The Future of Networks:
An operator's perspective in a changing world

Fifth Visions for Future Communications Summit

Challenges for 2030 and Beyond

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Looking
in the mirror

1G

1980

2G

1990

3G

2000

4G

2010

5G

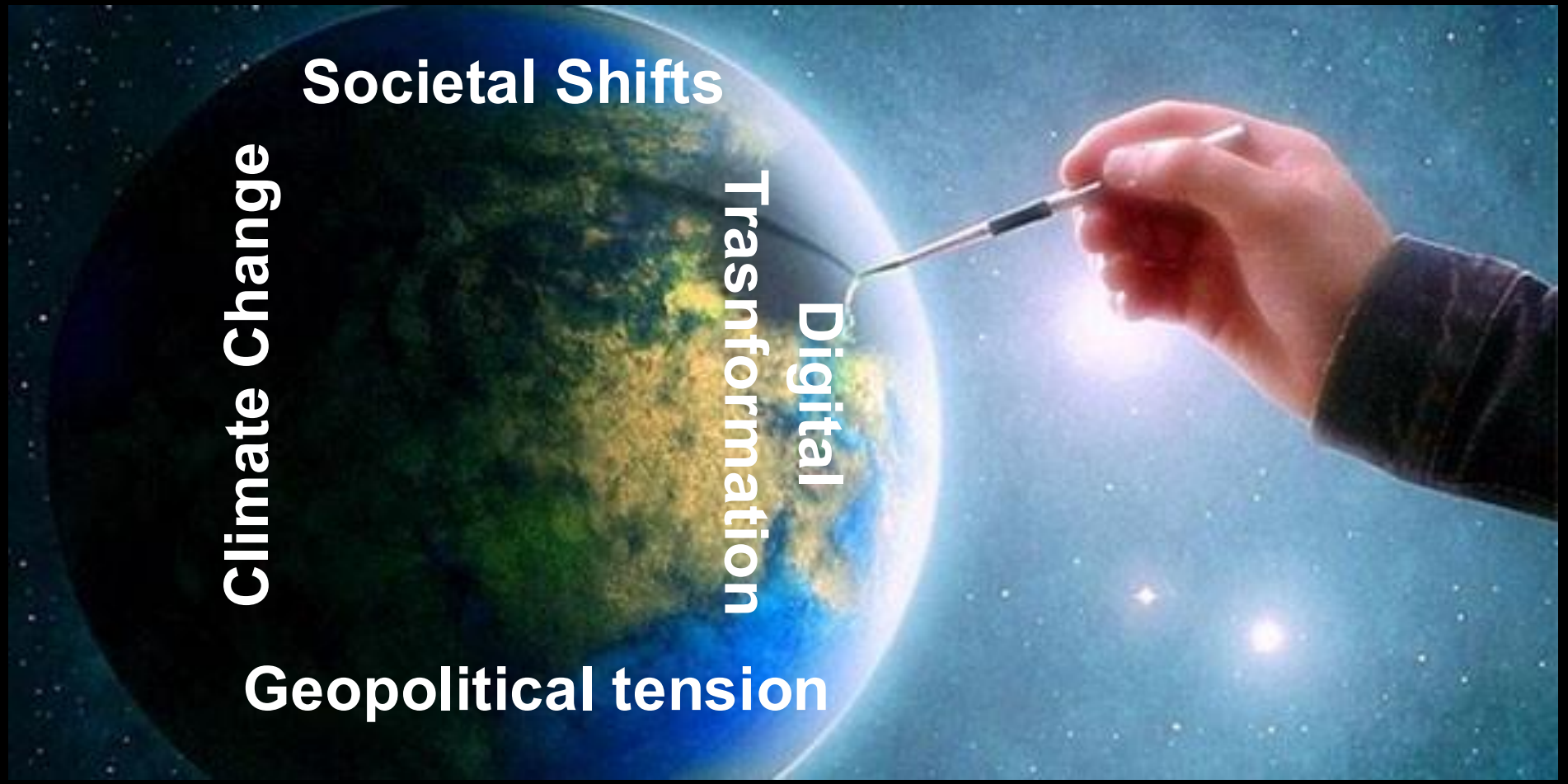
2020

?

