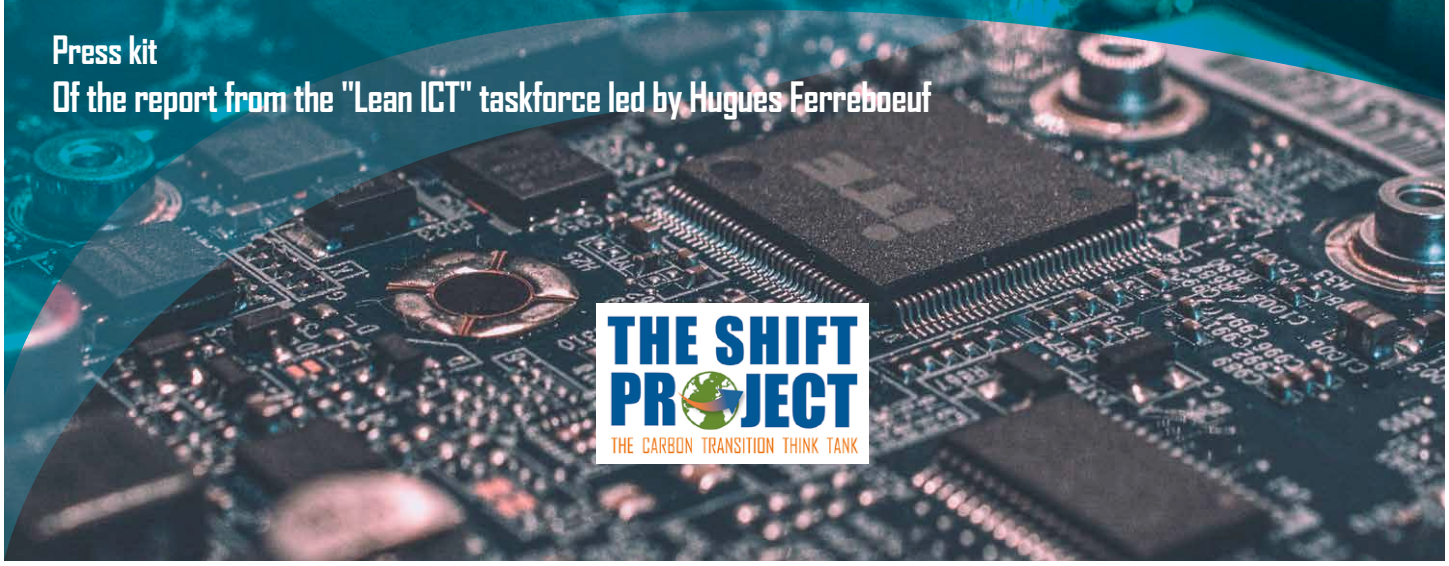
*Press kit* *March 2019*

# "LEAN ICT" - TOWARDS DIGITAL SOBRIETY

**Press kit**

**Of the report from the "Lean ICT" taskforce led by Hugues Ferreboeuf**




## ABSTRACT

**We live in a world where energy-gulping digital infrastructures and products are developing beyond control.** The energy consumption of Information and Communication Technologies (ICT) is increasing by 9% every year, and already accounts in 2018 for 3.7% of global greenhouse gas (GHG) emissions.

**The digital transition as it is currently implemented participates to global warming more than it helps preventing it. The need for action is therefore urgent.** Such is the main conclusion of the carbon transition think tank *The Shift Project*'s report on the environmental impact of ICT. If we do not tackle this impact, ICT will be part of the problem rather than part of the solution.

**The environmental impact of digitalisation becomes manageable if it is leaner**, and it is possible to limit this growth to 1.5% per year by moving to sober digital practices - as this report proves. While high income countries alone bear the responsibility of overconsumption, we must recover our individual and collective abilities to challenge the social and economic benefits of both our purchasing and consumptions behaviours of digital objects and services. **Are we up to the collective challenge of becoming digitally lean?**

## CONTEXT

**The Paris Agreement commits all countries** to end fossil fuel dependency as quickly as possible. Fossil fuels represent 80% of worldwide energy consumption and are the main sources of anthropic greenhouse gas emissions. **Any increase in global energy consumption hinders the success of this historical and vital challenge: preventing climate chaos.**

Digital technologies are essential for economic and social development. **The digital transition appears to be critical** for countries and companies with digital objects and interfaces gradually becoming part of every aspect of our social life. The digital transition is also considered to be a key tool to reduce energy consumption in many sectors ("IT for Green"), to such an extent that it now hardly seems possible to address climate change without the large scale incorporation of digital technologies.

