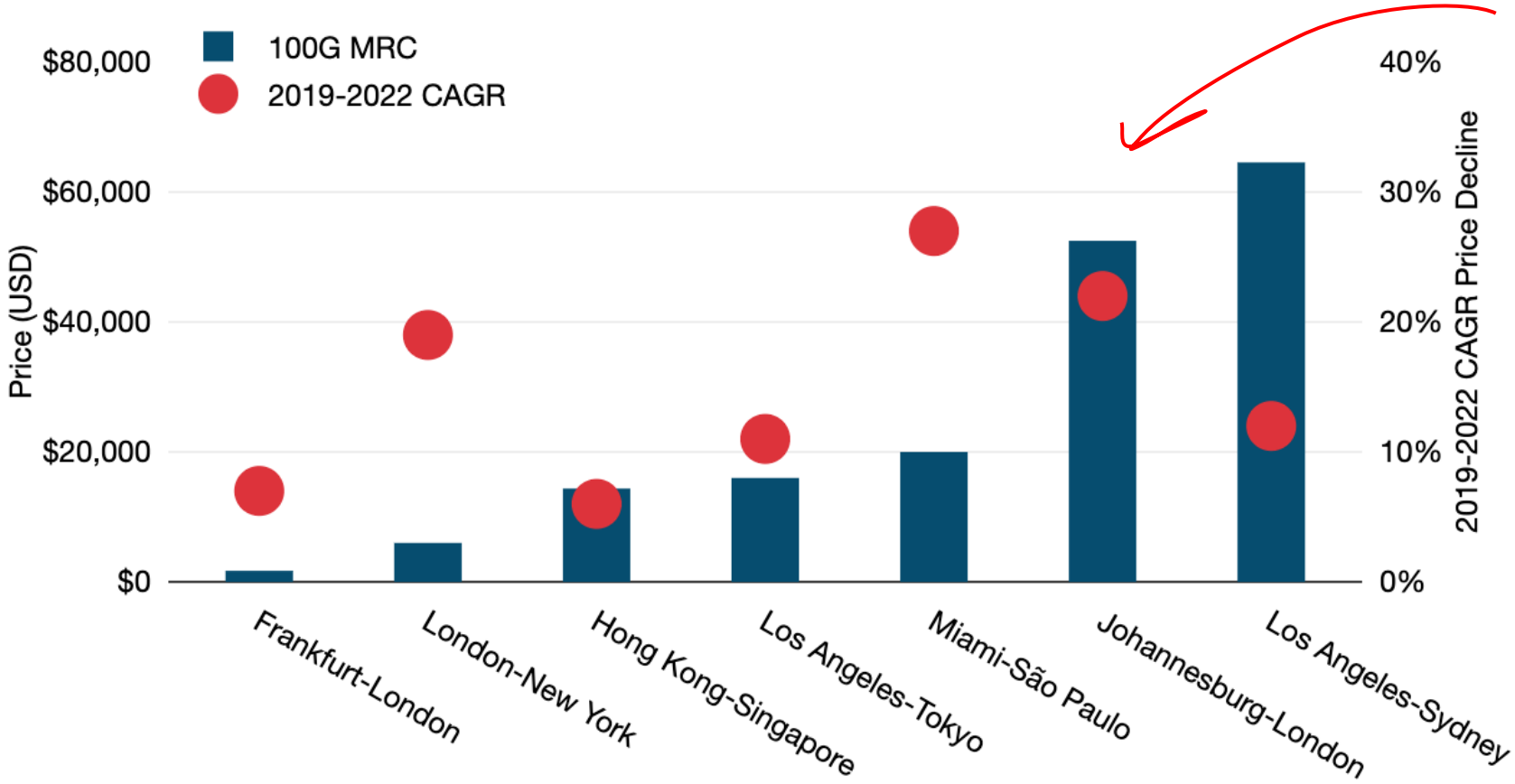


Content providers vs others bandwidth growth by region



100 Gbps median prices and erosion rates varies by route

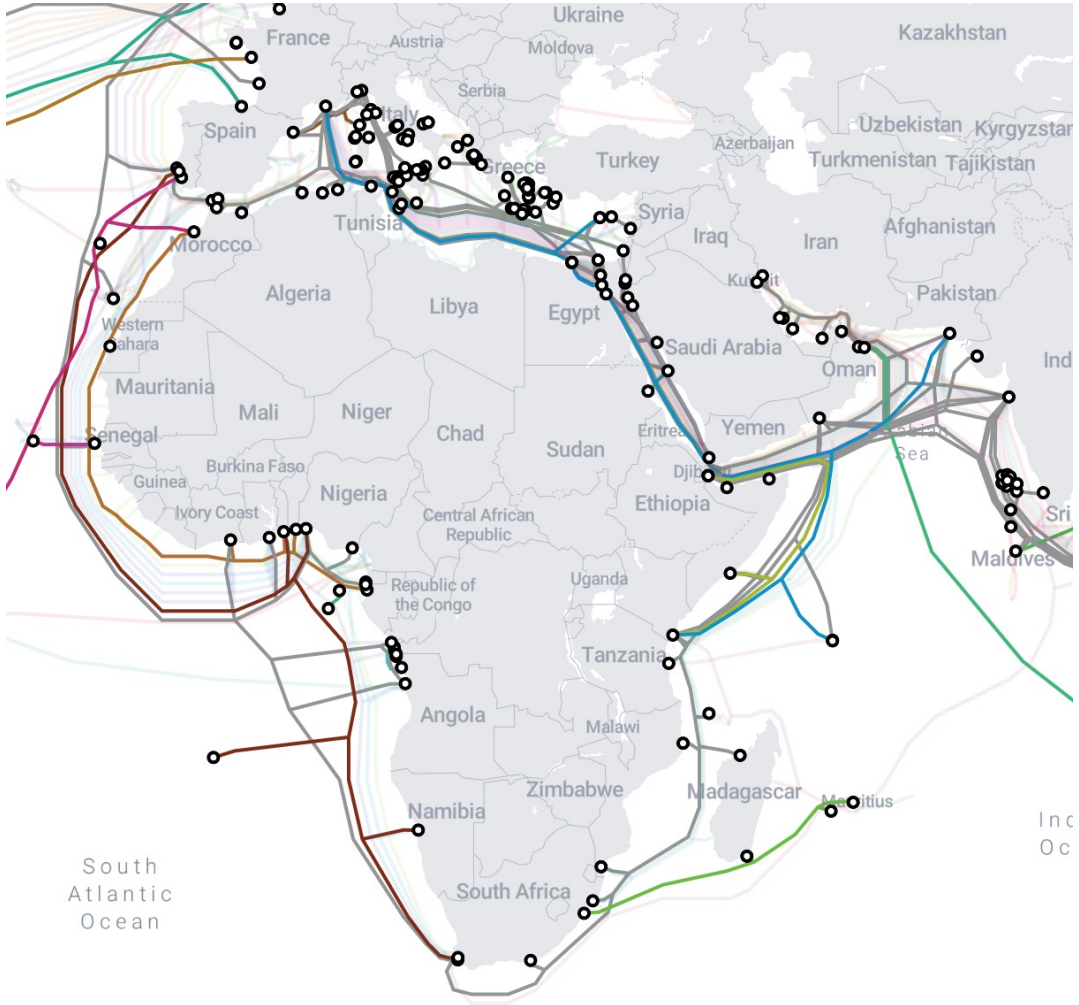
Weighted Median 100 Gbps Wave Prices & CAGR Price Decline on Select Int'l Routes



- Joburg has one of highest erosion rates
- Joburg only lower than outliers LA-Sydney
- Following lead of Miami-Sao Paulo

