

CLIMATE CRISIS: THE UNSUSTAINABLE USE OF ONLINE VIDEO

The practical case for digital sobriety

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The Shift Project – July 2019

**THE SHIFT
PROJECT**
THE CARBON TRANSITION THINK TANK

FOREWORD

It is no longer necessary to demonstrate the material reality of digital technology and the flows of data it produces. However, a large share of public opinion, as well as that economic and political spheres, still presumes that the uses of digital technology do not require the same vigilance as other sectors regarding their compatibility with energy and climatic imperatives.

Consequently, *The Shift Project* has decided to use a practical case study, that of online video, to show how important it is to reflect on digital sobriety not as a simple concept, but as a practical solution.

The Shift Project and Maxime Efoui-Hess

The author and *The Shift Project* would like to thank Jean-Samuel Beuscart, Jocelyn Lachance, Julien Marcinkowski, Marion Muracciole, Gauthier Roussilhe and Lan Anh Vu Hong for their contributions to this work through the interviews granted, as well as *The Shifters*¹ Raphaël Lemaire and Eric Pellereau for their contributions to the bibliographic research.

The interpretations, positions and recommendations contained in this report cannot be attributed to either the interviewees or the reviewers. The content of this report is the sole responsibility of *The Shift Project*.

¹ *The Shifters* are an association that supports *The Shift Project*: volunteers with very diverse profiles, experiences and skills, interested in the carbon transition of the economy, whether or not they are already active in this field.

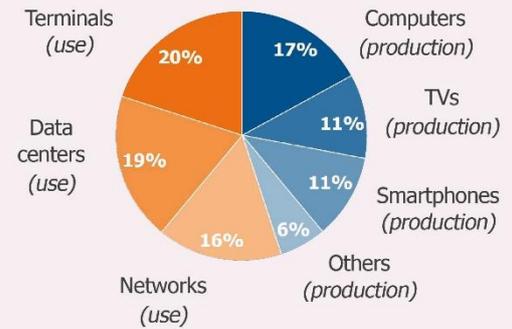
CONTEXT – AN UNSUSTAINABLE AND GROWING IMPACT

The Paris Agreement commits all the governments of the planet to drastically reduce their greenhouse gas emissions from now to the end of the next decade. Any increase in energy consumption will make this historic challenge of avoiding climate chaos more difficult to overcome. Meeting this challenge demands rethinking the world's energy consumption, 80% of which is today provided by fossil fuels. This can only be considered by reviewing the functioning of each of our sectors of activity, all currently highly dependent on non-renewable resources.

A large share of public opinion and our economic and political decision-makers still consider that digital technologies do not require the same level of scrutiny as other sectors, regarding their compatibility with energy and climate imperatives. Nonetheless, **the direct and indirect environmental impacts ("rebound effects") linked to the uses of digital technologies are both unsustainable and increasing rapidly.**

Digital technologies now emit 4% of greenhouse gas emissions (GHG), that is to say more than civil aviation. This share could double from now to 2025 to reach 8% of all GHG emissions, i.e. the current share of car emissions. Reducing the threat of climate change requires drastically reducing global greenhouse gas emissions in the next few years; however, the energy consumption required for digital technologies is increasing by 9% a year.

In October 2018, The Shift Project published the report "Lean ICT – Towards digital sobriety". In it we recommended making digital transition compatible with climate imperatives and the constraints of resources. **Digital sobriety consists in prioritizing the allocation of resources as a function of uses, in order to conform to the planet's physical boundaries, while preserving the most valuable societal contributions of digital technologies.** This requires questioning the pertinence of how we use digital technologies, one of which is online video whose use we focus on here.



Distribution of energy consumption per source for the production (45%) and use (55%) of digital equipment in 2017

[Source : Lean ICT, The Shift Project 2018]

KEY TAKEAWAYS

ONLINE VIDEO IS NOT A DEMATERIALIZED USE

Intensive use is now made of online video. Stored in data centers, videos are transferred to our terminals (computers, smartphones, connected TVs, etc.) via networks (cables, optical fiber, modems, mobile network antennae, etc.): all these processes require electricity whose production consumes resources and usually involves CO₂ emissions.

• **Video is a dense medium of information:** 10 hours of high definition video comprises more data than all the articles in English on Wikipedia in text format!

• **In 2018, online video viewing generated more than 300 MtCO₂,** i.e. as much greenhouse gas as Spain emits: 1% of global emissions.

• **Pornographic videos make up 27% of all online video traffic in the world.** Taken alone, in 2018 they generated more than 80 MtCO₂, i.e. as much as all France's households: close to 0.2% of global emissions.

• **The greenhouse gas emissions of VoD (video on demand) services (e.g. Netflix and Amazon Prime) are equivalent to those of a country like Chile** (more than 100 MtCO₂eq/year, i.e. close to 0.3% of global emissions), the country hosting the COP25 in 2019.

DIGITAL SOBRIETY REQUIRES THE REGULATION OF USES

- **The purpose of digital sobriety is to make the digital system resilient:** the aim is to create a framework that generates uses compatible with the constraints on resources.
- **Regulation is the process by which we can ensure that uses are in phase with the physical constraints that are imposed on the digital system.** Two tools are required to build it: the lever of legislation and the design of the systems that generate uses.
- **Addictive designs (autoplay, embedded videos, etc.) are incompatible with digital sobriety,** since they are aimed at maximizing the quantity of content consumed. The broadcasting platforms (their design, the underlying economic model, audience metrics, etc.) play a central role in the form taken by uses and thus their environmental impact. So, **uses are to a great extent the product of a system, and not the sole result of individual consumer behavior.**
- **Reducing the uses of digital technologies therefore requires regulating the mechanisms that generate these uses:** neither the self-regulation of broadcasting platforms nor the voluntary decisions of users will suffice.

REGULATION REQUIRES PRECISE PROCEDURES

- **At the individual level,** being "digitally sober" in one's online video consumption means using the lowest definition that can be used to benefit from contents, reducing one's consumption, and being more selective about what one watches.
- **On the collective level,** collaboration between the actors concerned is required to develop sobriety: regulatory bodies, politicians, service providers, the law, and the users.
- **The prioritization of uses is the key challenge of the debate,** in a world threatened by climate change: there is a risk of a random selection of uses occurring in any case if we do not reflect upstream on the uses we wish to preserve in priority.
- **The global dimension of the digital system demands both national and international regulatory tools:** an excellent subject for the European Union.

REGULATION FOR SOBRIETY IS A REALISTIC SOCIETAL DEBATE

- **Regulation in favor of digital sobriety is compatible with the principle of "net neutrality"**, which concerns the signification of contents, not their volume. Digital sobriety is aimed at making the digital system resilient, and managing it as a common good.
- **Prioritizing uses means evaluating respective pertinences.** However, the evaluation of societal pertinence goes far beyond technical environmental evaluation and must be carried out on the scale of society.
- **This evaluation must rely on tools that are already available** such as the sociology of uses and on the competences of **existing regulatory bodies** (in France: ARCEP, CNIL, CSA, Hadopi; in Europe: BEREC).
- **Reflection on the regulation of hateful online content shows that serious discussion is possible,** when there is a risk for societal integrity. There is no need for further proof of the societal risk linked to environmental constraints at a time when a "state of climatic emergency" is being evoked.

METHODOLOGY

On the basis of the case study of online video, *The Shift Project* proposes an **initial series of questions to be asked explicitly in view to reducing the impact of digital uses intelligently**, and thus implementing digital sobriety. *The Shift Project* consulted a panel of experts and academics specialized in the societal issues of digital technology and online video, including: Jean-Samuel Beuscart (LSIS), Jocelyn Lachance (University of Pau), Julien Marcinkowski (expert in change management), Marion Muracciole (expert in gender equality), Gauthier Roussilhe (designer) and Lan Anh Vu Hong (expert in web marketing). These interviews have been combined with a literature review, calculations and an analysis of reports from regulatory bodies.

This report is accompanied with three tools:

- a browser extension (add-on) for Firefox to **visualise the environmental impact of one's online data consumption**, developed with Richard Hanna and Gauthier Roussilhe: available online: search "Carbonalyser" on <https://addons.mozilla.org>
- a **guide to reduce the size of video files**, produced with Gauthier Roussilhe: available on <https://theshiftproject.org/guide-reduire-poids-video-5-minutes/>
- an **educational video**, produced by the scientific communication agency Science Explainers: available on YouTube under the title "This video is bad for climate change: thank you for watching".

USES ARE AT THE HEART OF THE ENVIRONMENTAL IMPACT OF DIGITAL TECHNOLOGIES

Data traffic is responsible for more than half of digital technology's global impact, with 55% of its annual energy consumption. Every byte transferred or stored requires large scale and energy-greedy terminals and infrastructures (data centers, networks). This traffic is currently increasing by more than 25% a year, so it is necessary to characterize the uses related to it if we wish to manage the energy consumed by digital technologies intelligently.

Video flows represented 80% of global data flows in 2018 and 80% of the annual increase in their volume. The remaining 20% is composed of websites, data, video games, etc. In terms of uses, the overconsumption of digital technology is mainly comprised of videos. Driven by the deployment of very high-resolution technologies such as "8K", whose necessity is questionable, video absorbs a large share of network infrastructure costs, whereas lower resolution images would suffice for current uses.

Online video takes up the largest share of video flows, with 60% of global data flows in 2018. In this study the term "online video" designates a share of video data flows, corresponding to "on demand" uses: video files accessible via servers on a broadcasting platform (e.g. YouTube, Netflix, etc.) or direct broadcasting circuits (package channels, etc.) without definitive downloading of the file.

VIDEO, THE HEAVYWEIGHT OF DIGITAL TECHNOLOGY USE

20%: THE VOLUME OF GLOBAL DATA FLOWS OF ALL NON-VIDEO USES

These other non-video data flows cover extremely varied uses: web sites, emails, instant messaging, the storage of photos and various data, company networks, etc. They also cover uses that can be associated with video, but which we have chosen to separate, such as peer-to-peer (which permits exchanging files including videos) and video games.

The rapid growth in the total volume of data – thus of energy consumption and its associated greenhouse emissions – is to a great extent due to video. This evolution runs counter to the objectives of the Paris Agreement.