6G

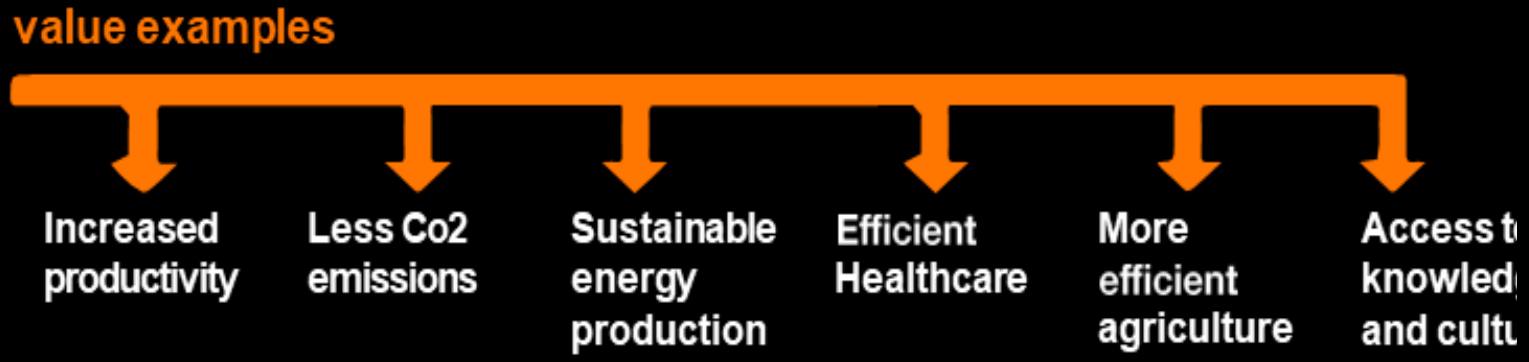
2030

In the meantime….



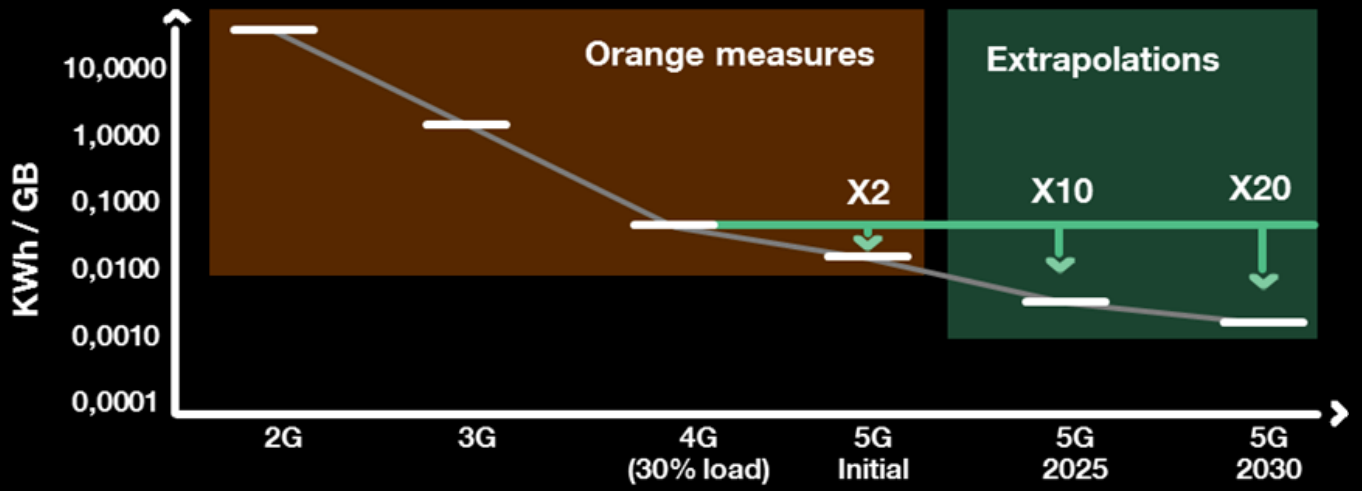
Next Gen Networks ?