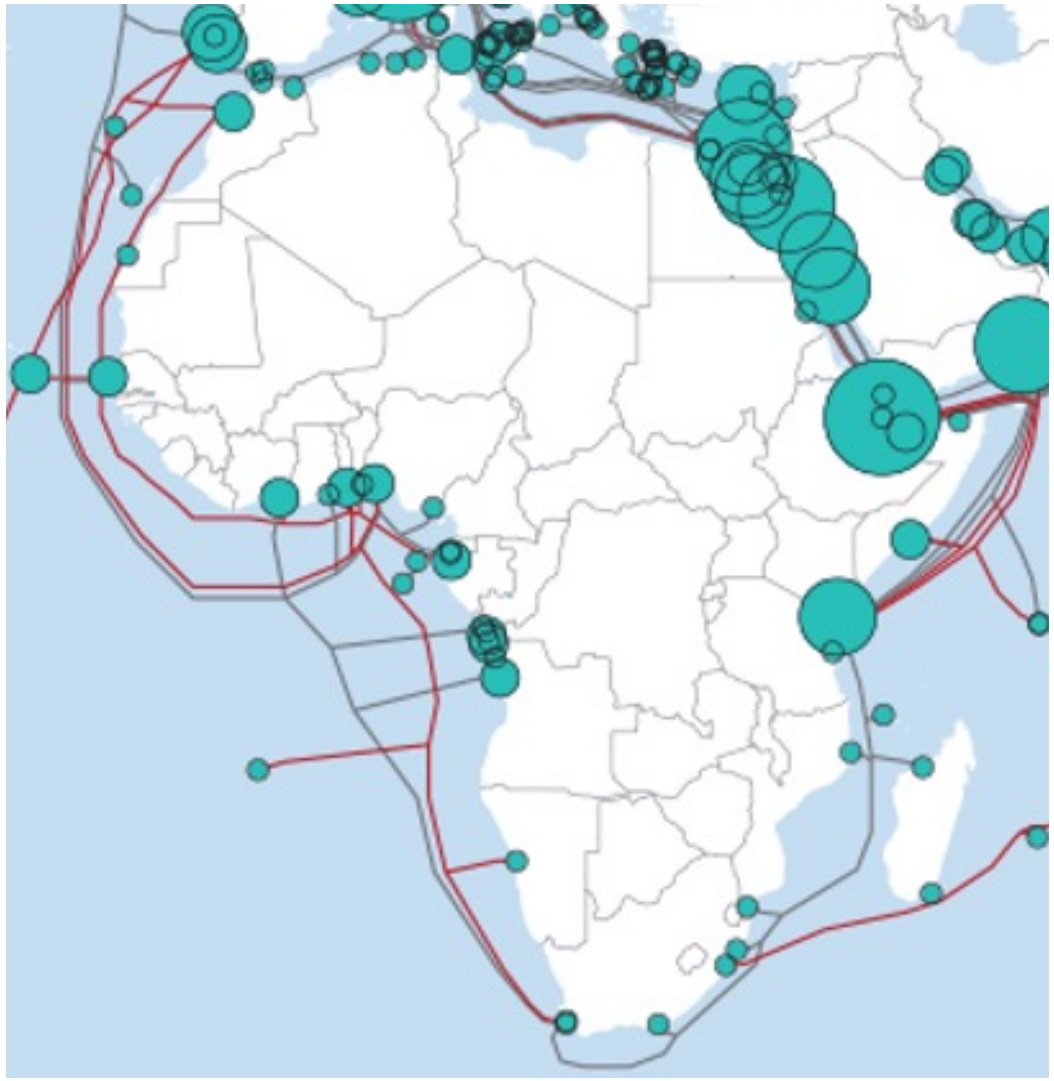
Africa Bandwidth Trends

Major recent & planned cables in Africa & ME



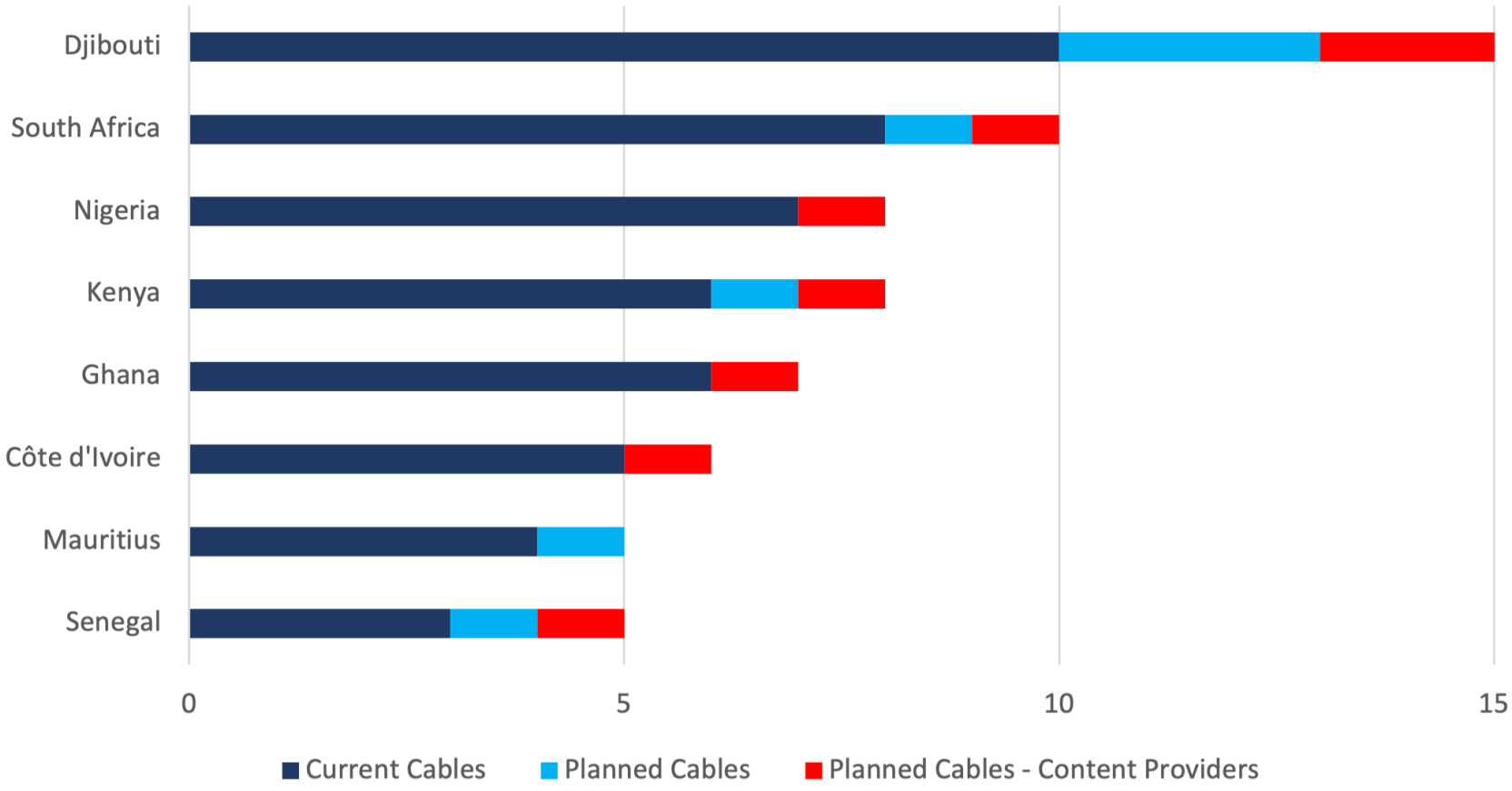
- **Equiano (2023)** – NG, NA, TG, ZA
- **2Africa (2023)** – 33 African, ME, Europe & South Asia
- **Africa-1 (2024)** – Egypt, Saudi Arabia, UAE, Djibouti, Kenya, PK
- **Raman (2024)** Saudi Arabia, Jordan, Oman, Djibouti, India
- **Blue (2024)** – Jordan, Israel, Cyprus, Greece, IT, FR
- **IEX (2024)** – Saudi Arabia, Djibouti, Egypt, Oman, India, Italy
- **Medusa (2024)** – N Africa + S Europe
- **SeaMeWe-6 (2025)** – EG, DJ, SA, PK, LK, IN, BD, MY, SG, FR

Planned sub cable landings



- Highest number of planned landings in East/NE
  - More concentrated—in just 3 locations
- West has similar number of landings but spread out among more than 12 countries
- South Africa has 5 different locations

Sub-Saharan Africa cable landings

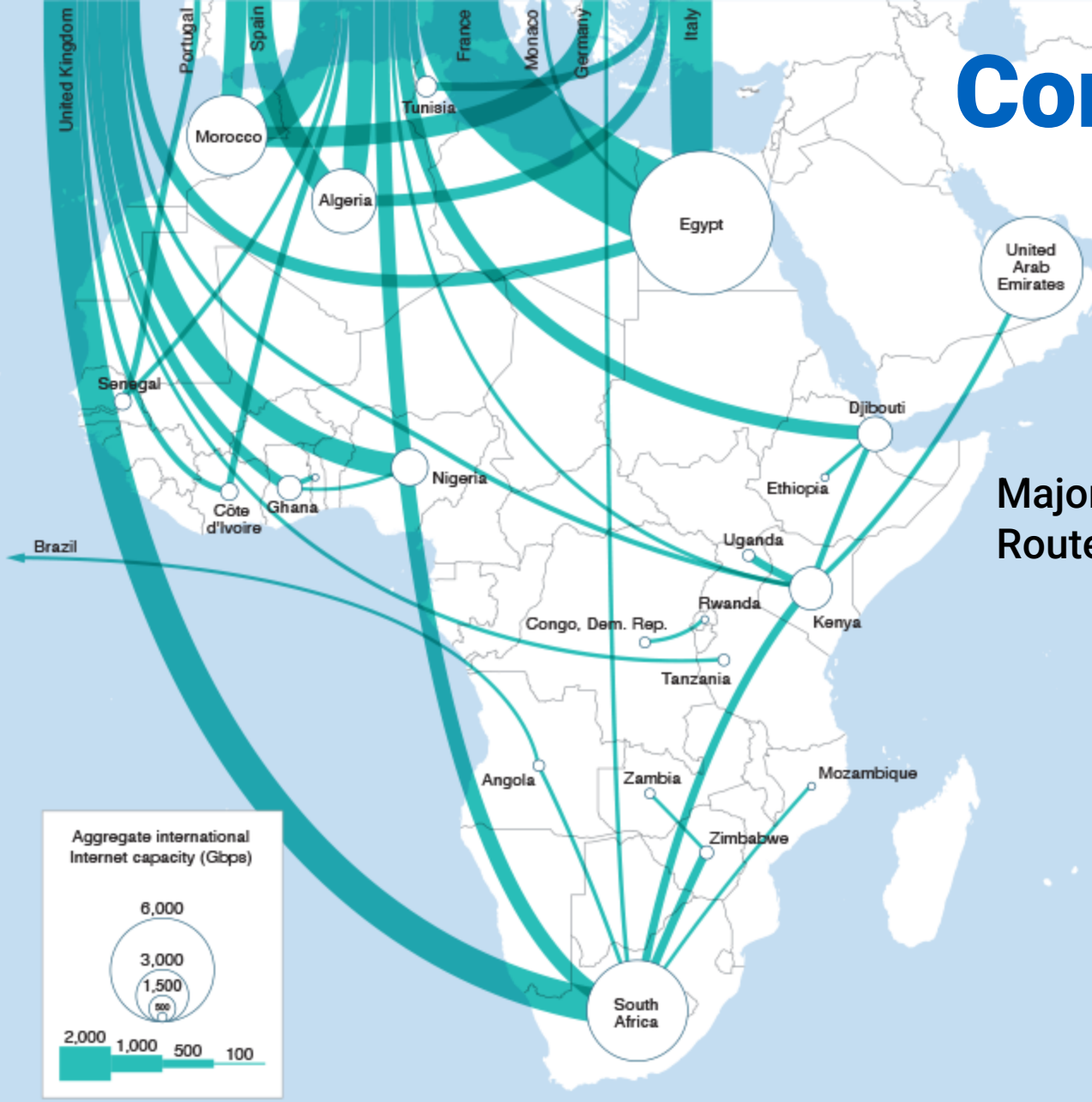


Djibouti has the most cables but primarily serves as a transit hub

Main hubs ZA, Nigeria and Kenya have 8 or more cables

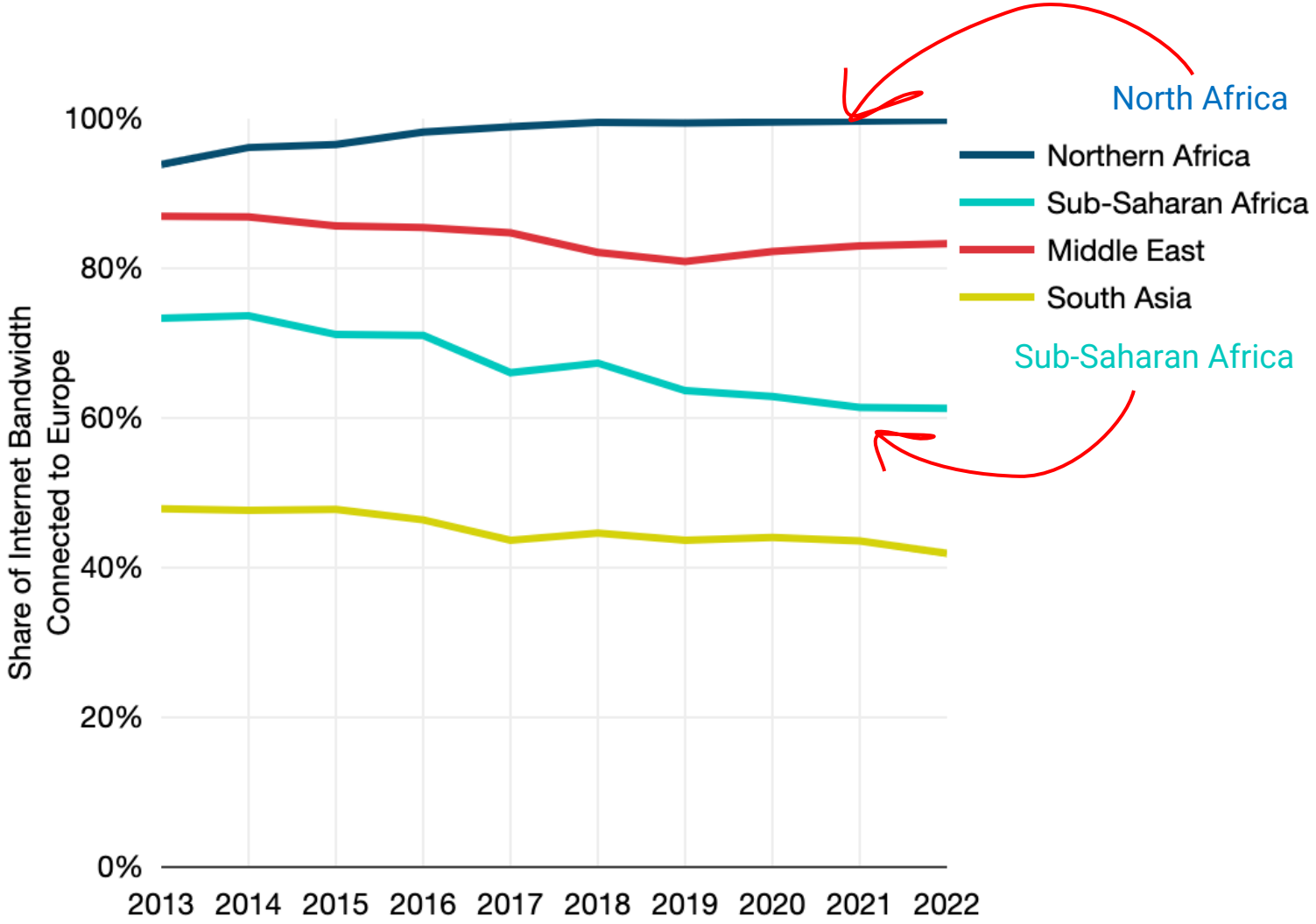
Growing hubs Ghana, Côte d'Ivoire, Mauritius and Senegal with 5 or more

Connecting to Europe



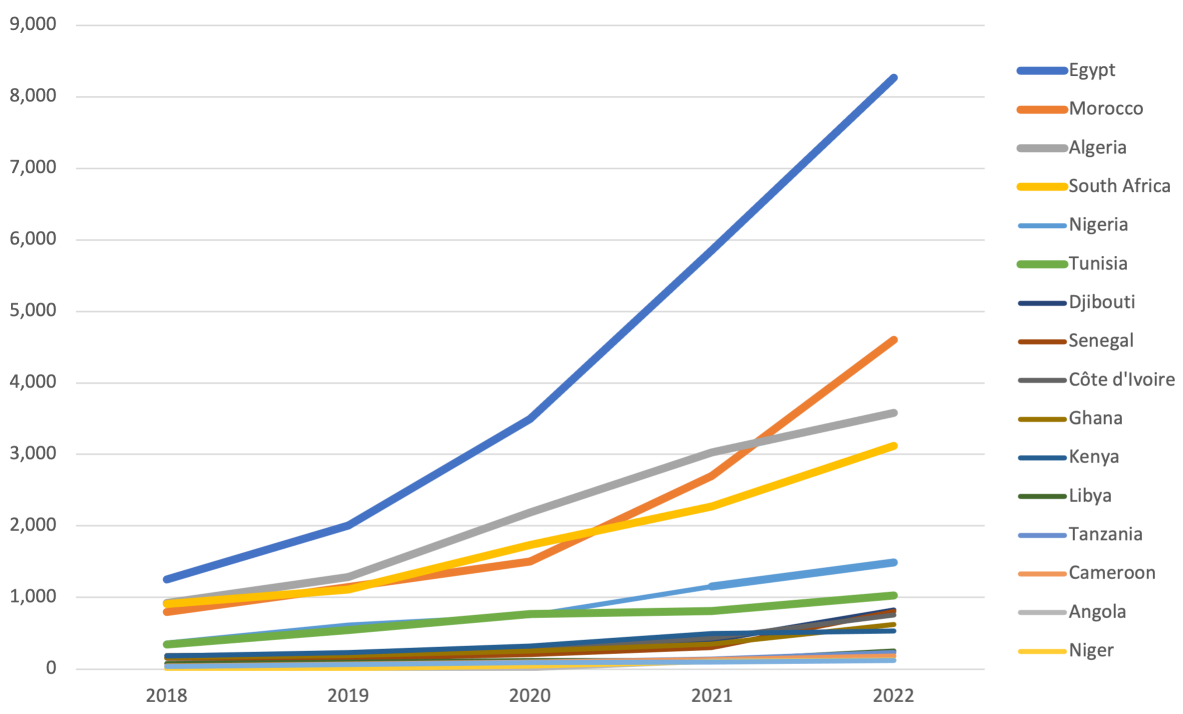
Major International Internet Routes in Africa, 2022

