ENVIRONMENTAL IMPACTS OF DIGITAL TECHNOLOGY: 5-YEAR TRENDS AND 5G GOVERNANCE

Updated prospective scenarios for the environmental impacts of global digital technology, and proposals for a reasonable 5G deployment

SYNTHESIS

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THE SHIFT PROJECT

Editorial board

Authors

Hugues Ferreboeuf (The Shift Project, Project manager)
Maxime Efoui-Hess (The Shift Project, Project coordinator)
Xavier Verne (SNCF, Digital Sustainability Manager)

Layout and data visualization

Anaïs Carrière (Communication officer, The Shift Project)
Fanny Breteau (Graphic designer)
Nicolas Hervé and Léa Fourcade (Freelance graphic designers)

Reviewers [1]

Sylvain Baudoin (Expert, Product Owner in IT production)
Bruno Foucras (Aix-Marseille University, IUT Department of Thermal Engineering and Energy, Associate Professor)
Arnaud Gueguen (7 hours 23, Mentor | Darwin-X, Consultant | Teacher)
Celine Lescop (AXA, Enterprise Architect)
Francois Maitre (Open Group France, Enterprise Architect)
Iain Richardson (Enterprise Architect)

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1 - Also members of The Shift Project "Deploying digital sobriety" report working group (The Shift Project, 2020)

1 – Introduction: Problem statement and observations

How can we make the digital sector compatible with a 2 C emissions pathway? Which debates merit serious attention, and which players should be put in motion to work towards a resilient digital environment? How do we approach the current 5G debate, so as to build a digital governance system that is both relevant and effective?

Since 2018, our works on the digital sector have enabled us to lay out our vision for the concept of **digital sufficiency**. These observations, and the quantitative evidence backing them, have helped to raise awareness around the significant environmental footprint of the digital sector and the **systemic factors** which have led to its worrying growth. Since then, 5G bids have taken place in Europe, and the first installations have started. Concurrently, the health crisis has acted as a stark reminder to society that digital technologies are now a core component of essential services.

The progress of 5G roll-out in France and Europe offers us **a window of opportunity to collectively reflect on how we can make digital transformation compatible** with climate and energy-related constraints and how we adapt our decision-making mechanisms to consider the scale of our technology choices and their consequences.

The purpose behind debating these technological choices is not to embrace or reject any particular technology. **Such debates are beneficial if they question what motivates the direction in which we take our digital environment**, what justifies this orientation and how it is to be implemented across society. By re-examining the stalemate of the 5G debate, we can see that it is necessary to **create the conditions for a collective discussion** on technological choices that is broader, more effective, and centered on **collective governance** that has explicit goals.

Without this kind of analysis, our digital policies and development strategies will remain wasted opportunities in a digital transition that, ubiquitous as it may be, fails to take on the physical and societal challenges of this century.

2 – Objectives: Key objectives of this document

1. **Consolidate our quantitative estimates** for the environmental impact of the global digital sector, by updating our scenarios from 2018;
2. **Use 5G deployment in France as a real-world illustration** of the questions to be raised for scaling and managing a relevant digital system, based on reasoned and well-considered technology choices;
3. Show how **the current state of the 5G debate calls for building a broader and more effective collective discussion** regarding our lifestyle and technology choices, that aims for digital governance in line with energy and climate-related constraints.

3 – Trends: Current trends in the digital sector are unsustainable

We have updated the prospective scenarios we published in 2018. The results confirm the previously identified trends: **the digital sector makes up a significant proportion of global emissions (3.5% in 2019) and the worrying growth of its impacts (+6% / year) is inconsistent with a 2°C pathway** [2]**.**

Technological progress in energy efficiency has always fallen short of increases in usage. Therefore, **it is undeniable that the digital footprint will only ever increase unless we make deliberate moves to keep it under control.**

Should we fail to reinvent digital behaviors and business models, the deployment of next-generation cellular networks - starting with 5G - and the subsequent development of uses (e.g., IoT, AI, edge computing, high-resolution mobile video feeds) are bound to aggravate this trend.

