HELLENIC TELECOMMUNICATIONS & POST COMMISSION

Initiatives to Foster 5G Deployment

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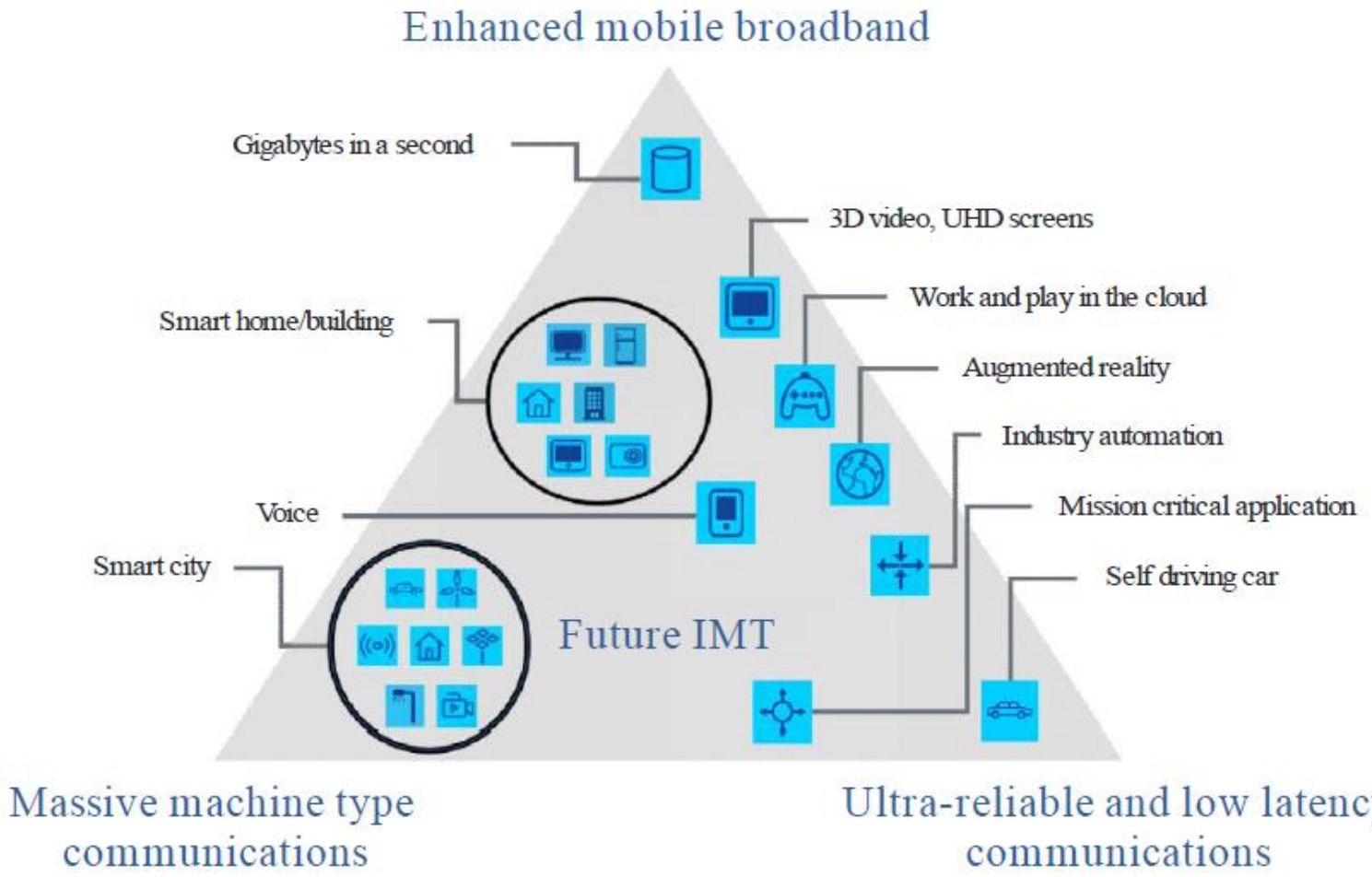
President - Hellenic Telecommunications & Post Commission