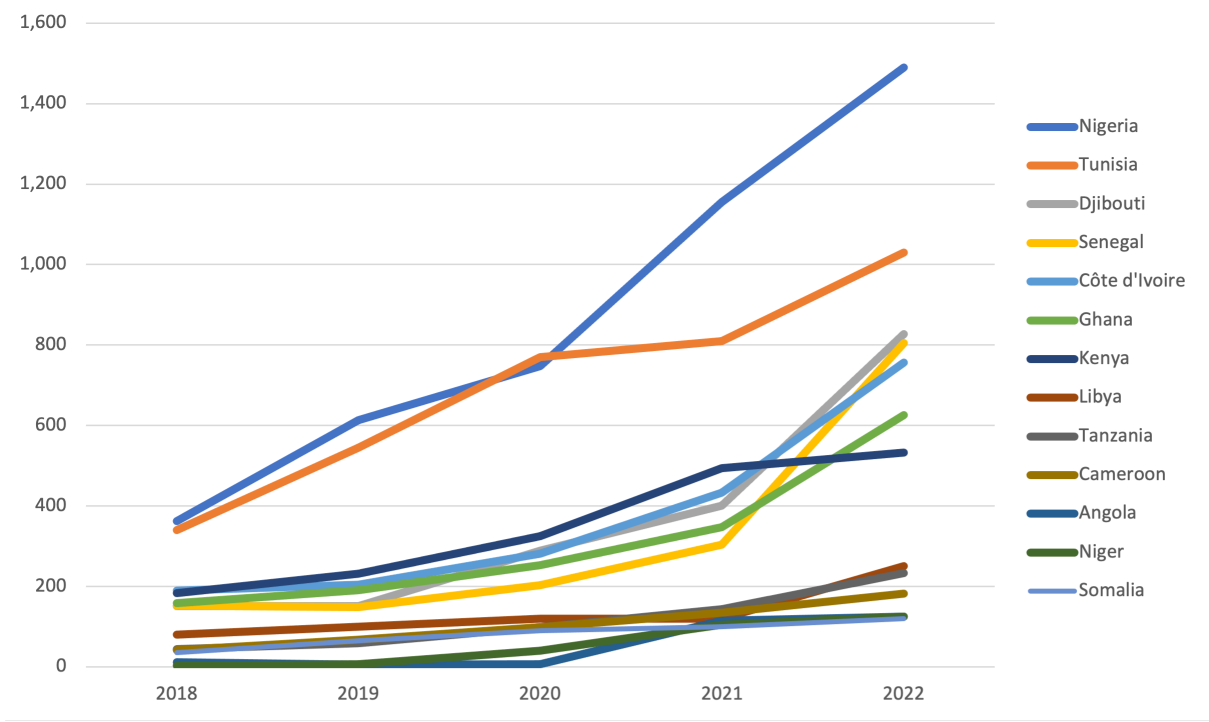
Changes in Subregional Capacity Connected to Europe



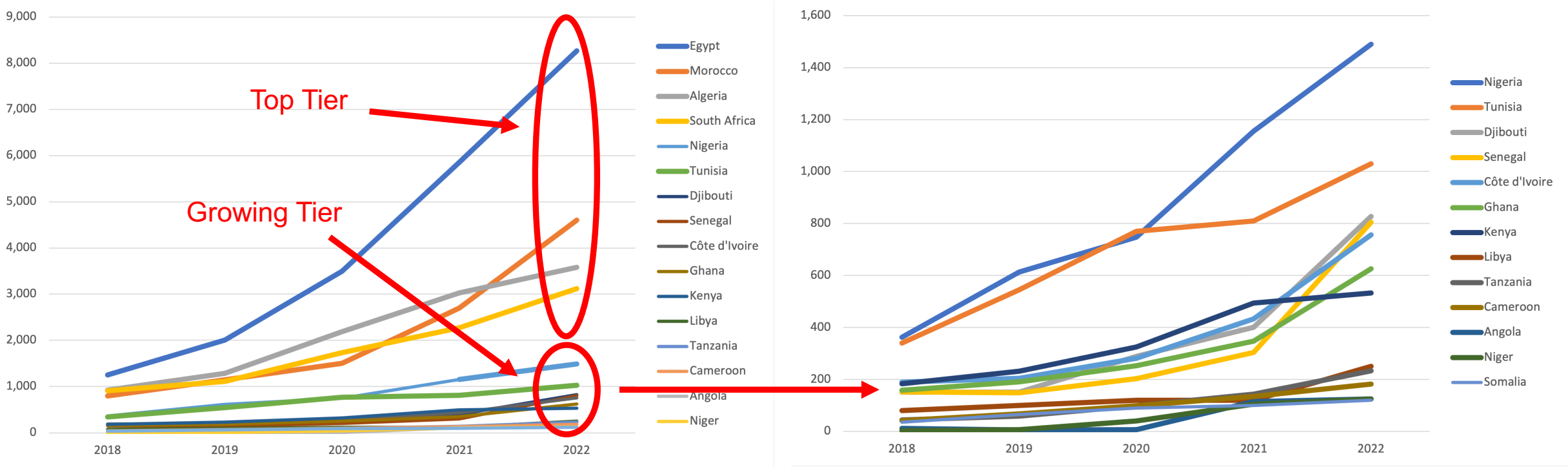
- Total Africa-Europe connectivity has hovered around 80% for the past 5 years
- North Africa's international connectivity is almost 100% to Europe
- While Sub-Saharan Africa's share of connectivity to Europe has dropped to about 60%

Int'l IP capacity growth of African countries connected *to Europe*

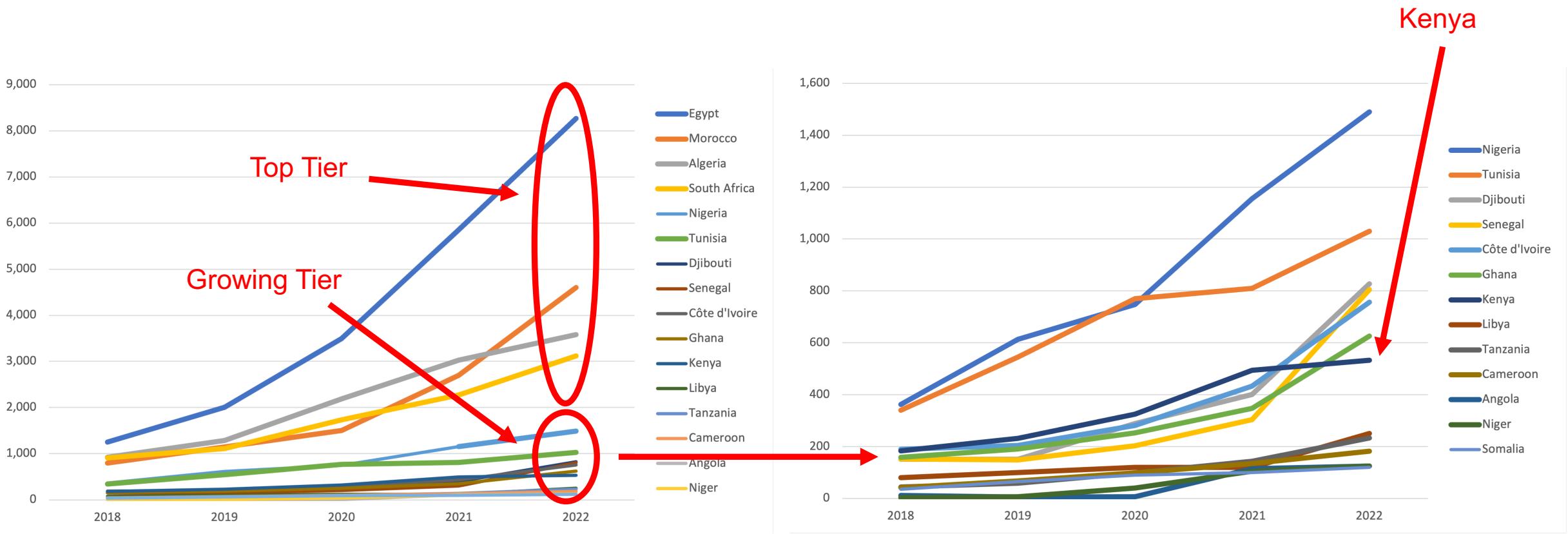




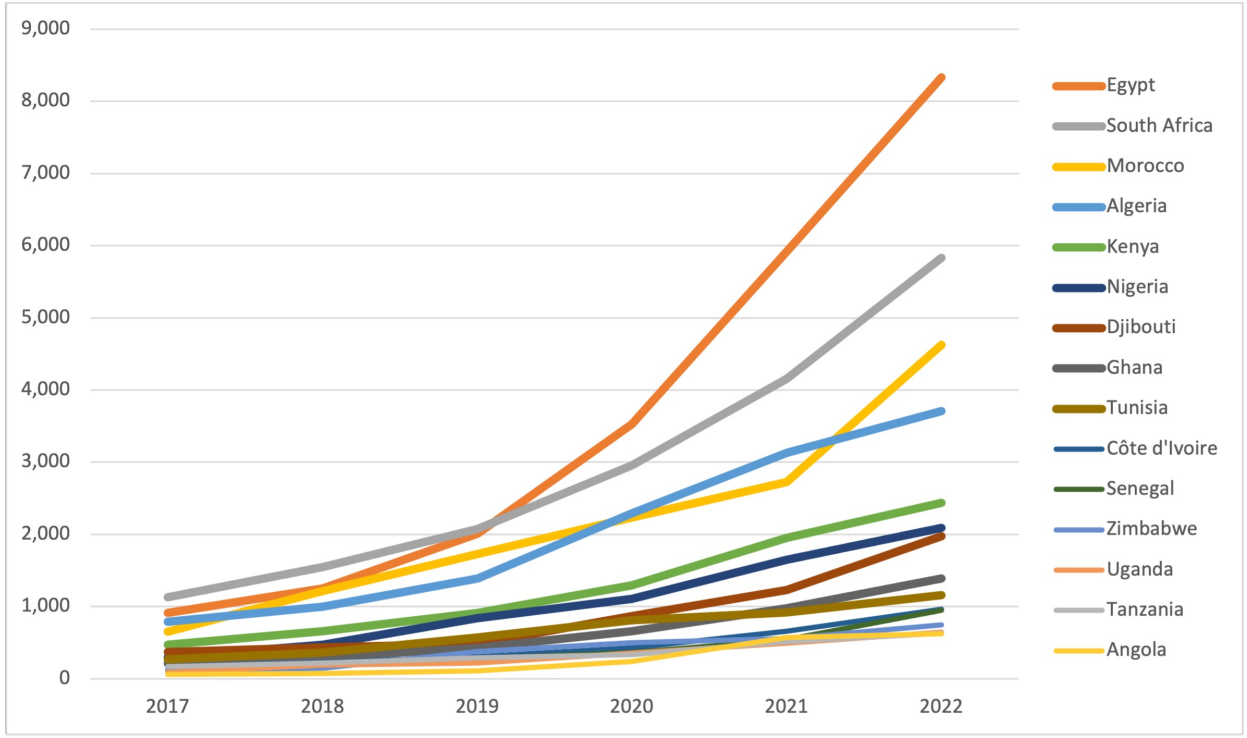
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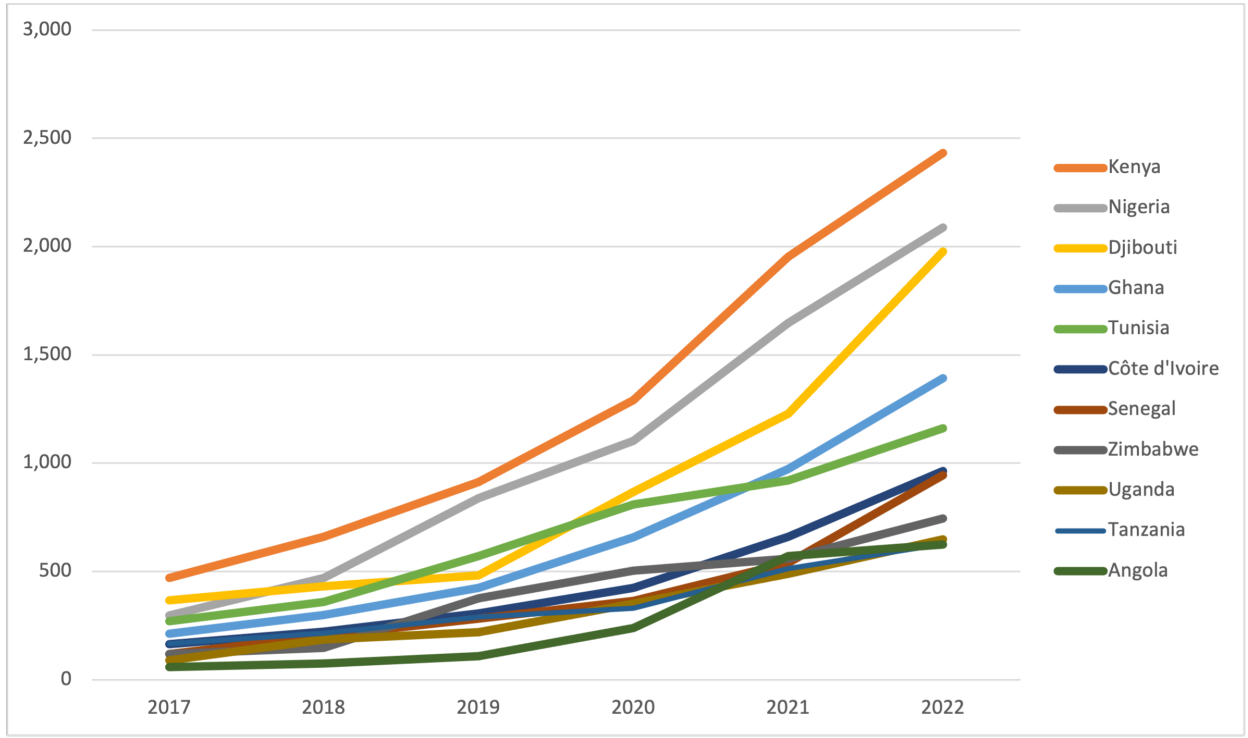