However, direct and indirect **environmental impacts (rebound effects) related to the growing use of digital are constantly underestimated**, due to devices'miniaturization and the "invisibility" of the related infrastructures. There is a real risk of a scenario in which increasingly massive investments in digital technologies would contribute to a net increase of digitalized sectors' carbon footprint– which has in practice been the case for more than a decade.

# 4 KEY TAKEAWAYS

## The digital industry's energy intensity is increasing globally

The digital industry energy intensity is increasing by 4% per year, is in stark contrast to the trend of global GDP's energy intensity evolution, which is currently declining by 1.8% per year.

Every year, the energy intensity of the digital industry increases by **4%**

The direct energy consumption caused by **$1 invested in digital technologies has increased by 37% compared to 2010.**

This evolution goes against the objective set in the Paris Agreement to decouple both energy consumption and climate change from GDP growth. Therefore, the real trend of digital is in opposition to its presupposed function of dematerializing the economy.

**The $CO_2$ emissions of digital technologies increased by about 450 million tons since 2013** in OECD countries, while globally, overall $CO_2$ emissions decreased by 250 million tons of $CO_2$ over the same period.

The net contribution of digital technologies to reducing negative environmental impact is yet to be determined, sector by sector, by being aware of the numerous possible rebound effects.

## Current digital consumption is highly polarized

Digital consumption profiles are extremely contrasted. In 2018, an average American owns **10 digitally connected devices and consumes 140 Gigabytes of data monthly** while an average Indian only owns one device and consumes 2 Gigabytes monthly.

**70x** times more gigabytes, that's what an average American consumes compared to an average Indian

The digital overconsumption is not a global phenomenon: it is caused by high income countries, for which the major challenge is to take back control of their digital uses.

Expected impacts of the digital transition on growth and productivity remain invisible in developed countries over the last 5 years. **OECD GDP's growth rate remains stable around 2% while the annual growth of digital expenditures has increased from 3% to 5%.**

The key challenge is to plan and prioritize investments by ensuring they efficiently serve sectoral priorities, that developing countries will derive the greatest benefits from increasing use of digital technologies.

## The digital overconsumption trend is not sustainable in regard to its need for energy and raw materials

The digital transition currently generates a strong increase in the direct energy footprint of ICT. **This footprint includes the energy for the production and the use of equipment which is increasing rapidly, by 9% per year** (servers, networks, terminals).

Every year, the direct energy footprint of ICT increases by **9%**

The capture of a gradually disproportionate part of available electricity increases the demand on electric production, which already struggles to decarbonize.

**The share of digital technologies in global greenhouse gas emissions has increased by half since 2013**, from 2.5% to 3.7% of global emissions. The demand for raw materials such as rare and critical metals, essential for both digital and low-carbon energy technologies, is also growing.

The explosion of video uses (Skype, streaming, etc.) and the increased consumption of short-lifespan digital equipment are the main drivers of this inflation.

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## The environmental impact of digital transition becomes more manageable if it is leaner

In our relationship with digital technologies, to **move from intemperance to sobriety would limit digital's energy consumption increase to 1.5%.** While this is in line with the global trend for all sectors combined it is not yet compatible with the Paris Agreement's objectives.

