STREAMING

THE WEB MONSTER

A **52'** investigative documentary and a **4x15'** series

Directed by: Adrien Pavillard & Pierre-Philippe
Produced by: ARTE France & ALLSO

From an ecological point of view, this investigation tells us the rise of an invention of the 1990s, streaming.
THE must-have technology and its exponential carbon footprint are now uncontrollable, to the point of raising the question of its survival.

Patcharapon Pachasirisakun/Getty Images

SUMMARY

It's an ecological fable that tells the story of the rise of an invention born in the recesses of the Web in the 1990s, which has become the must-have technology of the 2020s. As it grows, its carbon footprint skyrockets, to the point of becoming uncontrollable and raising the question of its survival in the near future.

Told in the manner of a fable with a voice-over that is sometimes storytelling and sometimes playful, this series meets the founding fathers of streaming and interviews experts in digital pollution. The story is enriched with archives on the beginnings of streaming and data-visualization popularizing the technical aspects of this story, and sometimes plays with words to raise awareness on the issues to come.

SYNOPSIS

Episode 1- Baby stream, an unwanted child

The series begins in joy. A kind of digital pie, streaming was born following a happy accident. **In the 1990s, a German researcher named Karlheinz Brandenbourg invented a new format: MP3.** Music became digital, it would be downloaded, exchanged, and then, as the last stage of digital evolution, it would be streamed.

Streaming was then only an obscure object of research. Reading data remotely and in real time -this is the basic definition of streaming- was considered useless. The word "streaming" did not really exist at that time. Nobody or almost nobody was interested in it, except for Rob Glaser. This American entrepreneur stumbled upon it while trying to stream live commentary from his local radio station on the Internet. He succeeded in 1995. What seemed to be a small technical breakthrough was in fact the birth of livestreaming and the beginning of a cultural revolution that would allow anyone to make and broadcast live audio and video content.

At the dawn of the year 2000, nobody wanted streaming. It had a double handicap: it needed space and speed. In other words, its data needed to be stored on servers and connections had to be fast to read that data in real time. Today's Internet has neither. Neither data center nor broadband. **56k modems consume as much power as a landline. The carbon footprint of streaming is close to zero.**

Fun and useless little gadget, streaming would remain so for a few years. The real star at the time was the download. People swore by it. All the music in the world seemed to be accessible, right there, at your fingertips. Streaming was patient. It watched and learned. To be adopted by all, it had to be gargantuan, exhaustive, and fast! The immediacy is its best asset. The arrival of ADSL and residential gateways in 2002 would allow it to reduce the video playback time.

Episode 2- Sea, stream and sun

It then conquered the world. It was **now technically possible to play a video in real time, without having it on your computer. No more downloading, too long, and also too illegal.**

In 2005, a media platform would make streaming one of the most popular technologies among Internet users, its name? **YouTube. Today, this media platform alone emits 11.2 tons of CO2 into the atmosphere. As much as a city like Frankfurt**. At its birth, it polluted as much as a moped. In its early days, YouTube (and streaming in general) was small and slow. The first video posted on the platform lasted 18 seconds and was of very poor quality. It weighed less than 10 Mb. Quickly, the YouTube machine went wild. The "cloud" invaded our lives and streaming replaced movie theaters. **It accounted for 80% of the bandwidth, its energy consumption grew by 9% each year.**

Episode 3- Streaming's dangers

In 2021, streaming was so popular that it became a threat to the planet. It accounted for 80% of the bandwidth and **emitted 1% of greenhouse gas emissions, just as much as a country like Spain.**

The match at the origin of this explosion was the birth of mobile broadband. Starting in 2007, phones were getting more sophisticated and were replaced every 18 months or so.

New uses of streaming started to appear, like video games. It is now possible to play games in 4K from 5G. This activity gobbles up 50 GB of data per hour, a real digital diesel! **A one hour meeting on Zoom generates 1 kg of CO2.**

Servers are overheating. Data centers consume **10% of the world's electricity.** Streaming generates new cultural practices that are devastating for the environment, such as binge watching. A Netflix series seen by 60 million viewers generates the equivalent of 189,000 tons of CO2. The planet is suffocating. But how can we stop the massacre?

