HTS Roundtable

Satcom Key Global Trends

December 7th, 2021

ABOUT NSR

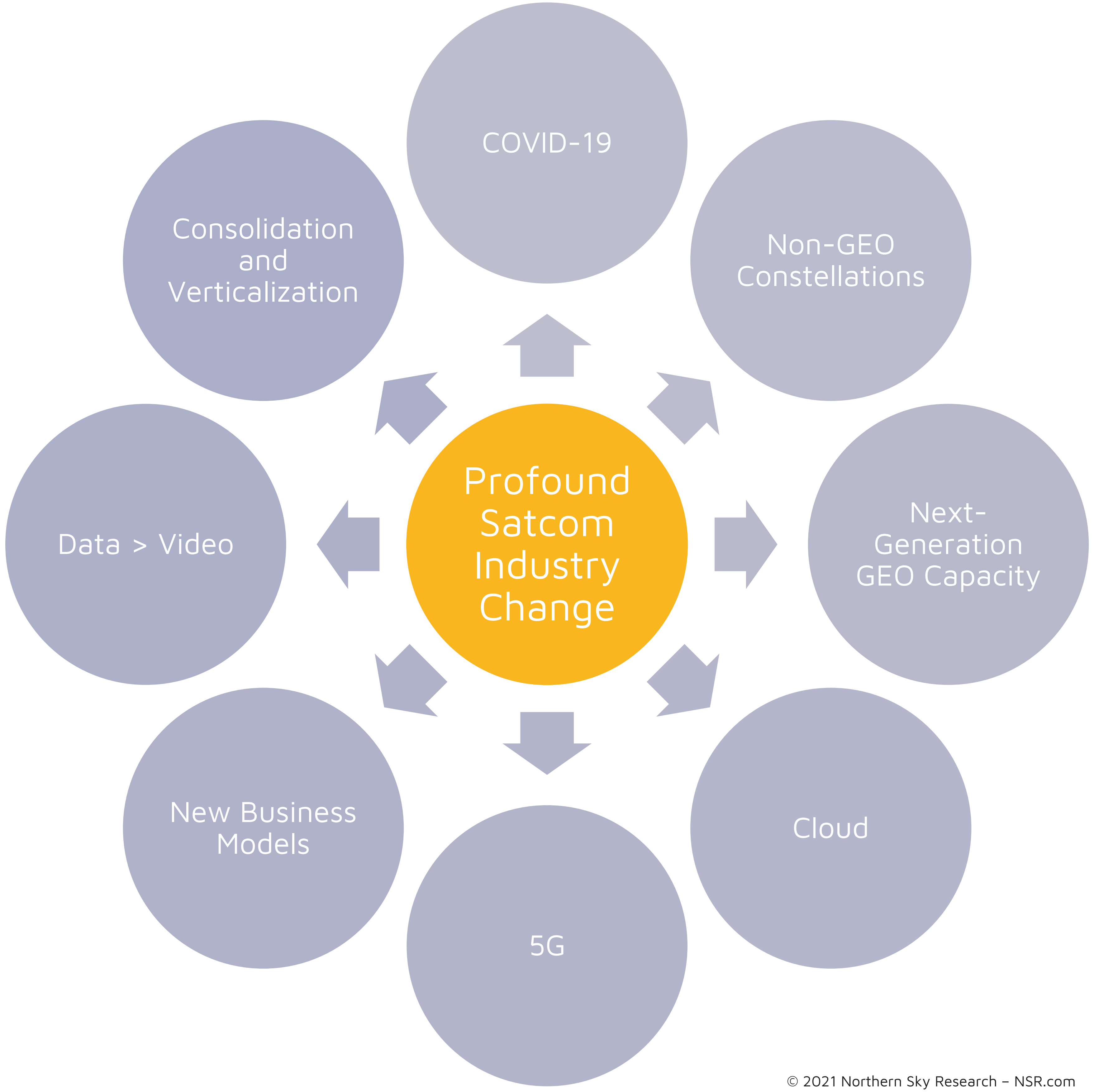
AHEAD OF THE CURVE

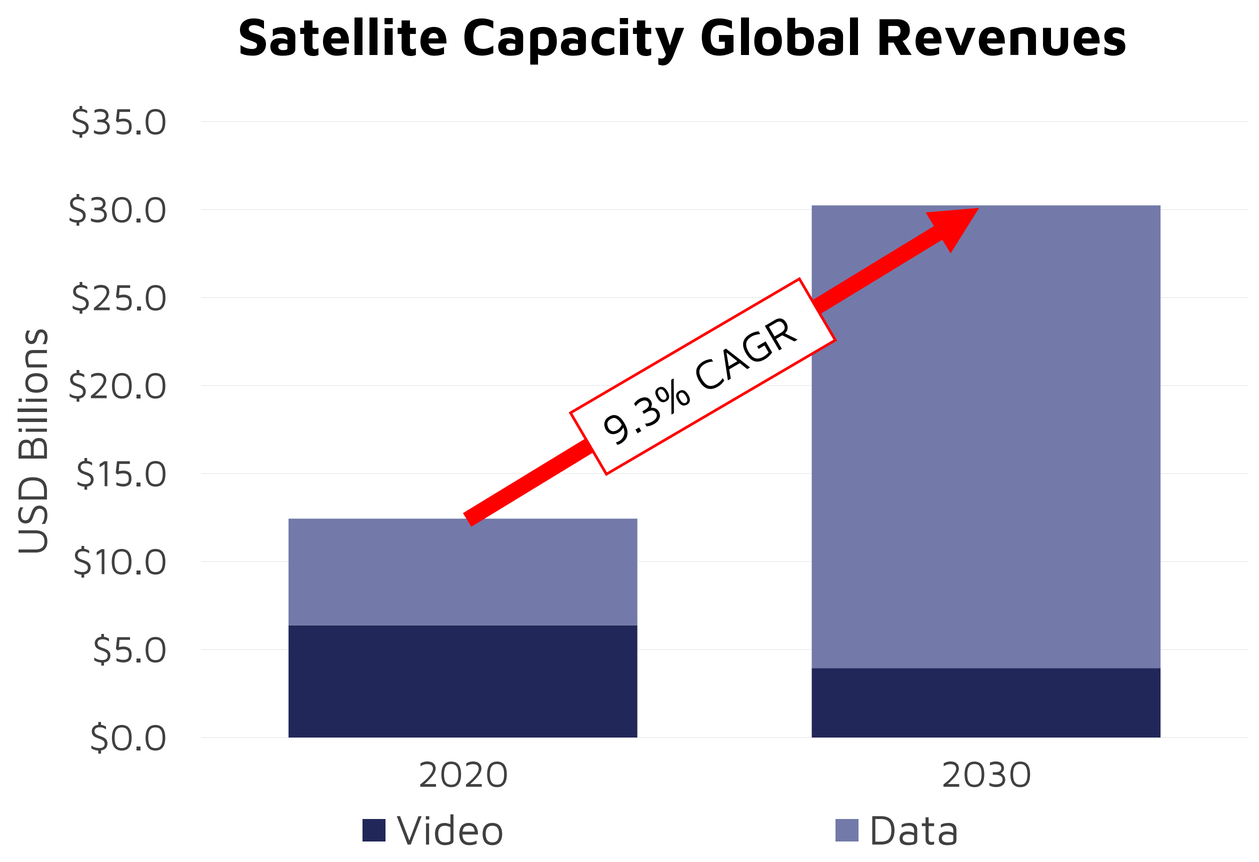
As the satellite & space industry boldly expands in new directions, success is directly aligned with your ability to know where the market is headed and why. NSR helps you get there first.

