



COMMUNICATIONS
REGULATORY COMMISSION
OF MONGOLIA



Global 5G Market and Spectrum Insight

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5G ADVANCED SERVICES INNOVATION SEMINAR

November 17 | Ulaanbaatar

Building a Fully Connected, Intelligent World

Content

1

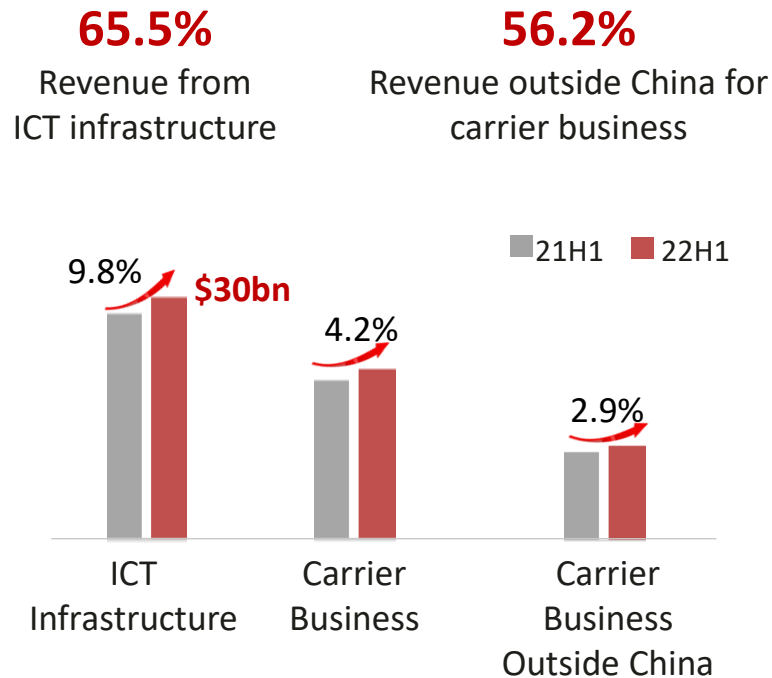
**Global 5G Industry Update
~10 Min**

2

Global 5G Spectrum Insight

Huawei Business Achievements Met Expectation in 2022H1

Steady Growth for ICT Infrastructure

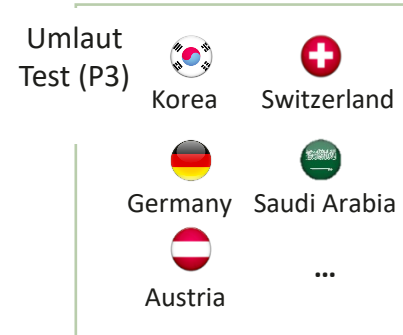


Source: Huawei 2022H1 unaudited report compiled in compliance with IFRS

Leading 5G Performance

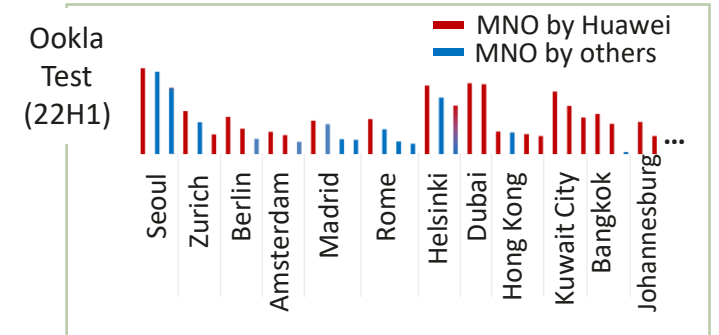
No.1

in all 13 countries supported by Huawei



Best

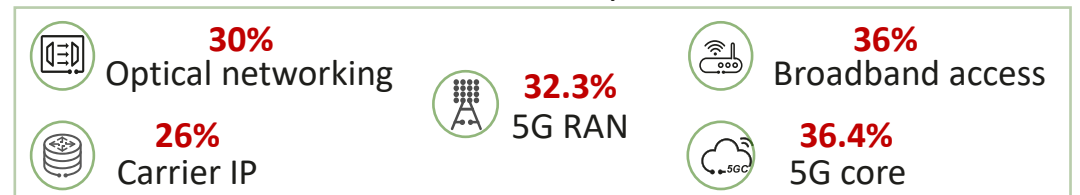
iPhone 5G user experience in top 20 cities



Leading Position in E2E Network

No.1

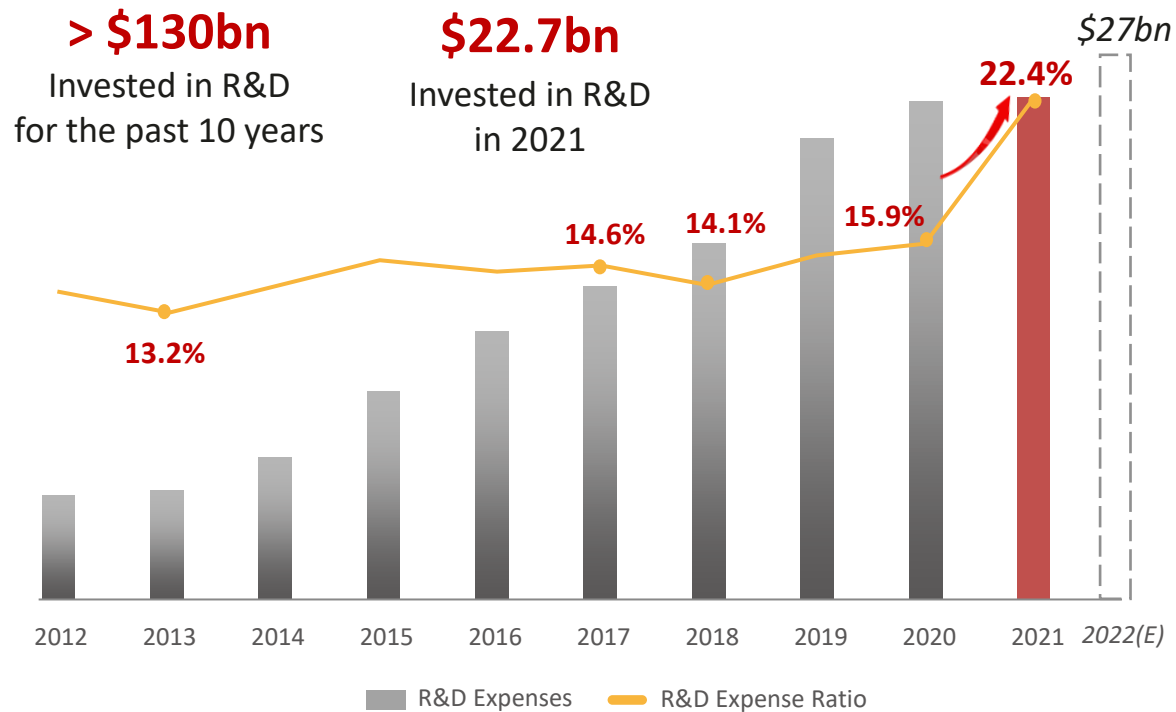
Global market share by revenue



Source: Umlaut & Ookla report; Omdia, global revenue market share 1Q22; Dell'Oro mobile RAN report 2Q22; Dell'Oro mobile core network 1Q22