Episode 4- Green streaming?

Green streaming is possible. Simple actions mitigate the harm of streaming: typing the address of a website directly rather than searching for it on Google reduces greenhouse gas emissions by four. **Turning off the video of a Zoom call reduces the carbon footprint of the conversation by 96%.** Switching from "HD" to "standard" quality reduces the CO2 emissions of a YouTube video by 80%.

Streaming can be tamed, but the damage is already done. Streaming has become a culture, with its rituals and codes, its rhythms and architecture. Youtubers are the new comedians, music albums are disappearing in favor of playlists and data centers are reshaping cities...

In a world of limited resources, we may have to choose between powering a hospital or a data center. We become aware of the threat and the ecological disaster caused by streaming. We need to rethink our relationship with technology, to take back control of the way we conceive and think about it. Isolated activists or governments, each of us has his or her own set of prospective solutions.

NOTE OF INTENT

The environment is a major concern for our generation. We are young people in our thirties and like 32% of people our age, we are "seriously concerned" about the environment, compared to 26% of the rest of the population.

This **ecological commitment does not prevent us from being compulsive consumers of technological goods.** We are already on our 7th or 8th smartphone model, not to mention our tablets and laptops... Above all, we are insatiable streaming consumers. This double interest for ecology and technology is a problem to us. The two seem irreconcilable. As if we had to choose. One or the other. **The tech or the planet.**

"A stream" in English refers to a body of water. Figuratively speaking, it becomes a flow. In the technological jargon, it means an endless flow, a live and infinite broadcast. We see it as a sponge that absorbs and spits out the world's failings. It is the revelation of the excesses of our time: the thirst for images, the primacy to the ephemeral and the immediate, the assignment to the remote work. **Streaming is the substitute of our office. Zoom is our new colleague.** We don't want to burn him at the stake though. Streaming simplifies the access to culture and knowledge.

We are addicted to movies, comic books, and network games, and we don't leave our homes anymore. We absorb culture without ever getting off our sofa. Goodbye concert halls, cinemas, bookstores, or toy libraries. Streaming is sweeping away these physical places. It didn't wait for the Covid epidemic to impose itself as the main vehicle of the works of the mind. With it, there is no need to move. Culture and entertainment come to us, served on a platter.

We must question the streaming, question its functioning and examine its carbon footprint because its omnipresence imposes it. The form of the fable seems to us to be the most adapted to achieve this. It allows us to tell the story of streaming and to put it in a moral framework. Our speech is not moralizing in the sense that it does not condemn the use of streaming, but it reminds us of certain drifts and leads us to question certain practices.

DIRECTOR'S NOTE OF INTENT

This series offers a dive into the underbelly of the Internet over the last thirty years. This great story is made of little stories. Those of engineers, mathematicians, geeks of the early days, inhabited by a desire to create what they want, moreover in a still virgin space and who would offer all the technical solutions without necessarily anticipating the human, economic and especially ecological consequences. It is these stories - in themselves informative, astonishing, original -, carried by truculent protagonists, that will advance our narrative and give the keys to understand how all this went wrong and generated consequences that went far beyond the original intentions of their creators.

We want to get out of a cold and smooth iconography of high tech to rely on the **aesthetic cachet that will bring offbeat images** *(research in progress)*. These extracts, present at the beginning of each episode as well as during certain key stages, will serve as **markers for the evolution of streaming. They are commas, flashes, which give a color and a shift to the film** without being our main narrative axis.

As in any fable, **the chronology is linear, simple, without flashbacks, and guided by a voice-over** that directs this dive through the technologies of the Internet and communication. With a certain frankness, sometimes **very enthusiastic, sometimes cynical, this narrator addresses a random streaming user; no one and everyone at the same time, and therefore the viewer too.** The series starts with this voice - *why not Vincent Dedienne* - who calls out to this user to make him/her realize that watching a video is not a trivial thing.