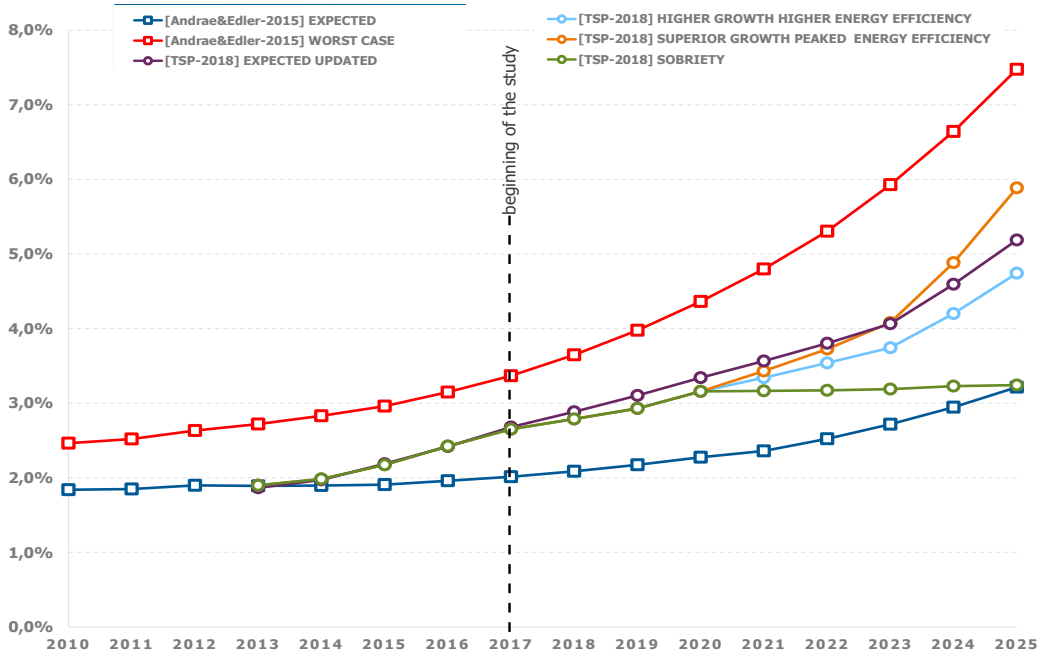
Digital sobriety could limit yearly energy consumption increase to **1.5%**

Our "Sobriety" scenario is possible without challenging the core principles of the digital transition. In this scenario, **the volume of data flowing through data centers and mobile networks would still increase respectively by 17% and 24% per year,** and both smartphones and televisions yearly productions would stabilize around 2017 level- whereas their markets in developed countries are close to reaching saturation.

**However, our "Sobriety" scenario is not sufficient to reduce digital environmental footprint. It only prevents its explosion. Its reduction will need additional efforts.**

## SCENARIOS FOR 2025

The *"Worst Case"* scenario, imagined by *Andrae & Edler* is avoided, but reality is still far above their *"Expected"* scenario. *Andrae & Edler* had actual data up to 2013. *The Shift Project* updated this data up to 2017 and used the same data assumptions to achieve the *"Expected updated"* scenario.
*The Shift Project* has also performed, in the light of recent developments, its own assumptions for the other scenarios. ***The Shift Project*'s Sobriety scenario enables a halving of the expected energy footprint of the ICT industry.**



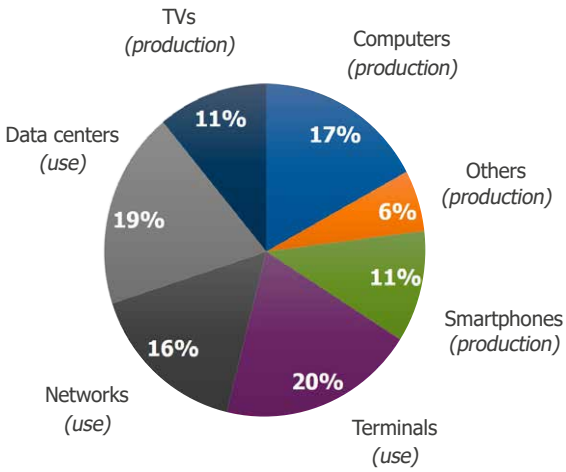

**Evolution of global energy consumption of digital between 2010 and 2025, as a proportion of total world energy consumption**
[Source: *The Shift Project 2018*, as of Andrae & Edler 2015]