20% OTHER VIDEOS

We have chosen to separate online videos from other types of video, that bring together here: live television streaming, live video (Skype, "camgirls", telemedicine, etc.) video monitoring, etc.

This type of video makes up 20% of the total flow of data.

80% FOR VIDEO USE

60% ONLINE VIDEO

The largest share of video flows can be placed in the "online video" category. It represented 1.05 thousand billion billion bytes (1.05 zetta-bytes) in 2018, i.e. 60% of world data flows. It is thus the main type of video use and the main use of digital technology as a whole.

This generates 306 million tons of CO₂, i.e. 20% of the total greenhouse gas emissions (GHG) due to digital technology (utilization and production of all equipment confounded) and nearly 1% of world greenhouse gas emissions. Online video covers 4 main types of content.

**34%
VoD**
(in online video)

**27%
PORNOGRAPHY**
(in online video)

**21%
"TUBES"**
(in online video)

**18%
OTHERS**
(in online video)

These are videos hosted on streaming platforms that broadcast **film and serial type contents** (Netflix, Amazon Prime, etc.), grouped under the name VoD, for Video on Demand.

VoD represents 34% of online videos, 20% of total data flows and 7% of total GHG emissions due to digital technology.

These are videos hosted on streaming platforms with **pornographic content** (Pornhub, YouPorn, XVideo, etc.). This excludes, for example, direct streaming, photos, etc.

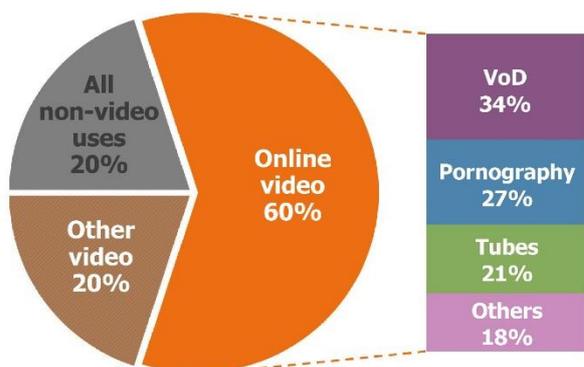
Online pornographic videos represent 27% of online videos, 16% of the total flow of data and 5% of total GHG emissions due to digital technology.

These are videos hosted on streaming platforms with **various types of content for all audience categories** (95% dominated by YouTube, the remaining portion being taken up by Dailymotion, Youku Tudou, etc.).

"Tubes" represent 21% of online video, 13% of the total data flow and 4% of total GHG emissions due to digital technology.

These are videos hosted by **social networks** (Facebook, Instagram, TikTok, Snapchat, Twitter, etc.) and **other online videos** (small streaming services, videos hosted directly on a site).

These other types of use represent 18% of online video, 11% of total data flows and 4% of GHG emissions due to digital technologies.



Distribution of online data flows between different uses in 2018 in the world

[Source : *The Shift Project 2019* - as of (Sandvine 2018), (Cisco 2018) and (SimilarWeb 2019)]

NOT CHOOSING IS NO LONGER A VIABLE OPTION

VoD, Pornography, Tubes and other uses: none of these four categories is negligible in online video uses. Alone, each of them represents 10 to 20% of global data flows. Implementing sobriety in online video uses means reducing the use and size of video files.

This reduction implies choosing between assigning a similar weight to every category, or choosing to give priority to certain of them to better preserve their use – whether in terms of resolution/size of video media (for example, which videos can remain in 480p rather than in "8k" display resolution?), platform design, etc.

The climate crisis and the planet's finite raw resources require that we reduce our greenhouse gas emissions, and our consumption of energy and raw materials. In a world confronted by such limitations, not choosing between uses will lead to the random imposition of constraints rather than to arbitration between options.

Not choosing means potentially allowing pornography to mechanically limit the bandwidth available for telemedicine, or allow the use of Netflix to limit access to Wikipedia.

From the standpoint of climate change and other planetary boundaries, **it is not a question of being "for" or "against" pornography, telemedicine, Netflix or emails: the challenge is to avoid a use deemed precious from being impaired by the excessive consumption of another use deemed less essential.**

This makes it a societal choice, to be arbitrated collectively to avoid the imposition of constraints on our uses against our will and at our expense. **In the 21st century, not choosing is no longer a viable option.**

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READING THE BIBLIOGRAPHICAL REFERENCES

Bibliographic references are made in this report according to a code and sometimes the page number in the cited publication. The reference (CNNum, 2013), for example, means that reference should be made to the Rapport Relatif à l'Avis Net Neutralité, published by the Conseil National du Numérique in 2013. The codes are located to the left of the name of each publication cited in the bibliography in the annex.

INTRODUCTION: Limiting the environmental impact of ICT with digital sobriety

In its report “Lean ICT – Towards Digital Sobriety”, published in October 2018, *The Shift Project* recommended the implementation of a series of sobriety measures built around a macroscopic strategy aimed at making digital transition compatible with climatic imperatives and limited resources. **What the digital sobriety strategy proposes is to prioritize allocations of resources among digital uses in order to conform to physical constraints while preserving the most precious societal contributions of digital technologies.**

To understand the need for such consideration, it is useful to recall the observations of our report regarding the aggregated environmental footprint of digital technologies on a global scale (Figure 1): **digital technologies now represent close to 4% of worldwide carbon emissions** - that is to say more than civil air transport – **and their impact is increasing by 8% a year**. Thus, whereas the threat of climate change leads us to target the reduction of global emissions in the coming years, **those of digital technology could double from now to 2025 to reach 8% of the total** -equivalent to the current share of light vehicles in global emissions.

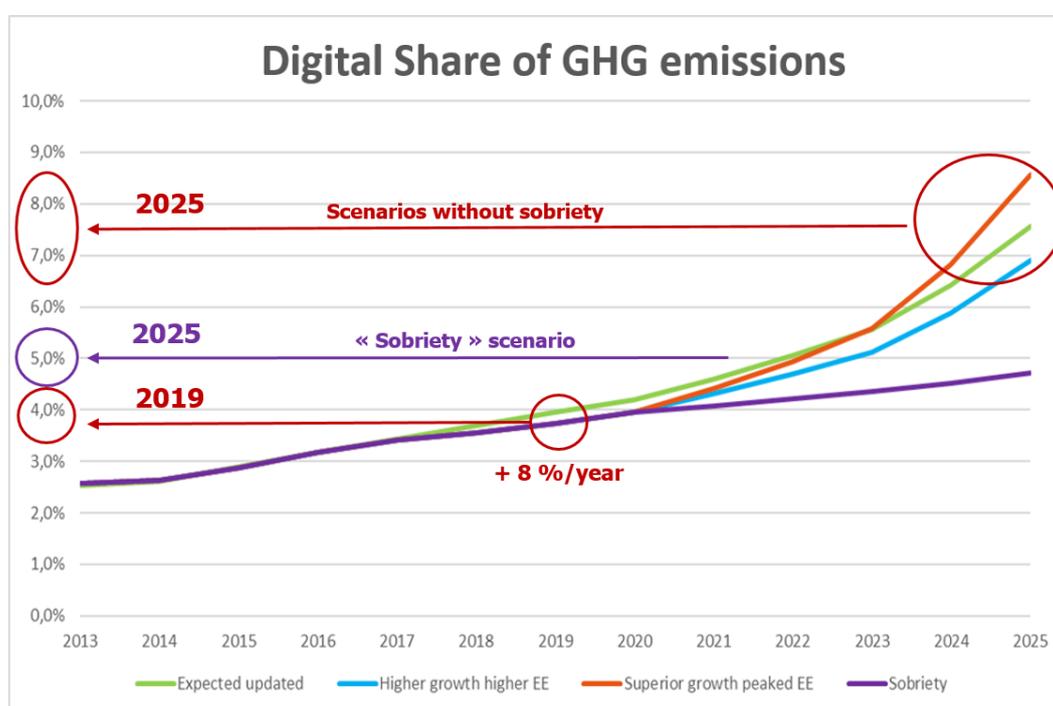


Figure 1: Evolution from 2013 to 2025 of the share of digital technology in world GHG emissions [Source: “Lean ICT – Towards Digital Sobriety” (*The Shift Project*, 2018)]

An initial scenario was proposed by *The Shift Project*, that of the “Sobriety” scenario, to show that it is possible to slow down the impetus of digital technology without calling into question its underlying principle². Although it allows reducing the increase in the impact of digital technologies to the current global trend, all sectors confounded³, this scenario is not sufficient to make digital transition compatible with the Paris Agreements. To reach this objective, made non-negotiable by the physical constraints of the climatic system, it is vital to question the way in which we have conceived digital transition over the last few decades.

The objective of our approach is to take advantage of digital technology, essential for overcoming the challenges of the energy and climate crisis, by efficiently allocating the resources available to our systems. **Building a mindful digital transition from the instinctive process it has been until now: this is the solution that describes the concept of digital sobriety. This study aims to address the questions raised by reasoning on digital sobriety up to its implementation.**

² In this scenario, the volume of data transiting via data centers is increasing by 17% a year, traffic on mobile networks by 24% a year, and the number of smartphones and televisions produced every year has stabilized to the level of 2017 – with the markets of western countries now having reached near saturation levels.

³ This scenario permits limiting the increase in the energy consumption of digital technology to 1.5% a year.