It's not there to judge, it's there to explain. It also introduces the characters in our story, providing information but also humor and off-beatness by commenting on the speaker's remarks, to support them or, on the contrary, to be sarcastic. There is a **real interaction between the voice-over and the interviews, the former bringing concision and off-beatness while the latter, who are also directly addressed to the camera, give a more humane, personal dimension in order to create a very smooth narration.** This link between the voice over, the interviewees and the viewer allows to put all the interlocutors on the same

level. No one is left out, neither visceral technophobes nor blissful technophiles. All are embarked in a fable that goes beyond technology and evokes a future and sustainable living together.

Our characters are divided into two categories: the founding fathers of streaming and the experts in its environmental impact.

The first are actors and direct witnesses of the history of streaming. **Researchers, engineers, entrepreneurs, and all of these at the same time, they have allowed streaming to exist but also to endure.** They tell us their little individual stories that will make the big story. A more subjective dimension that allows us to better understand the zeitgeist that led them to their creation. With hindsight, they will also be able to share their view on streaming and its consequences on the environment.

The second are more into analysis and prospective. If their fields are varied, they all have in common to include in their reflection on the digital, the limits that the planet imposes to us. They are also **proactive in thinking about new practices and uses of streaming.**

These sequences will be punctuated by **archival images (extracts from the first musical streams with Suzanne Vega, Pamela Anderson, etc.)**, shifted, even diverted, but also animations that will explain the functioning of the technologies we will refer to and their impact on the environment.

To make the immaterial material, we will use computer graphics. **In the form of " paper cut" animations, with hand-made, colorful, and anti-technoid graphics, they aim at de-dramatizing the technological aspect of the topic.** Operating as visual breaks during the episodes, these pedagogical data-visualization tablets will make it possible to popularize processes that may seem abstruse at first glance. Understanding that **data centers consume the equivalent of 650 nuclear reactors today makes things much more concrete.** It is important to give the viewer elements of comparison so that they can judge for themselves the gigantic weight that streaming puts on the planet's resources. These pellets will be designed to be reused as is on Instagram.

Between the short stories, we will have a kind of **" back to the studio" via the graphic interface of a computer on which windows open and close, allowing us to move from one topic to the next.** The reference to interfaces helps us go back to the history of computing, revisiting the primitive design of Windows 95 to today's apps and their post-modern purity. This device is evolutionary: The image grainchanges from the low-definition quality of the early days of streaming, to the perfect sharpness of 4K, or even 8K streaming in 2021. This visual history of the computer world will provoke in some a delicious nostalgia of the first computer emotions.

Materializing streaming, also means showing its physical components to denounce the concepts of "cloud" and dematerialization", deceptive screens which hide the polluting effects of streaming. This "machine" is an installation that consists of a heap of objects that have participated in the history of streaming: an accumulation of 56k modems, floppy disks containing the first MP3 encoding software, MS DOS Windows 95 PCs, ADSL cables, wifi cards, Palm Pilots, every residential gateways generation, 3G, 4G, 5G receivers, every iPhone generation, tablets, optical fiber fragments , routers... All these components are put together, intertwined to show the body of streaming: its metal skeleton, its copper veins and its electronic muscles. **The monster is alive, it makes noise: diodes blink, modems rustle with their characteristic ringing, screens light up, the ventilation of computers emits the dull roar of a technology in full calculation.**

Our camera captures the machinery and the data centers by flash. These shots are distilled throughout the episodes. The camera stops on details, shows the increasing sophistication of streaming and its exponential energy consumption with quick shots of data centers. For example, a shot of a gigantic pile of cables can punctuate an interview that states that the use of streaming is exponential.