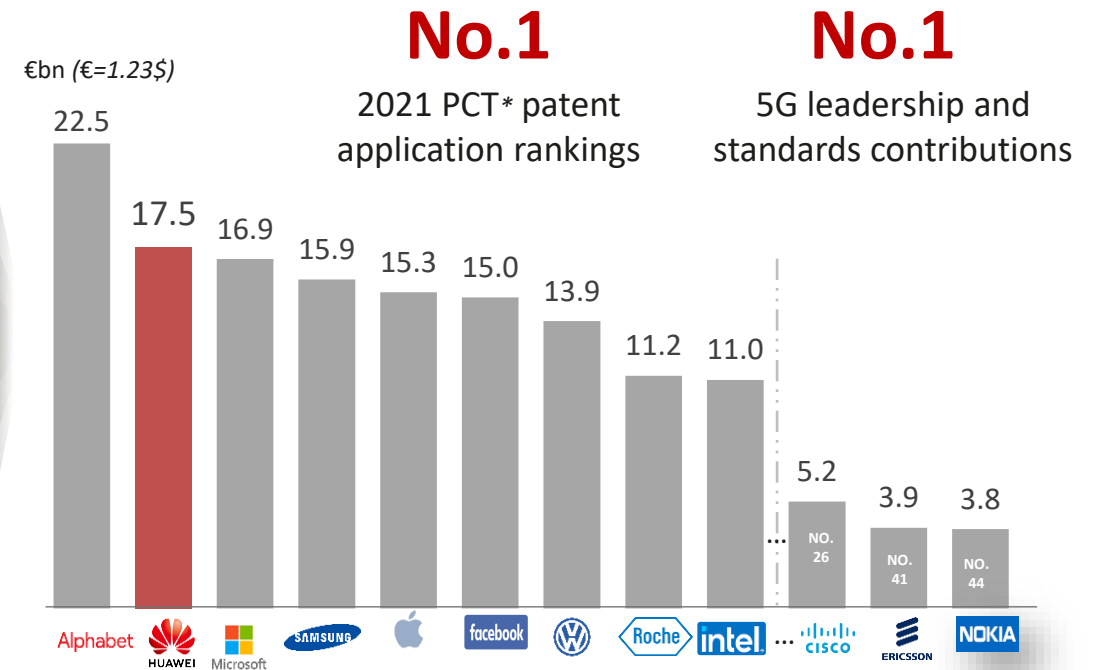
Huawei Driving Future Development through Nonstop Innovation

Hit a 10-year High in 2021: R&D Investment in Amount & Percentage of Revenue



Source: Huawei annual report, 2021

No.2 R&D Investment in ICT Industry

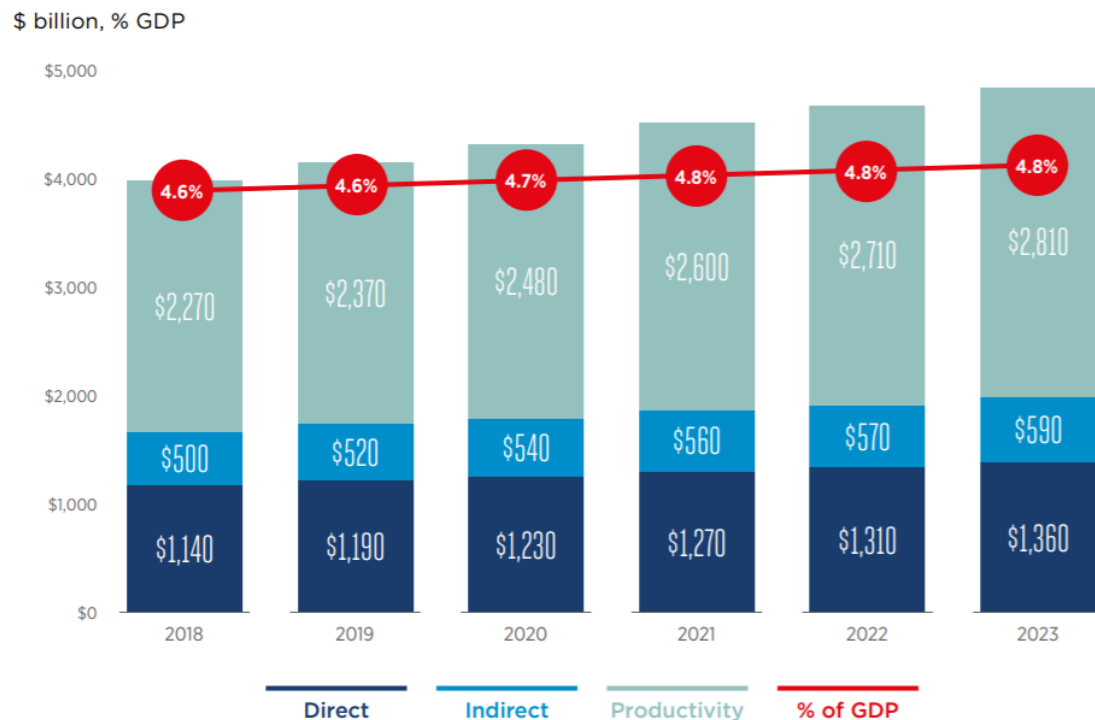


Source: 2021 EU industrial R&D investment scoreboard, EU, WIPO report 2022, IPlytics report Nov 2021

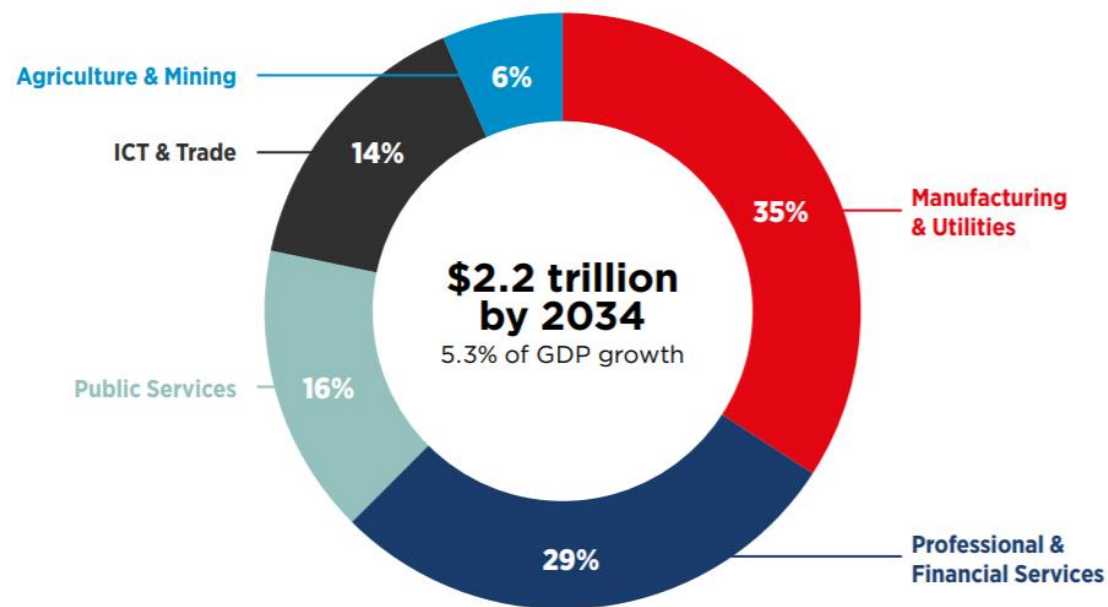
* PCT: Patent Cooperation Treaty

5G the National Strategy will contribute to sustainable economy growth

The global economic contribution of mobile will increase by almost \$850 billion by 2023



5G will contribute \$2.2 trillion to the global economy over the next 12 years



GSMA™
Intelligence

<https://www.gsmaintelligence.com/research/?file=b9a6e6202ee1d5f787cfebb95d3639c5&download>

Source: The mobile economy, GSMA

5G ≠ 4G+1G, from Consumer Connection to Industry Connection

B2C

B2X

Consumer Connection

Industry Connection

Calling Changed

Internet Access Changed

Life Changed

Society Changed

1G



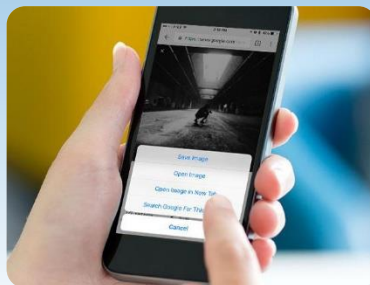
Analog Voice

2G



Digital Voice and SMS

3G



Mobile Internet

4G



Mobile Broadband

5G



eMBB

Speed
10X (10Gbps)



uRLLC

Latency
1/20 (1ms)



mMTC

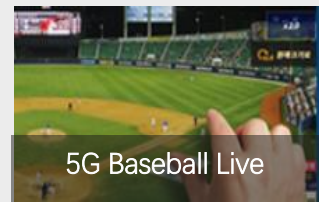
Connection
10X (1M / km²)