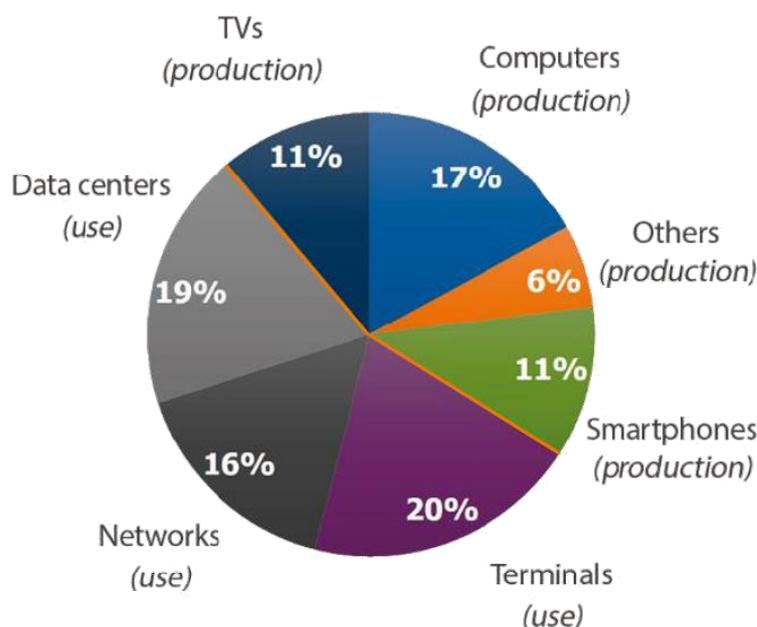


Figure 2 : Distribution of energy consumption per digital workstation for production and use in 2017
[Source: "Lean ICT – Towards Digital Sobriety" (The Shift Project, 2018)]

In the global evaluation of digital technology energy consumption, the contribution due to the phase of utilizing terminals, network infrastructures and data centers amounts to 55% (Figure 2). **In other words, the consumption of data is responsible for half digital technology's global impact.** When taking into account that data traffic in the world is growing by more than 25% a year (Cisco, 2018), it is obvious that it is necessary to focus on the contents transiting via the networks and on the uses they cover. The evolution of the volume of data drives the development of the infrastructures that allow their transmission, thus leading to new uses that in turn may become greedier for data due to this new availability: it is this self-feeding automatism that now governs the evolution of the global digital system.

Among these contents, videos make up 80% of world traffic and 80% of their growth in volume (Cisco, 2018). This can be explained not only by the multiplication of uses of video but also by the very nature of the medium. Indeed, video is a dense medium of information: **in terms of volume 10h of HD film corresponds to a larger amount of data than all the articles in English of Wikipedia, the online encyclopedia**⁴. Both considerable in terms of quantity and representative of many societal phenomena regarding how it is used, video has been chosen for this report to investigate the conditions required for implementing digital sobriety in practice.

The ambition of this study is therefore not to provide general and exhaustive responses, rather it aims to **explicitly identify the essential directions of reflection required to implement efficient sobriety.**

⁴ A 2h film in high definition represents about 2 to 5 GB of data. In 2015, all the text articles of Wikipedia in English represented around 12 GB (https://en.wikipedia.org/wiki/Wikipedia:Size_of_Wikipedia#Graphs_of_size_and_growth_rate).

I. Online video: heavy traffic for myriad uses

A. Definition of the subject of the study

Among the flows of video data – which represent 80% of world traffic, only a fraction of them will be considered in this study. They will be designated in what follows by the term “online video” and will cover “on demand” uses. These are video files hosted on a physical server separate from the terminal on which the video is watched, and accessible via Internet broadcasting platforms⁵ (e.g., YouTube, Netflix, etc.) or viewable via direct broadcasting circuits (channel package operators, etc.) that transmit them on demand without having users permanently downloading the file on their terminal. The technology used to execute this operation is known as “streaming”.

This type of content generates flows of data that are described in categorizations formulated by Cisco (a network equipment company) and in the study by Sandvine (another network equipment company) used in the rest of this document.

Online video, the subject of this report, represents nearly 60% of world data traffic⁶ (Sandvine, 2018) (Cisco, 2018).

The other types of content included in global video flows (remote monitoring, etc.) are not taken into account in the following results.

B. Distribution of flows according to uses

1. Definition of categories of uses

Established on the basis of the approaches of Cisco (Cisco, 2018), Sandvine (Sandvine, 2018) and different audience measurement tools (SimilarWeb, 2019) (The Shift Project Materials, 2019a), the following categorization forms the basis of the reasoning developed in this report:

- **“Pornography” uses:** sites categorized as “adult” in referencing tools **and** whose content is focused on the diffusion of video streaming, “tube” type sites (from which are excluded pornographic sites based on image contents, live contents and adult dating sites);
- **“VOD” uses:** long video streaming sites, i.e. for series and films. This type of use is clearly dominated by Netflix, Amazon Prime, Hulu and Openload, a free service.
- **“Tube” uses:** “tube” type sites for the general public, i.e. streaming of videos of various lengths though generally shorter than film and series formats, and which do not contain pornographic content. 95% dominated by YouTube in terms of number of visits (SimilarWeb, 2019).
- **“Social Network” uses:** videos on social networks like Facebook, Instagram and Twitter and social networks focused on the mass production of short videos, like SnapChat and TikTok.

⁵ An initial definition of “broadcast platforms” proposed in 2015 by the European Commission is the following: a sharing platform is “a company operating in bidirectional (or multilateral) markets, permitting interactions between two or more groups of interdependent users via the Internet, in such a way as to create value for at least one of the groups” (Cabrera Blázquez, F., J. et al., 2018). This definition has since been replaced by a list of precise characteristics though it continues to synthesize the essential aspects.

⁶ Online video represents 58% of downstream traffic -downloaded by the user – according to the study by Sandvine (Sandvine, 2018). Taking into account uncertainties in comparison to the studied by Cisco (Cisco, 2018) leads to an interval of 50 to 60% of world traffic.

2. Methodology and hypothesis

The quantitative analyses presented in this study are formulated using data collected for 2018.

To establish the distribution of video flows between the different categories of uses, the following methodology was applied:

- Global data traffic was obtained from the studies of Cisco (Cisco, 2018) to ensure consistency with the methodology of our report "Lean ICT – Towards Digital Sobriety" (The Shift Project, 2018) ;
- The data relating to flows linked to different online video uses were taken from the study by Sandvine (Sandvine, 2018), by grouping the sites listed in the study within the different categories of uses defined in our approach (as defined previously, cf. I.B.1 « Definition of categories of uses », p. 10);
- Since the "Pornography" category was not explicated in the study by Sandvine, we used an internet site audience measurement tool to calculate the share represented by pornography streaming in video flows (The Shift Project Materials, 2019a) (cf. 0 « ANNEX: Methodological details », p. 29).

The divergence of methodologies used to characterize internet site audiences leads to sometimes large variances in the figures published by different organizations in the sector. This study and the figures it presents are therefore established by crossing the different sources and methodologies whose consistency, verified during this work (cf. 0 « ANNEX: Methodological details », p. 29), leads to a set of quantitative and qualitative conclusions in line with the characterization of the essential items in terms of use.

3. Results: the distribution of data traffic between uses

Distribution of online data flows between different uses of digital technologies and of online video in 2018 in the world

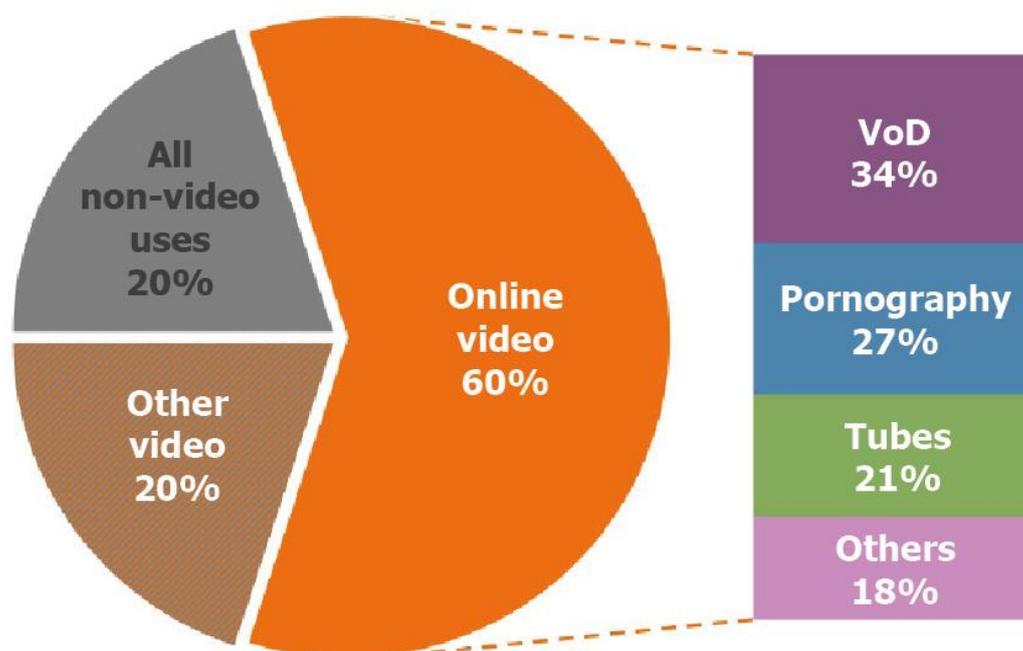


Figure 3: Distribution of online data flows between different uses of digital technologies and of online video in 2018 in the world [Source: « [Video+ Materials] Internet Video Traffic by use » (The Shift Project Materials, 2019a)]

The methodological approach described previously therefore permits drawing up a global map of the distribution of video flows between different types of use, based on total online video traffic (cf. Figure 1).

The share of video contents in the global contents of social networks is not accessible given the data available. They are included in the category grouping non-differentiated uses (“Others, including social networks”) and will be dealt with qualitatively in this report by observations by experts and their evolutionary trends.

The distribution of online video traffic between our four categories of uses shows that none of these categories is negligible when compared to the others, since each of them represents from about 20 to 30% of global online video flows. This means that if we wish to influence the dynamics of the evolution of the volumes of video data in view to implementing digital sobriety, an impact will be necessary on each one of these categories, or it will be necessary to focus efforts of sobriety on certain of them to preserve the others better.

This observation raises **the question of the evaluation of the pertinence of uses**, which we will examine in greater depth further on in this study: what criteria can be used to choose the uses to be conserved in priority?