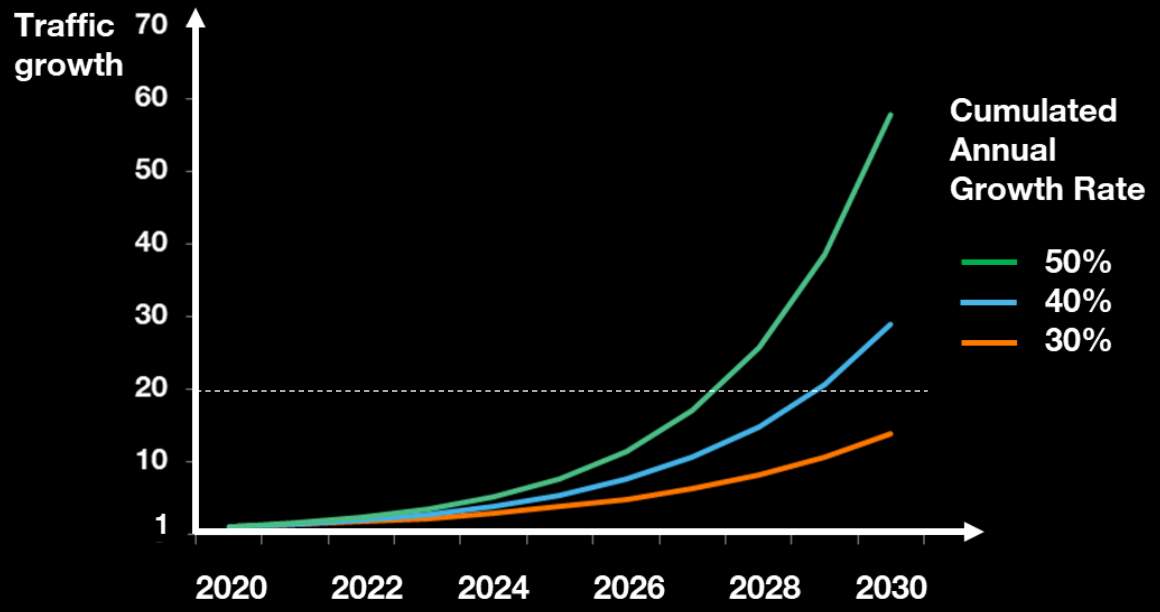
Goal: bring Value and Sustainability to the society



Having Value and Sustainability as the core drivers for designing future connectivity technology is a necessary condition for the long-term economic sustainability of the telecom industry.

1 Mobile Networks energy consumption needs to remain stable, or even reduce





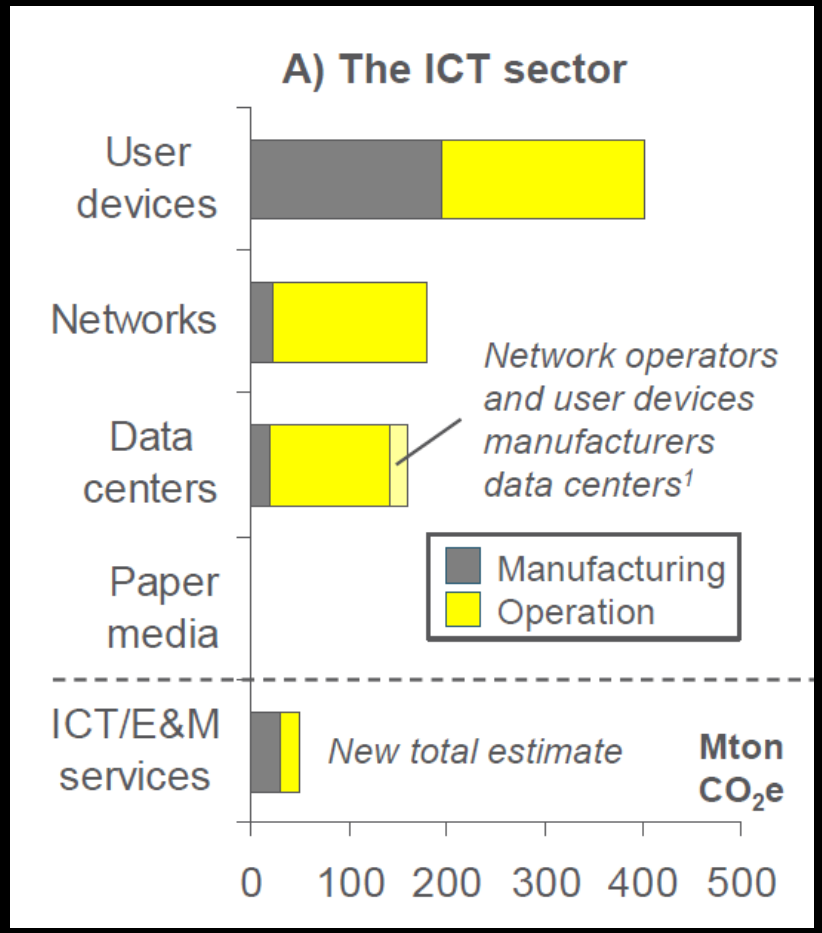
Need for significantly higher energy efficiency → At least of the same order as the capacity gain