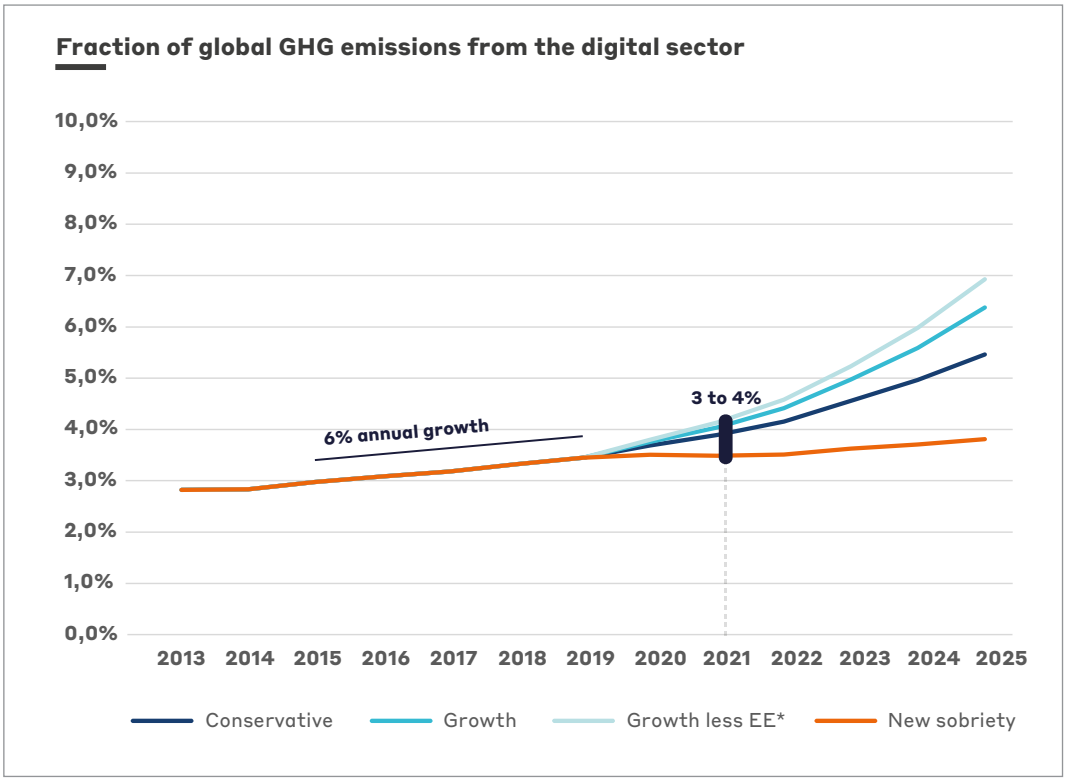

Figure 1: fraction of global GHG emissions from the digital sector from 2013 to 2025 *(The Shift Project – Forecast Model 2021)*
** Growth less Energy Efficiency*

2 - Our 2018 estimates were slightly higher: 9% annual growth (2015 to 2019) for the digital carbon footprint and final energy consumption, and a fraction of global emissions around 4%. See the full document for more details.

4 – Deploying 5G: A real-world manifestation of unsustainable trends

Having grown by 34% per year from 2013 to 2019, **the electrical consumption incurred by mobile uses is now 1.5 times that of landline uses**. This makes mobile activity a core component of the unsustainable trends which were identified in 2018 - and confirmed by the present update - and which now motivate deploying the fifth generation of cellular networks.

It is not controversial to state that mass-deployment of 5G will incur an increase in energy consumption, in particular via indirect effects. Therefore, the real issues lie in the following questions: ***why*** and ***how*** should we deploy 5G?

How do we move towards a "rational" use of 5G rather than a blanket mass deployment? To what uses should we limit ourselves, and how should we choose them? Is 5G really needed for personal use? To what extent will 5G reduce or increase the digital divide? Should we instead favor more specific applications of 5G – e.g., in healthcare or industry?

