ΕΝΩΣΗ ΕΤΑΙΡΕΙΩΝ ΚΙΝΗΤΗΣ ΤΗΛΕΦΩΝΙΑΣ

Greece towards a “mobile first” digital strategy: Prospects & Requirements

ITU – Towards 5G Enabled Gigabit Society

11 October 2018

Mobile Telecommunications Future Prospects & Opportunities for Greece

- **Rapid mobile telecommunications technological evolution: 4 generations in 3 decades & parallel evolution in devices** to catch up with continuous network developments
- **5G technological requirements, footprint & services**
- **Mobile telecommunications - a stimulus for growth**
- **Growth potential: opportunities, prerequisites & incentives**
- **Greece's digital snapshot**
- **Steps towards a "mobile first" digital strategy for Greece**

4G-LTE Radio Networks Key Technologies

Standardisation & Commercial Development

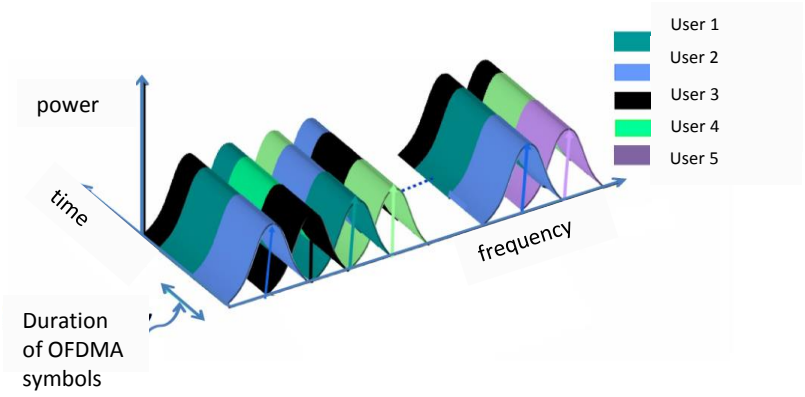
- **2008** - The 1st 4G standardisation (3GPP Rel.8) was finalised
- **2008 - today** - 6 upgrades in the standard (Rel. 9 to 14)

  Key upgrades :
  - LTE-A (Rel.10), finalised in 2010.
  - LTE-A Pro (Rel.13), finalised in March 2016.
- **2009** - The first 4G commercial network operated in Stockholm
- **2018** - in operation approximately
  - 644 LTE commercial networks in more than 200 countries worldwide.
  - 100 LTE-A commercial networks in more than 50 countries worldwide.

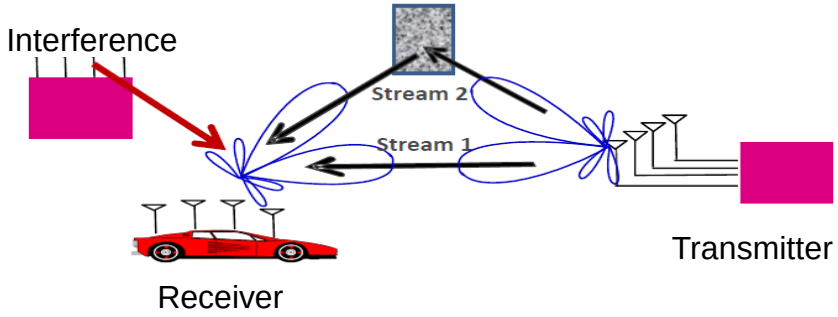
Key Technologies

- OFDM/OFDMA techniques in down-link, SC-FDMA in up-link.
- Adaptive differential /codification and scheduling of telecommunication traffic.
- Inter-Cell Interference Coordination - ICIC.
- Use of MIMO techniques (multiplexing, diversity, beamforming).
- Multicasting & Broadcasting Support.
- Carrier aggregation.

OFDMA



MIMO



Mobile Communications Worldwide Today

Better networks:
- ❑ 4G networks cover half of world's population (4 bn people)
- ❑ $ 900 bn investments

Greater connectivity:
- ❑ 4,8 bn people own a mobile telephone.
- ❑ $1 trillion of annual contribution to global GDP (4.2%)
- ❑ 36 million jobs
- ❑ $500 bn of public revenues

Richer services:
- ❑ Internet (3.5 bn users – 1 million new users each day)
- ❑ social networks
- ❑ e-gov
- ❑ health services, etc.