Founded in 2000, NSR is a global leader in Satellite & Space Market Research and Consulting Services. NSR specializes in the analysis of growth opportunities across four core industry sectors: Satellite Communications, Satellite & Space Applications, Financial Analysis and Satellite & Space Infrastructure.

The NSR team consistently forecasts events and trends well ahead of when they become common industry knowledge. Our clients get results that are broader, balanced, and with the most honest assessment of the impact to their particular business.

2020: THE YEAR THAT CHANGED EVERYTHING (BEYOND COVID-19)

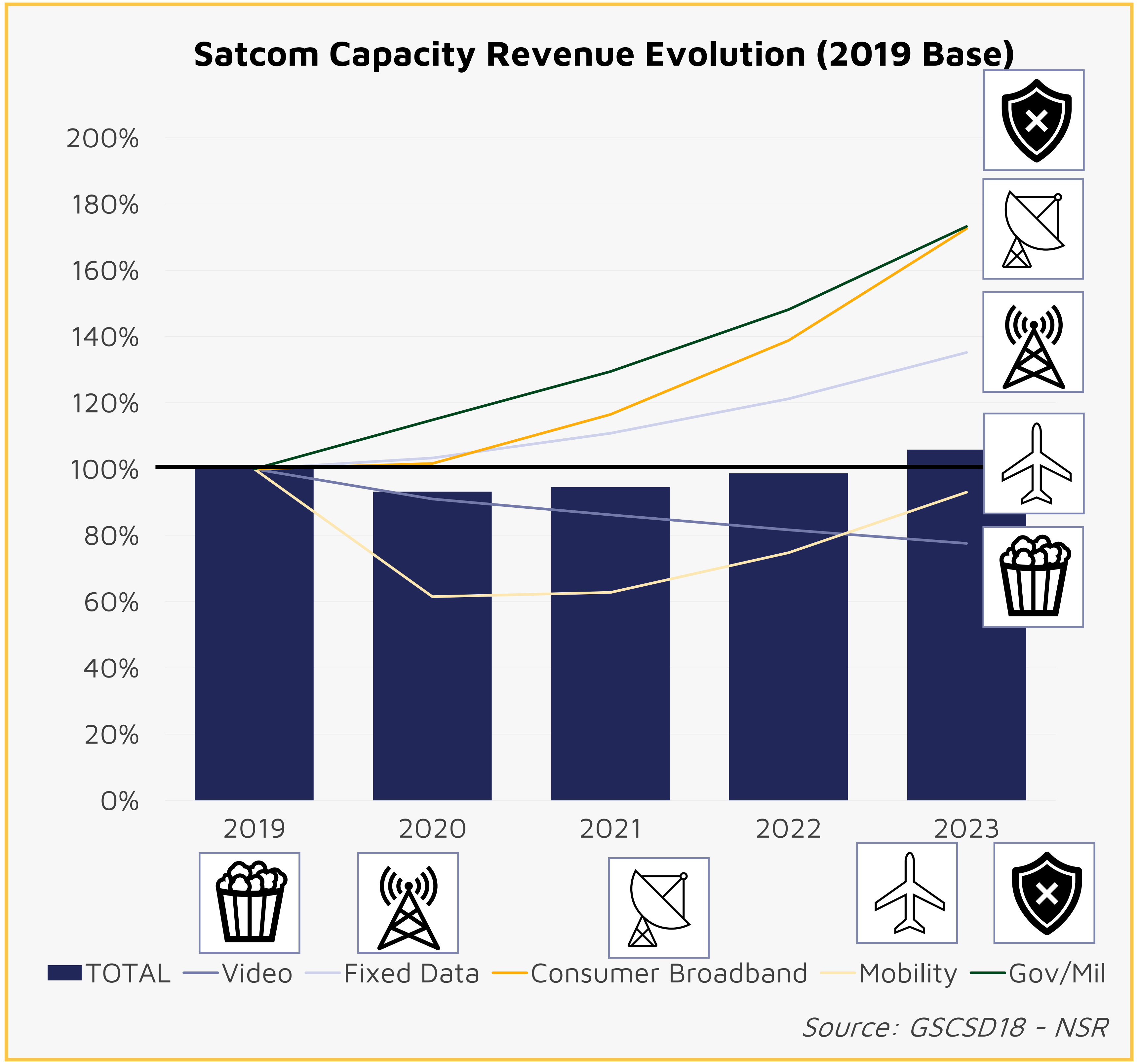




Source: GSCSD18 - NSR

The Satcom industry has a bright future ahead…

…but only the actors that adapt to the new ecosystem will capture those opportunities.