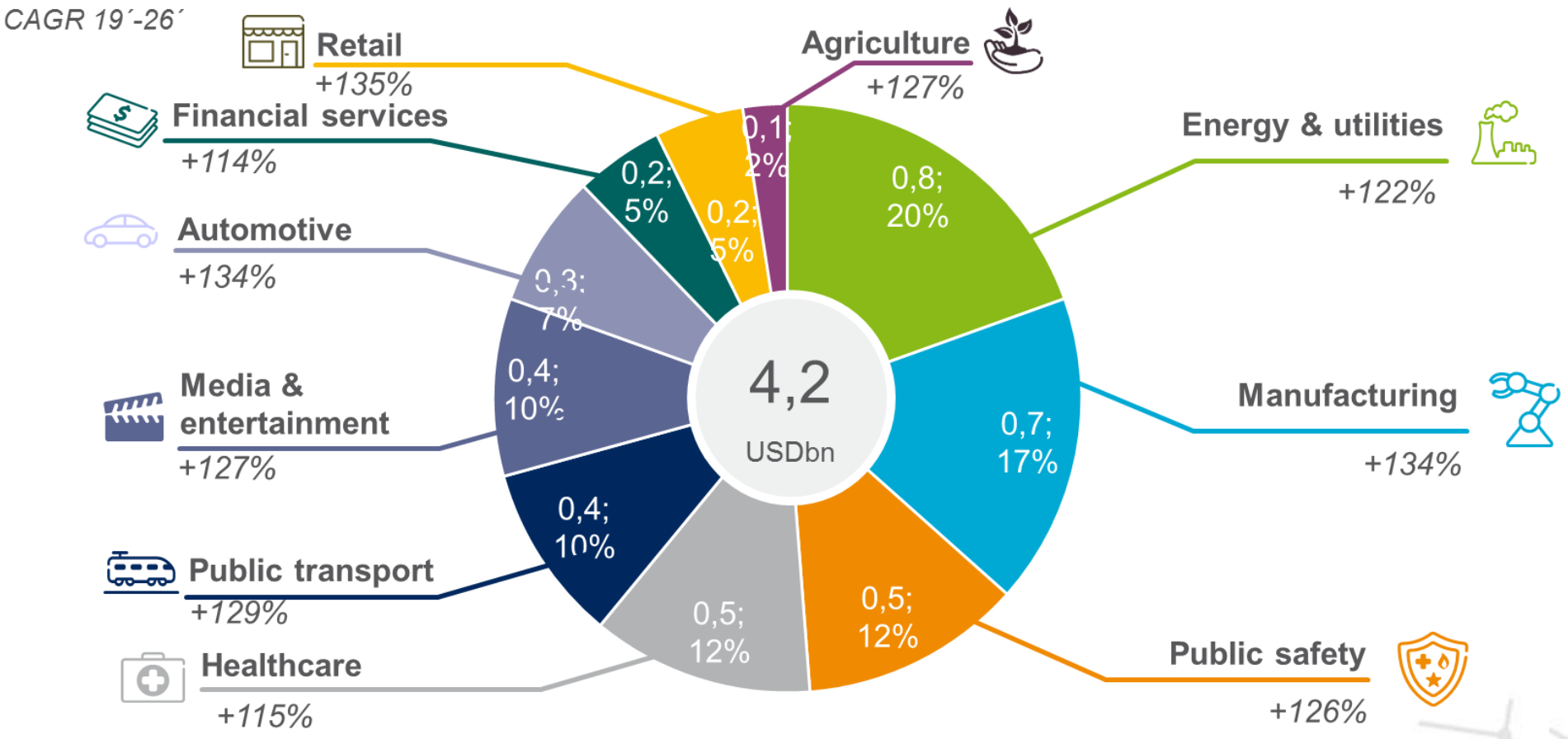
ITU Forum "Towards 5G Enabled Gigabit Society"
Athens, 11-12 October 2018