Average mobile broadband speed

13.5 Mbps (2015) → 16.6 Mbps (2016)

Number of social network users

2 bn (2015) → 2.5 bn (2016)

29% Increase

1.5 bn people have carried out purchases via mobile phone

1.3 bn people have used governmental services via mobile phone

Source: 2017 Mobile Industry Impact Report, GSMA

The Future is almost here (5th Generation)

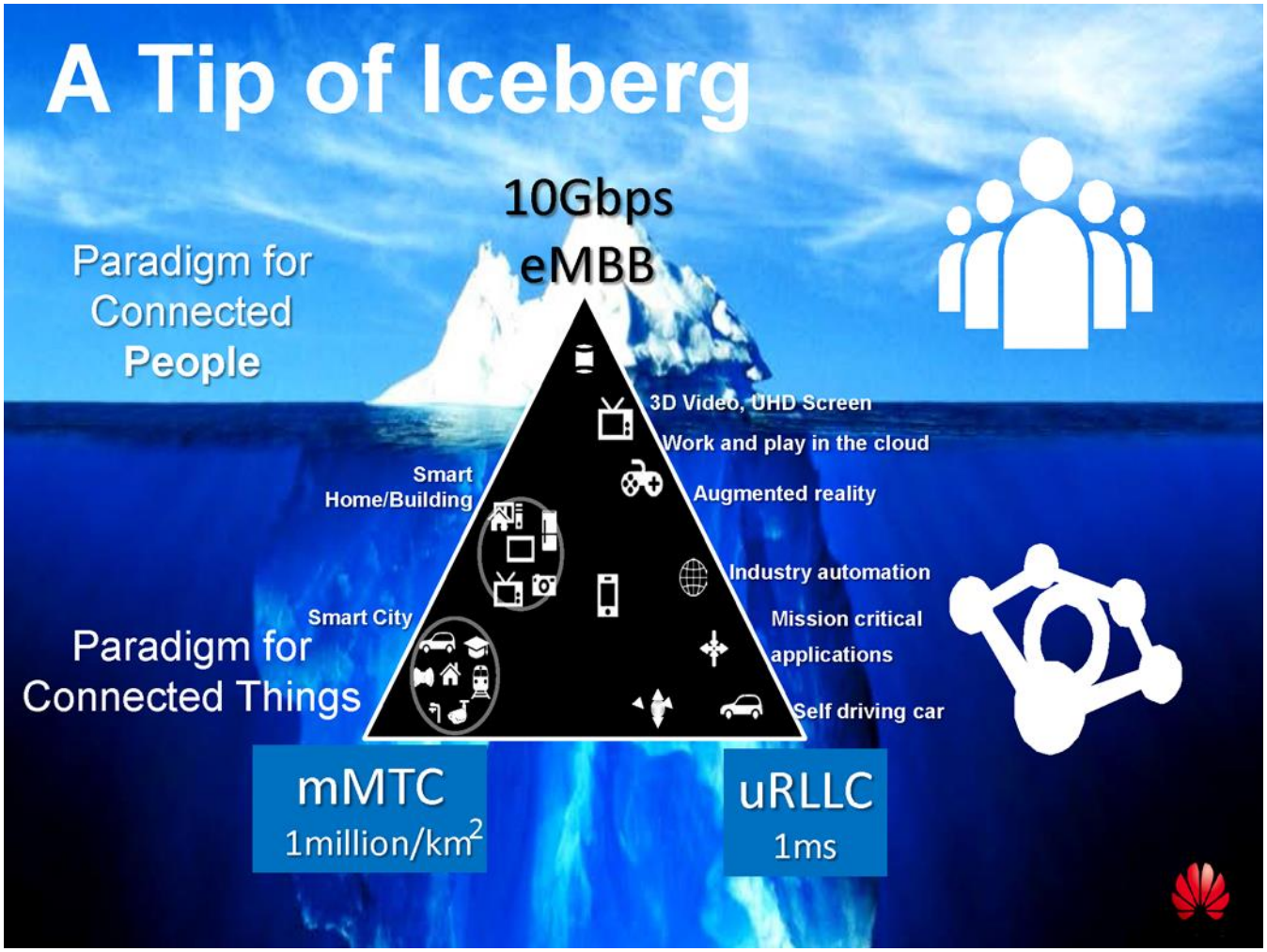
Next generation (5G) has already taken its first steps