Distribution of online video flows between different uses in 2018

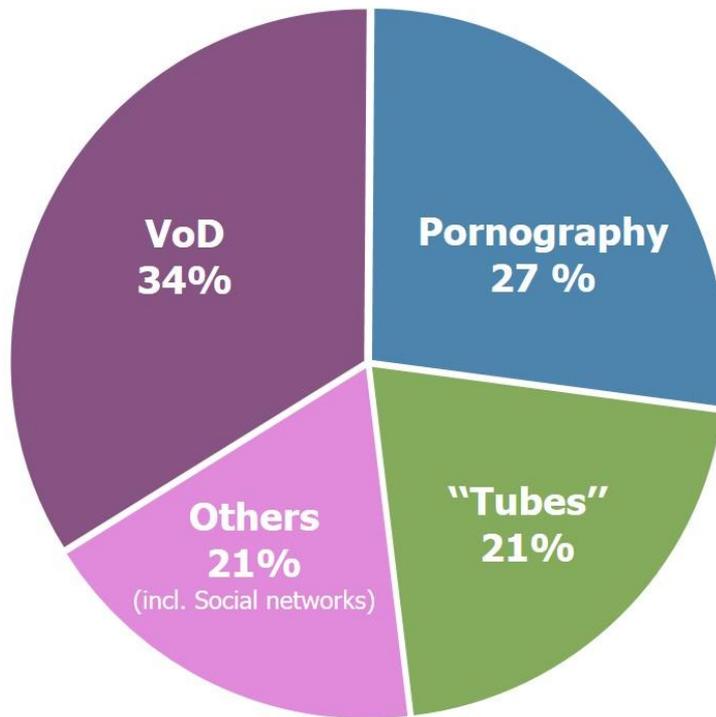


Figure 4 : Distribution of online video flows between different uses in 2018
[Source: « [Video+ Materials] Internet Video Traffic by use » (The Shift Project Materials, 2019a)]

C. Associated greenhouse gas emissions

1. Methodology and hypothesis

The methodological approach pursued to characterize the greenhouse gas emissions associated with each category of video uses was the following:

- Based on the total quantities of data exchanged in 2018, identified in work on the distribution of online video traffic (The Shift Project Materials, 2019b), the corresponding total viewing durations were calculated via an average bitrate⁷ characterized by crossing the data for different platforms (cf. 0 « ANNEX: Methodological details », p. 29);
- The use of the “1byte” model (The Shift Project Materials, 2019b), developed during the work presented in our report on digital sobriety (The Shift Project, 2018), allowed us to calculate the electricity consumption associated with the quantity of data consumed and the corresponding viewing time of each use;
- The conversion of these electricity consumptions into greenhouse gas emissions was done using the average emission factor associated with electricity generation world-wide: 0.519 kgCO₂e/kWh (The Shift Project, 2018).

The main hypotheses linked to this approach are the following:

- Terminals considered: an average was deduced from smartphone and laptop computer electricity consumptions;
- Networks considered: an average was deduced for the three types of network considered in the 1byte model (FAN Wired, FAN WIFI, and mobile network);
- Only the electricity consumption associated with the terminal utilization phase was taken into account in the calculations presented, through the construction of the model used (The Shift Project Materials, 2019b). To evaluate the total energy impact of the action, a pro-rata of the terminal’s onboard energy⁸ should be included.

⁷ Number of bits that are conveyed per unit of time. A video watched with high bitrate will content more data per unit of time.

⁸ Energy linked to the production phase of the terminal.

2. Results: greenhouse gas emissions

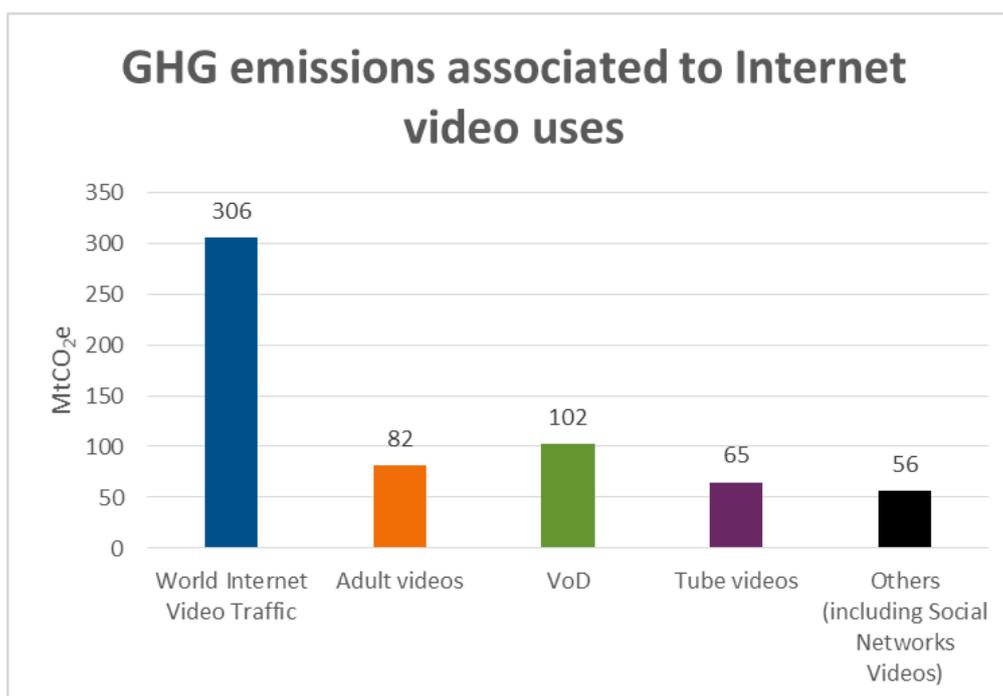


Figure 5: Greenhouse gas emissions generated by the different uses of online video in 2018
[Source : « [Video+ Materials] Internet Video Traffic by use » (The Shift Project Materials, 2019a)]

A preliminary observation can be made following the intermediate results of this calculation: the contribution of terminals in terms of electricity consumption rapidly becomes negligible for video content. Indeed, video files concentrate large volumes of data in a proportionally short period of time. Since the consumption by terminals is proportional to their time of use, the decisive contribution is in fact that of the network infrastructures and the data centers involved (The Shift Project Materials, 2019b). The methodological approach described previously finally resulted in quantifying the emissions linked to world video traffic for 2018 and for each category of use (cf. Figure 2).

Online video viewing, which represents 60% of the world's data traffic, generated **more than 300 MtCO₂e during 2018, i.e. a carbon footprint comparable to the annual emissions of Spain⁹.**

None of the different categories of uses is negligible in terms of traffic and thus in terms of impact. **Therefore, viewing pornographic videos in the world in 2018 generated carbon emissions of the same magnitude as that of the residential sector in France¹⁰, while recourse to the VOD¹¹ services as Netflix or Amazon Prime generated the same volume of greenhouse gas emissions as the entire economy of the country hosting the COP25¹² in 2019, namely Chile¹³.**

⁹ Greenhouse gas emissions of Spain in 2010: 311.6 MtCO₂e (The Shift Project, 2019c).

¹⁰ Emissions associated with the residential sector in France in 2010: 84.6 MtCO₂e (The Shift Project, 2019c).

¹¹ Video on Demand.

¹² Conference of Parties.

¹³ Greenhouse gas emissions of Chile in 2010: 96.4 MtCO₂e (The Shift Project, 2019c).

II. Levers for sobriety in online video uses

A. Levers for sobriety

Given the importance of the utilizations of video in the digital ecosystem and their subsequent impact in terms of carbon emissions, it is vital to implement measures capable of attenuating current trends in their evolution. The challenge is therefore to identify possible levers of action and the conditions that will allow us to convert them into concrete initiatives on a large scale.

The levers identified in the following obviously do not represent the full extent of possible practical solutions. The objective here is to identify paths of reflection regarding the mechanisms to bring into play to make video uses compatible with digital sobriety. **This entails identifying the points that must be deliberated and questioned so that sobriety becomes possible and effective in practice.**

Two approaches can be distinguished regarding the regulation of online uses (Le Club des Juristes, 2013) (Sénat, 2014) :

- Regulation by vectors¹⁴,
- Regulation by content.

1. An example of regulation by vectors: unlimited access

The approach by vectors is aimed at regulating uses by acting on the physical infrastructures – in particular networks. Historically, driven by organizations such as the ARCEP¹⁵ (Sénat, 2014), regulation by vectors ensures that the network infrastructures and the uses made of them are compatible with legal imperatives (Sénat, 2014).

A lever of sobriety bearing on unlimited access is an example of action by vectors. By offering flat rates whose prices are uncoupled from the volumes consumed, offers of unlimited access do not allow regulating the quantities of data transmitted. Low-cost subscriptions that give access to more limited volumes of data could be developed. This would enable work on consumption regulation mechanisms, by setting up an adjustable pricing system to access data (Roussilhe, 2019).

The vector approach therefore has the advantage of dealing with all contents indifferently, initially fending off questions linked to Net Neutrality¹⁶. Through its application to physical infrastructures, regulation by vectors would integrate limitations on resources more directly in the design of network tools and the services depending on them.

In addition to raising pertinent questions of acceptability regarding its potentially coercive nature, difficulties linked to the vector approach are paradoxically intrinsic to the fact that it addresses the problem according to a highly technical rationale. This makes it complex to evaluate its potentially important secondary societal effects, for example, the risk of creating or exacerbating certain inequalities of access to digital technology, leading to the emergence of alternative and pirate channels that would escape any attempt to set up a coherent strategy to ensure sobriety.

¹⁴ Vectors: technologies and infrastructures used to broadcast content, media, broadcast modes.

¹⁵ Electronic Communications and Postal Services Regulation Authority.

¹⁶ "Net neutrality is a founding principle of the Internet that guarantees that telecom operators must not discriminate the communications of their users but remain simple transmitters of information. This principle allows all users, whatever their resources, to access the entirety of a network." Definition by the association La Quadrature du Net (https://www.laquadrature.net/neutralite_du_Net/).

2. An example of regulation by content: the paradigm of broadcast platform design

The approach by content is aimed at regulating uses by acting directly on the information made accessible by broadcast vectors.

An example of a lever belonging to this type of regulation concerns the **regulation of addictive design techniques** (Roussilhe, 2019).

Addictive design means the techniques of building platforms that broadcast content aimed at maximizing the amount of time spent by the user on the platform (*autoplay*¹⁷, recommendation and notification mechanisms, etc.). This entails procedures deliberately installed to orient behavior to boost the consumption of a large amount of content, thereby generating an increase in the volumes of associated data¹⁸. **This type of design is incompatible with the implementation of a sobriety strategy** aimed at reducing the volumes of content consumed.

Regulation by content would aim at redimensioning the design of platforms to orient behaviors to a more precise selection of the content consumed. It would reduce the volume of content consumed and be more consistent with the user's needs.