The stalemate reached in debates around 5G in 2020 shows that **our decision-making mechanisms are no longer fit for the scale of our technological choices and their consequences**. While technology plays a central role in society today, we are barely starting to realize how pivotal our technological choices are and thus how critical it is for society to debate them.

Therefore, it appears more necessary than ever to create a new system of digital governance at both national and European levels, rallying all relevant players to manage our digital infrastructure.

5 – Achieving digital resilience in Europe: We need a plan

From the above observations, we arrive at **three requirements** that must be met if the European digital sector is to achieve resilience:

1 Building a new digital governance framework

- **At the national level, creating and harmonizing** decarbonization objectives, quantitative assessment tools .
- **At the regional level: giving elected officials the means to consult the public** to decide on priority uses and expansion paths
- **At the European level: developing relevant governance bodies suited to the scale** of the Union's infrastructure, its uses and economic players.

2 Inventing new economic models [3]

- **Leaving behind a model where service profitability depends on massive volumes of data.**
- Making **profitable** uses built on **modularity, reuse and lifespan extension** of terminals, devices, and network hardware.

3 Developing digital management tools

- **Establishing quantified and normative goals for digital technology**, designed to guarantee compatibility with a 2°C pathway.
- Developing **robust energy and carbon impact assessment tools.**
- Developing **monitoring tools** to measure the **effects of digital governance and adjust it** to achieve our goals.

3 - Operators, manufacturers and service providers must be able to offer viable business model alternatives. Public authorities and regulators must create the conditions allowing these new economic models to be adequate.

6- Summary chart

Today's digital sector...

Our digital system

is at the heart of our other systems

+

is a key asset to face future crises

... is incompatible with a 2°C pathway.

GHG emissions from the digital sector grow by **6%** per year, and already account for **3.5%** of global GHG emissions.
This share could double by 2025.

The pace of technological progress in energy efficiency falls short of fast-increasing usage.

User influence effect
Growing usage calls for increased network capacity.

Usages

- Uptake of Internet of Things (IoT)
- Comfort of smart / connected devices
- Generalization of smartphone usage
- Pervasive video uses
- Soaring data transfer, especially mobile

2G
3G
4G
5G
...

Infrastructures

Vendor influence effect
Increased network capacity enables new uses.

As such, making 5G deployments rational rather than compulsive...

Mass 5G roll-out would increase the digital sector's environmental footprint*, from both utilization and production

** Source : HCC, 2020a ; Huawei, 2020 ; GSMA, 2019a*

... would pave the way towards a new, sustainable digital sector.

Making 5G sustainable requires thoughtful deployment, and being able to answer two questions:

1. **Where is it needed, and why?**
2. **To what uses do we limit ourselves, and how do we choose them?**

To that end, we need a plan:

1. **Building a new digital governance framework, involving all stakeholders** (incl. regulatory bodies, consumers, national and international institutions)
2. **Inventing new economic models, compatible with reducing environmental impacts** (operators, service providers, manufacturers)
3. **Developing sustainable management tools:**
   - Defining quantitative goals
   - Developing impact assessment tools
   - Evolving digital governance based on the above

The Shift Project is a think tank working towards a post-carbon economy. As a non-profit organization recognized as being in the public interest and guided by the demands of scientific rigor, our mission is to enlighten and influence the debate on the energy transition in Europe. The exponential development of digital technology, and the way in which this development may interact with decarbonization objectives of our societies, is one of the essential challenges of the carbon transition.

Our members are large companies that want to make the energy transition their priority.

www.theshiftproject.org

Press contact:

Ilana Toledano
Communication Officer
+33 (0)6 01 19 64 04
ilana.toledano@theshiftproject.org

Project contacts:

Maxime Efoui-Hess
“Digital technologies” Project Coordinator
+33 (0)6 35 13 08 37
maxime.efoui@theshiftproject.org

Hugues Ferreboeuf
“Digital technologies” Project Manager
hugues.ferreboeuf@theshiftproject.org

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