And for efficient power management → To scale power consumption with actual load

By 2025, 44 MNO representing almost half of the market have committed to reach carbon neutrality between 2040 to 2050 → Innovatives solutions are needed & Energy efficiency is just a part of the problem

2 Environmental impacts need to be limited E2E

- Quantify the E2E CO_2 impact + other impacts e.g. abiotic resources (metals, water, etc.)
- Develop sustainable services and equipment (including terminals)
- Considering the whole lifecycle
- Ecosystem effort involving devices and service providers



Total carbon footprint results for the ICT (A) and E&M (B) sectors in 2015 (Malmodin, Lundén).

3 Resilience, Security and privacy need to be much higher

As the backbone of digital society, networks are already today essential for social life, economy and public services

- as connectivity expands to more critical fields, expectations on resilience, security and privacy grow stronger
- resilience = high robustness + fast recovery over failure

E2E Security, privacy and resilience should be

- design criteria of the development of new features
- ensured in multi-tenant environments - federated
- An accelerator of innovation

4 Digital inclusion is a societal and technology stake

Digital inclusion: A growing concern as accessing “good enough” connectivity is getting each year more essential

Coverage of low-density areas at affordable cost…

… In a sovereign and reliable way…

… so that technology is accessible for all (cheap enough, simple enough)…

… while minimizing environmental impact

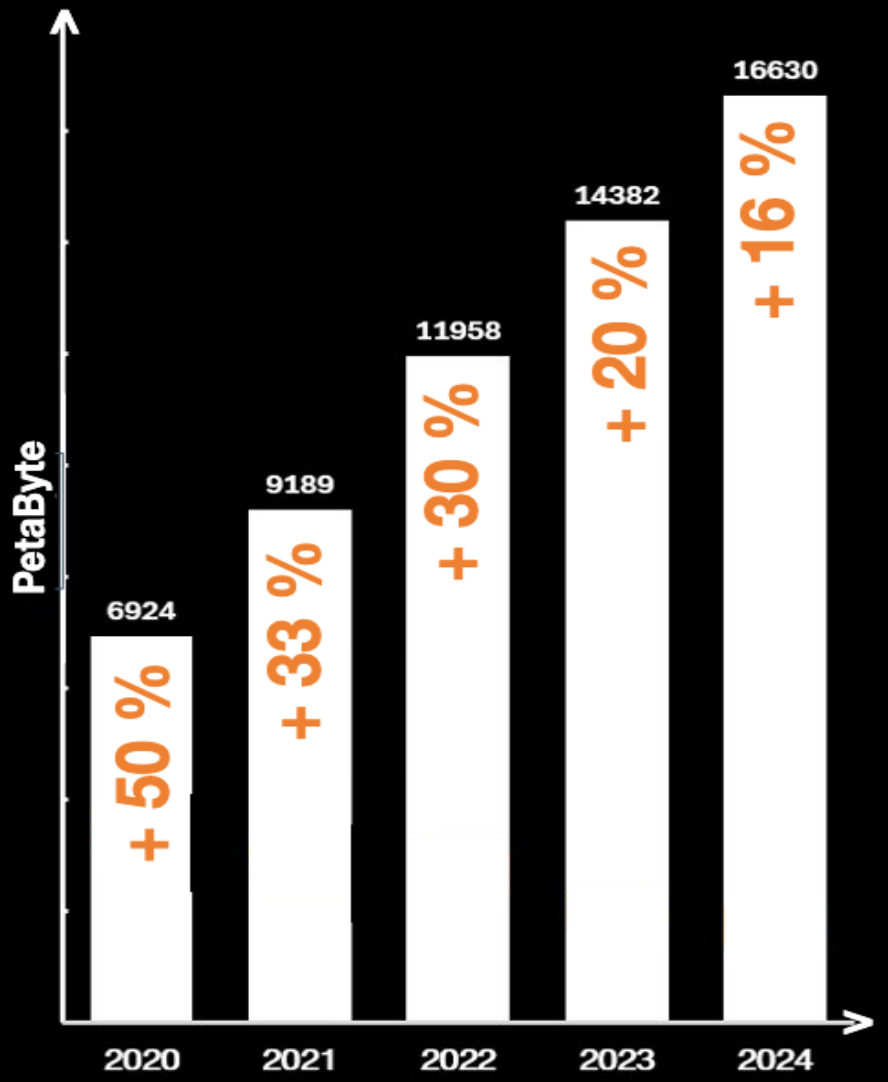
5 Networks need to become more capable

Provide new capabilities:

- Sensing & positioning
- Convergent communication and computing infra
- Yet to imagine…

Continue to support a realistic capacity growth

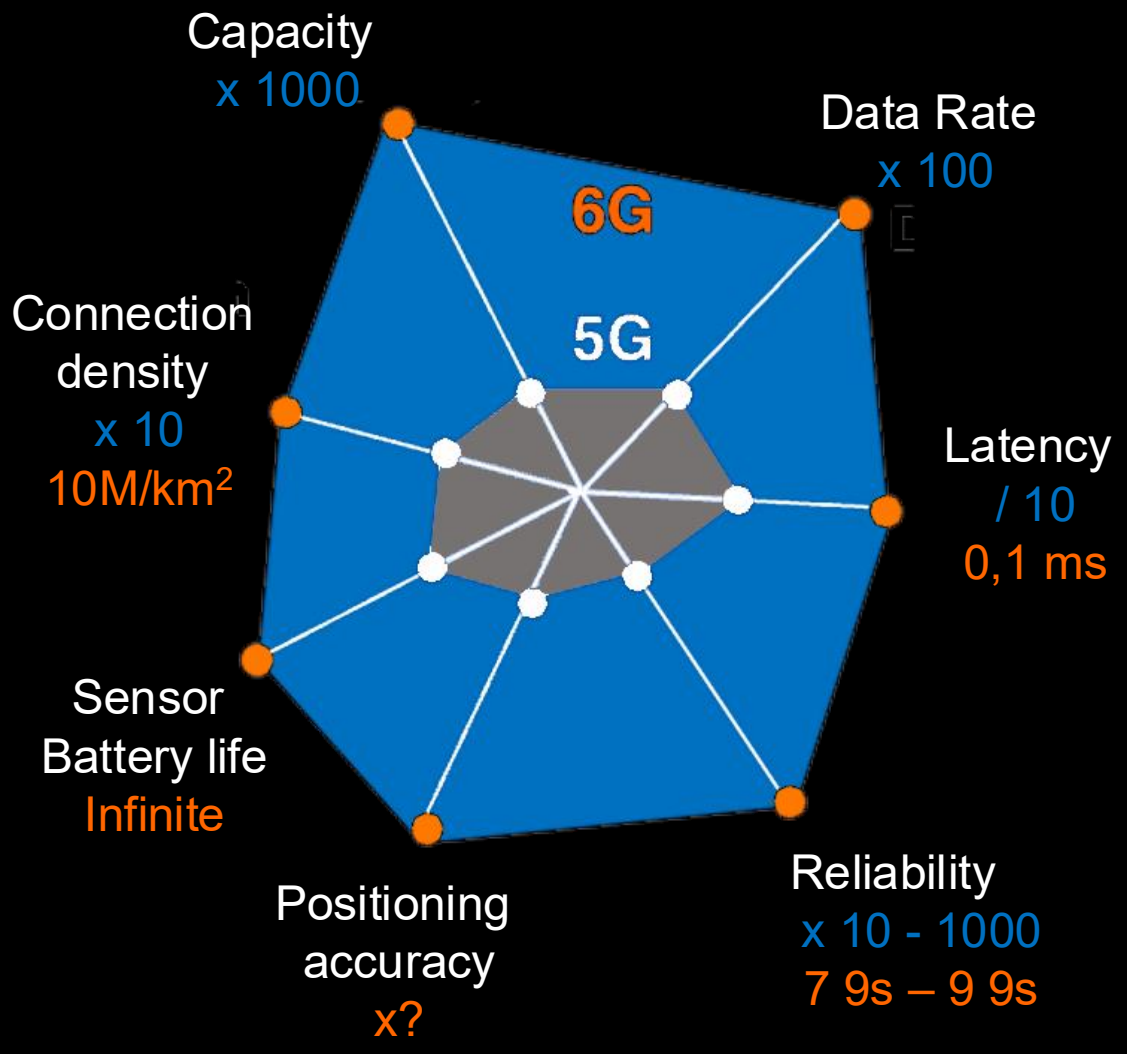
- YoYear growth rate decrease but the absolute increment stay the same
- With cost and environmental limits