- **March 2017**, 3GPP published the first studies for Release 14, which constitutes the first version systematically referring to 5G.
- **2020:** The1st wide-range pilot operation (Tokyo Olympic Games)
- **Software and Service centric transformation**
  - Telecoms → Multiple stakeholders
  - Bit pipe → Enabling platform
  - Phones → Things
  - Procedures → Services
  - Protocols → APIs
  - Dedicated Hardware → Orchestrated Resources
    - Network Function → Virtualized Software Instances
    - Network → Slice

Parallel steps in Greece

- **Consultation process initiation for drafting comprehensive 5G roadmap** – collaboration among policymakers, mobile telcos & critical sectors of the economy
- **5G pilots underway by the 3 providers in 3 municipalities** – estimated launch date 2nd half of 2019
- 2020 onwards **new spectrum frequencies allocation**

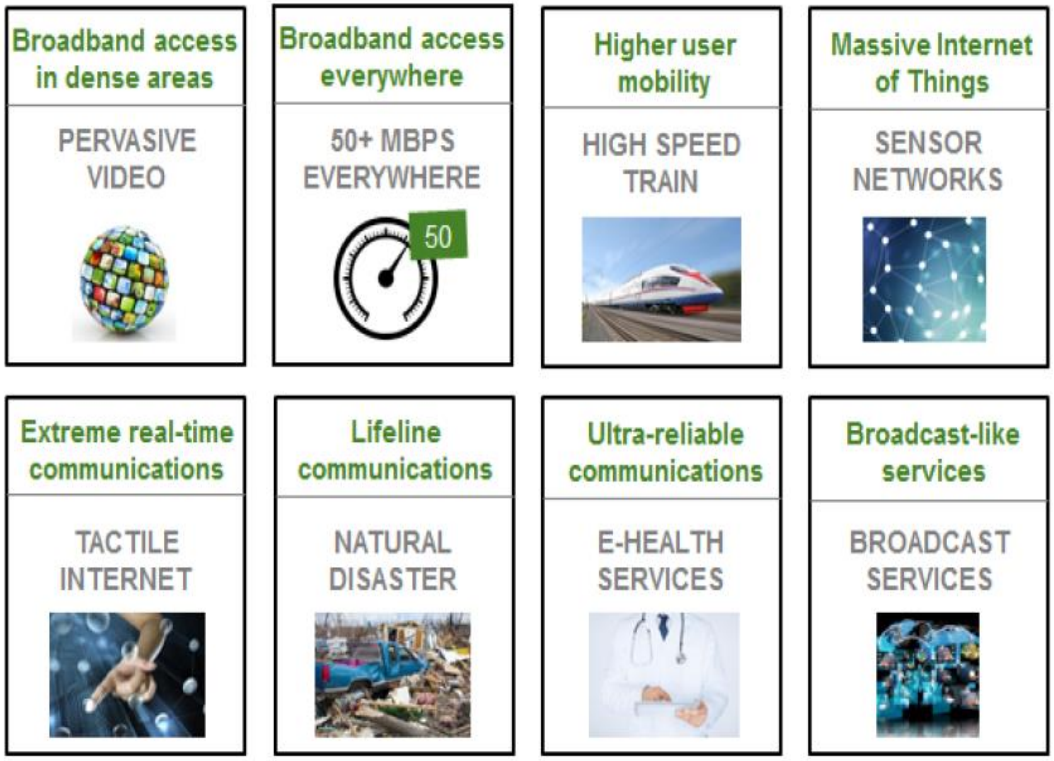
Evolution of 5G new reality (2020-2030)



Source: HUAWEI Technologies

Evolution towards 5G (2020-2030)