Call

MBB

5G: Possibly Fastest Adopted Technology in History

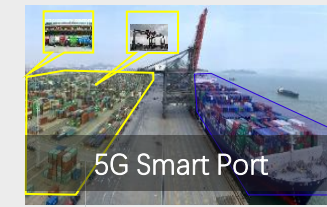
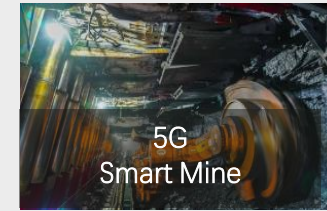
2C (Consumer): 5G enriches life



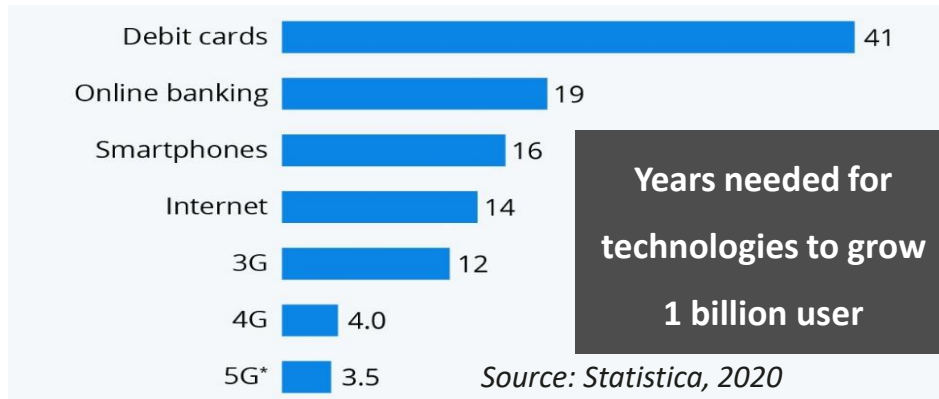
2H (Home): 5G empowers family



2B (Business): 5G enables industry



5G: Possibly Fastest adopted Technology in History



toC: 5G Enable New Digital Services for Consumers and Bring Business Growth to MNO

Providing "Killer Experience" with **Proactive Device Strategy**



Xiaomi Redmi



\$38

VIVO Y52



\$44

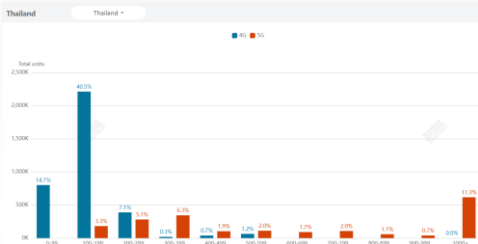
Realme



\$59

150\$

Down to \$40 / 2 years contract



collaboration with LG U+ on New Content



Disney content & Cloud gaming cooperation



XR studio content making



2020~2021

10%+ ↑
5G ARPU

4.75M
5G Phone
2.2M
5G Users

70%
5G Coverage
13k
5G Sites

- ✓ T+F Dual-band
- ✓ 5G MBB Network
- ✓ 100Mbps Everywhere

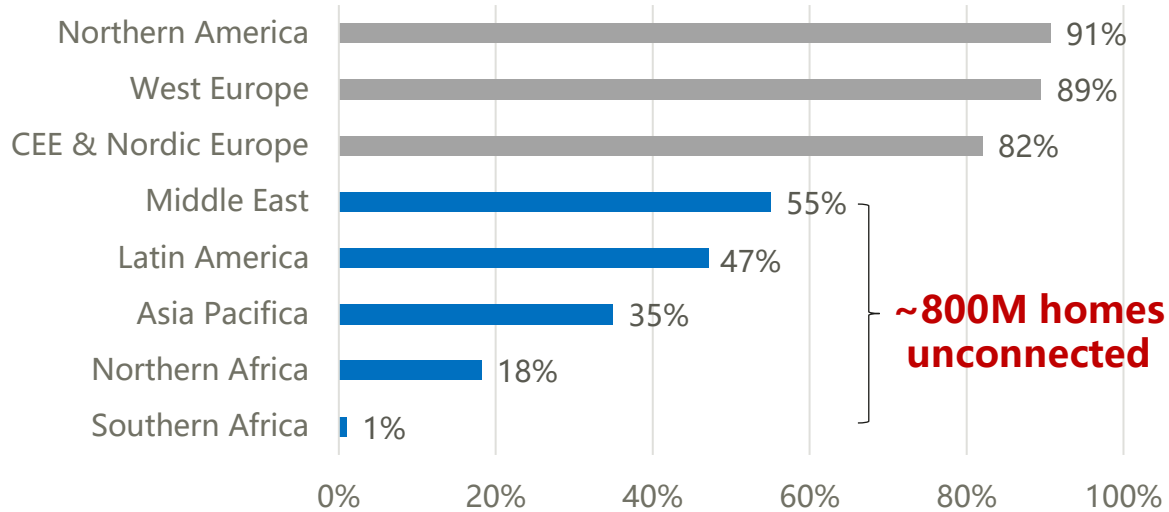


- **TDD 2.6G:** 5G Basic Coverage and Capacity Layer
Priority Bangkok and EEC High Value Area
- **FDD 700M:** 5G Wide and Deep Coverage Layer
Increase Population coverage Nationwide

toH: 5G Boosts Home Broadband Connections

5G Accelerates Connecting Unconnected Homes

HBB penetration rate in each region



5G can provide fiber-like experience



- ✓ Speed up to Gbps
- ✓ Short ROI
- ✓ Full HD video streaming

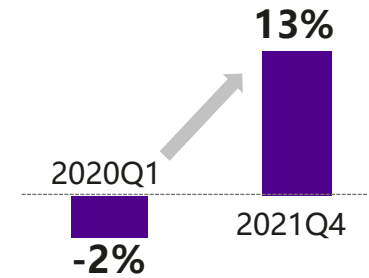
5G FWA Business Success

Zain, Kuwait: **270k 5G FWA** subs, **13%** profit growth

5G home package

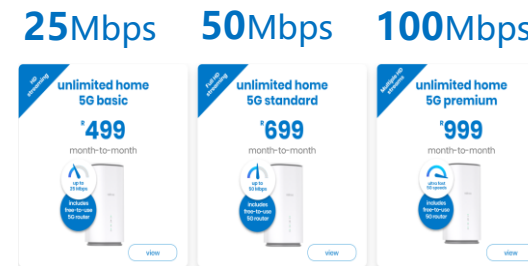


Operator Profit growth

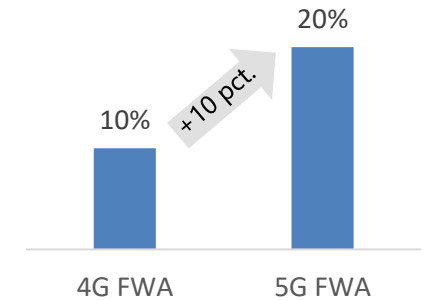


Rain, South Africa: **200k 5G FWA** subs, increased by **10 pct.**

5G home package



HBB market share



toB: 5G Accelerates Industry Digitalization and Expands Business Scope

5G Mining: Enable mine workers back to office

Manual operation



Remote operation



Early Retire Age



Average Mine Workers

Difficult Recruitment



Positions Candidates



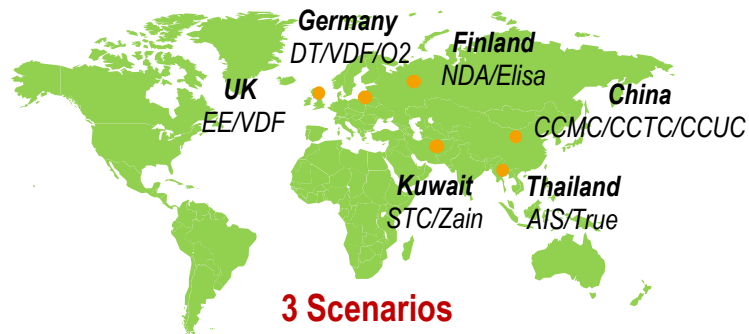
50+ 5G smart mines in China

Workers remote operation in a comfortable office



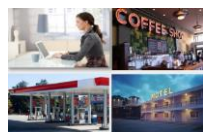
5G Private Line: boost smart Enterprise prosperity