5G



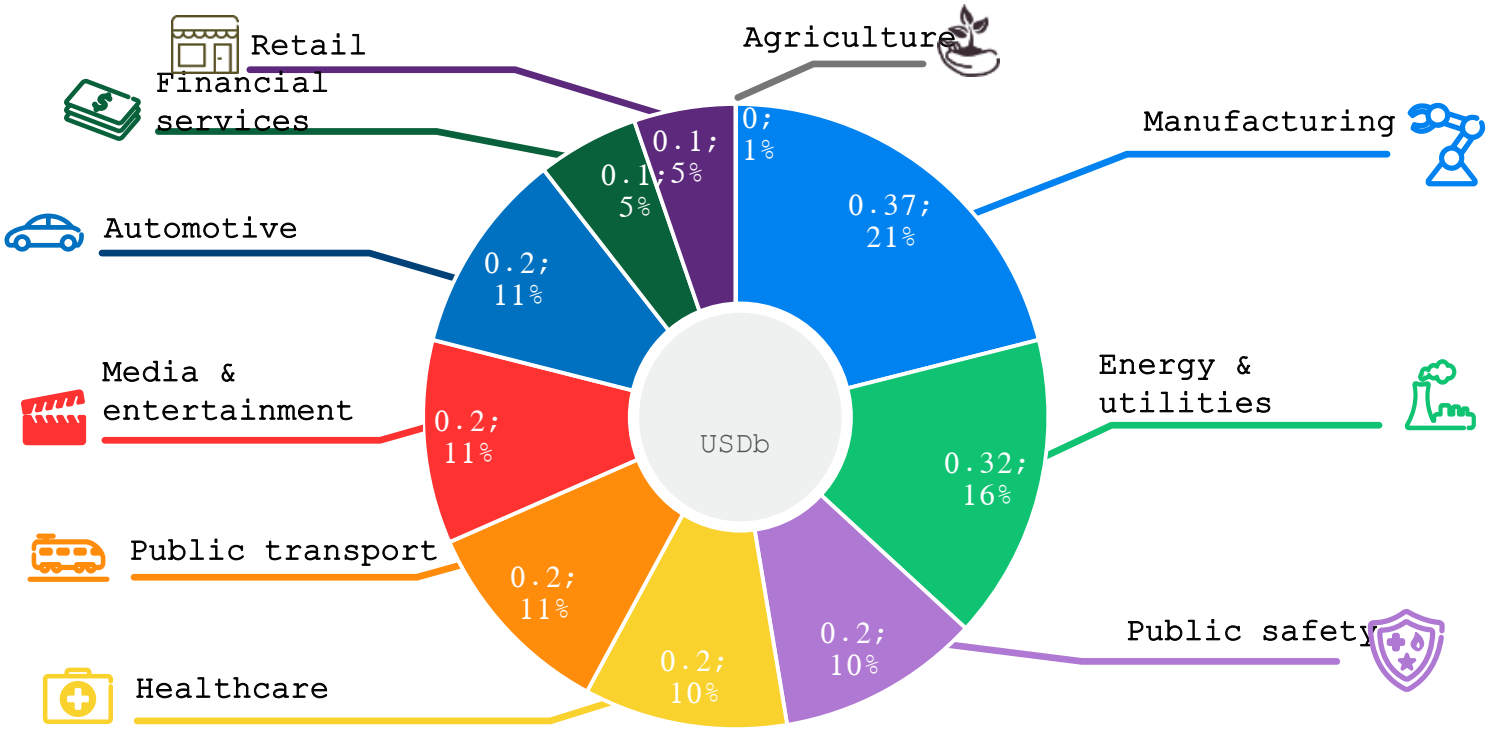
Source: Rec. ITU-R M.2083-0, IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond, 09/2015

5G Enabled Revenues from Industry Digitalization in Greece Year 2026



Source: Arthur D. Little & Ericsson

Greek Operators 5G Business Potential 2026



Source: Ericsson and Arthur D Little Industry digitalization revenue model

Note: 5G operator addressable revenues as Service Creator operator role

EETT Targeting 2018

- *“Launch initiatives for the rapid introduction and deployment of fifth-generation networks, develop a relevant regulatory framework and contribute to the relevant national strategy”*

- *“Emphasizing EETT's critical role in the national eco-system of innovation in the field of information and telecommunications technologies and its participation in the digital transformation of the country”*

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Trials Objectives

- Accelerate the deployment of 5G networks
- Ensure that Greece can take early advantage of the applications 5G networks can enable
- Maximize the productivity and efficiency benefits to Greece from 5G
- Create new opportunities for Greek businesses and encourage investment

Frequency Use Rights for 5G Trials

- EETT grants frequency use rights for trials to:
  - ➔network providers to assess the performance of networks they intend to deploy, and
  - ➔ manufacturers of radio equipment to assess the performance of their equipment