Possible Operation Scenarios



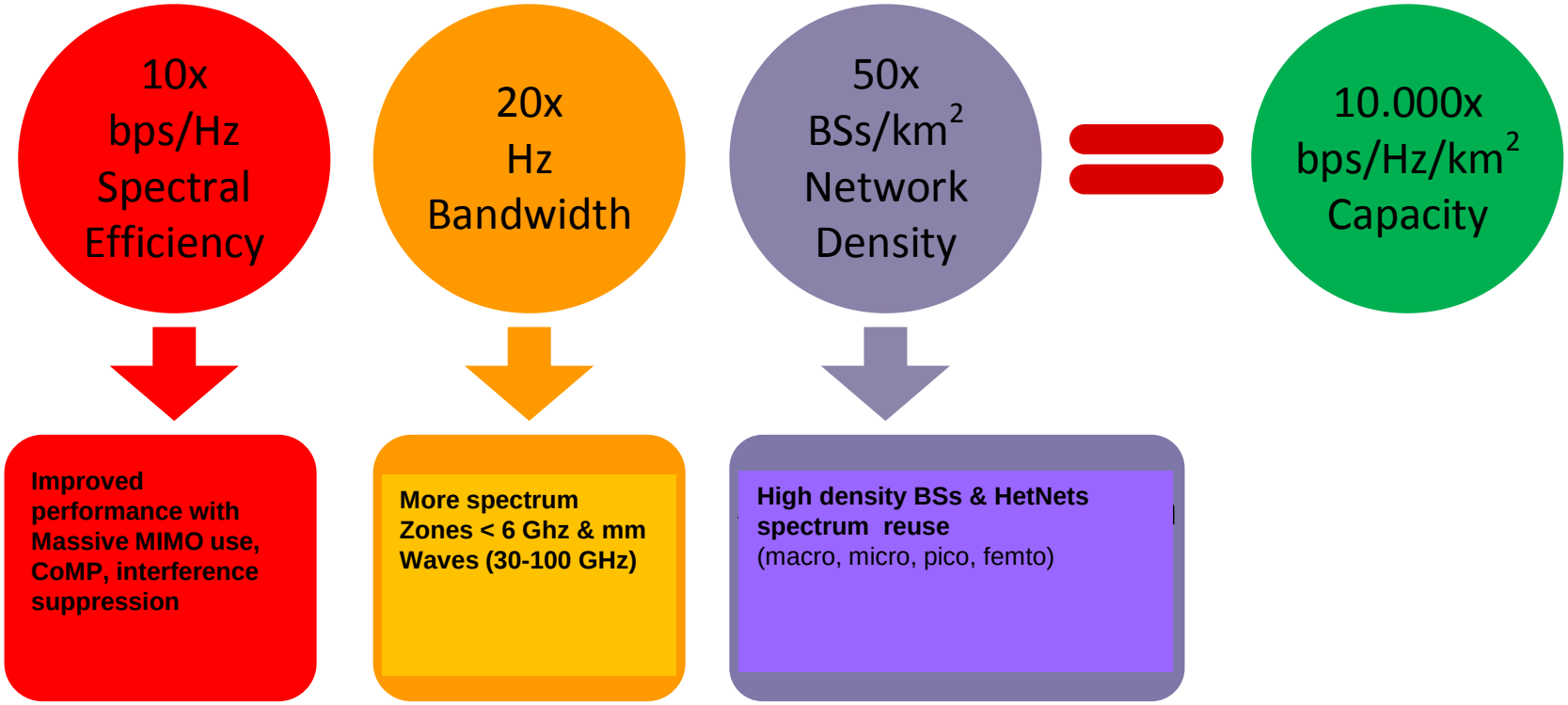
Source: NGMN Alliance,5G White Paper

Requirements

- 300-500Mbps mean time of transmission & max >10Gbps
- < 1ms. response time (latency)
- 100 times higher speed than the current cutting-edge systems
- 100% coverage.
- 1000 times reduction of energy consumption
- High Reliability (99,999%).
- 30× device density
- 10-100× more connected devices
- Higher security levels in communication