30+ Carriers deploy 5G Private Line Globally



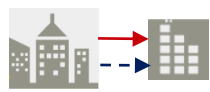
3 Scenarios

Base Connection



SME

Mobile & Fixed backup



HQ branch

Mobile Connection



Kuwait:

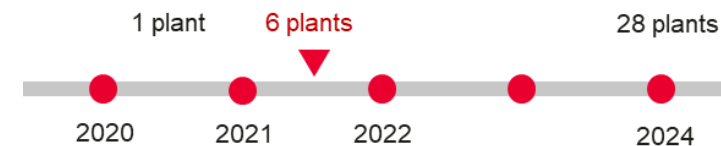
- ✓ 20Mbps / sector: **4** Users
- ✓ ROI/sector: **14** months



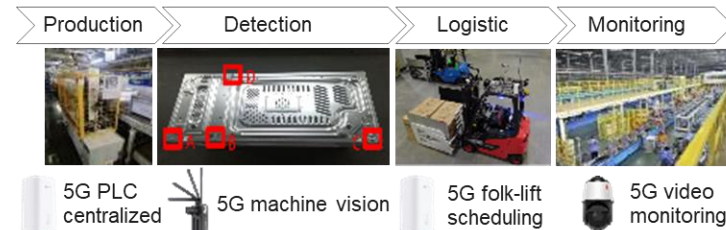
5G Factory: brings efficiency and low cost