- 3+ years to recover revenues
- COVID hitting an already challenged industry

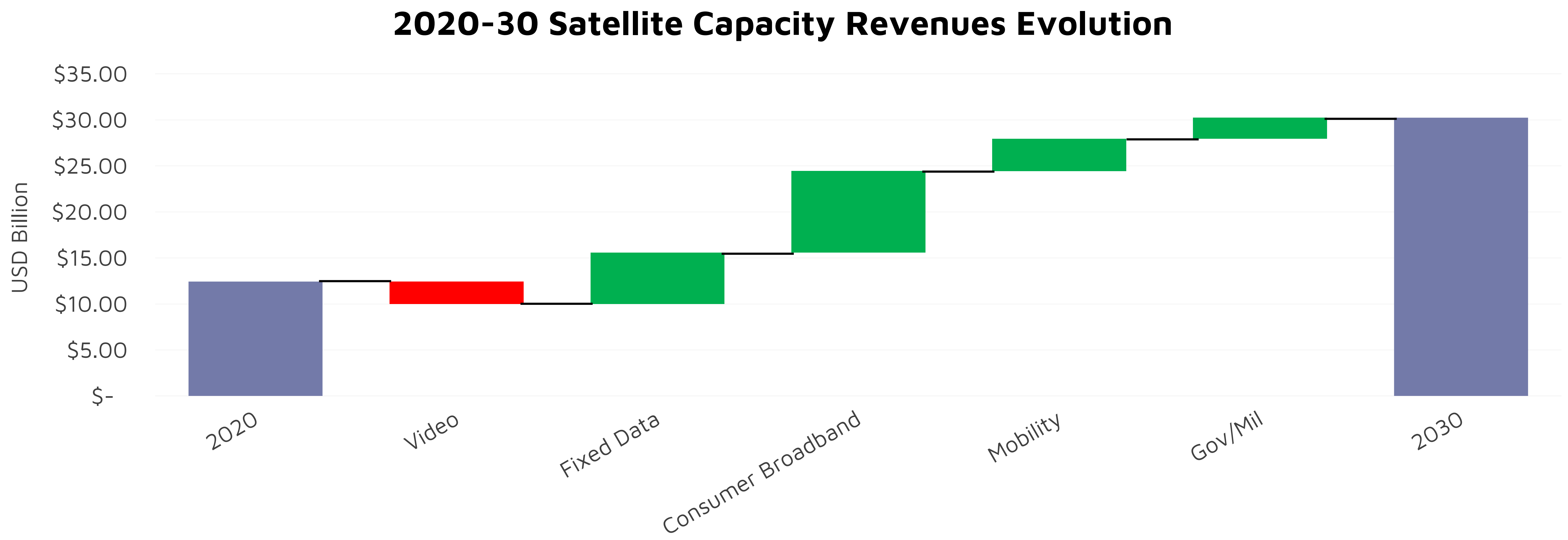
Now a catalyzer for digital transformation