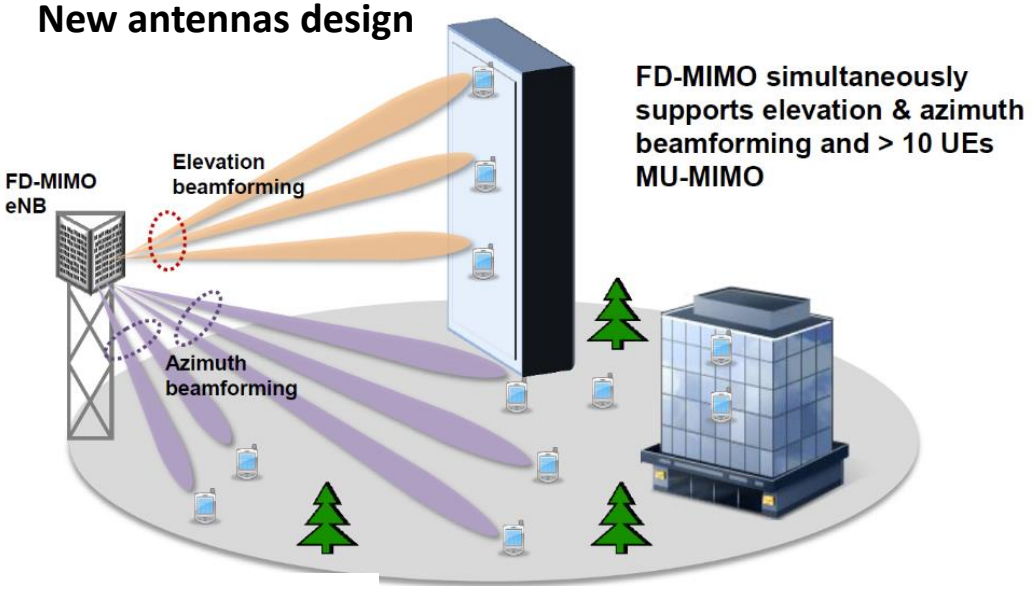
The 5G “10.000×” Challenge

- Mobile data traffic demand is almost doubling each year
- In a decade, 10,000 times higher telecommunications volumes (bits/sec/Hz/km^2) shall be required



Evolution towards 5th generation (5G) (2020-2030) Technological Perspectives

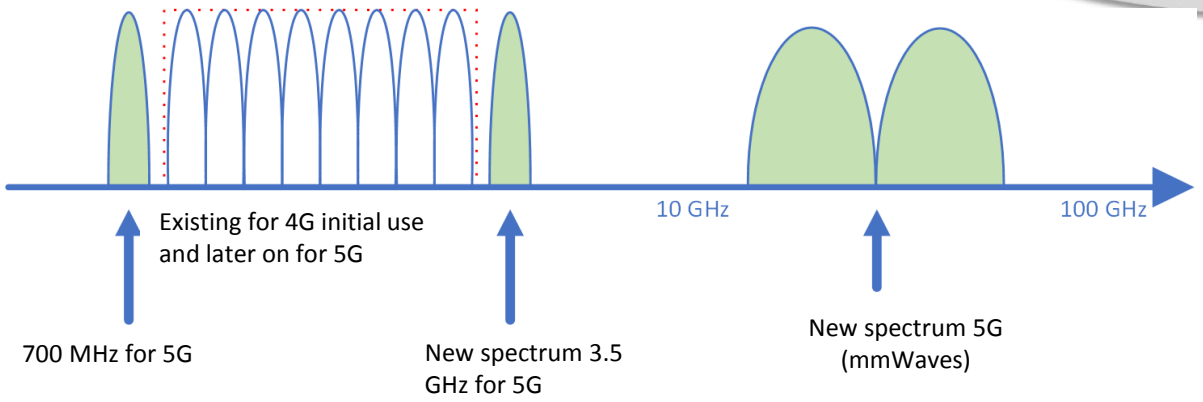
New antennas design



Massive MIMO Technology

(Source: "Full-Dimension MIMO: Status and Challenges in Design and Implementation")

Need for new 5G spectrum



Mobile Communications Critical Contribution in European Economy

Europe is the world's most highly penetrated mobile region as 4G shifts continue

84%

84% of the population owns a mobile telephone

124% Penetration (457 million subscribers with 752 million connections)

€540 bn

Growing contribution to GDP

(3.4% in 2016 ➤ 3.9% in 2020)

2,6 million jobs

Significant contribution to employment

€100 bn

Important contribution to public revenues

€143 bn

143 bn euros turnover

(CAGR 0.4%)
Mobile data CAGR 42%

- **The EU vision**: In a decade Telecoms and IT shall be unified in a common infrastructure with extremely high capacity.
- **Ensuring flexibility & expandability requires "virtualised" network operations**, carried out by generic purpose, programmed and high performance hardware, providing the resources for transmission, routing, storing and processing data.
- **5G networks shall integrate telecommunications, IT and storing resources in one programmable unified infrastructure**, allowing the optimum use of allocated resources.