Media Group - Microwave Oven Plant



11 use cases : 4000+ · 5G connections online



Equipment Cost **15%** ↓

Efficiency **17%** ↑



20+ Industry **3500+** Contracts **12K+** Projects

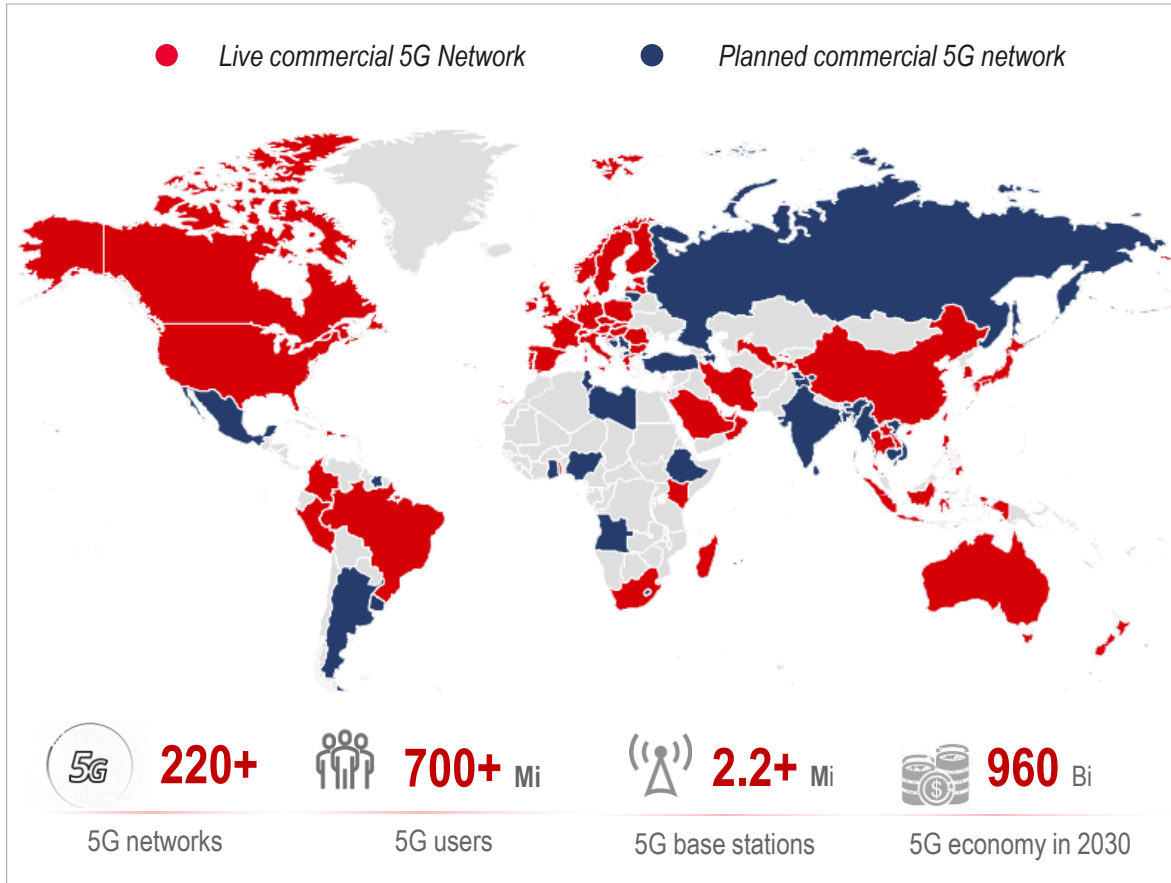


MNO toB Revenue : **\$ 1.2 → \$ 3.2 Bi**



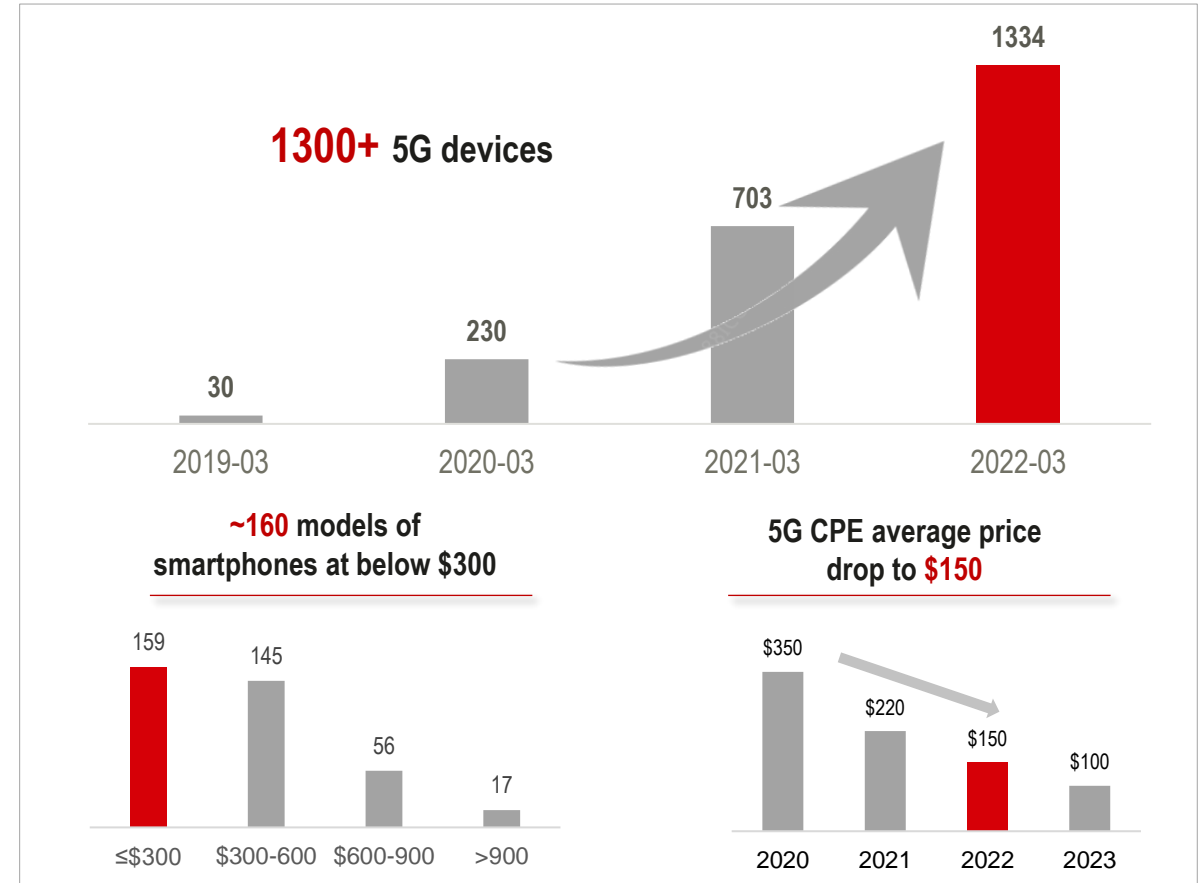
5G Deployment is Accelerating Globally

82 countries have launched 5G service



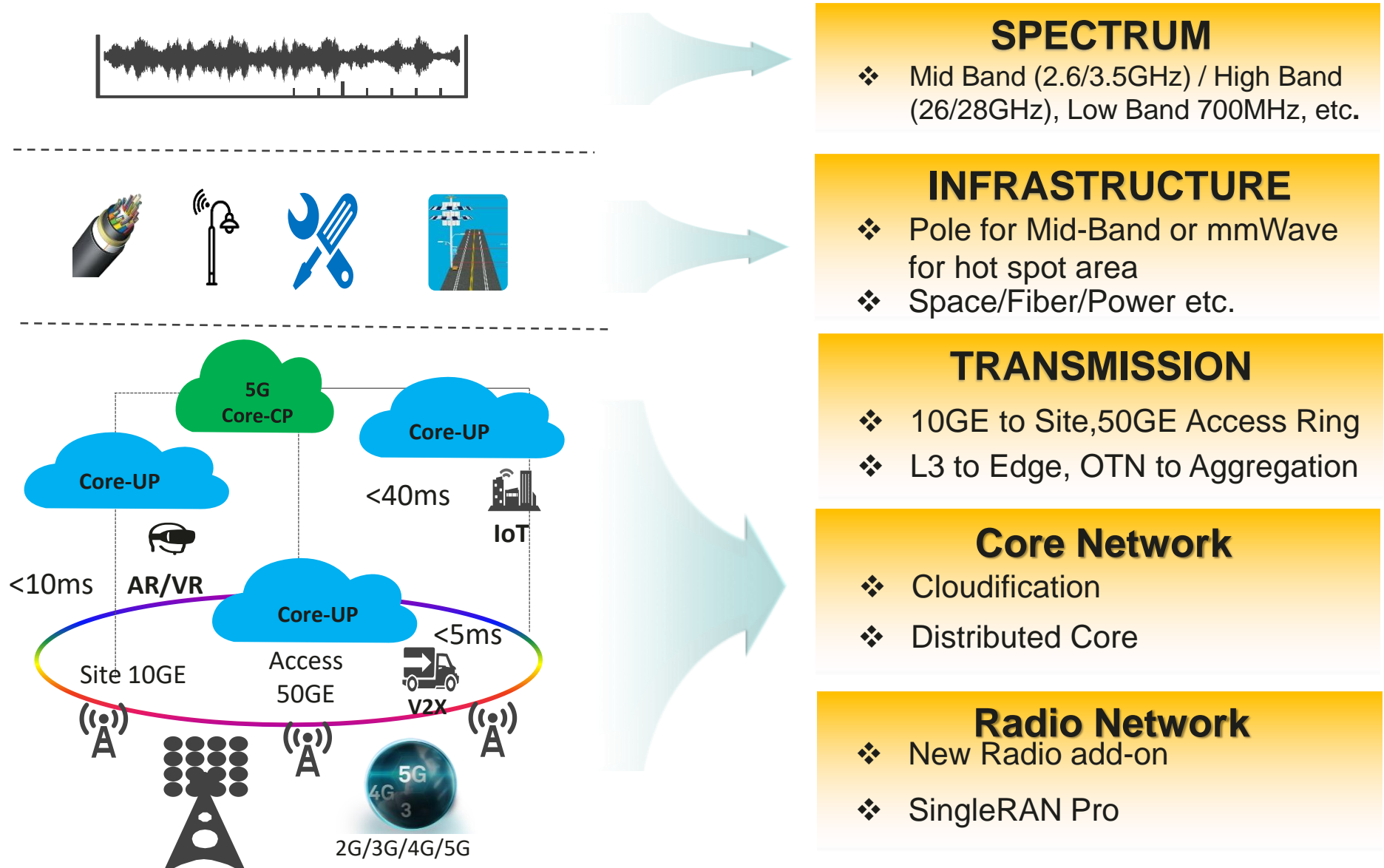
Source: GSA & GSMA & Huawei MI, 2022-03

Mature E2E ecosystem supports the rapid development of 5G



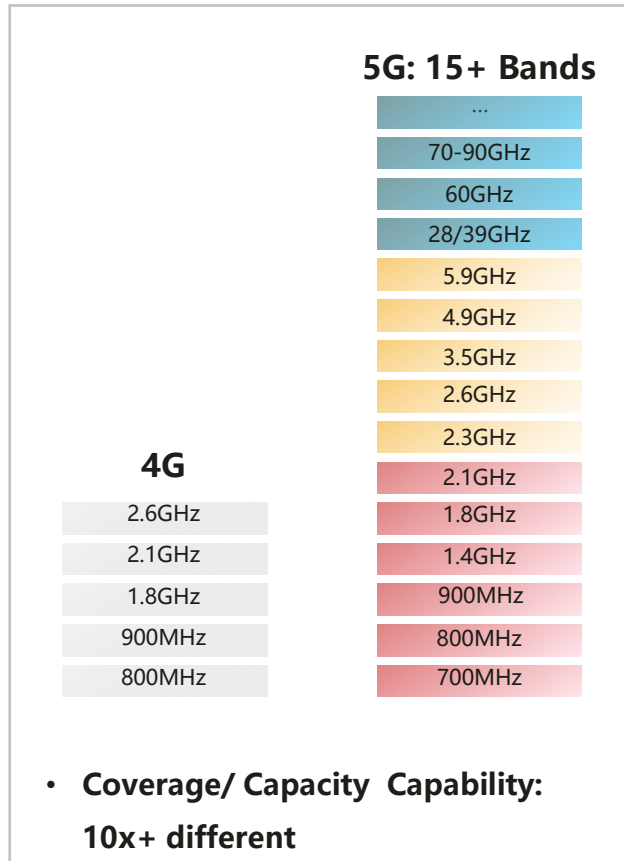
Source: GSA & Huawei MI, 2022-03

5G Development Preparation Needed in Advance

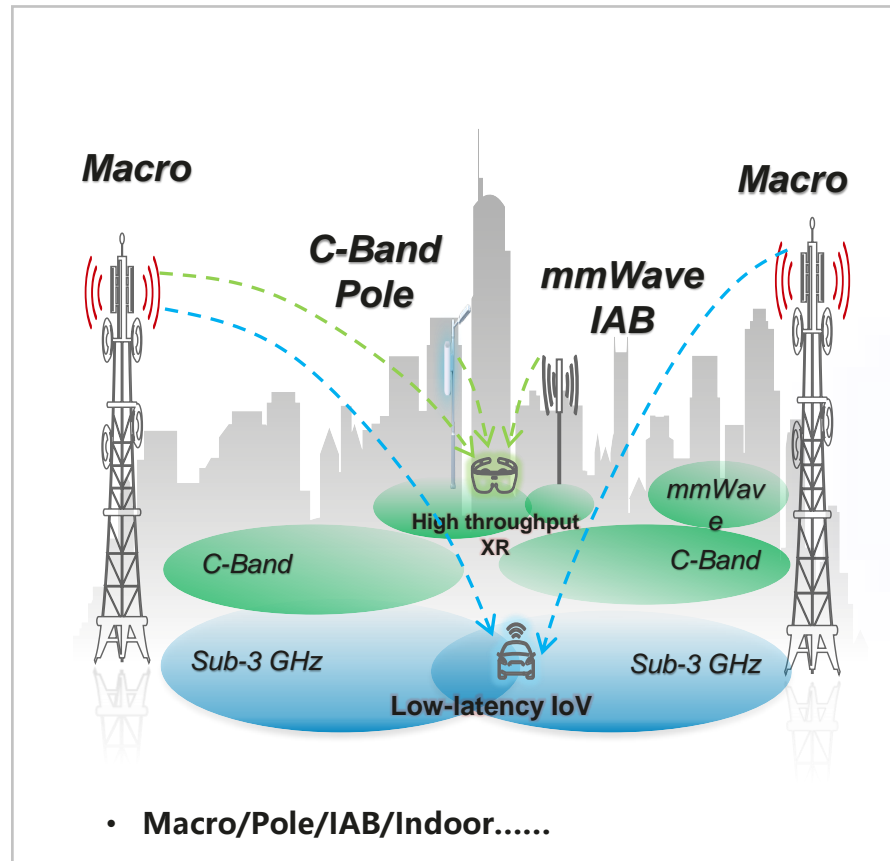


Insight #1: 5G increases complexity, How to efficiently manage the network and simplify parameter configuration?