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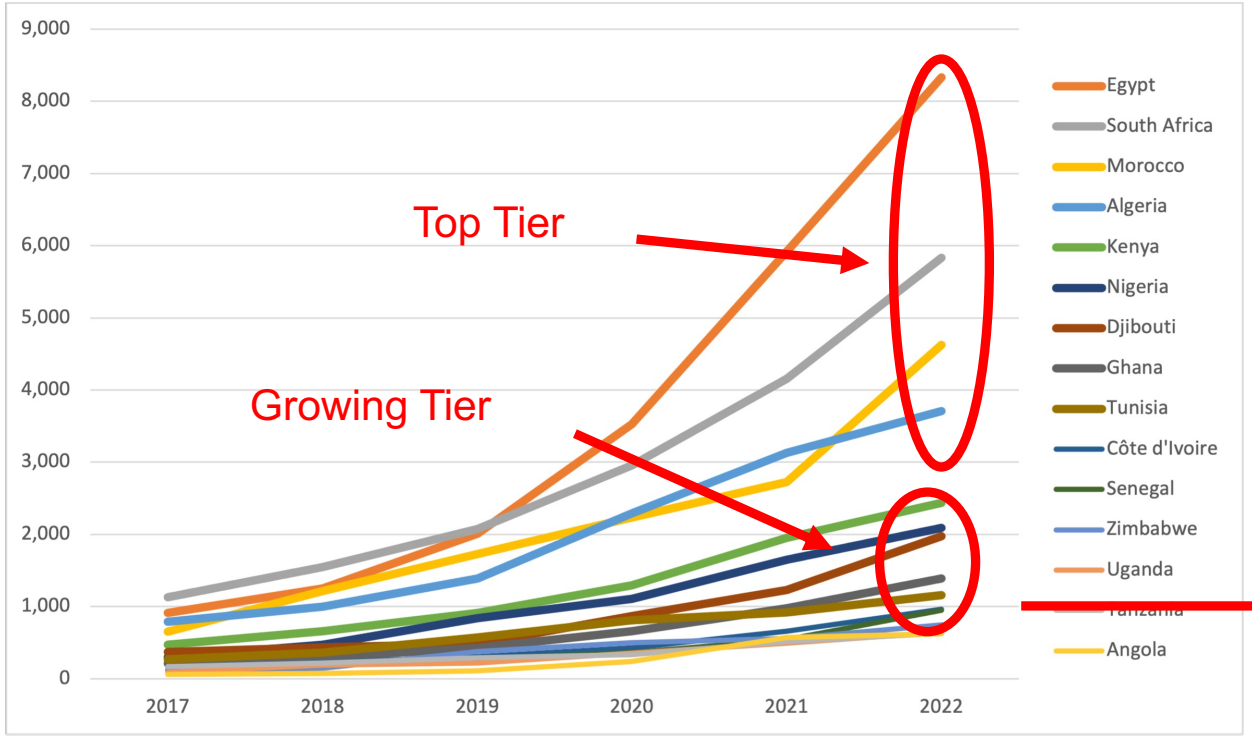


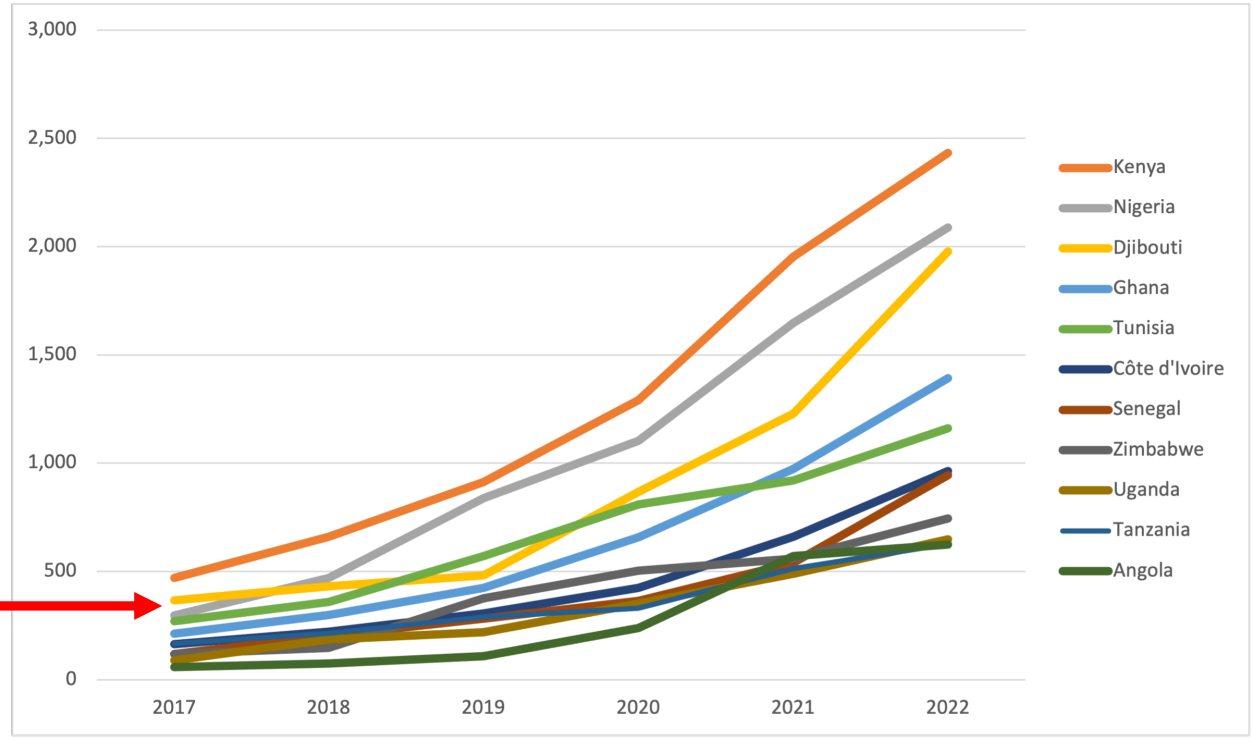
Int'l IP capacity growth of African countries to Europe *plus intra-Africa*