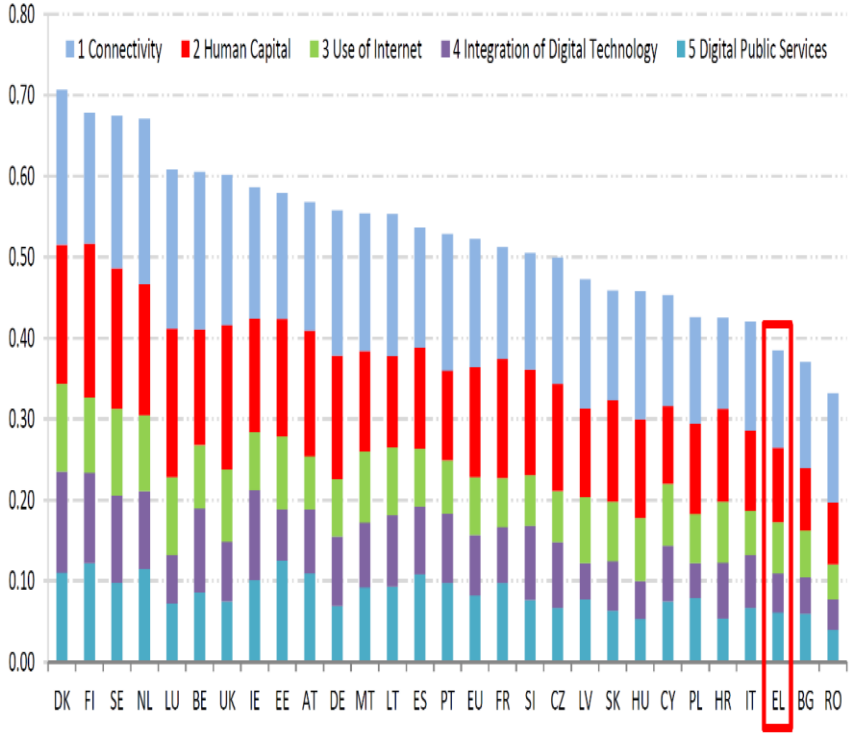
Source: The Mobile Economy: Europe 2017, GSMA

Greece compared to the EU

Greece is far behind the EU average (26th in EU-28)

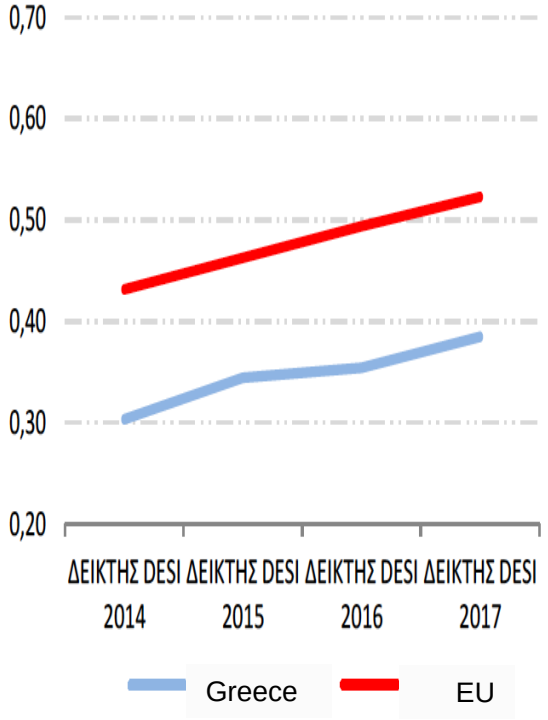
Greece fails to converge with the EU, lagging steadily behind 4-5 years in digital modernization

2017 ranking based on Digital Economy and Society Index (DESI)