## FACTS & FIGURES

Producing a smartphone weighing 140 grams (approximately 0.3086 lb) demands about 0.700 GJ of primary energy whereas, according to ADEME, about 85 GJ to produce a gasoline powered car weighing 1,400 kg (approximately 3,086 lb) (ADEME, 2013). Therefore, it is necessary to consume 80 times more energy to produce "a gram of smartphone" than to produce "a gram of car". **It is noteworthy that miniaturization also increases energy consumption during recycling, since the energy needed to separate the metals increases as a function of the complexity of the assembly.**

| DER - Digital environmental repository : *Production Phase* | | | | | |
|---|---|---|---|---|---|
| Impacts | | Hadwares | | | |
| | | Laptop | Smart-phone | Server (Data center) | Connected TV |
| Primary Energy (MJ) | | 6640 | 717 | / | / |
| **GHG ($kgCO_2e$)** | | 514 | 61 | 588 | 441 |
| **Metals** | Gallium [Ga] (mg) | 8 | 0.5 | / | 200 |
| | Indium [In] (mg) | 20 | 7 | / | 12,000 |
| | Tantalum [Ta] (mg) | 500 | 50 | / | / |
| | Copper [Cu] (mg) | 170,000 | 20,000 | / | 885,000 |
| | Cobalt [Co] (mg) | 12,000 | 6,000 | / | / |
| | Palladium [Pd] (mg) | 1 | 5 | / | / |
| Ore Extracted Volume (L) | | 7 | 2 | / | 200 |

[Source: "[Lean ICT Materials] DER", tab "DER Prod Phase". Produced by *The Shift* Project]




**Distribution of energy consumption per source for the production and use of digital devices in 2017.**
[Source: *The Shift Project* 2018, as of Andrae & Edler 2015]

## DIGITAL SOBRIETY: HOW CAN WE DEPLOY IT?

**A sober digital transition mainly consists in buying the least powerful equipment possible, in changing them the least often possible, and in reducing unnecessary energy-intensive uses.**
Digital sobriety is a "lean" approach, which is also a source of efficiency for organizations. Its principle expands to a societal level the consideration of objectives pursued by technical approaches such as "Green IT" and confirms their importance.

***The Shift Project* calls on companies and governments to adopt digital sobriety as a principle of action.** Lower environmental and energy footprints of the digital go through our individual and collective abilities to question the economic and social utility of both our purchasing and consumption behaviors of digital objects and services, and to adapt them in consequence.

**Accelerate the awareness of the digital environmental impacts** in corporations and public organizations among the general public and the research community.

**Include environmental impacts as decision-making criteria** when developing policies for the purchase and use of digital equipment. This concerns private as well as public organizations, in both developed and developing countries.

**Enable organizations to manage their digital transition** in an environmentally responsible manner, with tools and references that enable them to assess the environmental impact of the digital's component of their choices, at different levels of control. Taking advantage of the "Digital Environmental Repository" example, we call for the implementation of a public database (such as French Ademe's carbon impact database) in order to enable stakeholders to analyze their environmental impact.

**Undertake carbon audits for digital projects**, to include this data into the wider analysis. The supply-side pressure (GAFAM, BATX*) and the GDP growth expectations related to digitalization shall not be the only criteria for the project selections. In addition, the potential economic, environmental and social benefits are greater for developing countries, where infrastructures are yet to be developed.

**Improve the consideration of digital systemic aspects in key sectors** such as energy, transports, housing, and agriculture-food. Develop an expertise around this approach to accelerate its implementation.

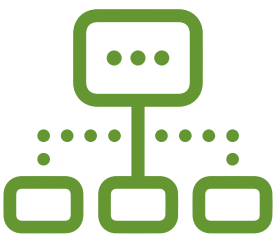
**Implement those actions to the European level** and with international organizations, given the global scope and economic power of the main digital players.

**GAFAM (Google, Apple, Facebook, Amazon, Microsoft), BATX (Baidu, Alibaba, Tencent, Xiaomi)*

## TOOLS AND POLICIES

***The Shift Project* elaborated several tools to help this paradigm shift.** Intended for large organizations (public administrations, large companies), these tools should be coupled with public policies pursuing the same objectives.