COVID-19 downturn is left behind

Mobility

Backhaul, Broadband, Gov/Mil

Video

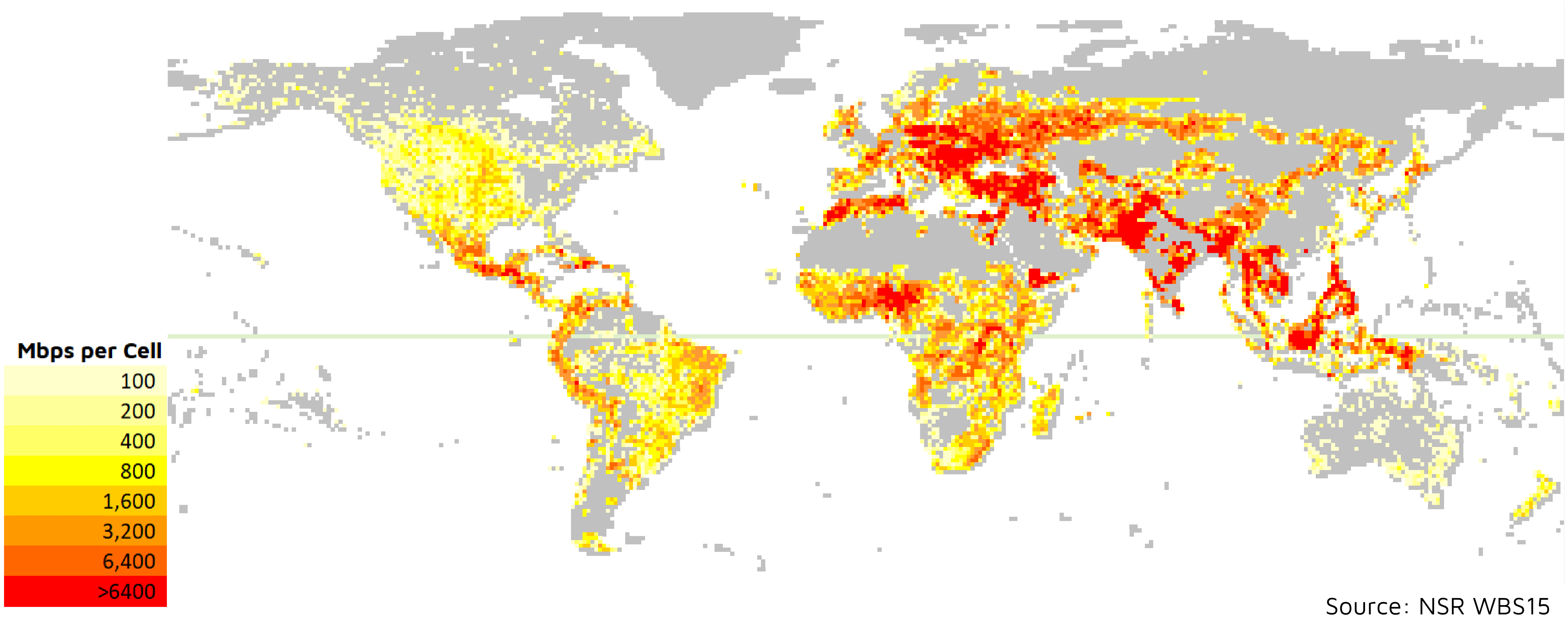


Source: GSCSD18 - NSR

Need to develop targeted solutions for key growth verticals

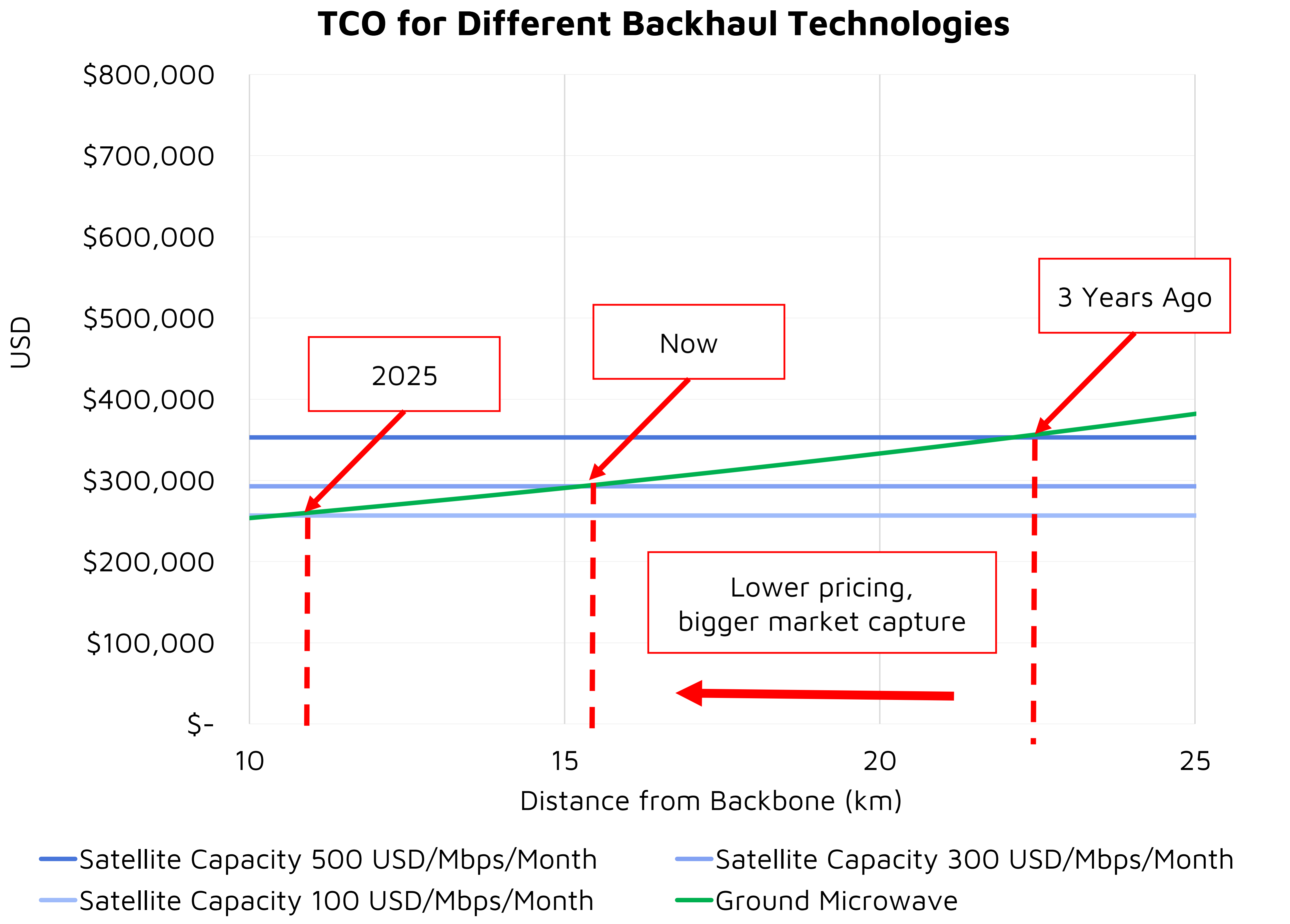
22 Tbps of total unserved addressable market (compared with 224 Gbps of Backhaul traffic today)

NSR Total Addressable Market Assessment – Wireless Backhaul via Satellite



Source: NSR WBS15

- Population Distribution Data extracted from: Center for International Earth Science Information Network - CIESIN - Columbia University. 2018. Gridded Population of the World, Version 4 (GPWv4): Population Count, Revision 11. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4JW8BX5. Accessed 17th February 2021
- Network Coverage Data extracted from: GSMA, National regulators, OpenCellID (https://opencellid.org/)