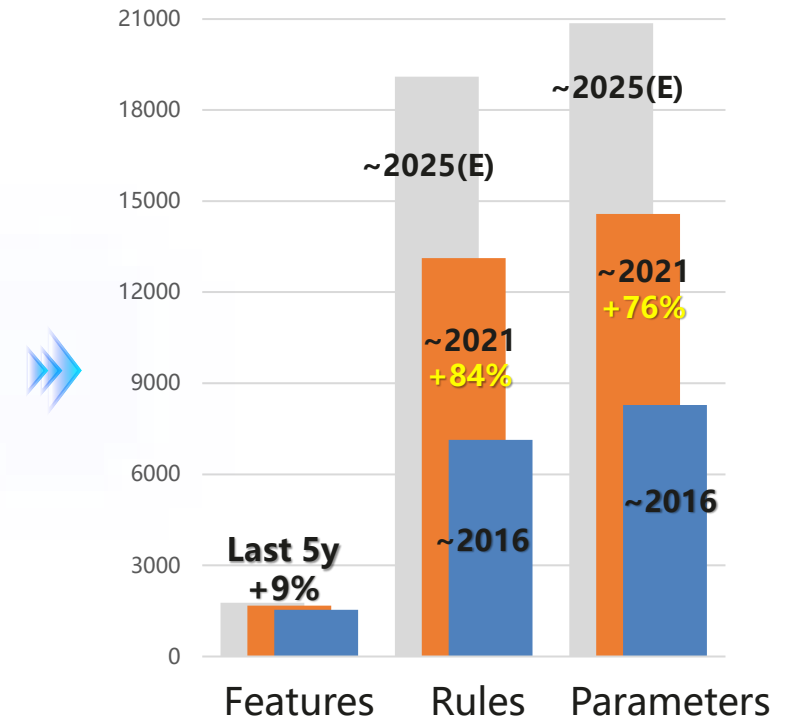
More bands & Greater diversity



heterogeneous network(HetNet)



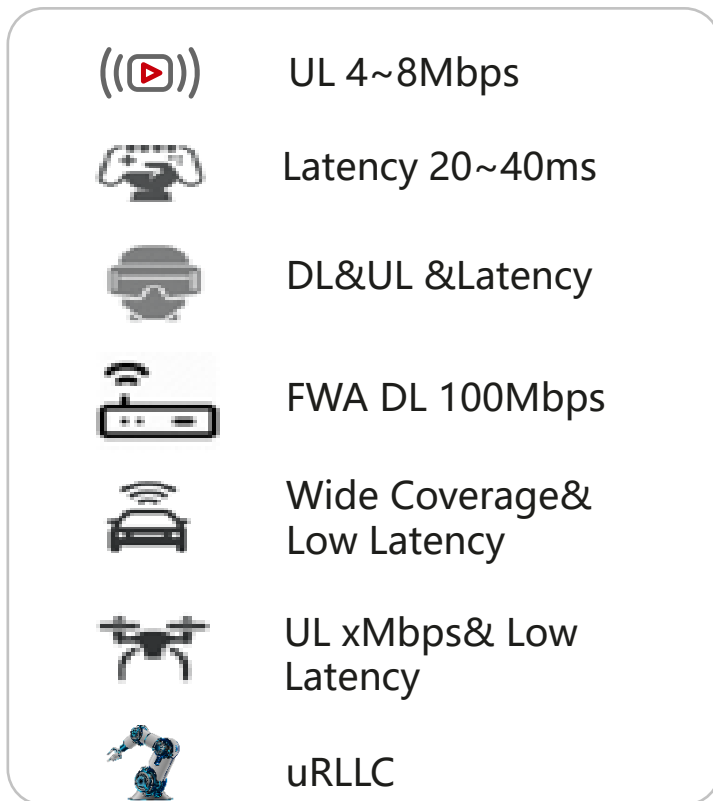
Parameters & Rules: > 10k, 80% growth in 5 years



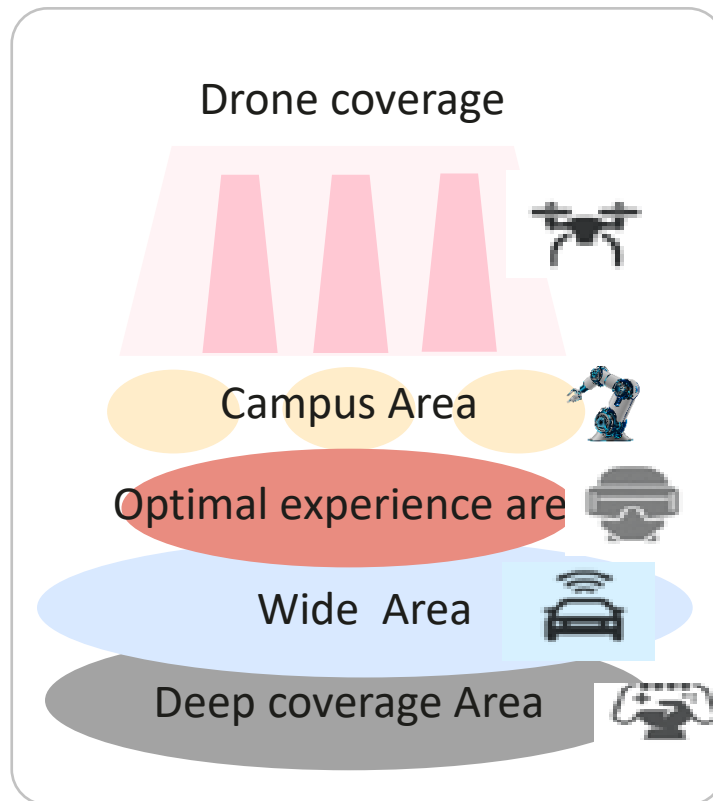
Develop self-configuring and simplified network to meet carriers' planning, construction, maintenance, operation

Insight #2: 5G/5.5G Bring new business opportunities, How the network match the Diversified service requirements ?

Diversified service requirements



All scenario coverage



Different policy of user SLA

- **HVC(10%):** *always* optimal experience
- **MVC(70%):** *on demand* experience boosting
- **LVC(20%):** *Unawareness* experience but large traffic
- **Industrial customer:** *High SLA*

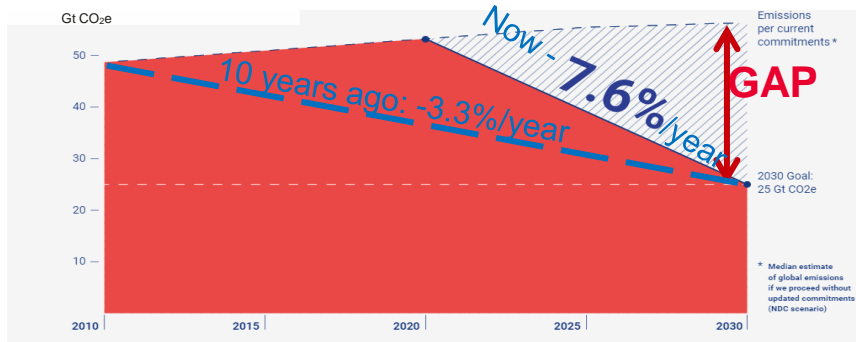
Cross domain collaboration to Guarantee service experience(EI info, slicing)