Πηγή: Digital Economy and Society Index (DESI) 2017

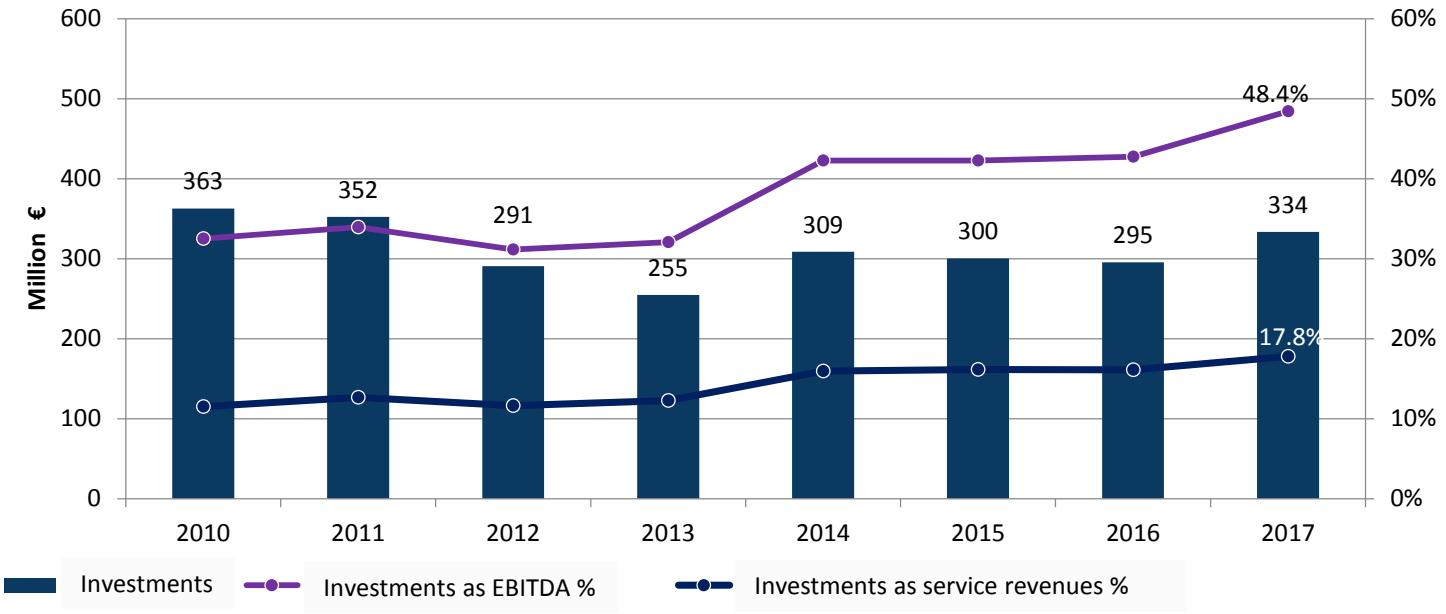
DESI – Evolution over time



Πηγή: Digital Economy and Society Index (DESI) 2017

However the Industry is One of the Largest & More Stable Investors

- €334 million investments in 2017 or 48,4% of EBITDA
- €537 MinEcon investments including cost for spectrum licenses
- €2.5 bn investments in fixed and mobile networks for the 2017-2020 period
- 3,6% of industry's turnover invested in R&D



Source: Providers' data processed

The roll out of new generation networks is expected to create the necessary broadband dynamics that shall support the new 5G services.

Greek Economy Growth Potential

The industry's additional contribution*

- ❑ +2.05% or €3.06 bn to GDP
- ❑ + € 1.62 bn to public revenues

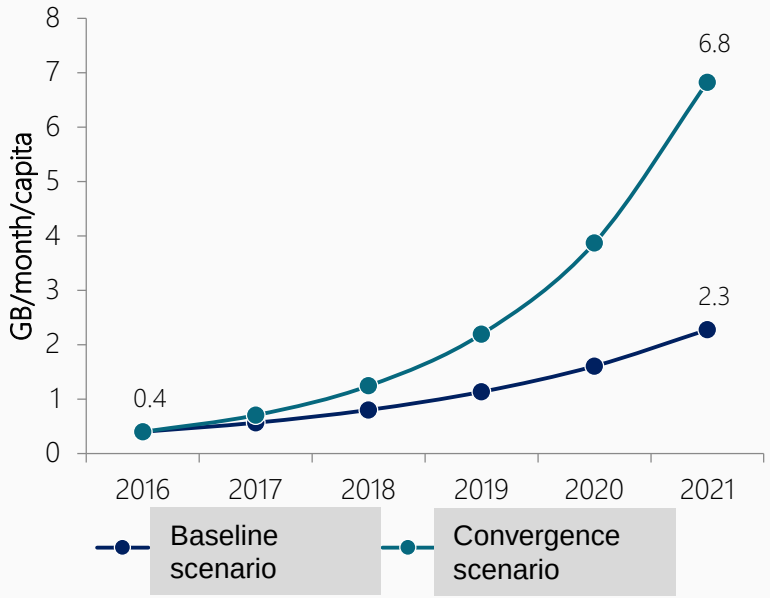
* Prerequisite: the implementation of required reforms, so that Greece may digitally converge with the rest of the EU (Convergence scenario).