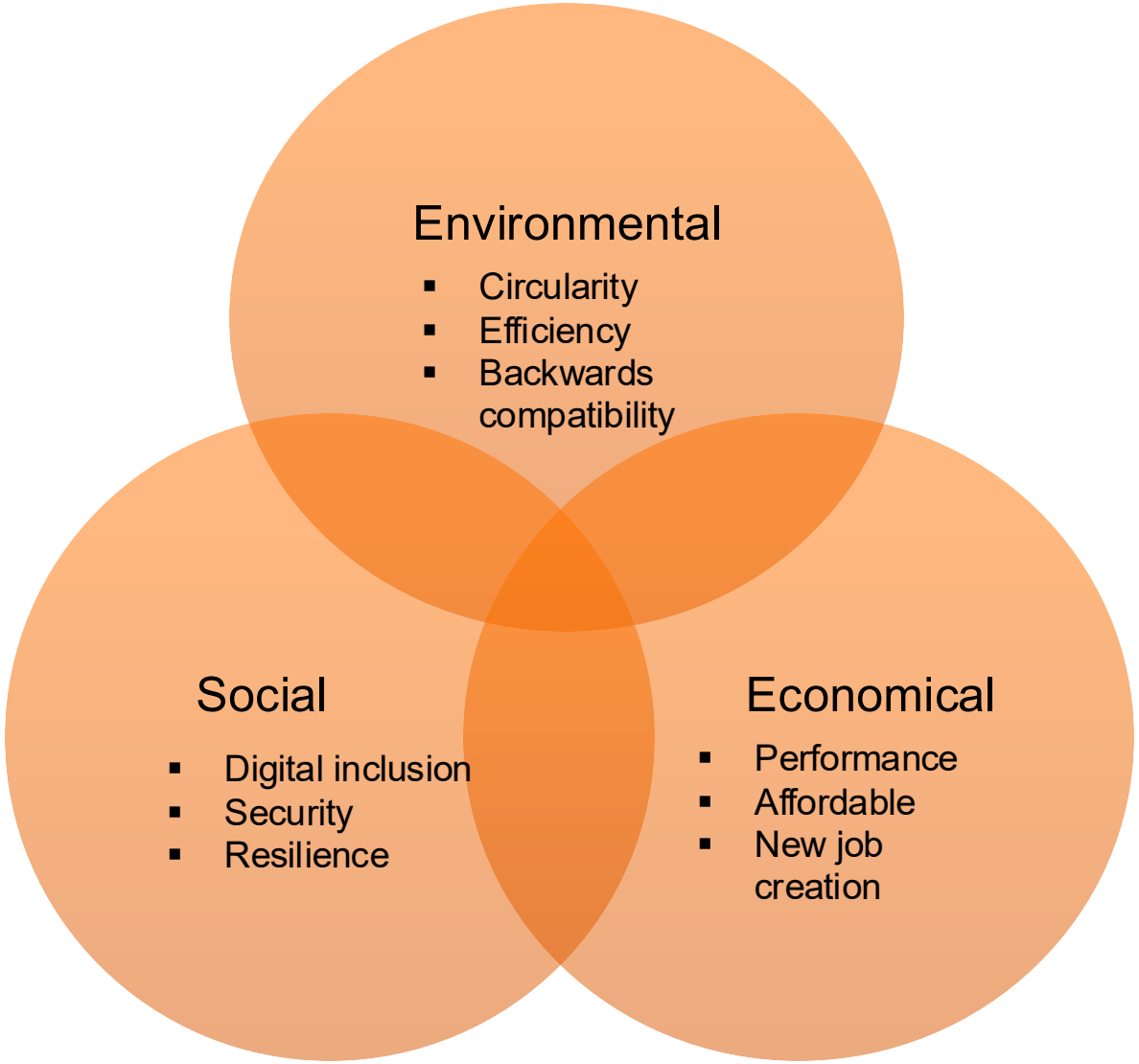


Source: Orange mobile traffic dashboard – Q2 2025

The example of 6G Conception

Before (2019)
Key Performance Requirements (KPI) AND Key Value Indicators(KVI)





And beyond 2030 ?

6G and Fiber are here to last for a while. But how to:

Reach Carbon Neutrality ?

Ensure Sovereignty, Security & Resilience ?

Be ready for Usages Evolution ?

Increase Operational efficiency ?

How to:

Reach Carbon Neutrality?

Ensure Sovereignty, Security & Resilience?

Be ready for Usages Evolution?

Increase Operational efficiency?

No more peak dimensioning:
Deliver just what is needed
not less but not more.

Better lifecycle management (with more modularity & upgradability)

More energy efficient HW & SW +
Proper energy management

Sustainability assessment

How to:

Reach Carbon Neutrality?

Ensure Sovereignty, Security & Resilience?

Be ready for Usages Evolution?

Increase Operational efficiency?

Smart integration of TN & NTN Connectivity

Federated communication & compute Infrastructure

Free space optical communication

Quantum communication

Semantic representation

Anticipate supply chain impact

Sustainability assessment

How to:

Reach Carbon Neutrality?

Ensure Sovereignty, Security & Resilience?

Be ready for Usages Evolution?

Increase Operational efficiency?

Maximise network flexibility & upgradability by design

Anticipate devices evolution (AI, glasses, objects)

Federated communication & compute Infrastructure

Experiment new usages to understand actual need

Be able to estimate global value

Sustainability assessment

How to:

Reach Carbon Neutrality?

Ensure Sovereignty, Security & Resilience?

Be ready for Usages Evolution?

Increase Operational efficiency?

Maximise network flexibility & evolution potential

No more peak dimensioning: Deliver just what is needed not less but not more.