- **A DIGITAL ENVIRONMENTAL REPOSITORY (DER)** that gives, in an accessible way, verified accounts of the magnitude of energy and raw materials required for the production and use of common digital technologies.



- **LEVERS FOR THE MANAGEMENT OF LARGE ORGANIZATIONS:** those levers are actions enabling them to act on both demand and consumption of digital services, without hindering their digital transition.

- **PRINCIPLES FOR PUBLIC POLICIES**, notably intended for developing countries, to help them reap the benefits expected from the digital transition.

# WHAT OUR EXPERTS HAVE TO SAY

"Our Lean ICT report brings evidence to companies that their digital transformation is not automatically compatible with their climate change mitigation targets. As digital has become an integral part of the corporate strategy, we have developed tools that are intended not only to Information Systems departments but also to business leaders. This way, the environmental impacts of digital technology can be integrated in the definition of strategies and in the choices made on organizational structures and innovation methods. Creating awareness of the stakes involved is the first and mandatory step. It enables a reset of our digital ecosystems and consumption patterns, a reset that we need in order for them to contribute to an environmentally and socially sustainable society."

**Hugues Ferreboeuf**

Director of the "Lean ICT" working group at *The Shift Project* and former IT Executive

"We must break free from the fascination of the all-digital world that could limit global warming, and we must raise our collective awareness of the environmental impacts of these technologies. Such is the challenge adressed by this report, which aims to be constructive. We outline ways to limit the depletion of non-renewable resources (metals in particular) and to limit the massive amount of energy wasted by the digitalisation of our society."

**Françoise Berthoud**

Senior Researcher and Director of the *EcoInfo Research & Service Group* at the *French National Research Center* (CNRS) and *University of Grenoble*

"We frequently consider that when a given process is digitalized, it is also "dematerialized". At *The Shift Project*, we wanted to know whether going digital was indeed being more sustainable. And the truth is that behind each byte we have mining and metal processing, oil extraction and petrochemicals, manufacturing and intermediate transports, public works (to bury the cables) and power generation with coal and gas. As a result, the carbon footprint of the global digital system is already 4% of the global greenhouse gas emissions, and it's energy consumption rises by 9% per year. What should we do? All we can!"

**Jean-Marc Jancovici**

President of *The Shift Project*, and member of the French *High Climate Council*

Inventor of the Bilan Carbone, the French GHG Protocol compatible carbon accounting methodology

"With regard to global digital consumption and foresight, this report replaces preconceived ideas with figures, false trends with orders of magnitudes, and digital promises with clear initial recommendations on what should actually be done. If our goal is to stay below 2°C, we understand that the Digital Industry and each and every one of us must do their part, in order to initiate a virtuous circle for all. As an IT program manager, it is all about insights. Understanding how the choices that are made about infrastructures, applications and use cases have a straight impact on a project's carbon footprint is crucial for me to make these choices in an informed way!"

**Xavier Verne**

IT Project Director for a major French transport company

# TEAM & METHODOLOGY

***The Shift Project* gathered a panel of experts to assess the environmental impact of digital technologies, in the context of digitalization,** and therefore the rapid increase of both data flows and installed base of terminals as well as the multiplication of digital uses.