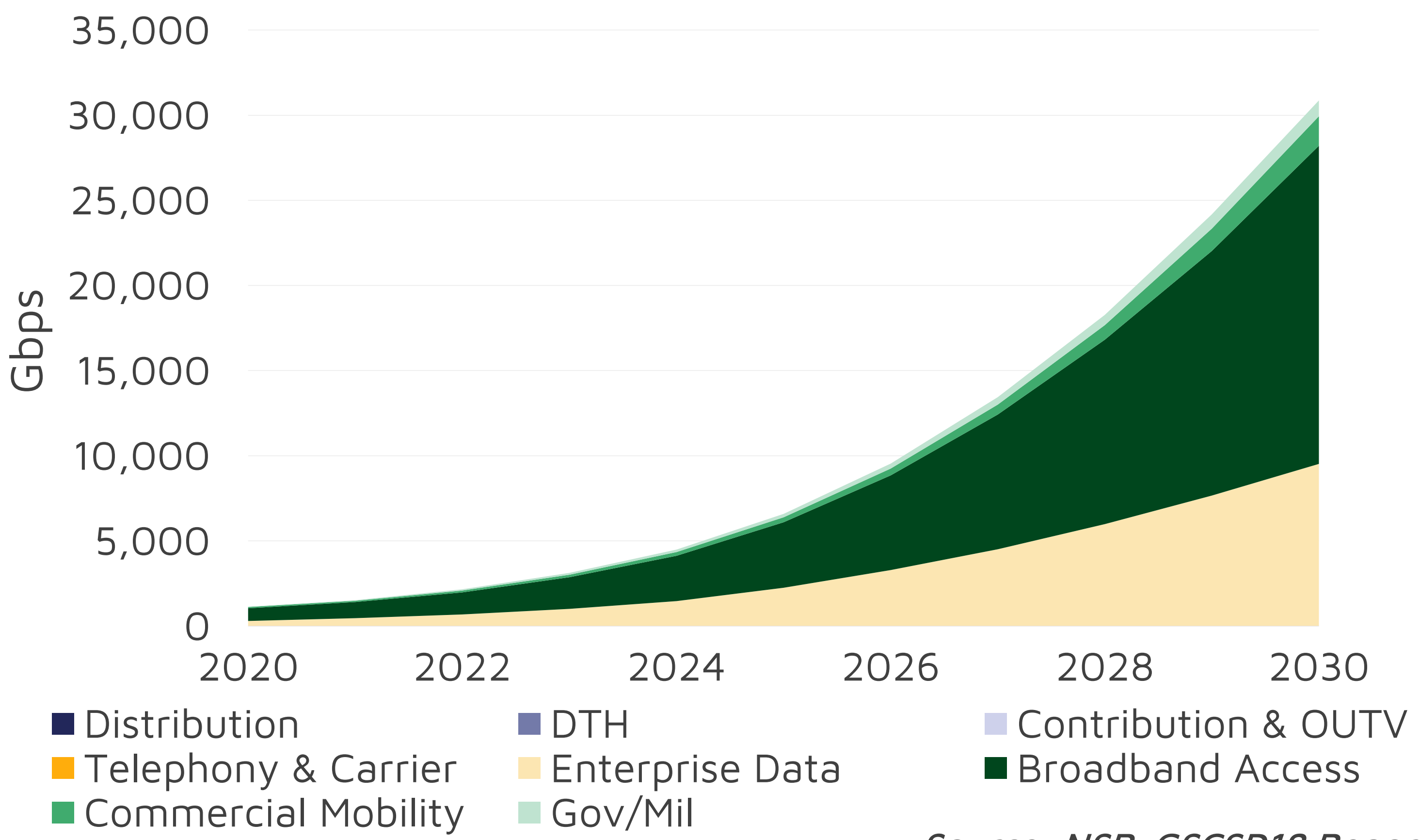
Source: NSR WBS15

- **Backhaul Case Study**
- Inelastic to Elasticities
- Cell sites concentration (
- MNOs need to close their own business case (End-user price-per-GB declines at 10-30% per year)

Backhaul is a highly elastic market

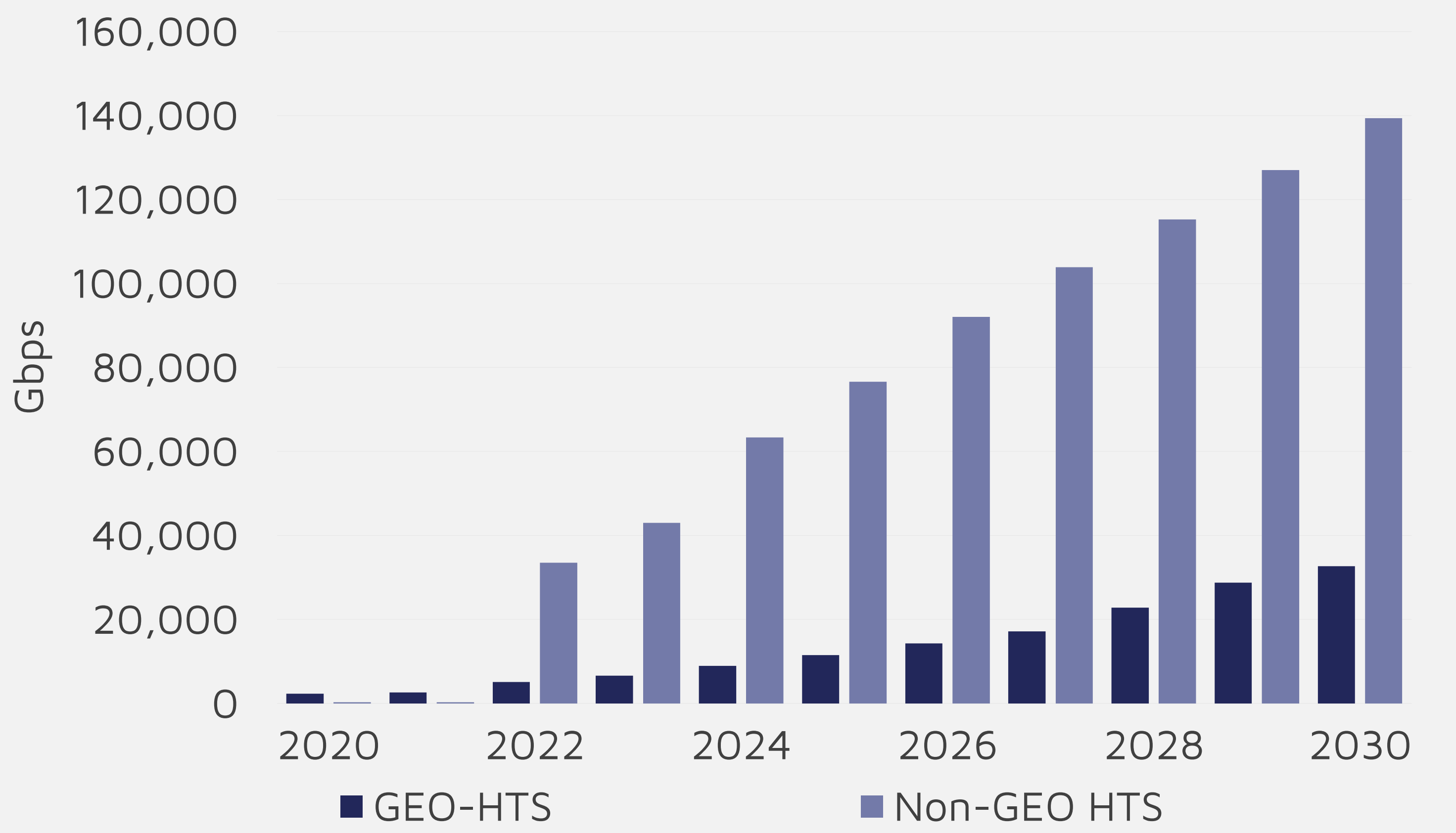
Similar cases could be applied to other segments (Aero, Maritime, Cloud, etc.)