- Public consultation for trials in the pioneer bands 3.4-3.8 GHz and 24.25-27.5 GHz:
  - ➔Allocation of spectrum at a municipality level which will facilitate the rapid deployment of the trial networks
  - ➔Increased validity period of one year
  - ➔Reduced spectrum fees (115 euros per month and per municipality)

Spectrum Assignment for 5G

2018-2022

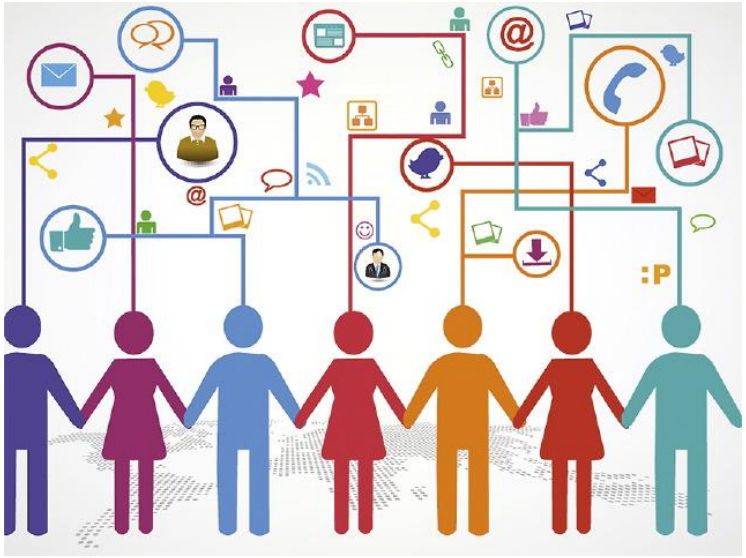
Frequency Bands used for 2G/3G/4G	Frequency Bands under preparation for 5G use (priority)	Frequency Bands under preparation for 5G use	Rights of use that expire soon	Frequency Bands for further study and consideration
• 800 MHz (4G) • 900 MHz (2G/3G) • 1800 MHz (2G/4G) • *2100 MHz (3G)* • 2600 MHz (4G)	• 3400-3800 MHz • 1427-1517 MHz	• 700 MHz • 24.25-27.5 GHz	• 2100 MHz (3G/5G)	• 2300-2400 MHz • mm-wave Bands according to the results of the WRC19 (A.I 1.13)

- Discussions with stakeholders to understand their requirements (2018)
- Suggestion about 1500 MHz consultation process (2018)
- Work on 5G spectrum assignment plan (in progress)

European Electronic Communications Code

- Aim: by 2025 uninterrupted coverage for all urban areas and all major terrestrial transport paths

- Minimum license duration: 15+5 years
- 5G spectrum to be available by end-2020 (3.4-3.8 GHz and 26 GHz)
- Easier rollout of small-cell wireless access points
- Co-investment issues



Thank you for your attention!

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About EETT

Established in 1992

EETT regulates, supervises and monitors, as well as acts as a competition authority for the following markets:

Electronic Communications Market
Fixed & mobile telephony
Wireless communications
Internet
Radio & telecommunications terminal equipment