It is evident that such an approach raises the question of **legal regulation** of the business model that predominates in the current digital industry, which is based on the production and resale of behavior data on the users of free services. Therefore, it is impossible to bypass systemic considerations.

The approach by content has the advantage of making it possible to act directly on the product consumed – video content – and thus adapt regulation tools to its specific characteristics. In the case of platform design, it permits directly taking into account the processes at the source of the consumption of data in order to act on them. The difficulties inherent to this approach are linked to the fact that any regulation bearing on contents and their broadcasting **requires in-depth reflection on the implications in terms of freedom of expression, the accessibility of contents, and thus raises the question of Net Neutrality**.

B. Recourse to regulatory tools

The question of regulating digital media uses in view to getting them to conform to **energy-climate constraints is currently completely missing from the agendas of regulatory and legislative bodies**. The issues now dealt with by digital management bodies are for the most part linked to data protection, respect for copyright, maintaining freedom of expression, net neutrality and the protection of private and social integrity (CNIL, 2019) (CNUM, 2019) (Cabrera Blázquez, F., J. et al., 2018) (Sénat, 2014).

The following analysis is based on a methodology of existing examples: it entails identifying the motives (regulatory, societal, legal and legislative) at the origin of regulations already in place or under discussion as well as solutions built or proposed to make them viable in practice. These characterizations are then used to extrapolate and synthesize the paths of reflection essential for introducing regulation aimed at ensuring digital sobriety.

1. The need for regulatory tools

Behaviors are not only the result of individual choices, they are to a large extent determined by the design of the system and the uses it makes possible and privileges. Regulating individuals' uses on the basis of their own initiatives is limited; it is necessary to act on the design of the system, and that the individuals accept the constraints of certain regulations aimed at changing how they use digital technologies. (CNIL, 2019).

According to the CNIL¹⁹, reflection on the ethical responsibility of digital systems is not viable unless it relies on three vital pillars: a legal basis, a technical basis, and a design basis (CNIL, 2019).

¹⁷ A word meaning the functionality, on streaming platforms, for automatically reading videos at the end of the video initially viewed.

¹⁸ These volumes of data are of two types: in addition to the flows of video consumed by the users, using platforms generates behavioral data on the users that will be processed (or not) in view to their direct sale or the sale of advertising space.

¹⁹ National Commission on Computing and Freedom.

Indeed, the CNIL (Commission nationale de l'informatique et des libertés) considers it essential to define a clear regulatory framework. This framework is necessary to build a digital tool that corresponds to the ethical imperatives in force in France and Europe. The CNIL confirms that digital behaviors are to a large extent determined by the conformation of broadcasting tools and that it is necessary to regulate them if we wish to ensure the compatibility of platforms and utilization with the ethical framework in force.

When drafting the GDPR²⁰, it was considered necessary to define an explicit regulatory framework²¹ to ensure that the design of systems is in phase with the imperatives of the general interest: this is the concept of "Privacy by design" (CNIL, 2019). In the report on the Mission to Regulate Social Networks submitted in May 2019 to the Secretary of State for Digital Technology (Mission "Regulation of social networks - Facebook experiment", 2019), a suggestion was made to develop the concept of "Accountability by design" according to the same model. These two examples, which are the most recent manifestations of regulatory works on online platforms, emphasize the pertinence of developing precise regulatory frameworks for designing systems in order to stem effects deemed harmful for society.

These observations can be extended to the limitations we will consider in our analysis: the modification of digital behaviors in view to achieving digital sobriety must, on parallel with compliance with ethical standards, be backed by regulations bearing on broadcasting tools if they are to be effective.

"The regulation of architectures of choice²² will perhaps be one of the most important areas of regulation in the digital society for the next ten years, much more so than the sole issues of the protection of data and private life."

CNIL, 2019

2. The question of Net Neutrality: the regulation of content while keeping an Open Internet

Immediately a regulation addresses the contents of platforms, it raises the serious issue of maintaining Net Neutrality (cf. II.A.2 « An example of regulation by content: the paradigm of broadcast platform design », p.16). The exact question is that of the compatibility of regulation by content while maintaining non-differentiated access to all the contents.

The definition of Net Neutrality given in article D98-11 of the Postal Services and Electronic Communications Code (CPCE) (CNum, 2013) states that the "operator must ensure their services without discrimination whatever the messages transmitted", but also that "networks are considered as almost essential infrastructures whose management must not come into conflict with the interest of users to access information". The ARCEP defines Neutrality as a means for building the Internet as a common good (ARCEP, 2018).

A similitude appears between these two definitions and the fundamental motives of digital sobriety: **sobriety aims at making the digital world resilient. It proposes to incorporate the physical constraints that threaten the integrity of its infrastructures. By considering sobriety as one of the societal services that should be managed in common, at the international scale and through an enlightened collective approach, sobriety is precisely a methodology for managing digital technology as a common good.**

"Net Neutrality contributes to this new ambition which is to make the Internet a common good."

ARCEP, 2018

²⁰ General Data Protection Regulations.

²¹ The GDPR defines the requisite particularities, for example, that texts and questionnaires sent to users must have to obtain their agreement with respect to data sharing. This ensures that the actors respond appropriately to the demands of the regulations.

²² This means all the techniques and designs taken into account in determining digital media uses.

3. The conditions for an efficient regulatory tool

a. International scope

The need to give international scope to the regulations applicable to digital technology has been confirmed by all the competent organizations in France (Sénat, 2014) (Mission "Regulation of social networks - Facebook experiment", 2019), given the global range of content broadcasting platforms regarding their infrastructures and their users.

To achieve this, considerations on the subject call for the development "of a European regulation in order to recognize the global nature of digital platforms" accompanied by the "coordination (...) of the decisions taken by a collegial body grouping national regulators and the European Commission" (Mission "Regulation of social networks - Facebook experiment", 2019). Currently, digital platforms are governed by "the regulation (...) known as country of installation, according to which the country hosting the head office of the social network may intervene to regulate this network, [a rule that] has proven inefficient" (Mission "Regulation of social networks - Facebook experiment", 2019). Abandoning this logic is therefore a prerequisite for taking any efficient measure regarding digital media uses, since it would allow **positioning in the framework corresponding to the actors concerned**.

b. Bringing all the actors into phase

All the reflections bearing on the regulations of digital media uses currently express the opinion that the essential component in the practical viability of a regulation is the dialogue organized between the government, the regulatory body (whose role is to ensure the implementation of regulations and abidance with them by the actors involved), the industrial actors (broadcast platforms, content producers) and civil society, in order to develop regulatory decisions of relevance regarding the objectives. They must also be certified and compatible with the operation of the platforms, and total transparent regarding civil society (Mission "Regulation of social networks - Facebook experiment", 2019) (Cabrera Blázquez, F., J. et al., 2018) (Sénat, 2014).

This pooling of the actors concerned throughout the drafting of the regulations is indeed the essential condition for ensuring the pertinence of regulatory tools from the operational viewpoint. The CNIL recalls that the regulator's role is to draft regulations that satisfy the objectives set and that the instructions for their implementation by the platforms are compatible with their conformations, in order to render the regulatory framework applicable in an efficient manner (CNIL, 2019).

C. The need for public debate

1. Building coherent solutions with all the actors

The specificity of the system of production-broadcasting-reception of digital content and especially online video content, is due in particular to the large number of actors involved (beneficiaries, service providers, content broadcasters, content consumers, etc.): all of which lead to the considerable sub-optimization of the value chain.

Acting on the conformation of this chain therefore requires capitalizing all the approaches developed by the different actors concerned: in the case of ethical issues, **linking self-regulation mechanisms²³, regulations, assistance to the actors by regulatory bodies, and the initiatives of design communities** now appear to be the obvious solutions for building a strong basis for changing digital behaviors. The same process appears inevitable and pertinent in view to implementing digital sobriety, given the magnitude of the changes it implies.

The following examples can be mentioned regarding the practical implementation of such exchanges between actors:

- The concordance between the CNIL's observations and initiatives such as the methodological note "Méthode de diagnostic du design attentionnel" (Attentional Design Diagnostic Method (Faure, 2019), published by the "Designers Ethiques" collective, which defines the "awareness of attention capture" as

²³ Mechanisms implemented by the platforms themselves to moderate their contents, in particular to comply with regulations and ethical considerations.

a criterion necessary for creating a design that respects its user: an attentional economic system based on the utilization of addictive designs contradicts this criterion since it tends not to give the user what the CNIL describes as “the possibility of judging the time or the capture of [their] attention by the service” (CNIL, 2019);

- Multidisciplinary innovative tools like the hackathons, by bringing the different actors together, cited by several regulatory bodies (CNIL, 2019) (Mission "Regulation of social networks - Facebook experiment", 2019) as efficient levers for creating necessary innovations, techniques and uses.

To develop open-minded regulations that are pertinent and understood by the actors, and to limit as much as possible the risk of them being qualified as liberticidal and completely coercive, it is vital that the regulation building strategy includes a discussion between the actors to arbitrate between the available options. This is one of the central points which this report aims to demonstrate: the only way of genuinely integrating new constraints – those of energy and the climate – in uses is to integrate the entire value chain in the construction of solutions. Since this value chain is plural, notably regarding online video content, the construction of regulations cannot be achieved without a debate that actively involves every link.

This approach is what we call “public debate”: concrete collaboration between competent representatives of regulatory bodies, politicians, legal experts, service providers and users, with sufficient extent to address the societal issues that stem from regulations involving online content.

2. The inevitable issue of contents

Dialogue between the reflections in progress in regulatory bodies responsible for online content makes it possible to emphasize an essential observation: **the issue of content, its accessibility and the constraints that we accept to incorporate in it is both essential and inevitable.** Whatever the approach chosen, projecting the effective implementation of digital sobriety, meaning the regulation of flows of online videos, will inevitably raise the question of the particularities of their contents. That is to say that even applying the same rule to every category – for example, by limiting bandwidth or resolution – does not guarantee that all the contents would be affected in the same way: the information sent in a musical clip will be altered less by a reduction in resolution than an educational video comprising written information.