Global HTS Bandwidth Demand by Application



Source: NSR. GSCSD18 Report

Global HTS Commercial Capacity Supply

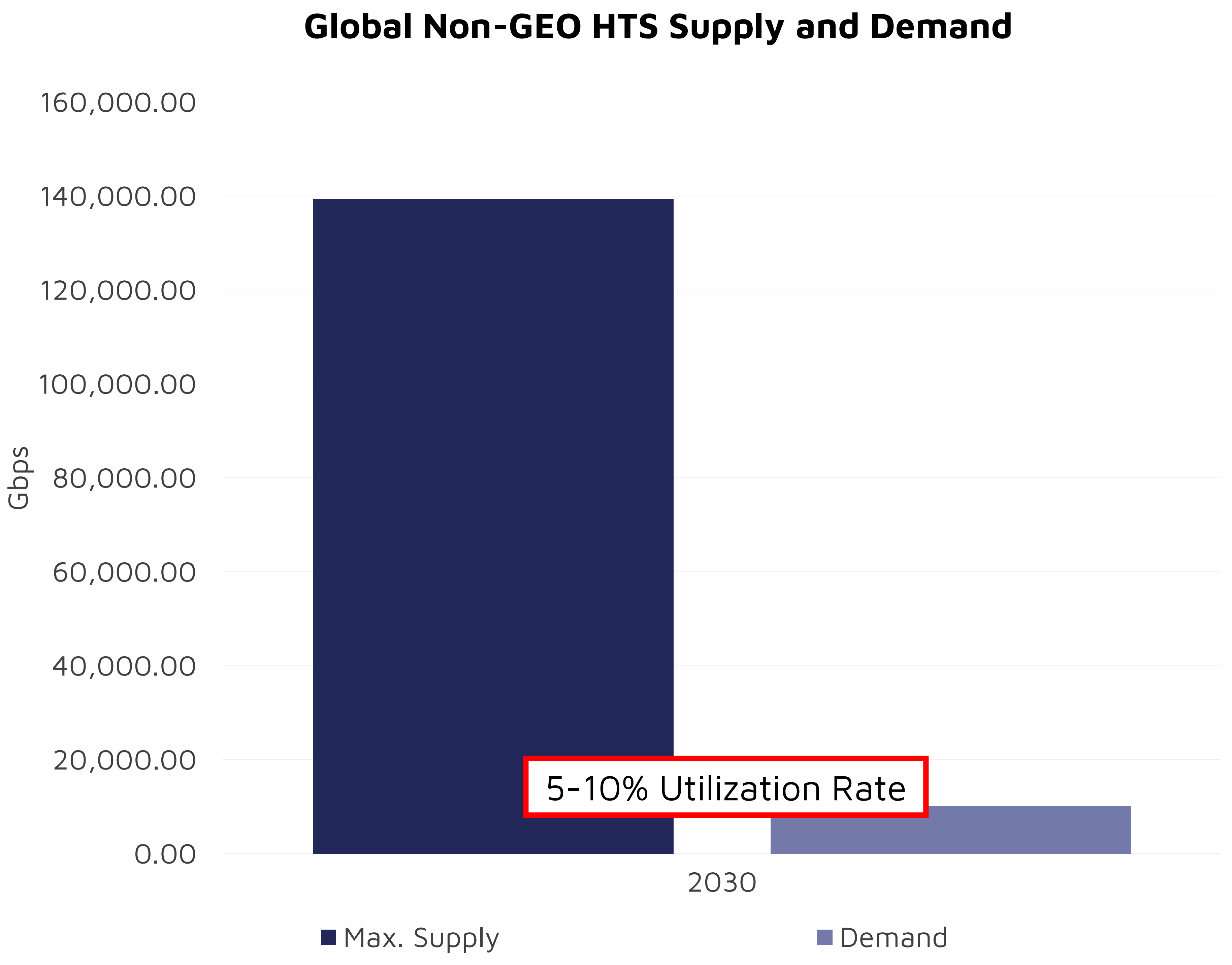


Source: NSR. GSCSD18 Report

- Addressable market is not the limiting factor
- Massive growth from Data verticals (Backhaul, Broadband, Mobility), but operators will need to invest in new infrastructure (HTS, Ground Segment) and capabilities (Cloud, consumer-facing sales channels)

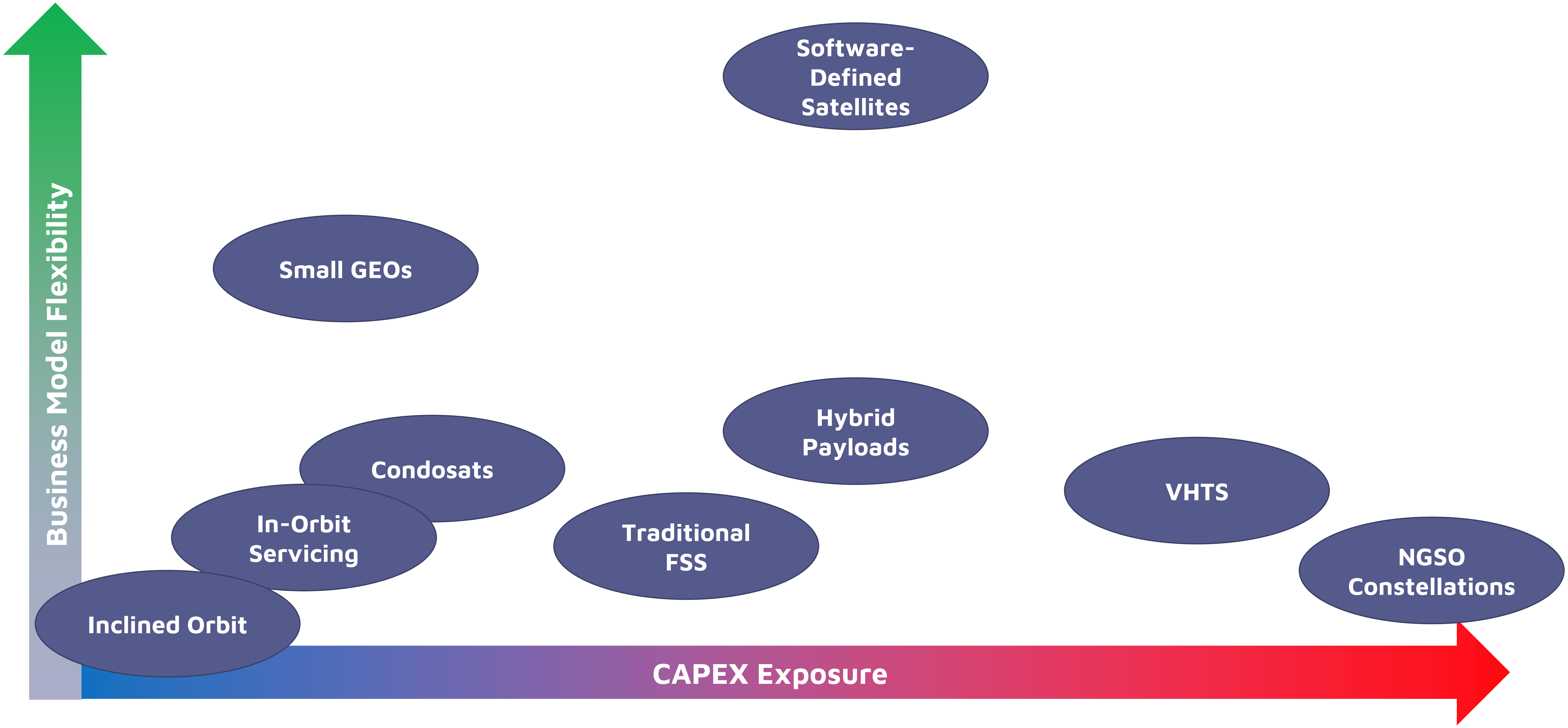
Will LEOs De-Stabilize the Satellite Capacity Ecosystem?