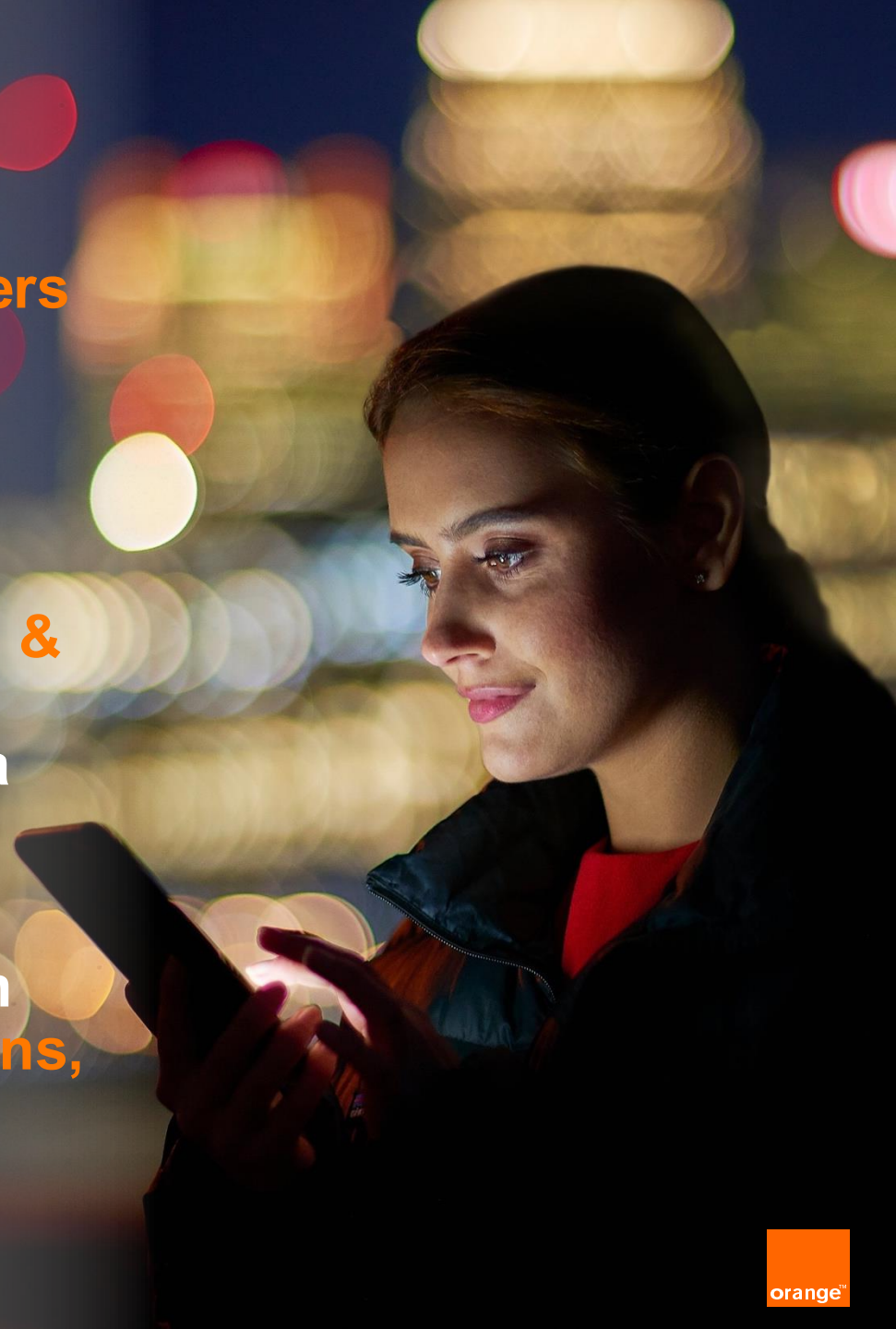
Federate infrastructures

Leverage on AI for operation & interaction

Sustainability assessment

Take-aways

- Value and sustainability should be the core drivers for defining future network technologies, as a necessary condition for the long-term economic sustainability of the telecoms industry
- As network evolution should be driven by usage & value rather than by technology, It is time to reconsider the G-based terminology in favor of a more continuous evolution
- Standardization is essential to a global and open ecosystem. Involvement in standard organisations, industry fora, EU projects is key to contribute shaping future technologies



References

- **More details in Orange White Paper “Mobile Network Technology evolutions beyong 2030” & Orange vision on 6G**

- **NGMN 6G Key Messages – An operator view**
  https://www.ngmn.org/publications/6g-key-messages-an-operator-view.html

- **NGMN Radio Performance Assesment**
  https://www.ngmn.org/publications/ngmn-radio-performance-assessment-framework.html

Thank you