It therefore becomes legitimate to question the criteria applied to characterize uses: **thinking digital sobriety in practice means choosing between the different types of lever to be activated to achieve it. However, this demands reflection on the uses that one wishes to be least affected by sobriety measures.**

III. Societal characterization of categories of uses

"To add the missing side of the regulation triangle, data protection authorities in Europe [should have greater recourse] to teams of designers and specialists on questions of human psychology."
(CNIL, 2019)

In its report bearing the title "The Form of Choice" (CNIL, 2019), the CNIL recognized the need to take into account methods of understanding the uses of digital media, theorized in the fields of design and behavioral psychology, in view to implementing efficient and well-conceived regulations.

The following lines address reflection in line with this rationale: it is necessary to characterize uses as a sociological object so as to be able to regulate them intelligently. To do this, our analysis is built on the basis of the opinions of experts chosen for the synergy between their approaches regarding different facets of the question. The aim of this "societal characterization of uses" is to synthesize sociological, psychological and design and marketing elements that provide insight into the dynamics that produce online video uses as they exist today, as well as the beneficial and harmful effects they generate at the societal level

A. Sociological definition of video uses²⁴

1. The triptych of online video

Using a medium and thus video can be characterized sociologically by the dynamic juxtaposition of three interdependent components (Lachance J. , 2019):

- content production,
- content broadcasting,
- content reception.

Video use is usually only characterized through its "reception" component, however the other two facets must be taken into account in the societal balance of use, as the three components have a considerable influence on each other.

a. Definition of the "production" component

The phase of creating the video content. Its societal impact has two dimensions:

- That of production as such, that is to say the creation of the content to be broadcast;
- That of a medium for building a social link during the production phase itself before the broadcasting of the content: the production of the video brings together individuals who can train or consolidate groups with shared social codes (communities of activists, influencers, etc. brought together during the production phase of a project to produce and broadcast content).

b. Definition of the "broadcast" component

This is the phase of making the video content available on a broadcasting platform. Its social impact resides in particular in the fact that making available a new content is the medium for social exchanges, even before its consumption (for example, the number of videos published has an intrinsic meaning in terms of social links independently of the content).

²⁴ This analysis and the concepts it synthesizes was taken from an interview: (Lachance, 2019).

c. Definition of the “reception” component

This is the phase in which the content is consumed and appropriated by its recipients. Its societal impact is that which is considered most often in video uses, in that it corresponds to the effects of the content once the information it contains is delivered.

2. Interaction of the three phases: an initial glimpse of the mechanisms of building uses

The three phases are in constant interaction, each component (choice of production method, broadcasting method and content consumption method) acts on the other two.

In particular, the conformation of broadcast platforms has an effect on the method of production and mechanisms of reception: thus, the choice of platform will be decisive in building the video uses. For example, the production processes and the way the content will be consumed differ according to the destination of a publication at YouTube or at TikTok²⁵: the first platform was designed for a highly diversified production whose importance among others is based on the pertinence of the content and whose objective is to favor the emergence of original contents; the second is built to orient the production of more standardized videos whose objective is to create common social links and codes during all three phases: production, broadcasting and reception.

B. The collective construction of uses

1. System and user, a dual mechanism

The uses are built via the interaction of **two components**:

- **the system used,**
- **the user of the system.**

The two components are not ranked in relation to each other, that is to say that **the user acts on the system by using it – notably because they promote the development of certain characteristics – and the architecture of the system acts on the way in which the user builds their uses** (Latour, 2000) (Beuscart, 2019) (Lachance J. , 2019). Considerations on uses are currently often oriented towards individual behaviors, though it is essential to integrate the other dimension of building uses to understand how the architecture of the digital system and the platforms hosting online videos act today on the three associated uses (production, broadcasting and reception).

In the case of online video, the general idea is that there is a retroactive loop between the evolution of uses and that of the professional practices that influence these evolutions (Beuscart, 2019):

- **Supply effects:** the architectures offered by online platforms orient the publication of contents towards video format, by making it increasingly pertinent and legitimate for sending information by mechanically showcasing it. This phenomenon falls in line with a certain number of innovations in the media with the appearance of models like Brut²⁶ and Konbini²⁷, focused on videos and social networks, and the integration of video contents on platforms initially built for other types of content. We mention, for example, the increasingly frequent use of short videos on the websites of the “traditional” written press, and the publication of video recordings of radio programs (Beuscart, 2019) (Vu Hong, 2019));
- **Effects of uses:** users’ behaviors also favor video as a privileged means of sharing and conducting horizontal exchanges without this phenomenon being the result of an implicit injunction of the platforms (Beuscart, 2019).

²⁵ Social network wholly built on the publication of short videos: <https://www.tiktok.com/>.

²⁶ French online infotainment broadcaster whose strategy is based on intensive presence on the social networks, via short videos (a few minutes): <https://www.konbini.com/fr/musique/en-ecoute-la-playlist-100-good-vibes-de-swindle>.

²⁷ Inline information broadcaster wholly based on video content whose size and type are adapted to broadcasting via social networks: <https://www.brut.media/fr>.

The area of marketing can be used as a practical case to illustrate this loop. Today, it is highly likely that a large share of the production of videos for online communication purposes is more motivated by the ease of production and publication, and broadcasting capacity, than by the strong conviction that video is more efficient than other formats. The weight of the role played by platforms is such that the showcasing of new functionalities, including that of favoring video consumption, will have a crucial influence on uses, users and content producers (Vu Hong, 2019).

Therefore, although multimedia supports are more suited for broadcasting advertising than other vectors, the second dimension of building uses cannot be ignored: that of the system's architecture, which here generates the impetus for multiplying video uses.

2. The role of system design

"Conditioning via design prefigures everything the individual handles or visualizes in the digital universe."
(CNIL, 2019)

System design is a central component in the determination of uses since it permits defining the modes of using platforms which tend to become more uniform in order to render the user's experience more intuitive. However, as stated by the CNIL in its 2019 report: "Any architecture of choice, whether it is designed intentionally to affect the behavior of users or not, will have an effect on the way users interact with a system." (CNIL, 2019). This means that these modes of utilization inevitably lead to specific behaviors that will be amplified until they become uses in their own right through the habit effect: the individual will privilege that to which they are habituated, including a mode of use to which they have been exposed repeatedly (Marcinkowski, 2019) (CNIL, 2019).

a. The two dimensions of addictive design

Addictive design techniques are now the central paradigm of the architectures of the dominant video broadcasting platforms (Roussilhe, 2019). Built according to known neuropsychological principles and technically characterized (with in particular cognitive biases (Marcinkowski, 2019)), they are aimed at maximizing the user's adhesion to the platform, that is to say increasing as much as possible the time spent consuming its content.

Two dimensions, that can actually be observed in every cultural domain, can be identified in the historic construction of these processes (Beuscart, 2019):

- **The construction of unlimited consumption at the heart of the offer**
Unlimited streaming is the result of the convergence of several phenomena, including in particular a legal offer in response to the development of pirate channels and the availability of powerful network infrastructures. This transformation of broadcasting models triggered the change of paradigm in the recommendation system and in the associated designs (Beuscart, 2019).
- **The construction of a new recommendation system**
The 2010s have witnessed a shift in the type of *KPI*²⁸ that predominate in the construction of the strategies of video broadcasters, which have recast their operating models around streaming technology (Seaver, 2018). Before this shift, the recommendation strategy was based on evaluating the user's explicit satisfaction via a content scoring system; with the introduction of streaming, all the user's activity (viewing, content searching, list of potentially interesting contents, etc.) becomes measurable, making it possible to develop a set of more reliable quantitative metrics. These new metrics are then centered on the user's implicit satisfaction, evaluated on the basis of the parameter "capacity of the platform to keep the user watching" henceforth positioned at the forefront of the content recommendation strategy.

We observe that these two dimensions, the offer of unlimited content and addictive design methods, converge with the aspects given as examples of regulation earlier in this report (cf. II.A. « Levers for sobriety », p. 15): this confirms that **sociological understanding of the construction of uses firmly supports the identification of the key points on which the levers of pragmatic sobriety can act.**

²⁸ Key Performance Indicator

The new recommendation systems are therefore concentrated on highly automated components of individual behaviors, via user profiling which requires large amounts of data provided by a growing number of sources (social networks, smartphones, browsing, etc.). The change of paradigm in the recommendation systems of streaming platforms is also a key component of the predominant economic model on the Internet, whose objective is to maximize the quantity of information consumed in order to acquire the data needed to broadcast a content optimized for its targets.

b. *Autoplay*, the central artefact of current video platform design

"Autoplay is the main 'bad pattern' of online video."
(Roussilhe, 2019)

The autoplay function is the equivalent for video of designs that permit uninterrupted scrolling on social networks: it erases the temporal references of the user by creating a continuous flow of content. It is one of the main mechanisms of today's addictive designs, popularized in particular by platforms like Netflix, then YouTube and social networks (Seaver, 2018). This transformation is the result of the change of paradigm in the *KPI* used in the online video industry, as mentioned above previously: *autoplay* is not a technology developed to meet an explicit need of users, it was developed to satisfy the new imperatives set by the broadcasters themselves (Seaver, 2018).

Video is now no longer a distinct vector of information on these platforms but an aggregate of media integrated in a continuous flow; the videos of social networks in particular, which have become a superposition of video and audio media, subtitles, titles, thumbnails, editing processes etc. Now, the question of the pertinence of adding unwanted information to the initial content must be asked not only because it is obvious with respect to sobriety, but also because it affects the user's experience: **allowing the user to choose to view content and give additional vectors to access the information it contains (texts, still images, audio) can be assets regarding the efficiency of the video itself** to convey information (Roussilhe, 2019).

3. The current logic of building uses is incompatible with digital sobriety

The logic of the industry today is therefore radically opposed to a logic of sobriety since current performance indicators are based on the quantity of content viewed. However, in addition to generating the effects described previously on the increase of data traffic, the logic now at work also gives rise to genuine desires for disconnection, notably among intensive users of the digital services now on offer (Jauréguiberry, 2014). This represents an additional indicator that the supply of digital technology exceeds demand, with services that no longer satisfy the needs they target.

C. Societal pertinence of video uses

The first two steps of our “societal characterization of categories of use” allowed describing the mechanisms of building uses for online video, the origin of their forms and current trends. This gives insight into how levers can be designed to reduce uses so as to make them compatible with digital sobriety.