RAN domain intelligent to improve spectrum efficiency by prediction radio and service features / Self-optimization

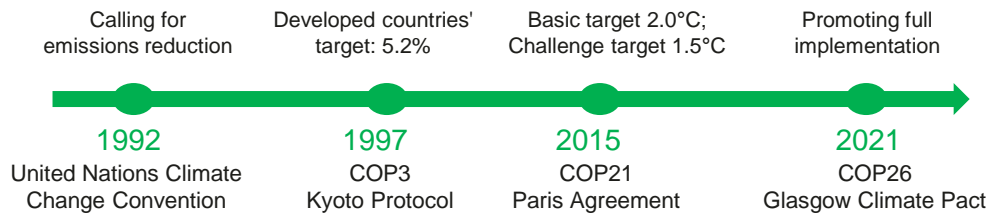
Insight #3: It's Urgent for Global Energy Consumption Reduction

1.5°C is Critical, Global Accelerated CO2e Reduction Action

To achieve the 1.5°C, needs to reach 7.6% reduction rate



2021 COP26: Reaffirmed 1.5°C target on Glasgow

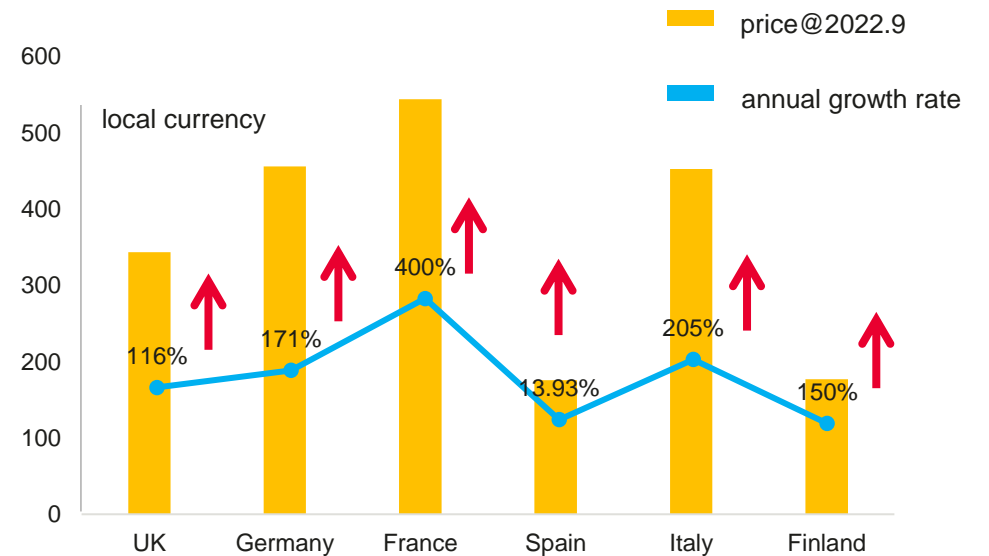


- **New net zero commitment:** 17 countries announced new net zero emission routes
- **Speeding up fossil fuel phase-out:** reduce coal, eliminating subsidies of fossil fuels
- **Green fund support:** 100B\$ climate financing is expected to be realized in 2023

Source: UN Climate Change

Energy Crisis Cause Electricity Prices Soaring from 2021

Electricity Price Trend(MWh)



Impact for operators:

- Electricity price increase cause OPEX increase, affecting profits by 5-20%
- Gov. requires operators to reduce energy consumption by 7-15%

Content

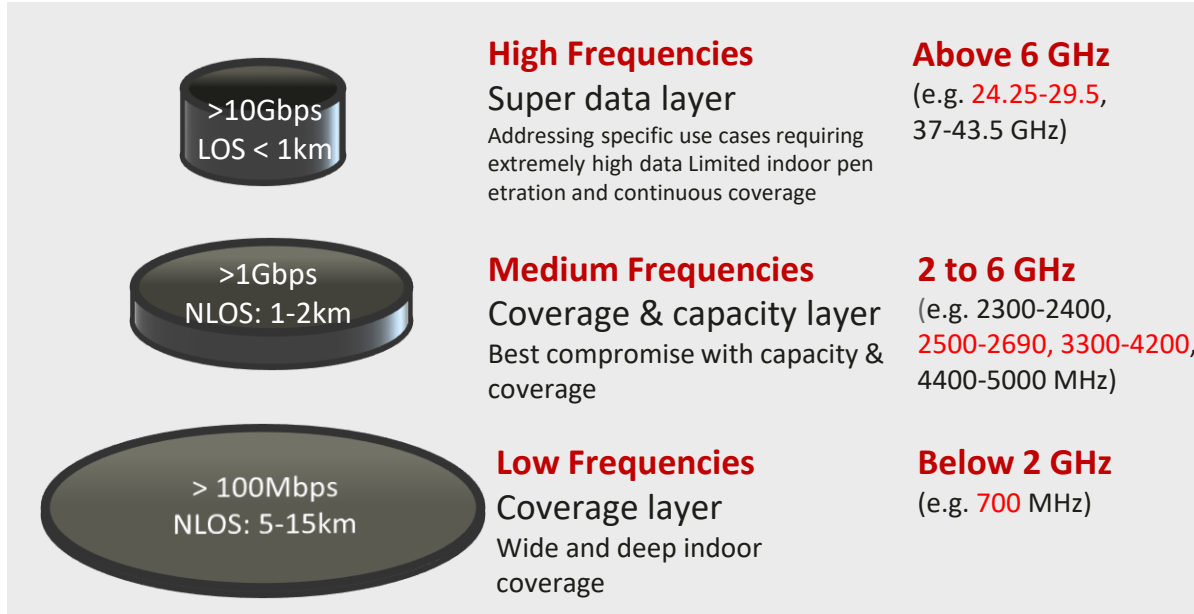
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Global 5G Industry Update

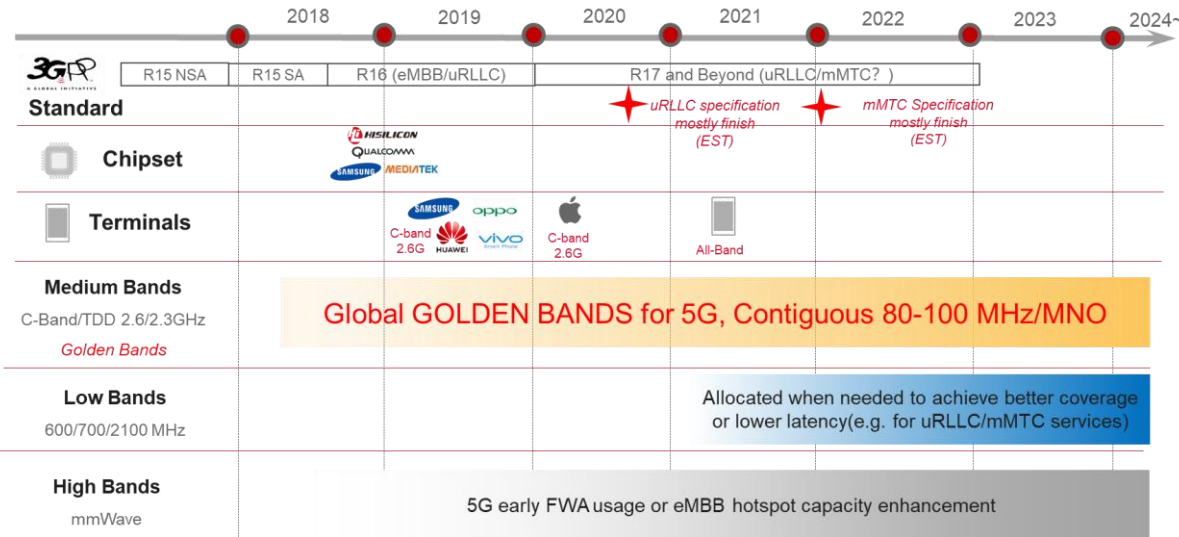
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Global 5G Spectrum Insight
~10 Min

5G launch with Mid-Bands First, Other Bands as Required Step by Step



A multi-layer 5G spectrum approach can address various usage scenarios and different requirements.