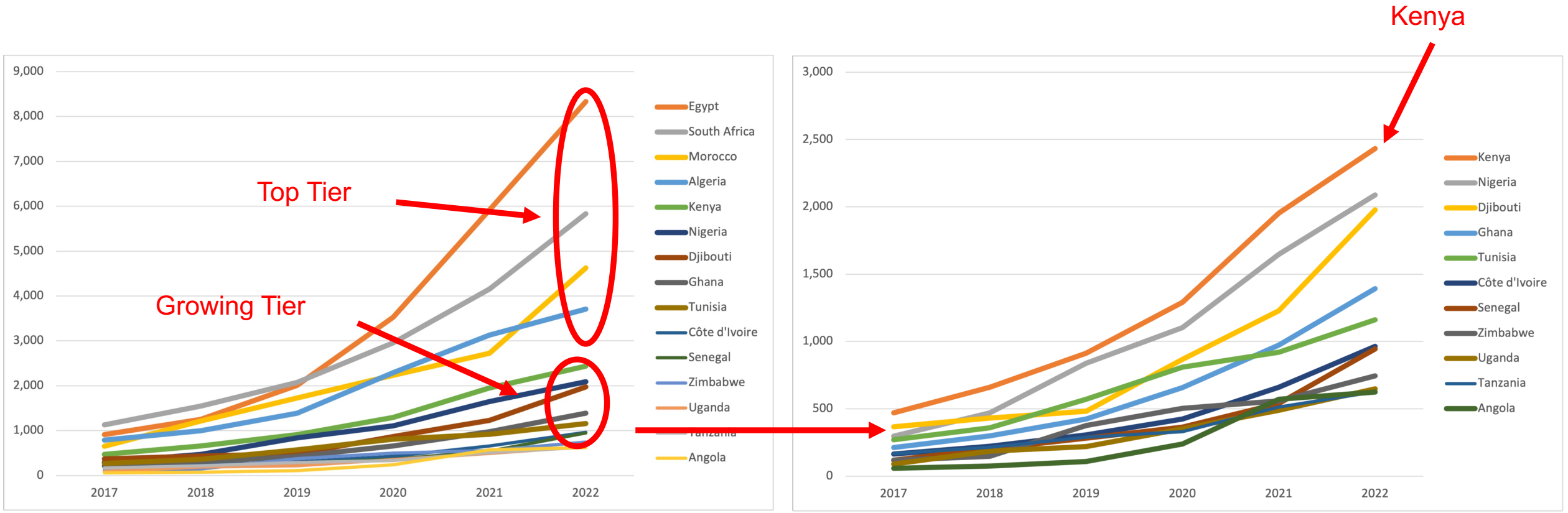


Int'l IP capacity growth of African countries to Europe *plus intra-Africa*

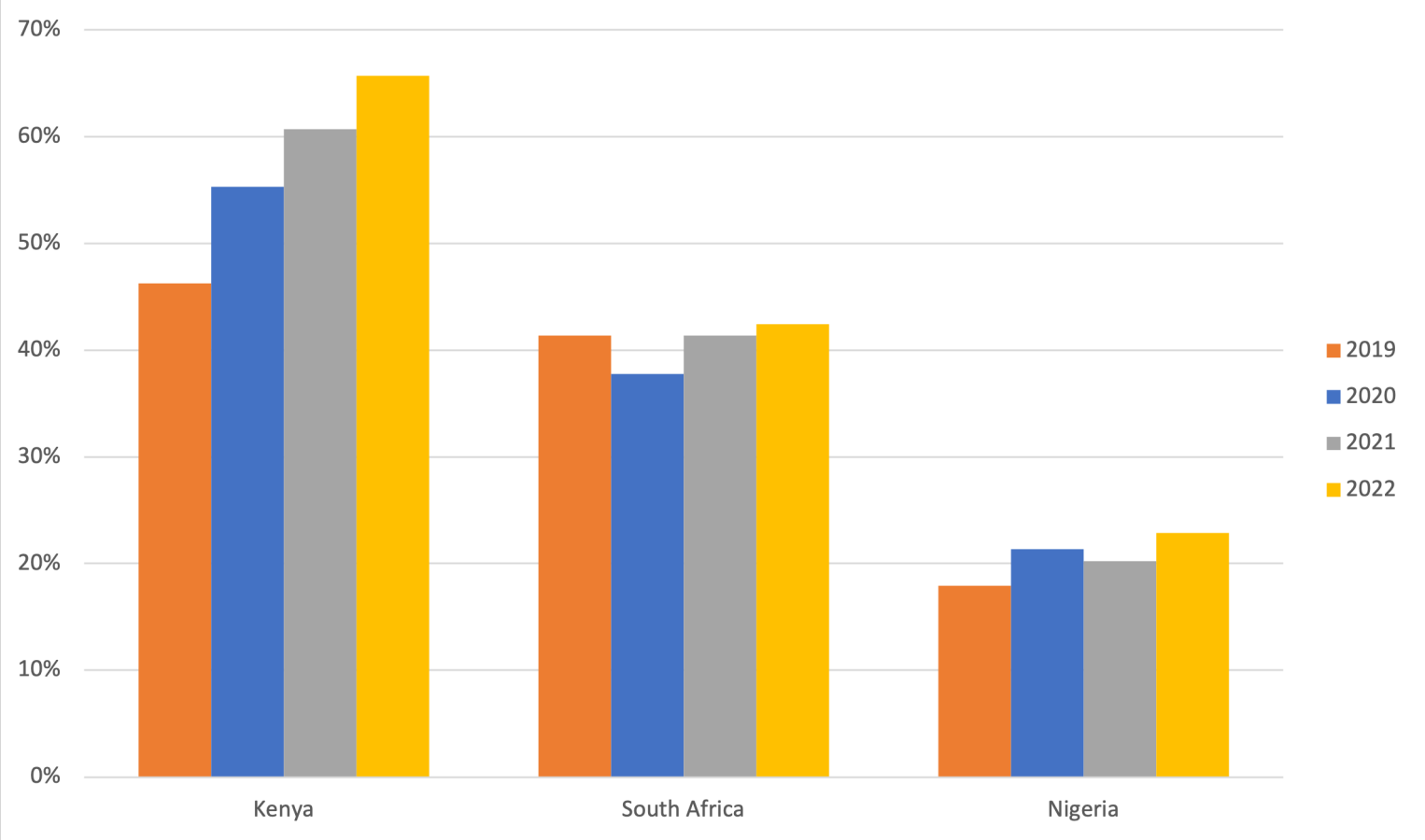




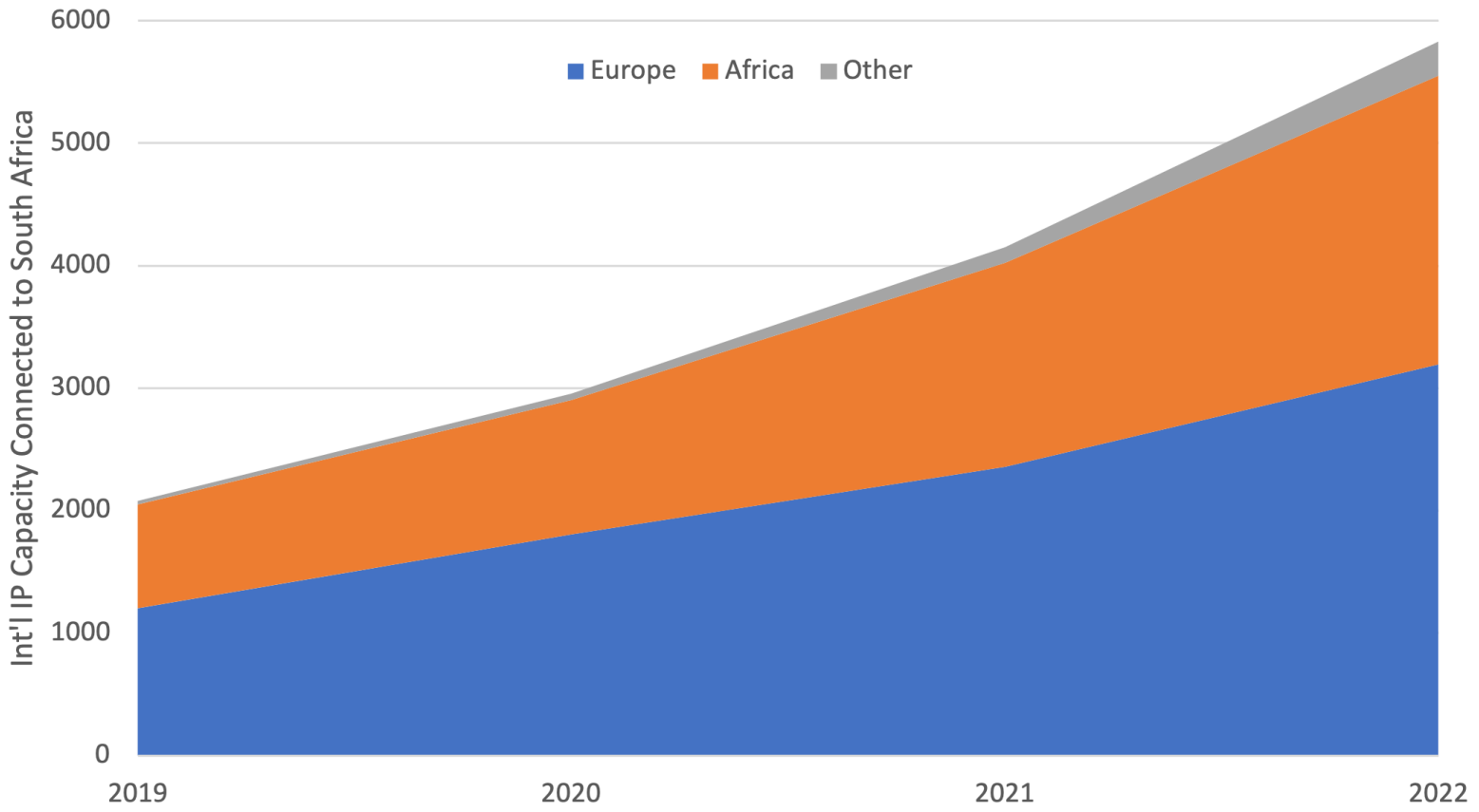
Int'l IP capacity growth of African countries *to Europe plus intra-Africa*



Share of Intra-African Int'l IP capacity

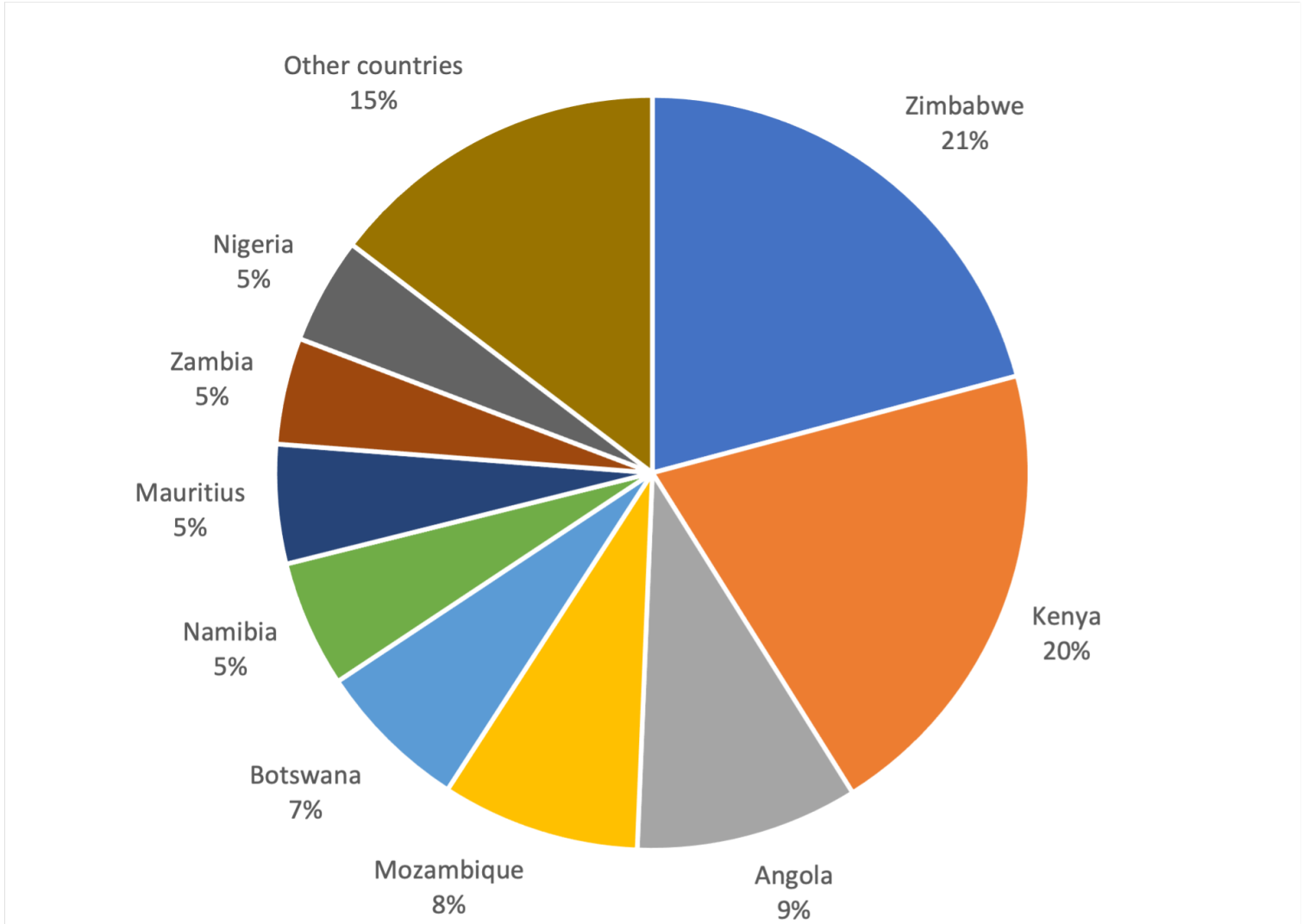


Int'l IP Capacity Connected to South Africa



- Europe still top int'l capacity but intra-Africa growing at a similar rate

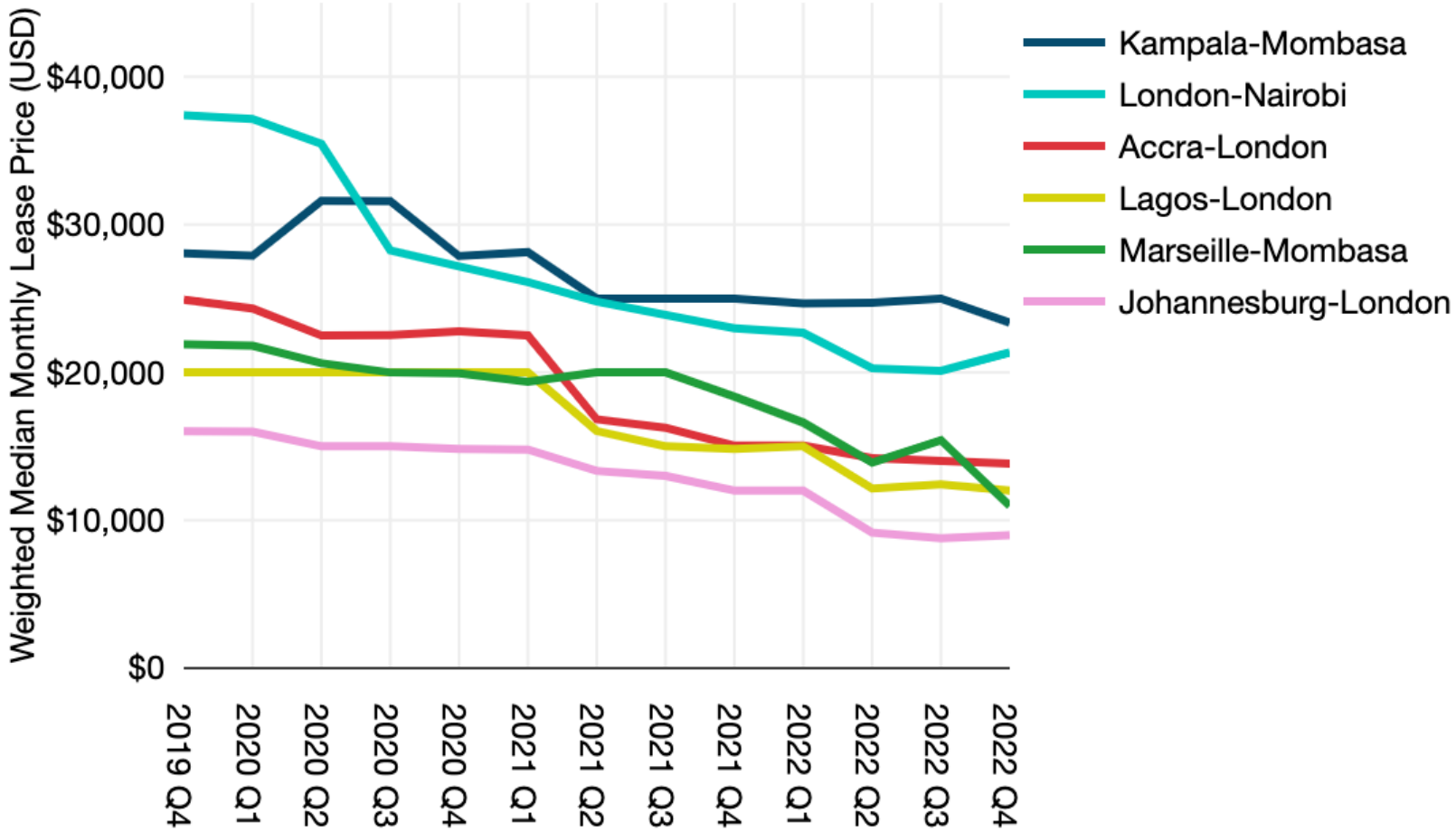
Int'l IP Capacity Connected to South Africa



- Largest share of int'l capacity connected to Kenya and Zimbabwe
- Angola, Mozambique and Namibia the next tier
- Four countries pretty even amounts of connected capacity includes Nigeria and Mauritius
- Nigeria still has small share of capacity compared to Kenya