Arbitrating between these levers demands supplementary reflection. Indeed, each of them acts differently on multiple uses. Choosing the levers to be implemented amounts to choosing the uses most affected by the measures taken. However, **this clearly implies societal considerations: choosing the uses that should have priority, means that they are considered more useful on the scale of society.**

Reflection on sobriety therefore enters the flow of the societal issues already under discussion, reminding us that **the role of the public authorities as an entity of arbitration is to prioritize certain uses in relation to others, on the basis of their pertinence and their essential nature.** In what follows, we propose to identify the essential questions that must be asked when broaching the subject of societal pertinence.

1. Societal pertinence

“[A public policy could take into account] social cohesion by encouraging social networks to develop ‘positive’ uses for their services, i.e. by contributing to social cohesion.”

(Mission "Regulation of social networks - Facebook experiment", 2019)

There is nothing revolutionary in questioning the societal pertinence of the uses of digital technology: current reflections on the regulation of the digital world to a great extent involve **the effects of these uses on respect for, and the upholding of, social cohesion, a matter for which the public authorities, established to act in the general interest, are responsible.** This clearly demonstrates that this problem can be heard and addressed at the societal level, **although the orientation of reflection here is different – since the initial problem of digital sobriety is of a physical and not an ethical nature,** though it is also about protecting the common good.

The evaluation of societal pertinence is obviously not intended as an absolute measurement, since it can only be determined in relation to the regulatory environment and the values of the societal entity considered. It can only be performed on the scale of a society, in keeping with the collective evaluation it pertains to be. This is why it is a political issue: because it requires an evaluation and thus discussion, both collective.

On the basis of two examples taken from our categorization of uses (cf « 30 Societal characterization of categories of uses », p.30), the purpose of the following lines is to raise some of the central questions that must be asked in order to evaluate the level of societal priority to be given to digital media uses on the basis of their positive or harmful effects. We will see during this analysis that it entails conducting a collective debate capable of justifying explicit political authority to ensure its satisfactory resolution.

2. Practical case: the video contents of social networks

a. Societal implications of producing video content for social networks

From the societal standpoint, one of the positive effects of producing video contents published on social networks stems from the fact that it is a vector for creating social cohesion (Lachance J. , 2019) (Beuscart, 2019). The producers of contents of the same type can form relations, for example, to create new contents according to mechanisms common to the production of cultural content in general, though in this case strongly supported by the “communities” that these collaborations contribute towards creating within social networks. The creation of video contents can therefore form the basis of gatherings – sometimes physical – of a virtual community and contribute to cultural germination.

The production mechanisms of these contents are not however exempt from harmful effects, notably in terms of *Social Media Fatigue*²⁹: maintaining social relations on networks intensively gives rise to permanent pressure on one's own image and to sometimes strong social exhortation from the audience to produce content. This results in particular in the need to make a large part of one's private life constantly socially interesting, which may have negative effects on the integrity of the person producing the content (Beuscart, 2019).

b. Societal implications of "broadcasting" and "receiving" video content via the social networks

As the medium of direct testimony of action by image, **video facilitates the generation of exchanges in a highly efficient manner, especially regarding discussion between different social categories**. For example, regarding intergenerational communication, the image broadcast – such as on a smartphone, at the beginning of a discussion – provides a common medium for forging a space of understanding and compatibility between two distinct spheres of expression. This characteristic makes it a powerful catalyst for the creation of common codes between initially different spheres (Lachance J. , 2019).

However, the development of video broadcasting can lead to harmful effects, whose risk is not limited only to the retranscription it provides: assumed to be a direct and faithful retranscription, video contents have rapidly become a guarantee of truth. They bypass critical examination more easily than other media – still photos, audio, text – whose credibility is undermined in comparison to video (Lachance J. , 2019).

What is more, the production and sharing of online video content has become very accessible thanks to new data capture technologies (in particular smartphones) and the multiplication of architectures designed for their broadcasting, **raising the serious issue of the security of children and their capacity to control their image online. Video is a tool of exhibition that can quickly become prejudicial for users unaware of its scope**. Although it is difficult to obtain real empirical data on this facet on the societal scale, this issue is nonetheless being studied by experts on the subject and remains evidence of the nefarious possibilities of this tool (Beuscart, 2019).

3. Practical case: pornography

The issue of the societal impact of pornography is a crucial manifestation of the tension that crystallizes the debate on the pertinence of a use at the scale of a society. A debate that has remained topical for the different stakeholders for several decades, pornography has been the subject of numerous sociological studies aimed at understanding its effects, notably since the boom of new platforms broadcasting pornographic content (Gauthier, 2018): **streaming sites, of "tube" type (cf. Erreur ! Source du renvoi introuvable. Erreur ! Source du renvoi introuvable. Erreur ! Source du renvoi introuvable. "Erreur ! Source du renvoi introuvable.", p. Erreur ! Signet non défini.), have revolutionized the consumption of pornography by making access to it by any smartphone, including by children and adolescents, simple and free**.

Our approach was to bring together the views of experts on the societal effects identified of online pornographic video contents. Obviously, the objective is not to pretend to sum up in a few paragraphs the complexity of a debate lasting several years: rather it entails establishing the questions raised by the evaluation of the pertinence of different uses.

The observations highlighted here do not pertain to providing proof of whether a nefarious effect is present or not. However, they permit reflection on the means of political decision-making that takes into account the risks linked to these prejudicial effects.

a. Societal implications of the broadcasting and reception of online pornographic video content

One of the problems mentioned regarding the effects of consuming pornography at the societal level is the phenomenon of shifting norms: during the consumption of content by an individual, a

²⁹ Phenomenon of excessive demand on a person by exigences linked to maintaining relations on the social networks they use (production of content, responses to interactions, the need to maintain a high rate of information consumption, etc.).

trend towards increased violence in the content viewed, for example, has been observed, leading to harmful effects on the individual's sexuality and their perceptions of physical relationships, including in the case of occasional consumption (Solano, 2018) (Muracciole, 2019). This phenomenon is catalyzed by the availability of all types of pornographic content – including the most violent – facilitated by the advent of dedicated online video platforms (Gauthier, 2018).

The impact that the *Tube* type broadcasting method of online pornographic video content can have constitutes an issue on the scale of our society. The content is diffused on the basis of a categorization “labelled” for the consumer (the role of keywords), based on the model used to categorize cultural products for the general public. However, this categorization is possible only through the standardization of the content itself and thus, because of the nature of the pornographic product, via the standardization of the characters and situations presented, since each category must be built according to easily identifiable specificities. **Regarding the standardization of representations of people and human relationships, experts on the subject point out that it raises the question of the role played by pornographic content in imprinting societal caricatures and manifestations of inequality on representations** (Muracciole, 2019).

In order to appreciate the societal impact of pornographic video use, it is necessary to include all the types of content in our reflection, notably those that claim to be committed and alternative (pornography claiming to be feminist, promoting diversity, content not showing any representation prejudicial to the couple, etc.). The question of the precise evaluation of the beneficial effects of these alternative approaches falls outside the scope of this report. Rather, we emphasize the need to take into account the effect of broadcasting vectors on the dynamics driving changes in uses: **the volumes of contents made available by online video platforms are big enough to influence trends in the evolution of uses on large scale.** It is therefore necessary to understand the role played by the architecture of platforms and to determine the point at which the dominant model – standardized industrial content – gives room for alternative contents to emerge (Vaton, 2018).

b. Societal implications of the production of online pornographic video content

As with all video uses, the content production phase is linked to those of broadcasting and reception (cf. 0. **Erreur ! Source du renvoi introuvable.** “**Erreur ! Source du renvoi introuvable.**”, p. **Erreur ! Signet non défini.**). For example, the observations made on the shifting of the norm regarding the violence of the contents viewed necessarily impact the production of contents. **The increase in the violence of the practices watched by the consumer leads to increased violence in practices during the shooting of the videos and films.** The question of the violence tolerated in these production processes subject to a legal framework is therefore raised by the participants in the debate (Muracciole, 2019).

The new broadcasting platforms permit the production and sharing of content by private individuals in private premises. This new possibility participates to a certain extent in the diversification of representations by going outside the standardized framework of the pornography industry. It is nonetheless essential to question the possibility of a genuine re-appropriation by private individuals of the contents and representations within a market largely dominated by the industrial groups in place.

c. The construction of pornographic uses

Catherine Solano, a sexologist, has observed “*for several years, that for a large proportion of men, masturbation is inseparable from pornography*” (Solano, 2018). The use of pornography and thus the visualization of online pornographic videos are therefore now associated with a utilization governed by highly automatic cognitive mechanisms, which allows the efficient monetization of the products proposed. Today, the economic development of viewing online pornographic videos is therefore built on a cognitive amalgam resulting from the marketing practices of the sector: the association of using pornography with the physical act of sex (Roussilhe, 2019).

Seeing a naked body activates an initial automatic reaction in the brain which arouses interest linked to the evolutive reflex of the possibility of procreation (Solano, 2018). Since we know that our cognitive mechanisms host a bias, called “trigger effect”, that induces inertia in our thought process³⁰ (Marcinkowski, 2019), we can understand that the sexualization of content for the general public introduces pornographic uses within a wider mechanism of influence: exposed to sexualized contents for the general public (advertising, video clips, etc.),

³⁰ Trigger effect: cognitive bias describing the automatic response of the individual to continue associating their thoughts with previous solicitations, and which continue to influence them for a certain period after their disappearance.

individuals find themselves in a state of recurrent solicitation of the areas of their brain linked to physical desire. This will therefore catalyze the use made by the individual within the same type of solicitation, including pornographic uses (Roussilhe, 2019) that are performed preferentially via online broadcasting platforms, the subject of this analysis.

So, we see, once again, that these uses are built according to a collective component that can't be ignored: the architecture of the system that transmits information on a large scale fully participates in the definition of the uses of online pornographic videos.

4. Synthesis of practical cases

The objective of these two practical cases was to investigate pertinent points of departure for dealing with the problem of arbitrating between uses, made urgent by the physical constraints that drive us to **reflect on the practical implementation of sobriety**.

The main observation that can be made is that it is necessary to understand the dynamics underlying the construction of different uses in order to characterize them from the societal standpoint. The treatment of societal pertinence would suffer from not taking advantage of the tools already developed by the sociology of uses and reflections on design to characterize video uses, including the two central approaches described in this report: the triptych of "production-broadcasting-reception" and the diptych "user-system used".