THE CHARACTERS:

The founding fathers of streaming

Three computer pioneers, three major figures in the history of the Internet who have each enabled the emergence of streaming

- **Rob Glaser**: Entrepreneur, founder of RealPlayer and inventor of livestreaming and video streaming. He lives in Seattle, USA.
- **Karlheinz Brandenbourg:** Researcher in computer science and acoustics, inventor of MP3 and audio streaming. He lives in Erlingen, Germany.
- **Mika Peltola:** Engineer, inventor of the streaming video game, otherwise known as "cloud gaming". He lives in Helsinki, Finland.

The Experts

- **Françoise Bertoud:** Researcher at the CNRS in computer science and pioneer in the green IT field.
- **Cécile Guiget:** Urban planner at the *Institut d'Aménagement et d'Urbanisme de Paris* (Planning Institute of Paris), she works on the consequences of the "cloud" in cities and on electrical networks
- **Hugues Ferreboeuf:** Consultant think-tank The Shift Project, oracle of the worst, prospective work on the future of digital pollution
- **Gauthier Roussilhe**: Researcher, low-tech specialist, supporter of digital sobriety and a systematically reasoned use of technology
- **Frédéric Bordage:** Green IT consultant, evangelizes good environmental practices to his fellow citizens
- **Inès Leonarduzzi:** founder of Digital for the Planet, who advocates for the self-regulation of technology. Technology has within itself the means to correct its own excesses.

PRO-SOBRIETY VIDEOS ON SOCIAL MEDIA
Square image format on Instagram and Facebook

The series thus finds a natural extension on social media with small videos looped like gifs, which include indicators of video consumption as well as a guide of good practices to stream in a more green way. For example, don't stream in 4G on the train, prefer to download movies in wifi connected to the fiber rather than ADSL, reduce the size of videos viewed on YouTube, be aware of the carbon footprint of a video conversation on Zoom or WhatsApp ...
Allso also offers to formalize 1 "#", #slowstreaming", allowing to collect testimonies and commitments of Internet users and to make them participate in a "weak Stream Period" during which they commit to regulate their consumption.

THE BROADCASTIN G

What if we put this series on the stream without going through the streaming? That's what we want to do to complete the picture. We would like to use a very simple technology known to all: peer-to-peer. Peer-to-peer is an exchange model where each entity is both receiver and giver. With the peer-to-peer system, a server is always used, but it is not the only one working. The sharing between Internet users is totally secure and preserves the quality of the content for each user. Nobody is harmed, the transaction is even "invisible" for both parties. The large upstream server works much less, its carbon footprint decreases significantly. The fiber networks are also less solicited and savings are made on the broadcasters' Internet bill. This is called the decentralized method where each Internet user plays the role of a mini-server to share the content with their neighbor.

THE DIRECTORS
Directed by: Adrien Pavillard and Pierre-Philippe

- **Adrien Pavillard** has among other things directed the web documentary series: Poilorama, *(Tr)oppressé*, Saveur

- **Pierre-Philippe Berson**
  In 2010 he started as author and director of photography for Loïc Prigent's documentaries.
  In 2012, he moved to Venezuela where he directed an audio documentary for RFI: *la révolution orpheline* and published an essay: *sous le soleil de Chavez*. He then lived in Beijing where he directed *Le masque et la brume* (France Tv Slash). Now based in Paris, he directed in 2019 the series on women's soccer: *Icônes Bleues* (Slash TV).

THE PRODUCER

- **Brieux FEROT**, producer at ALLSO (formerly known as SOFILM)

Selected filmography:

2010 – MY MELODY –

a documentary directed by Simon Rey and Bassem Ajaltouni (selected at the CPH:DOX 2010, with Tertulia)

2016 – LE PAQUEBOT DE l'ENFER – a documentary

directed by Julian Nodolwsky and Joachim Barbier

2017 – IN THE HEAD OF ALAN MOORE –

a documentary directed

by Rafaël Lévy (Arte Creative)

2018 – LE MASQUE ET LA BRUME –

documentary series directed by Pierre-Philippe Berson (France Télévisions Slash)

2019 – ICONES BLEUES –

documentary series directed by Lenny Grosman and Pierre-Philippe Berson(France Télévisions Slash)

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