Regional pricing trends

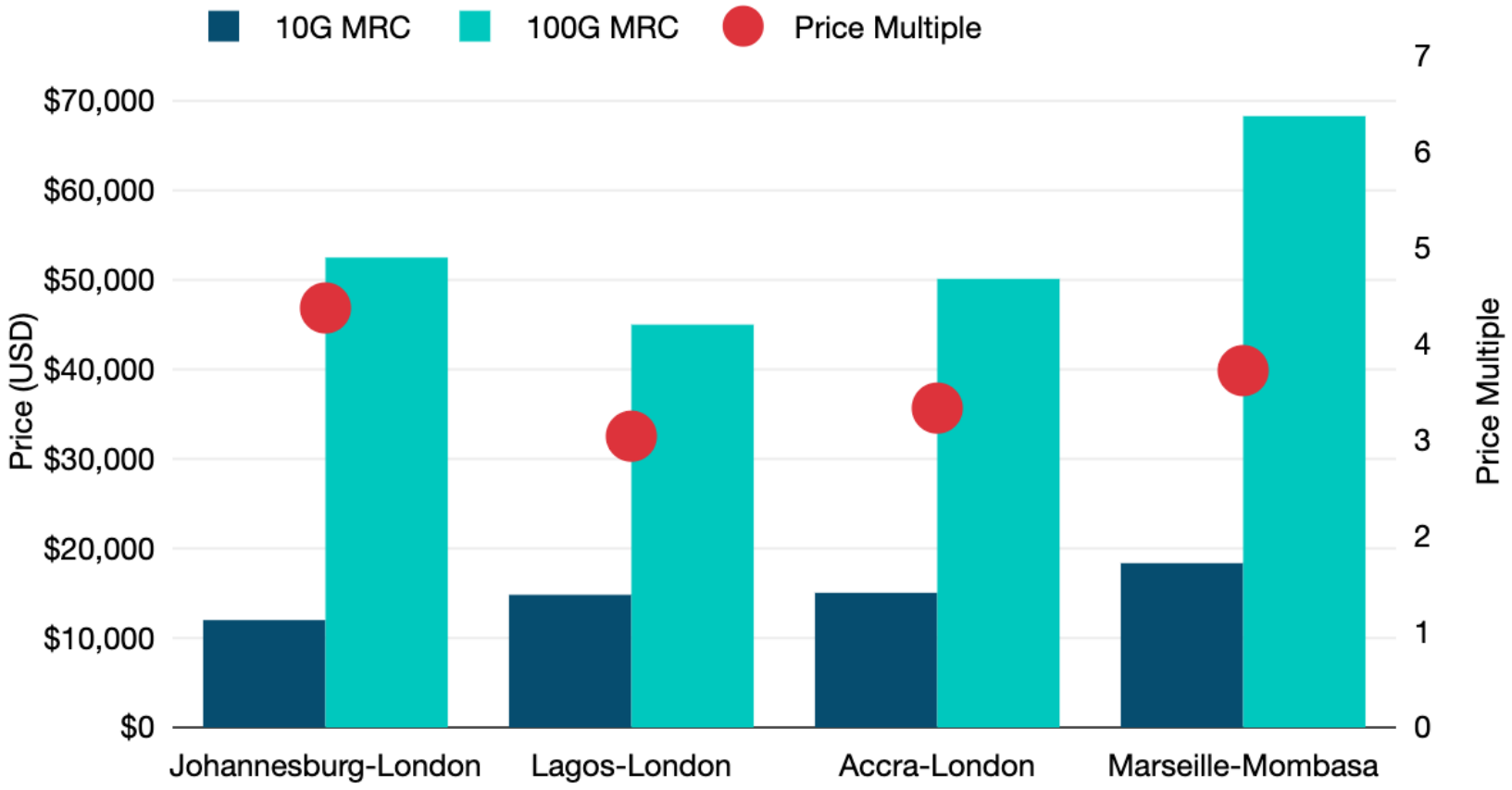
Weighted Median Prices for 10 Gbps Wavelengths on Key Africa-Europe Routes



- 10G prices decrease avg of 16% on these routes
- East vs West price differences exist 12-14k in Accra & Lagos-London vs 20k Nairobi-London
- Adding terrestrial backhaul increases price significantly

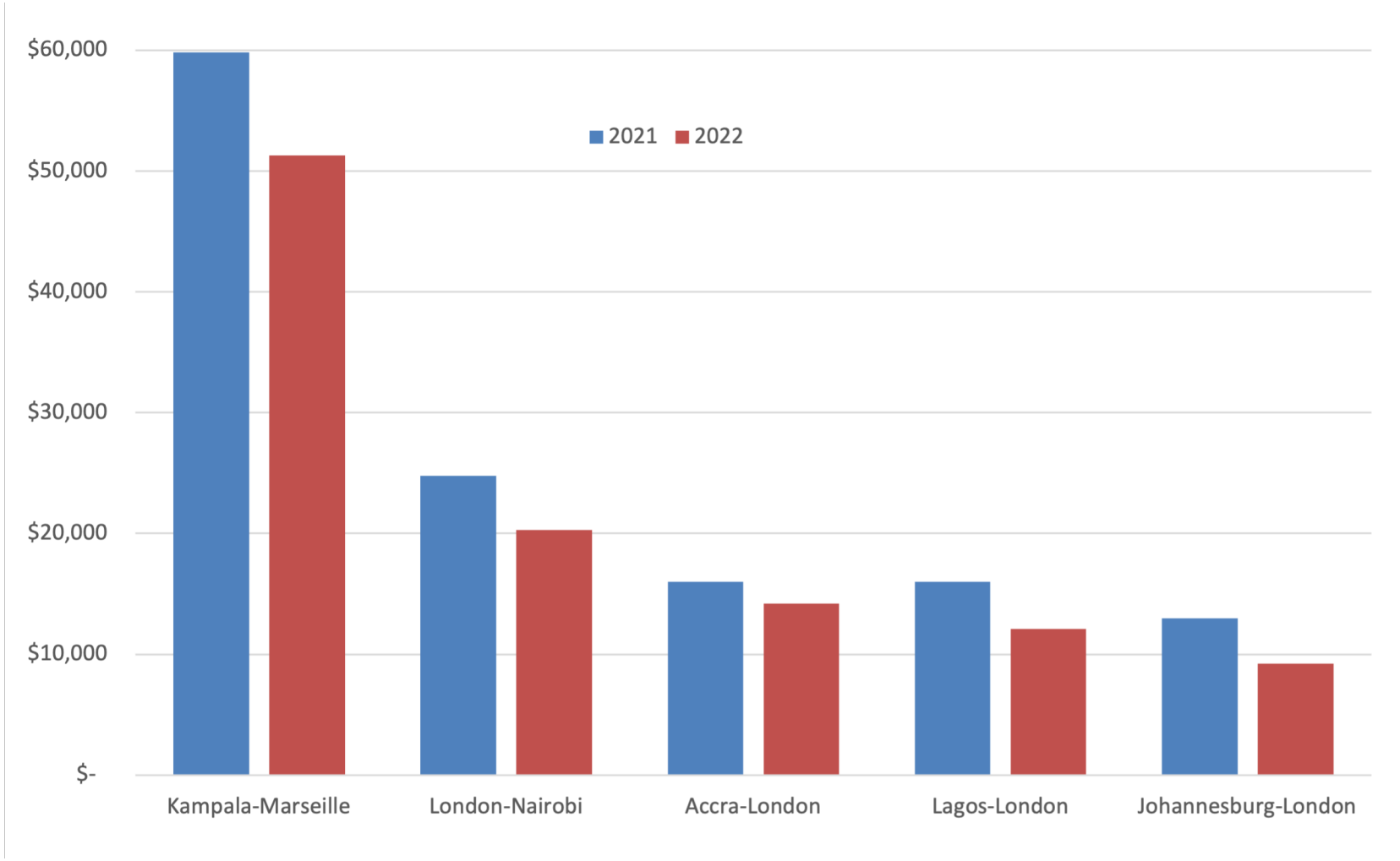
Shift to 100 Gbps Wavelengths

Weighted Median 10 & 100 Gbps Wavelength Prices & Price Multiples in Africa



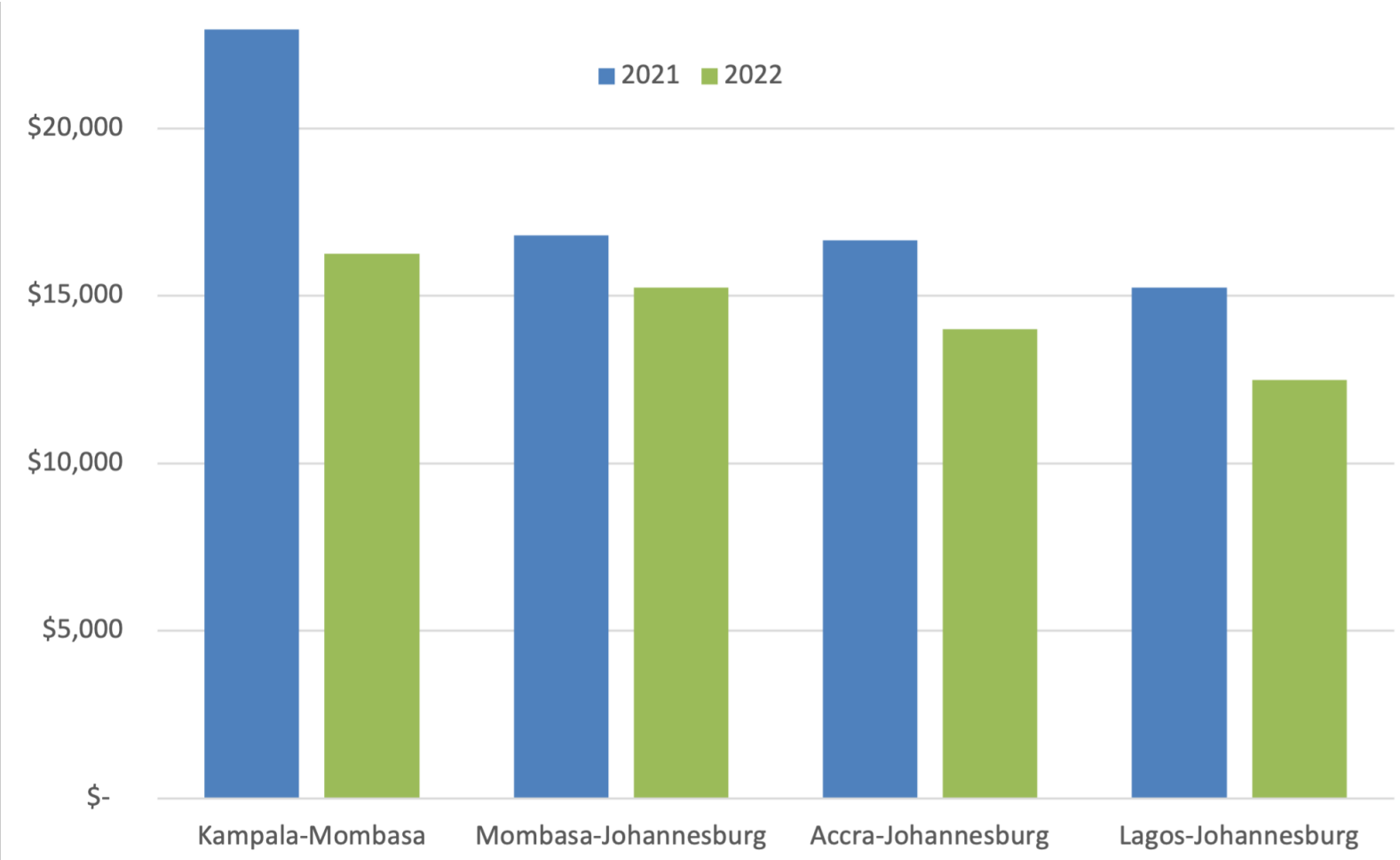
- 10G waves still make up a large portion of sales in Africa
- But 100G are growing in demand, particularly on high traffic routes out of Joburg and Lagos
- 100G waves on key routes dropped from about 7 times the price of a 10G 3 yrs ago to just 3x on Lagos-London & 4.4x Joburg-London

Africa to Europe 10 Gbps Wavelength Prices



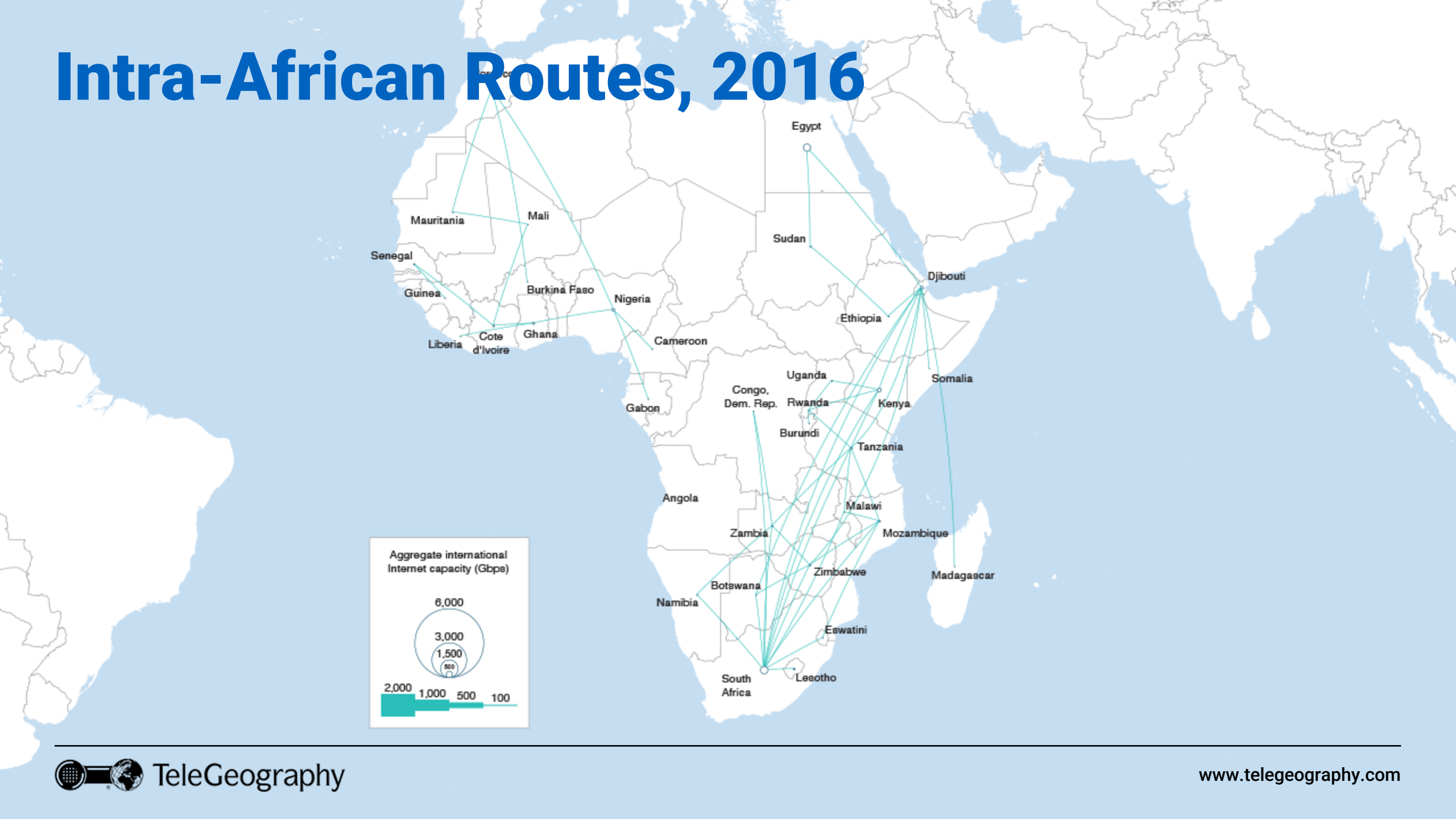
- 'Wet' routes – London to Joburg, Lagos or Accra are the cheapest
- 'Wet + dry' routes – Kampala-Marseille and London-Nairobi add a premium for the terrestrial part