Postal services market
Postal services
Courier services

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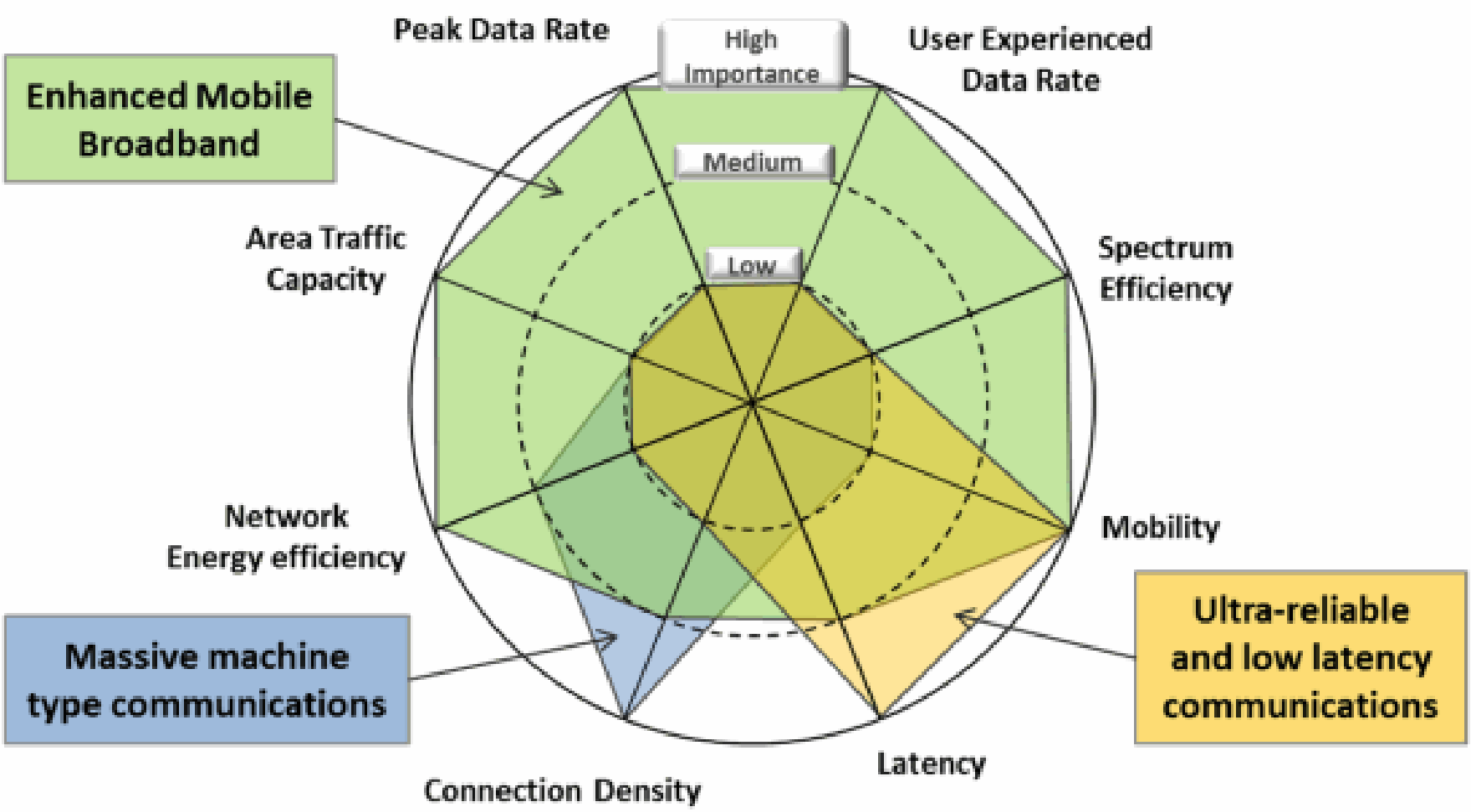
5G Capabilities



Source: Dr. Heung-Ryeol You, Key Parameters for 5G Mobile Communications ITU-R WP 5D Standardization Status, 2015

5G Capabilities

- **Peak data rate**
  - ➔ Maximum achievable data rate under ideal conditions per user/device (in Gbit/s)
- **User experienced data rate**
  - ➔ Achievable data rate that is available ubiquitously across the coverage area to a mobile user/device (in Mbit/s or Gbit/s).
- **Latency**
  - ➔ The contribution by the radio network to the time from when the source sends a packet to when the destination receives it (in ms).
- **Mobility**
  - ➔ Maximum speed at which a defined QoS and seamless transfer between radio nodes which may belong to different layers and/or radio access technologies can be achieved (in km/h).
- **Connection density**
  - ➔ Total number of connected and/or accessible devices per unit area (per km^2).

Source: Rec. ITU-R M.2083-0, IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond, 09/2015

5G Capabilities

- **Energy efficiency**
  - ➔ on the network side: the quantity of information bits transmitted to/ received from users, per unit of energy consumption of the radio access network (RAN) (in bit/Joule);
  - ➔ on the device side: the quantity of information bits per unit of energy consumption of the communication module (in bit/Joule).
- **Spectrum efficiency**
  - ➔ Average data throughput per unit of spectrum resource and per cell (bit/s/Hz).
- **Area traffic capacity**
  - ➔ Total traffic throughput served per geographic area (in Mbps/m^2).

Source: Rec. ITU-R M.2083-0, IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond, 09/2015

5G Regulatory Challenges

- Access and spectrum availability
  - ➔ Spectrum harmonization
  - ➔ Trials
  - ➔ Auction
- Small cells
- Verticals Regulation
- Net Neutrality
- Coverage
- Competition