- **10s of Tbps of LEO supply coming. But not all capacity is equal.**
- For some constellations, only about 10-15% of supply is actually "sellable" (Ground Segment, unused supply over oceans and deserts, interference, landing rights, etc.
- Are they ready (willing) for a price war? (Upfront investments, GEO bandwidth economics)
- What other valuable attributes are at play?



Source: NSR. GSCSD18 Report

Innovations in GEO



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Deep commoditization of capacity

- Abundant supply
- Declining 'Real State' value of orbital positions
- Easier access to Space

"*Anuvu Announces High Performance MicroGEO Satellite Constellation. Partnership with Astranis delivers a new approach to satellite connectivity for mobility markets*" - July 26, 2021

Building a service around the infrastrucutre

- Vertical solutions (consolidation)
- The value of the network → making satellite seamlessly integrable and customizable

"deploying a 5G-enabled network, providing seamless compatibility with the terrestrial broadband ecosystem and public and private cloud systems" - July 19, 2021

- **Satellites don't matter!** → Factors such as virtualization, abundant supply and cheap and easy access to Space pushing value to other layers of the ecosystem
- **Avoid commoditization** → Satellite "Platform-as-a-Service" and targeted offers (where it makes sense)

Virtualized network functions hosted by hyperscalers

- Flexibility, integrability, scale and cost advantages

Content and applications hosted by hyperscalers

- Connectivity is as useful as the applications and services deriving from it

Virtualization of network functions and applications based on the Cloud will trigger the rise of Hyperscalers

"SES teams with Amdocs to operationalise the first ONAP orchestration platform for scalable, automated delivery of satellite-enabled network services on Microsoft Azure"

Aug 5, 2019

"Google Cloud and SpaceX's Starlink to Deliver Secure, Global Connectivity"

May 13, 2021

5G Wide Scope

	5G NR (Access Network)	5G Core (Network Management)
What?	Standard for terminals to communicate with Base Stations	Orchestration of network infrastructure
Why is it Important?	Inclusion of Non-Terrestrial Defines new performance requirements Unlocks new families of applications	Inclusion of non-3GPP Access technologies Service-Based (Slicing) Inclusion of key technologies: SDN/NFV, Cloud, etc.
Opportunity	Satellite-mainstream device direct link (Billions of terminals) Re-defining customer expectations (throughput, etc.) Participate in new use cases	Make satellite transparent for any CSP Adopt 3GPP tools for network management

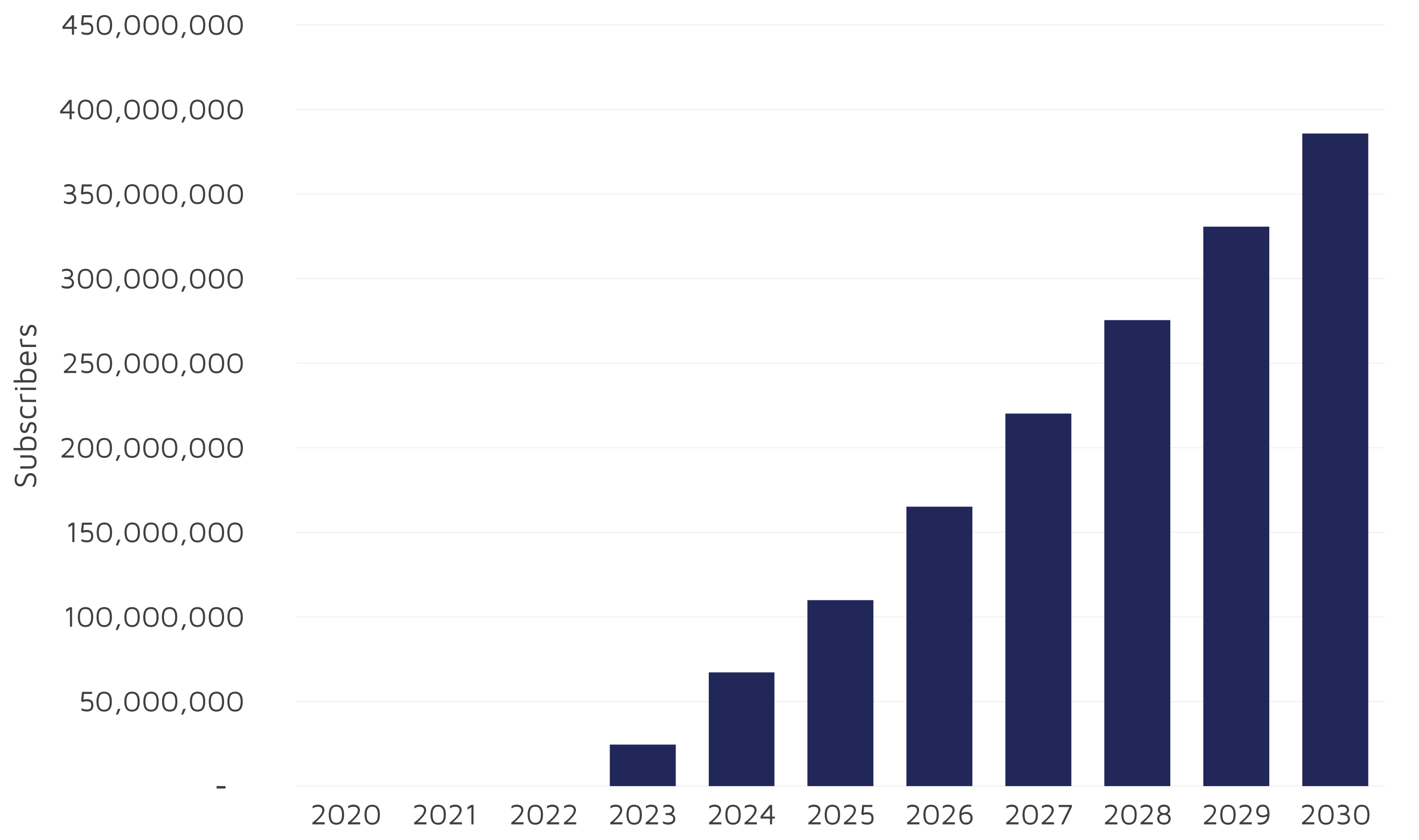
Source: NSR's 5G Via Satellite: Impacts, Demand and Revenue Potential to 2029 report

