

# CLIMATE CRISIS: THE UNSUSTAINABLE USE OF ONLINE VIDEO

*The practical case study of online video*

Report led by Maxime Efoui-Hess  
for the think tank *The Shift Project*



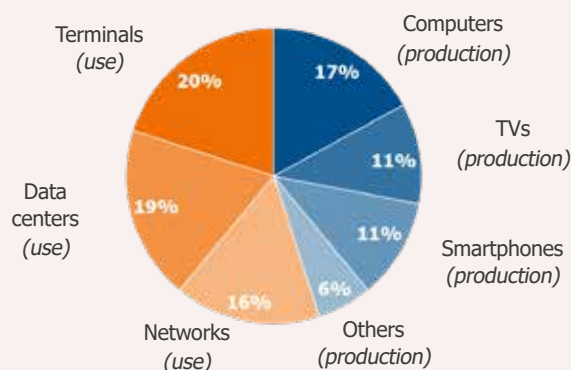
## CONTEXT – AN UNSUSTAINABLE AND GROWING IMPACT

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 CO<sub>2</sub> 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 MtCO<sub>2</sub>,** 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 MtCO<sub>2</sub>, 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 MtCO<sub>2</sub>eq/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

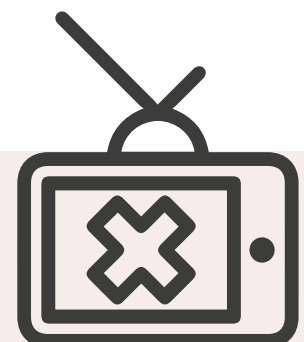
- **Regulation in favor of digital sobriety is compatible with the principle of "net neutrality",** which concerns the signification of contents, not their volume. Digital sobriety is aimed at making the digital system resilient, and managing it as a common good.

- **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).

- **The ongoing 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.

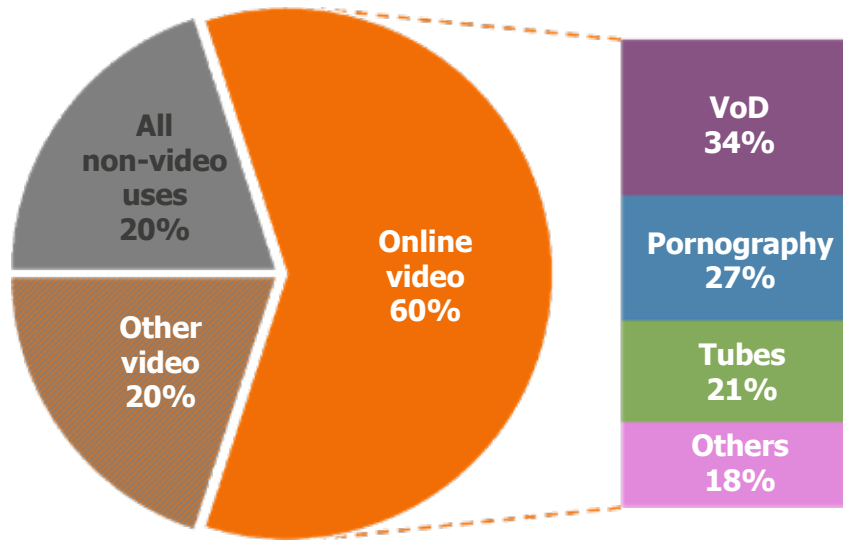
• Pornographic videos make up **27%**  
• of all online video traffic in the world.



## VIDEO, THE HEAVYWEIGHT OF DIGITAL TECHNOLOGY USE

### 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)]



### 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.

### 80% FOR VIDEO USE

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.

#### 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 CO<sub>2</sub>, 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)

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.

**27%**  
**PORNOGRAPHY**

(in online video)

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.

**21%**  
**"TUBES"**

(in online video)

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.

**18%**  
**OTHERS**

(in online video)

These are videos hosted by **social networks** (Facebook, Instagram, Tik Tok, 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.

••• **306 million tons of CO<sub>2</sub>** is what the "online video" category generated in 2018.

## 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 flows represent 80%**  
: **of the annual increase of global data flows.**

## 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.**

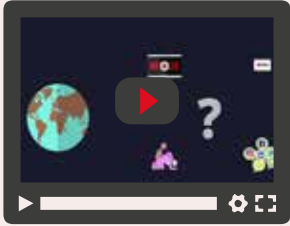
This makes it a societal choice, to be arbitrated collectively to avoid the imposition of constraints on our uses against our will and at our expense. **In the 21<sup>st</sup> century, not choosing is no longer a viable option.**

- Since we are constrained by climate crisis and the planet's finite raw
- resources, 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. **In the 21<sup>st</sup> century,**
- **not choosing is no longer a viable option.**



To complement the report "Climate crisis: The unsustainable use of online video", *The Shift Project* provides **three tools** to reveal the hidden environmental impact of digital technology to **users and citizens**. The aim is for them to grasp the consequences of data consumption, and more particularly video consumption. Two tools make it possible to **unveil the invisible impacts of your internet uses**, and the third tool allows you to decrease the impact of the production and online posting of videos as a professional or a simple amateur.