- Experts focused on the **consequences of climate change, on energy consumption** (production, utilization) and on the raw material supply (physical and geopolitical constraints, etc.).
- The definition adopted for "digital" is broad, coherent with the one retained by key sector stakeholders in their forward-looking perspectives. This definition includes **telecommunication networks** (access and transport, stationary, wifi and mobiles); **data centers**; **terminals** (stationary and portables personal computers, tablets, smartphones, traditional mobile phones, "boxes", connected audiovisual devices including televisions; **IoT sensors** (Internet of Things). This scope excludes non-communicating digital devices integrated into cars as well as numerical components of industrial production supply chain.
- Project director, Hugues Ferreboeuf, gathered **academics, professionals and sector experts**: Françoise Berthoud (CNRS, GDS EcoInfo), Philippe Bihouix (metal experts), Pierre Fabre (AFD), Daniel Kaplan (FING), Laurent Lefèvre (INRIA), Alexandre Monnin (INRIA, ESC-Clermont Origiens Media-Lab), Olivier Ridoux (IRISA, Universite de Rennes), Samuli Vaija (ACV expert), Marc Vautier (eco-conception expert), Xavier Verne (major IT projects experts) , Alain Ducass (energy and digital in Africa expert), Maxime Efoui-Hess (TSP), Zeynep Kahrman (TSP).
- The task force has met on a regular basis since April 2017 and undertook both **modeling and consolidation of studies** to assess the environmental impacts of digital technologies. The team took into account nearly 170 studies, mostly published between 2014 and 2018.
- The conclusions of the work add weight and urgency to the call to *"decrease environmental impacts of digital technologies and put its innovation potential to the service of ecological transition"* which was initiated by *Iddri*, the *FING*, *WWF France* and *Green IT.fr* in the **"Digital and Environment White Paper"** in spring 2018. It also asserts the importance of the problem outlined in September 2018 by the report of the United Nations Conference on Trade and Development, which titled *"developing countries may have much to lose in the face of digital monopolies"*.

**Hugues Ferreboeuf** - Director of the "Lean ICT" working group

Hugues Ferreboeuf is an **experienced IT Executive**. He graduated from the Ecole Polytechnique, he is an Engineer of the Corps des Mines and also a graduate of Telecom ParisTech. He led several Subsidiaries and Business Units of the Orange Group. He then continued his career as both an entrepreneur and consultant. He became the CEO of the French-German operator e*Message, and the Managing Director at Juniper Networks. He then joined the BT group as Managing Director responsible for banking and finance. He resumed his activity as consultant in 2016 and then co-founded Virtus Management to offer his experience in change management to major corporations and medium sized-enterprises. He is specialized in managing transitions (energy, digital, generational) and places his experience in the service of managing the "Lean ICT"project of the think tank *The Shift Project.*

**Maxime Efoui-Hess** - Assistant Manager and Main modeler of the "Lean ICT" project

Maxime Efoui-Hess is an **engineer specialized in the climate and computer modeling.** He graduated with degrees in Energy, Transport and Environment from ISAE-SUPAÉRO and in Climate Dynamics from the Université Paul Sabatier in Toulouse. He has also worked on the physical mechanisms of heatwaves and the future climate of France and Europe at the European Centre of Advanced Research and Education in Scientific Calculation (CERFACS), in Toulouse.

**Zeynep Kahraman** - Projects Director

Zeynep Kahraman is an **economist and econometrist** graduated from the Toulouse School of Economics. She joined *The Shift Project* in 2011 as Project Manager in charge of developing *The Shift Project*'s Energy and Climate Data Portal and works with Gaël Giraud on a research project in economics, aimed at demonstrating the relationship between energy consumption and GDP. She has also coordinated the drafting of *The Shift Project*'s "nine proposals for a change of era for Europe", cf. Zeynep Kahraman, André-Jean Guérin, Jean-Marc Jancovici, Décarbonons ! 9 propositions pour que l'Europe change d'ère, Odile Jacob, 2017. She supervises all of the think tank's research projects.

# ABOUT THE SHIFT PROJECT

***The Shift Project* is a French think tank advocating the shift to a post-carbon economy.** As a non-profit organisation committed to serving the general interest through scientific objectivity, we are dedicated to informing and influencing the debate on energy transition in Europe.

***The Shift Project* is supported by industry leaders** that want to make the energy transition their strategic priority. Since our foundation in 2010, we have achieved a significant impact on national and European policy-making.

THE SHIFT PROJECT
THE CARBON TRANSITION THINK TANK

# USEFUL LINKS AND CONTACTS

Full report


Executive summary


Press kit


**Hugues Ferreboeuf**
Project Director
+ 33 (0) 6 18 44 88 21
hugues.ferreboeuf@theshiftproject.org

**Lou Verschueren**
Communication & PR Officer
+ 33 (0) 6 50 31 67 31
lou.verschueren@theshiftproject.org



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