Intra-African10 Gbps Wavelength Prices

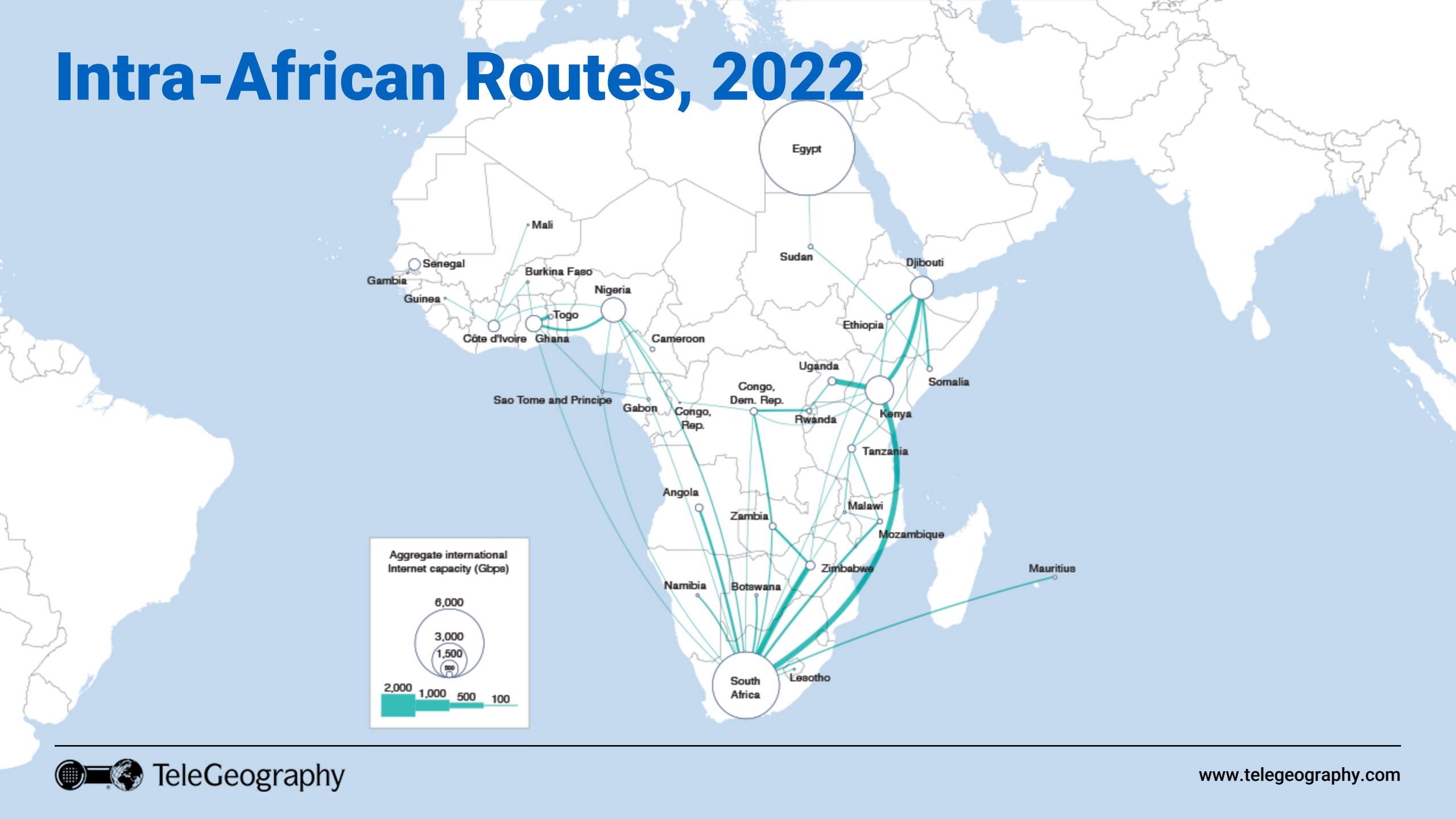


- East side routes are same or a little more expensive than west side routes now
- ‘wet’ intra-African routes are now similar but slightly more expensive than Africa to Europe routes