CONCLUSION : The energy-climate constraint is a direct societal constraint

A. Digital sobriety: its practical implementation cannot occur without public debate on uses

What digital sobriety proposes in response to the physical constraints of energy and the climate, is the enlightened and carefully thought optimization of the distribution of resources between uses, so as to preserve the most precious societal contributions of digital technologies.

Thus, sobriety would permit making the digital transition technically viable in the long-term by reducing its pernicious societal effects, at a juncture where, as mentioned earlier in this study, the supply of services exceeds the capacity of users to consume them.

The case study used in the framework of this analysis is that of online video, according to an approach that carries on from that of our report "Lean ICT – Towards Digital Sobriety" (The Shift Project, 2018). The purpose of this report was to raise the question of the pertinence in terms of energy and GHG emissions, not of digital technology itself, but of the uses made of it on a large scale. Likewise, this report questioned the place of video in the context of non-negotiable physical constraints and of how its beneficial effects can be conserved at the societal level.

Initially, the general problem of digital sobriety is physical, since it has been developed in reaction to the observation that digital transition as it is now progressing is incompatible with the constraints of this century on resources and greenhouse gas emissions. The analysis of the reflections now in progress in Internet regulation bodies has, however, allowed us to show that even an approach that focuses on the technical vectors of online video broadcasting will be faced with the issue of the societal importance of one use in comparison to the others.

This is the essential conclusion of this study: the integration of energy constraints in digital transition requires implementing a process for the collective management of the societal arbitrations to be made, to take into account all the actors and dimensions of the problem.

In practice, such an approach to management can only be pertinent if it takes the form of a public debate explicitly devoted to the issue of arbitration between uses.

B. Climate change and energy issues are societal constraints

If the spheres of economic and political decision-making, and of civil society, do not deny the observations set out in our report "Lean ICT – Towards Digital Sobriety", they should address the questions raised in the present report with gravity and pragmatism.

Today, it is no longer possible to pretend to deal with the issue of transition without tackling the issue of uses methodically. Implementing effective sobriety in a technical system requires dealing with the societal problems that stem from them. This was exemplified in our work through the example of online video.

Since sobriety is not a theoretical concept but one of practical proposition, it calls on decision-makers to launch explicit and concrete political discussions on uses and sobriety, and on the unavoidable political and ethical dimensions of the latter. This prerequisite is essential if we wish to propose pertinent solutions.

ANNEX: Methodological details

A. Physical characterization of online video uses

1. Distribution of online video traffic

Deliverable involved: (The Shift Project Materials, 2019a)

a. Categories "VOD", "Tubes" and "Others (including Social Networks)"

The figures used to characterize the total shares of video traffic represented by each of these categories have been taken directly from the study by Sandvine (Sandvine, 2018).

The correspondence between the categories defined in this study and those defined in the Sandvine report are as follows:

- **"VOD" uses:** this includes all the traffic of "Netflix", "Amazon Prime", "Openload" and "Hulu" categories of the Sandvine study;
- **"Tube" uses:** this comprises the traffic of the "YouTube" category of the Sandvine study (approximation justified by the fact that the traffic of this category of use is dominated by YouTube with 95% of the traffic (SimilarWeb, 2019));
- **"Other" uses (including Social Networks):** this comprises the categories "HTTP Media Stream", "Raw MPEG-TS", "Twitch", "Facebook", "Sky Go" and "Hulu" of the Sandvine study.

b. "Pornography" category

The figures used to characterize the share of total video traffic represented by this category have been taken directly from the **following methodology**:

- The use of the SimilarWeb (SimilarWeb, 2019) audience tool to count the total number of visits to the 100 most visited pornography sites in the world during the second semester of 2018 (sites representing the most representative share of traffic associated with this use: the traffic associated with sites less well ranked is negligible);
- The use of data published by the statistics department of Mindgeek regarding traffic and the number of visits to its site pornhub.com to determine the average quantity of data transferred by visit in 2018 (Pornhub Insights, 2018) ;
- Under the hypothesis that the pornography streaming sites propose similar contents from the technical angle, we consider that the quantity of data transferred per visit calculated previously remains valid for all the sites of this type. By crossing these results with the total number of visits determined earlier, we obtain the total quantity of data transferred when viewing streamed pornographic videos in 2018.

c. Verifying coherence between data sources

To verify the coherence between our hypotheses, the audience measurement tool (SimilarWeb, 2019) and the two main reports used (Cisco, 2018) (Sandvine, 2018), we followed the process below for each use (except the "Pornography" use which uses a different methodology, cf. above):

- From the distribution of video flows supplied by Sandvine, we deduce the traffic associated with the use (in B) based on the global traffic of the report from Cisco;
- We formulate a hypothesis on the average *bitrate* of online videos, on the basis of crossing multiple approaches (The Shift Project, 2018) (Aaron, 2015) (Cullen, 2018) (Cisco, 2018) (Google Help Center, 2019) (Google Help Center, 2019) (Netflix website, 2019): 3 Mbps³¹.
- From data supplied by the SimilarWeb audience tool, we determine the total number of visits to the sites associated with this use;

³¹ Corresponds to 3.10⁶ B/s.

- Crossing this total number of visits with the traffic associated with the use (in B) determined earlier and our hypothesis on the average bitrate (in B/s), we calculate from the previous quantity the average duration of a visit to platforms associated with this use (in s/visit);
- This average visit duration, which corresponds according to a first approximation of the viewing time of one session, allows us to verify the qualitative consistency between the different quantification tools.

2. Associated greenhouse gas emissions

Deliverable concerned: (The Shift Project Materials, 2019b)

The greenhouse gas emissions associated with the video flows identified were calculated on the basis of the data supplied by the "1byte" model -developed by The Shift Project when drafting the report "Lean ICT – Towards Digital Sobriety". The methodological details relating to this model are therefore available in the report: (The Shift Project, 2018).

This model accepts as input the quantity of data consumed and the duration of terminal use, and supplies as output the associated electricity consumption. The parameters used for this calculation and thus the results presented in this report are:

- The quantity of data: we use the flow of data associated with each category of use, calculated with the previous model: (The Shift Project Materials, 2019a) ;
- Utilization time: this correspond to the total viewing time of the video content belonging to the category considered, calculated on the basis of the quantity of data and the average bitrate, according to the hypothesis described previously in this annex.

The conversion of electricity consumption into carbon emissions is performed using the emission factor associated with the generation of electricity corresponding to an average world electricity mix: 0,519 kgCO_{2e}/kWh (The Shift Project, 2018).

The general assumptions intrinsic to the "1byte" model and its adaptation to the works of this report are as follows:

- Terminals considered: an average was obtained from the electricity consumptions of smartphones and laptop computers;
- Networks considered: an average was obtained from the three types of network considered in the "1byte" model ("FAN Wired", "FAN WIFI" and mobile network);
- The electricity consumption results from taking into account the consumption associated with the data centers involved, the network infrastructures concerned and the consumption specific to the terminal used (The Shift Project, 2018). Thus, in the calculations presented here (The Shift Project Materials, 2019b) we only take into account the electricity consumption associated with the utilization phase of the terminal.

B. Societal characterization of categories of uses

In view to obtaining a synthetic and multi-faceted view, the analysis of the different societal aspects of uses was performed according to a methodology involving interviews with experts on the subjects broached.

The remarks of the persons questioned were reorganized and adapted to link them together and fit them in the logic underlying the drafting of this report.

1. List of orientations defined for the societal study

The interviews were structured around four main orientations, and each of these orientations was defined on the basis of two central questions, listed below:

Sociological definition of use

- What are the sociological definitions and characteristics of online video use?
- What are the mechanisms of influence known and used regarding online video uses?

Regulation of online uses and Net Neutrality

- What levels of regulatory measures or influence could be implemented (or exist already)?
- What might be (or are) their implications in terms of freedom of access to contents and Net Neutrality?

Pornographic uses

- What mechanisms and dynamics have led to the current structure and the cultural and societal position of pornography?
- What societal balance can be found for pornography today?

“Videolized society”

- What position does video hold at present in social interactions, notably via social networks?
- What is the efficiency of information transmission by video (in comparison to still images and audio in terms of attention, etc.)?

2. List of experts questioned

The Shift Project would like to thank the following persons for their contributions to this work through the interviews conducted with them:

- **Jean-Samuel Beuscart**, researcher in the sociology of digital media uses associated with the Laboratoire Interdisciplinaire Sciences Innovations Sociétés (LISIS);
- **Jocelyn Lachance**, researcher in the sociology of digital media uses at the University of Pau;
- **Julien Marcinkowski**, expert in and teacher of the psychology of uses and change management;
- **Marion Muracciole**, consulted in her capacity as an expert on gender equality and violence against women;
- **Gauthier Roussilhe**, designer and expert on sobriety issues in digital design;
- **Lan Anh Vu Hong**, consulted in her capacity as professional expert on issues relating to web marketing.

C. Other publications of The Shift Project on the environmental impact of ICT

In 2018, *The Shift Project* published **the report “Lean ICT - For a digital sobriety”**: the result of the working group led by Hugues Ferreboeuf with the support of Maxime Efoui-Hess and Zeynep Kahraman.

In 2019, to accompany the report "Climate: the unsustainable use of online video", led by Maxime Efoui-Hess, *The Shift Project* created and published three tools:

- an **add-on for the Firefox browser**, which allows you to **visualize the environmental impact of your data consumption online**, developed with developer Richard Hanna and designer Gauthier Roussilhe and available online: search for "Carbonalyser" on <https://addons.mozilla.org> or find it directly on <https://addons.mozilla.org/fr/firefox/addon/carbonalyser/> ;
- a **guide to reduce the weight of a video in 5 minutes** while keeping a good quality, made with the designer Gauthier Roussilhe: available on <https://theshiftproject.org/guide-reduire-poids-video-5-minutes/> ;
- an **educational video**, produced by the science communication agency *Science Explainers*: search on YouTube for "This video is bad for climate change: Thank you for watching" or go directly to https://www.youtube.com/watch?v=JJn6pja_l8s.

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THE SHIFT PROJECT

The Shift Project is a think tank that works in favor of a post-carbon economy. A non-profit association in the general interest and guided by the requirement for scientific rigor, our mission is to enlighten and influence debate on energy transition in Europe. Our partners are large companies that wish to make energy transition their priority.

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