### THE EDUCATIONAL VIDEO THAT WARMS THE CLIMATE



**"This video is bad for climate change: thank you for watching"**

This [video](#), which itself emits greenhouse gases (an average of a little less than 10 grams of CO<sub>2</sub> per viewing), is intended for the general public. It aims at **making the environmental impact of digital technology visible**, whereas it is invisible on a daily basis. The video also highlights the consequences of digital use on climate change and resource depletion.

*"Like Julia, get to know that working on lowering your climate footprint means thinking about digital habits and consumption as well. Smartphones, data centers and networks need energy and precious resources to be produced and then run. [...] That is why byte by byte of data, with each second of a video, a bit more carbon dioxide gets released into the atmosphere."*

This video was produced by **Science Explainers**, a company specialized in the distribution and promotion of scientific topics ([www.scienceexplainers.com](http://www.scienceexplainers.com)), in partnership with *The Shift Project*.

### "CARBONALYSER":

#### THE BROWSER EXTENSION THAT REVEALS HOW MUCH OUR USE OF INTERNET COSTS THE CLIMATE

The [browser extension \(add-on\) "Carbonalyser"](#) allows to **visualize the electricity consumption and associated greenhouse gas emissions of Internet browsing**. It compares this impact to the equivalent of kilometers traveled by car or number of smartphone charges, hence "materializing" digital uses.

It helps you to have a better understanding that, even hidden behind our screens, the impacts of digital technology on the climate and our consumption of resources are a reality.

Available on Firefox, this extension was developed with *The Shift Project* by **Richard Hanna**, developer and host of podcast [techologie.net](http://techologie.net), and **Gauthier Roussilhe**, designer and researcher on transition and low-tech issues on [gauthierroussilhe.com](http://gauthierroussilhe.com).



### THE GUIDE TO REDUCE THE SIZE OF A VIDEO IN 5 MINUTES WHILE MAINTAINING A GOOD QUALITY



**Reducing the size of your videos reduces the energy required to broadcast them** and therefore the greenhouse gases emissions associated with it. Reducing the size of online videos is a first step towards a more sober internet.

This [guide](#) allows you to **reduce the size of a video by 60% to 90%**. However, reducing the size of video on the Internet begins by questioning the usefulness of their online presence.

This guide was created by **Gauthier Roussilhe**, designer and researcher on transition and low-tech issues on [gauthierroussilhe.com](http://gauthierroussilhe.com), and finalized with the team of think tank *The Shift Project*, which has been using it since May 2019.

## TEAM & 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.



**Maxime Efoui-Hess** - Project manager, main modeler and lead author for *The Shift Project*

Maxime Efoui-Hess joined *The Shift Project* to work on information and communication technologies. An engineer specialized in climate and computer modeling, he graduated with degrees in Energy, Transport and Environment from ISAE-SUPAÉRO and in Climate Dynamics from the Université Paul Sabatier and the French Meteorology University in Toulouse. He has also worked on the physical mechanisms of heatwaves and the future climate of France and Europe at the European Centre of Advanced research and Education in Scientific Calculation (CERFACS), in Toulouse. He is co-author with Hugues Ferreboeuf of the report "Lean ICT - Towards a digital sobriety" (The Shift Project 2019).

## ABOUT THE SHIFT PROJECT

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

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



## ABOUT OUR PARTNER SCIENCE EXPLAINERS

**Specialized in video production, Science Explainers focuses on scientific topics.** Whether for communication between experts or with citizens, the Science Explainers team feels fully involved in its role of transmitting scientific information.

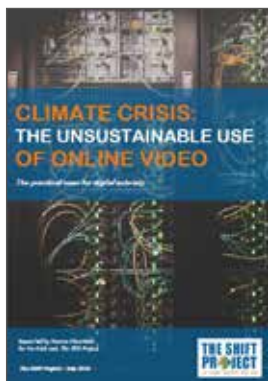
Through videos such as the one produced with the think tank *The Shift Project* on the energy consumption of digital technology, Science Explainers is committed to explaining complex statistics in order to enable policy leaders and citizens to make informed choices.



**SCIENCE EXPLAINERS**  
A trademark of Labs Explorer

## LIENS ET CONTACTS

[Full report](#)



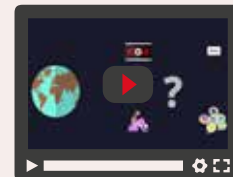
[Executive summary](#)



[Press kit](#)



[The educational video](#)



[The Guide to reduce the size of a video](#)



[The browser extension](#)



**CARBONALYSER**

**Maxime Efoui-Hess**

Project manager and author

+ 33 (0) 6 35 13 08 37

[maxime.efoui@theshiftproject.org](mailto:maxime.efoui@theshiftproject.org)

**Jean-Noël Geist**

Public affairs manager

+ 33 (0) 6 95 10 81 91

[jean-noel.geist@theshiftproject.org](mailto:jean-noel.geist@theshiftproject.org)