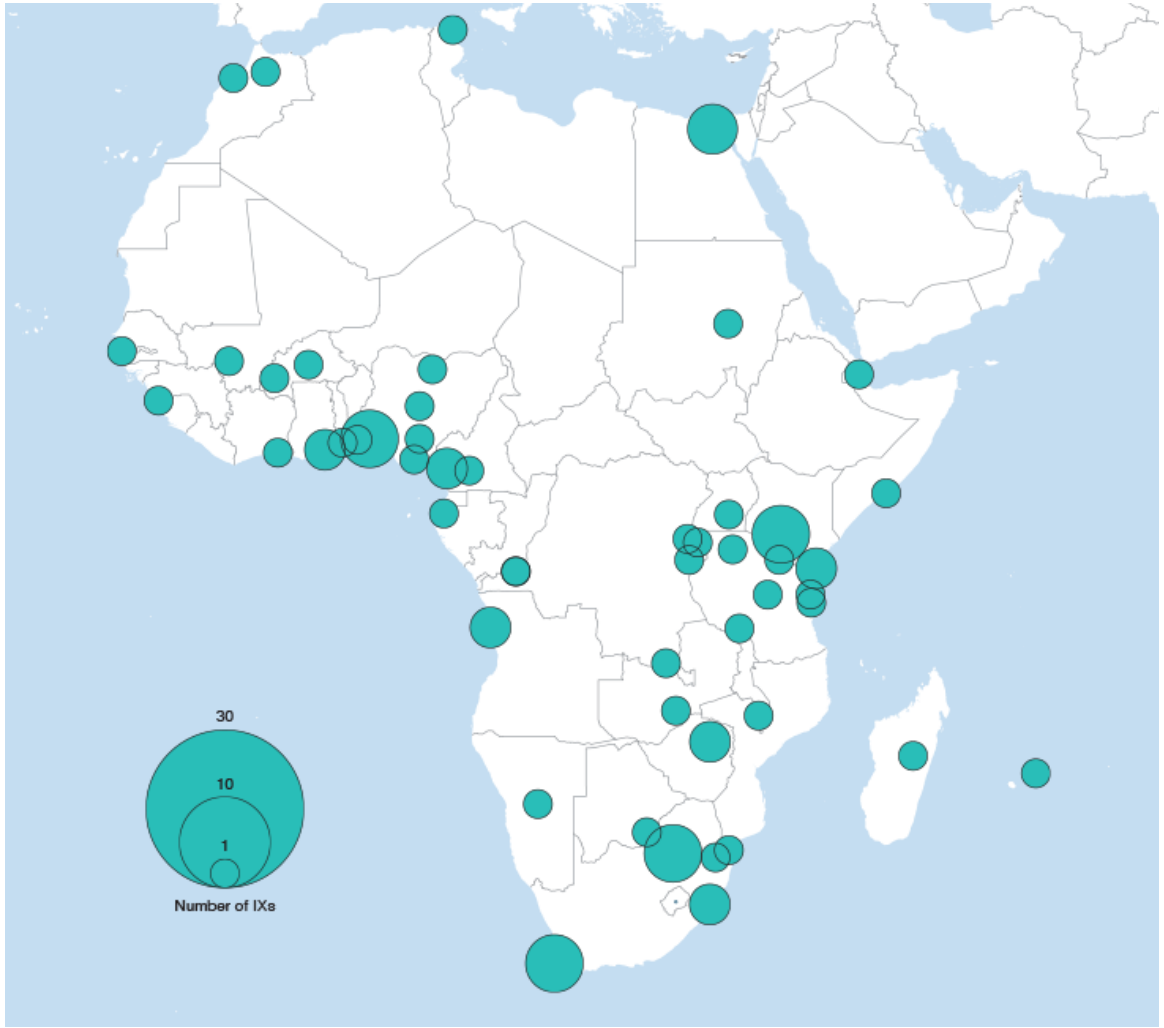
Intra-African Routes, 2016



Intra-African Routes, 2022

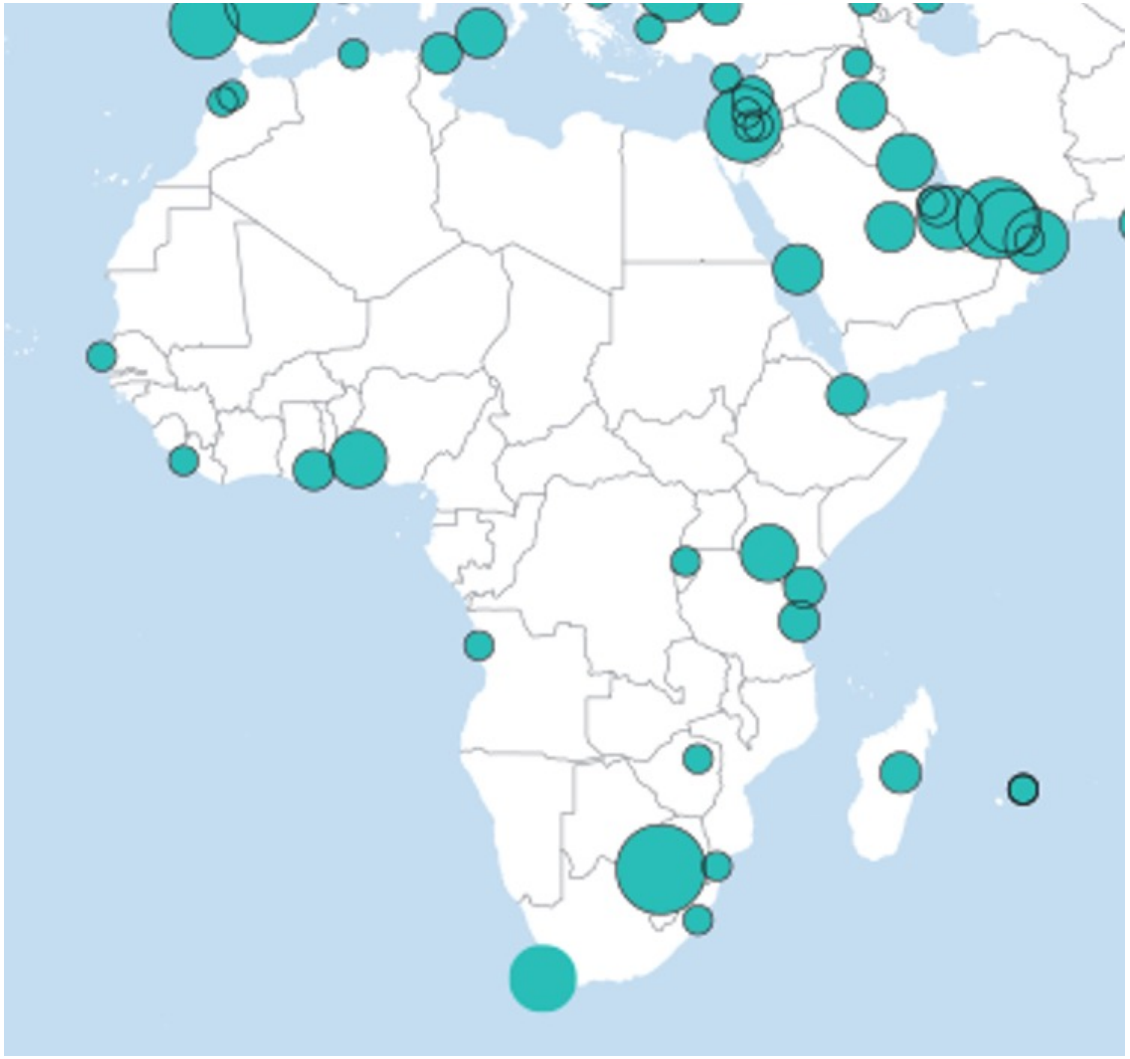


IXP Geography



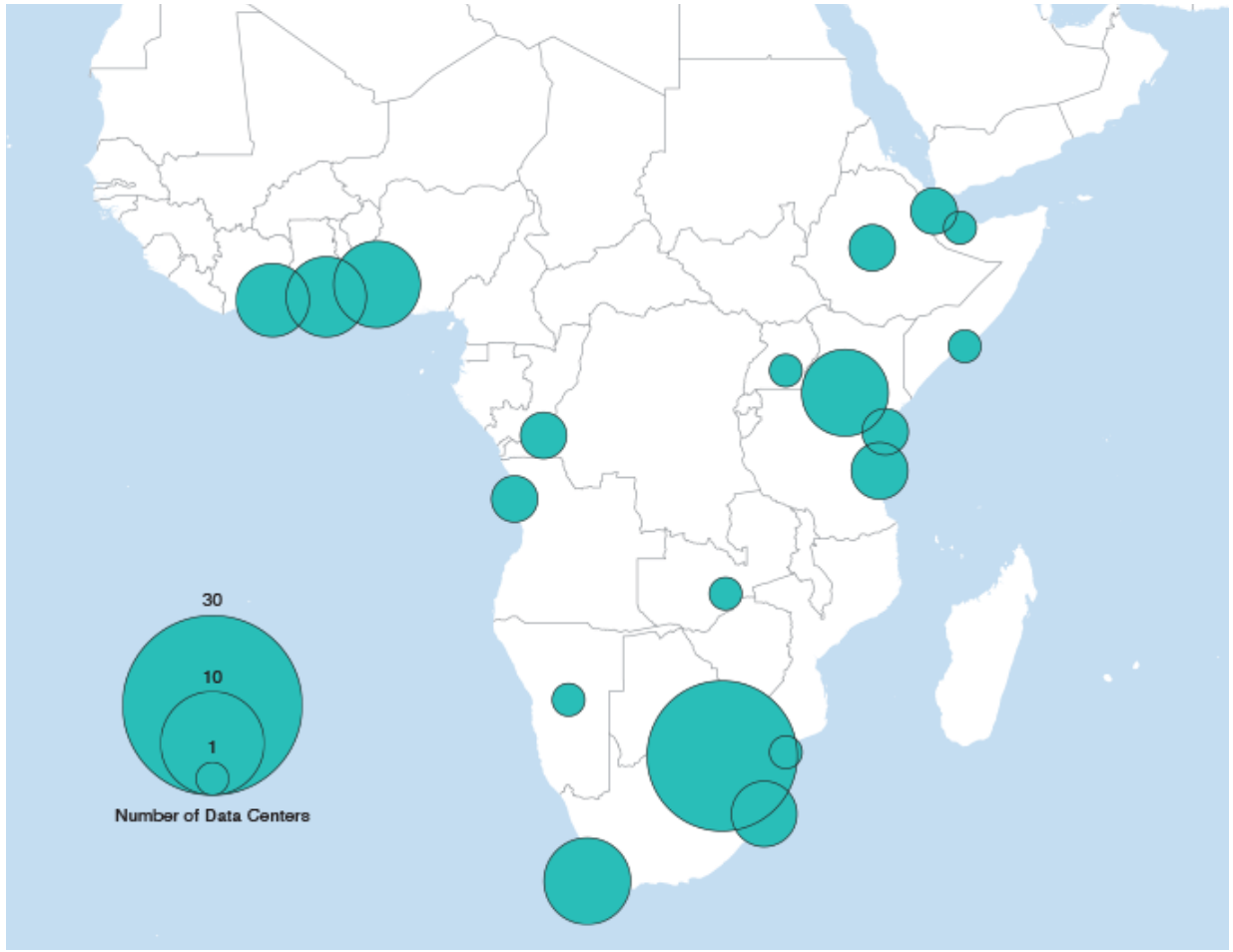
- IXPs help localize traffic and content connecting networks and content providers
- Lowering costs (less IPT) and enhances performance (lower latencies)
- Essential element of creating hubs and their ecosystems
- Sourced from IXPDB & Peeringdb

CDN Geography



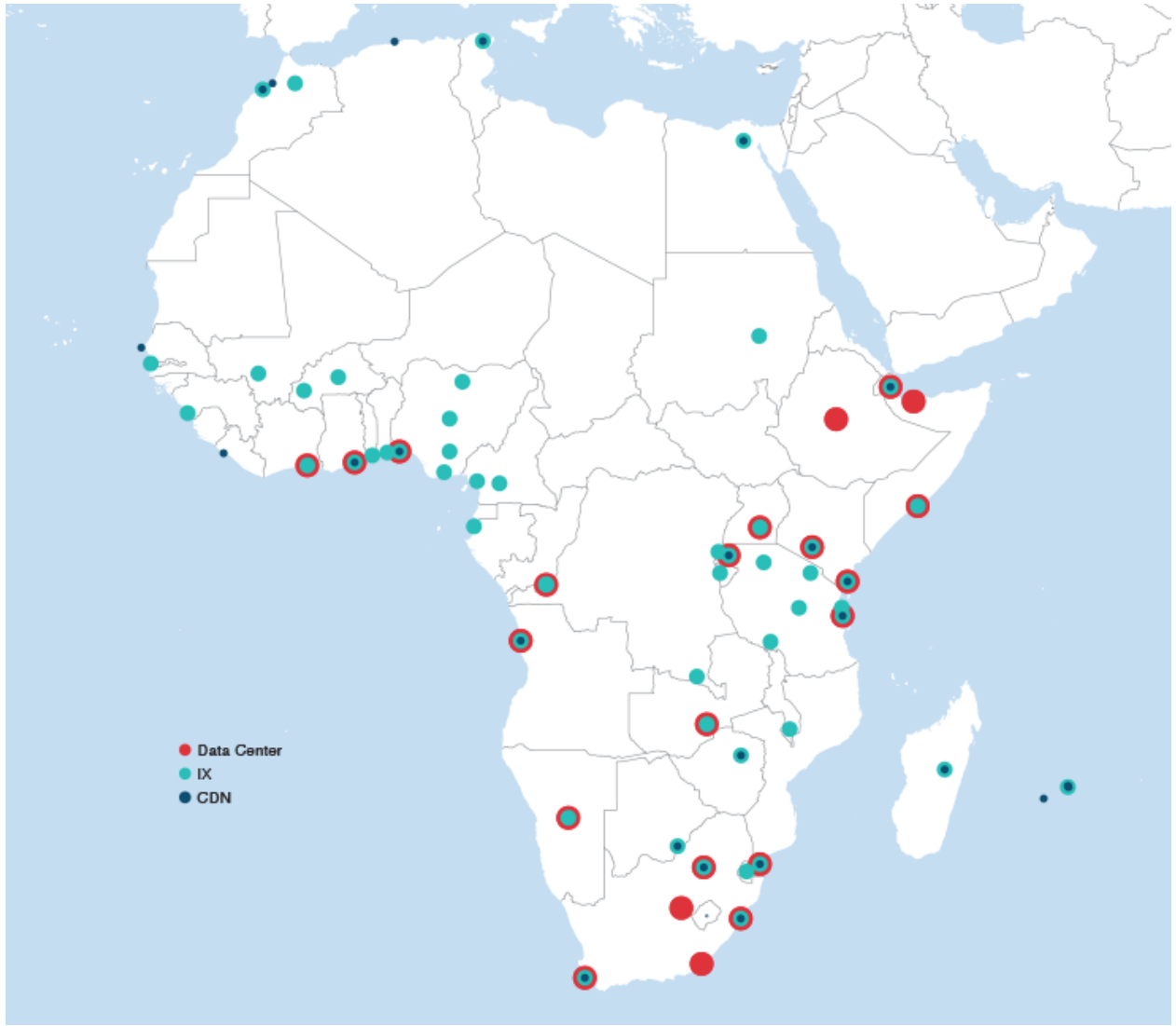
- 46 CDN nodes in Sub-Saharan Africa from 13 providers
- Tracks with the IXP presence
- Mainly in the primarily and secondary hubs

Data Centers 2021-2022 + Planned



- More than 90 current and planned data centers in Sub-Saharan Africa
- Data center investment goldrush… 20 planned or recently launched since 2021
- Primarily in Nigeria and Kenya and South Africa

Data Centers, CDNs & IXPs

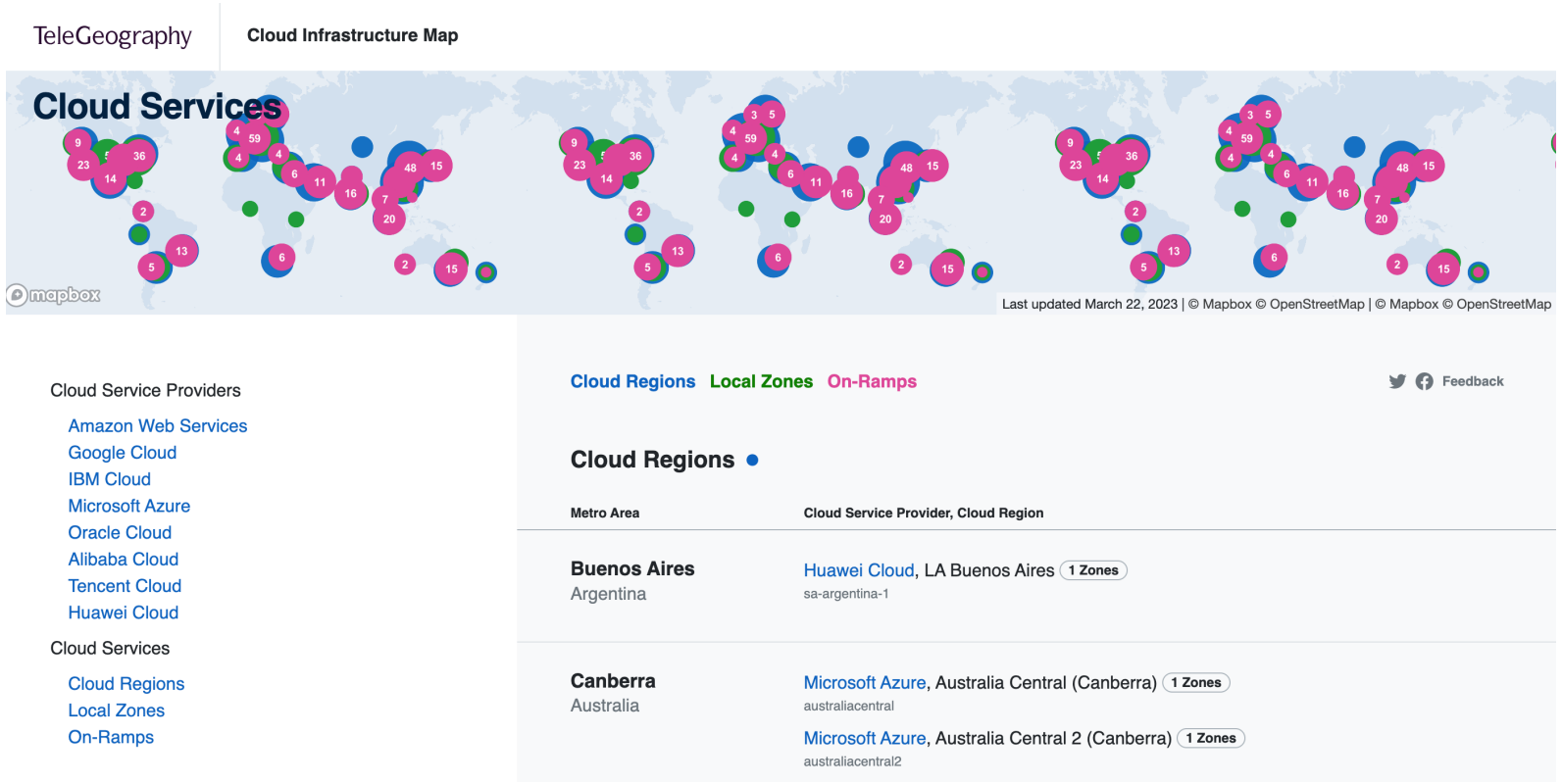


- 'Bullseye' markets (all three elements) are the most mature markets
- 2/3 elements shows developing market
- Primarily in Nigeria and Kenya and South Africa

Looking ahead

- **Boost in Int'l Capacity**
  - Both coastal and landlocked countries
  - Increase both number and size in intra-African routes
- **Decline in Prices**
  - Price erosion on key African routes, first coast then inland
  - Initial drop, then decelerate to historic level
- **Localized Content Growth**
  - First caches then CDN PoPs and finally DC builds
  - Content providers become the anchor tenants but spark growth of new ecosystems
- **The edge is moving closer to African end-users**
  - Away from Europe to major hubs within Africa

Have you seen the Cloud Infrastructure Map yet?



https://www.cloudinfrastructuremap.com

https://www.submarinecablemap.com (yeah, you know this one)

TeleGeography

Thank You

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