Mobile data

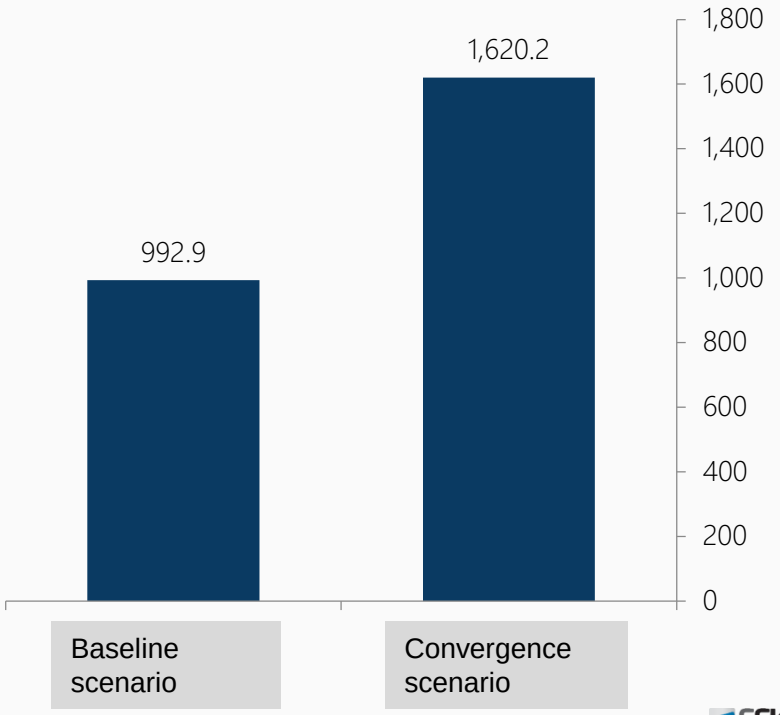
•**Baseline scenario**: data penetration increases by 42% annually, reaching 2.3 GB per inhabitant in 2021, without converging with european average

•**Convergence scenario**: Greece converges with the average of Italy, Spain and Portugal in 2021 (at 6.8 GB per inhabitant per month)

Evolution GB / per capita by scenario



Impact on public revenues per scenario in million € in 2021



Towards a “Mobile First” Digital Strategy

Greece has the potential to evolve to No1 destination in South-east Mediterranean region for investments in cutting-edge technology.

To this end, State initiatives are required to upgrade Greece’s position on the digital map:

01 Simplification and implementation of the regulatory framework in order to speed up the licensing process of base stations. The much anticipated upcoming Bill is expected to solve pending issues regarding network upgrades for faster implementation of planned investments.

02 Adoption & immediate implementation of a comprehensive “mobile first” digital strategy. The strategy should incorporate action plans for the digital transformation of all sectors of the economy. Therefore, it should be drafted and implemented by GR GOV in cooperation with the various sectors.

03 “Ready for use” spectrum allocation. Review of frequency auctions and infrastructure licensing cost, so as to be designed to balance fiscal requirements with the need for investment to enable economic development. It is critical to avoid artificial auction constructs which fail to strike a healthy balance for the industry.

04 Strengthening demand by introducing incentives for adoption of innovative mobile services by businesses, citizens, local authorities & public administration. Exploitation of 5G opportunities is not an automatic procedure. **Revenue prospects should be based on realistic forecasts, demand’s stimulation will be the key challenge for the 5G ERA.**

05 Removal of the special mobile tax distortion. In Greece, consumers bear a tax surcharge of up to ~50% of their final bill when the maximum charge in the EU is 25%.

06 5G Networks and Services are anticipated to become a key factor to sustainable development goals and achieving the UN 2030 targets.

07 GDPR - Optimum environment creation, safeguarding trust between providers, clients & public administration so as EU to thrive in innovative sectors (telcos, AI etc.) outflanking USA & China.