- **5G as a 'Network of Networks'**
- **Quantitatively, this should translate into a much higher adoption of Satcom services**

Probably the largest opportunity in Satcom's history

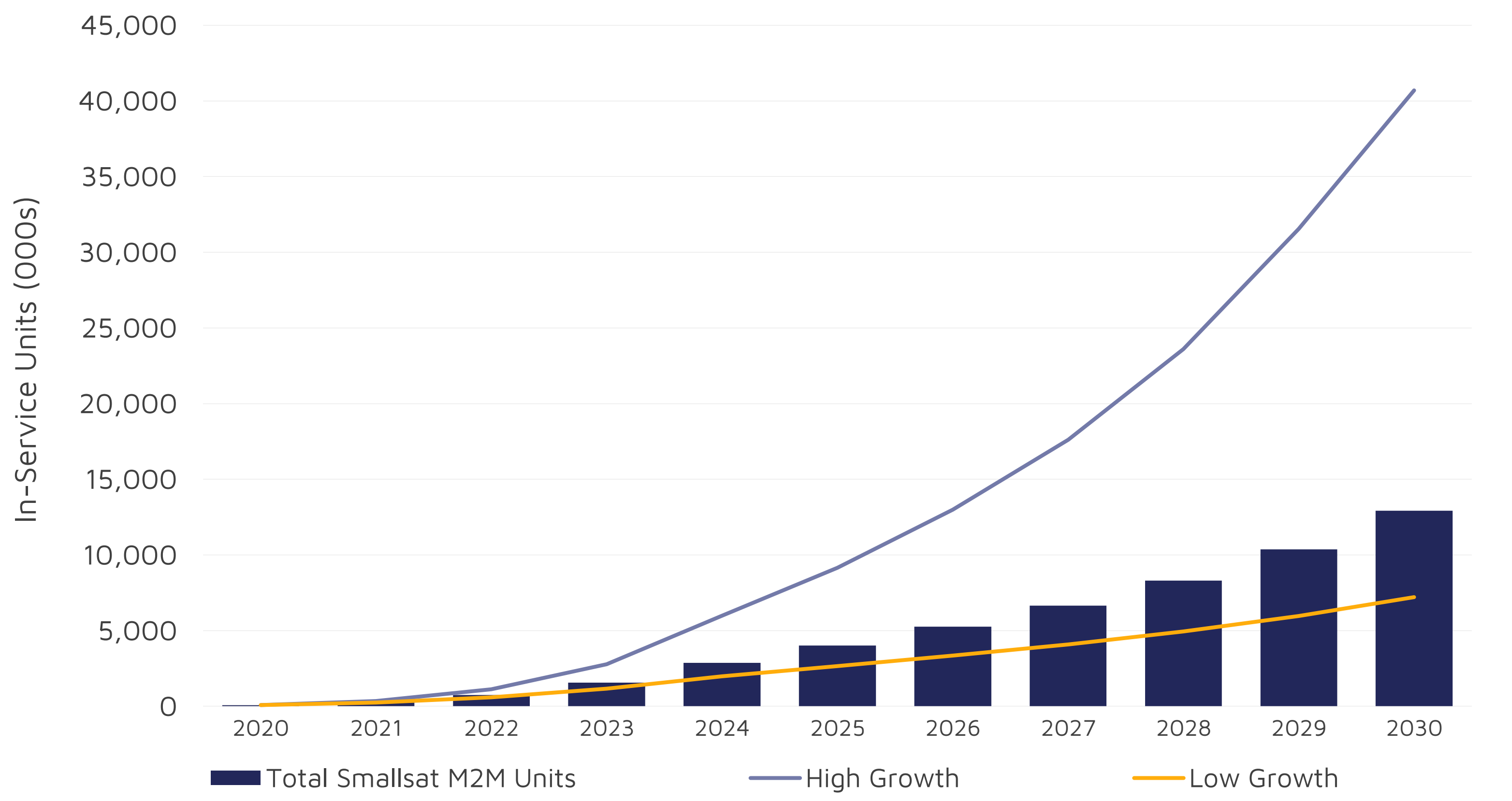
- Truly making satellite a mainstream solution
- Reducing cost of the terminal
- Instant access to global distribution through MNOs

Direct Satellite-to-Device Subscribers



Source: NSR

Total Smallsat IoT In-Service Units By Scenario



Source: NSR

3+ Years to recover 2019 revenues, but fundamentals continue to show large growth potential. Opening the industry to new markets.

Backhaul, Broadband, Mobility, IoT and Gov/Mil key growth verticals

Constellations, VHTS, Software-Defined Sats, SmallGEOs… **Massive supply influx with diverse strategies will change the nature of the industry**

Value Pivoting from Infrastructure to a "Servicification" of this Infrastructure

Emergence of new drivers (5G, Cloud), actors (hyperscalers, new entrants) and Business Models

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