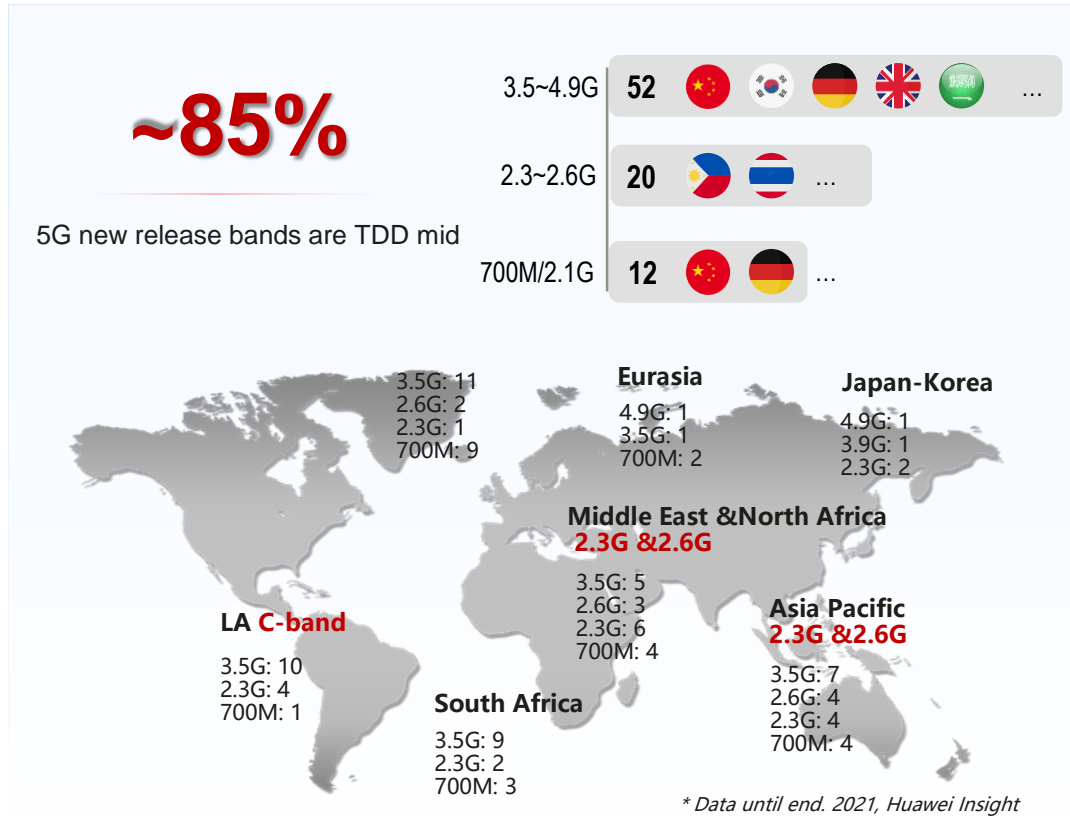
According to the **services requirement** and **maturity of ecosystem**, release 5G spectrum step by step:

- 1st Step:** Mid band, contiguous 80-100MHz/MNO @TDD 3.5 (C-Band)
- 2nd Step:** Low bands for 5G better coverage and lower latency such as 700MHz, 800Mhz, 900Mhz
- 3rd Step:** Mid bands for 5G early FWA usage or eMBB hotspot capacity enhancement such as 2.3Ghz and 2.6Ghz

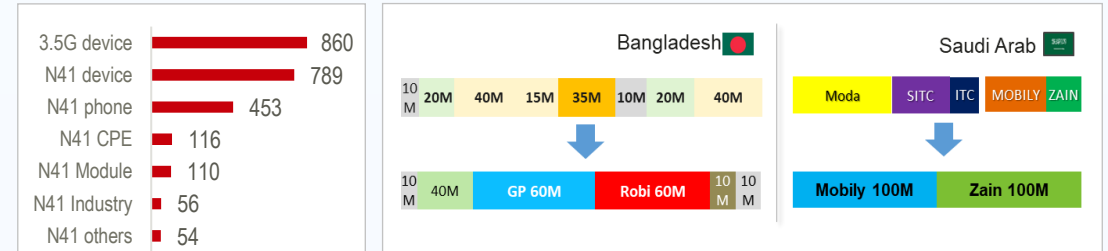
Mid-band Big Bandwidth Is the Global Primary Choice for 5G Deployment

TDD Mid-Bands are Mainstream, New Release Ratio ~85%

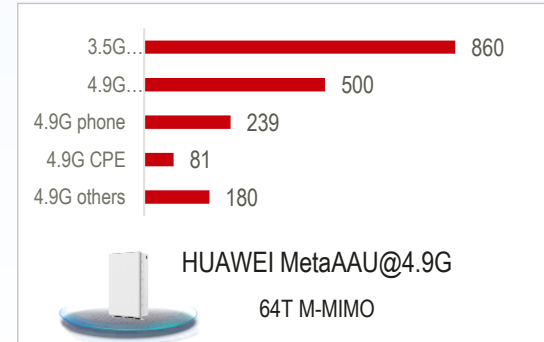
3.5/2.6/2.3/4.9 GHz Ecosystem is Mature



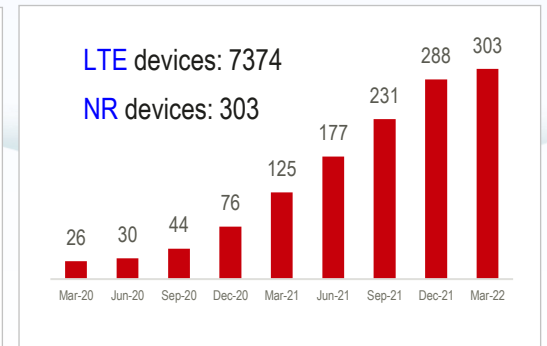
2.6G(n41) Eco. is very close to 3.5G More Countries Choose B41/N41 Mode for 2.6GHz



4.9G ecosystem is comparable to 3.5G, Coverage is comparable to 3.5G with MetaAAU

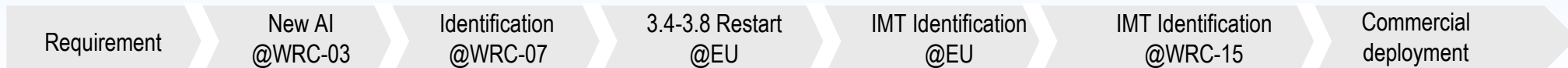


2.3G LTE ecosystem mature enough, NR ecosystem growing fast



* Source: GSA & Huawei MI

Experience from 3.5GHz: It have several steps from requirement discussion to commercial deployment



Rollout Obligations Guarantee Universal Service and High Quality Network

5G Network Rollout Obligation(with Spectrum Allocation)



Universal Service

Geographical Coverage, Population Coverage

- Site Number: 5G vs 4G 1:1, Hospitals, Schools, Airports, Stations
- Population Coverage: 90 ~ 100 %
- Geographic Coverage: Airport, highways, School...



High Quality Network

For HD Video, AR/VR, Metaverse services



- Outdoor wide area: 100Mbps, Indoor hotspot: >1Gbps



- Urban/Suburban: 100/50Mbps Everywhere, Dense Area: >1Gbps



Site Number

- Total 150k with C-band
- 3 years 22.5K of 15%
- 5 years 45K of 30%



Coverage

After 5 years

- NTT Docomo: >90%
- KDDI: >90%
- Softbank: 64%
- Rakuten: 56%



User Experience



Population

- At least **100 Mbit/s** for at least **98%** of households in each federal state by the end of 2022



Roads

- At least **100 Mbit/s** and a maximum latency of **10 ms** for all federal roads with connectivity function levels 0 or 1 by the end of 2022, all other federal roads by the end of 2024
- At least **50 Mbit/s** for all state roads by the end of 2024...



Railway

- At least **100 Mbit/s** for rail routes with more than 2,000 passengers daily by the end of 2022, at least **50 Mbit/s** for all other rail routes by the end of 2024,

Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。

Bring digital to every person, home, and
organization for a fully connected,
intelligent world.

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