

Queen Mary University of London

An Industrial Cloud

Environmental and Human Costs of the Digital World

Jaime Salmonson

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Dr. Richard Bingham

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A **single** AI query run through Chat GPT takes approximately 16 mL of water, roughly the size of an average water bottle, to formulate a response. Now, this might not seem like much, but this means that on a global scale, Chat GPT uses 39.16 million gallons of water **daily** (Wright, 2025).

Contrary to my ten year old self, “The Cloud” is not something that exists merely in emptiness, the best way to think of The Cloud is like several factories filled with data centers. “By treating the Cloud as a type of factory and not an idealized abstraction, we can re-situate the history of computing in the larger history of American industrial development and ask new and important questions about labor, capital, politics and power” (Esmenger, 2018, S20).

These networks of data centers are a part of nearly all aspects of life, from streaming services to artificial intelligence systems, like Chat GPT. The environmental and societal costs of these infrastructures are many times diluted by this abstract metaphor of “The Cloud”. In this essay, I will aim to critically examine the material and environmental realities of The Cloud, focusing on its mass of resource consumption, associated labor practices, and overall political implications. By looking at these three dimensions, this analysis will aim to contribute to a more meaningful understanding of the Cloud’s impact within digital culture and society.

The Cloud’s Anatomy

We know we can think of the cloud as a factory for a basic understanding, but let’s take a deep dive into what it actually is. We should steer away from looking at The Cloud as a boundless entity, because that couldn’t be further from the truth. The cloud is a massive network of data centers, undersea cables, and high energy computing systems. Data centers are the main hub of the Cloud – they house thousands of servers that store, and process, data. These facilities require enormous amounts of energy for computation, but also require continuous cooling systems,

which only increase its carbon footprint. We can see the environmental impacts as clear as day: U.S based mega-data systems in Chile and Uruguay are causing extreme weather conditions, like the 2022 draught that was “the worst in seven decades” and caused more than half the country’s “19 million people in areas suffering severe water scarcity [to live]” (McGovern and Branford, 2023).

These centers can be placed in the middle of nowhere, preferably in cooler regions - ever wonder why so much investment is going into Northern Ireland ... - or can even be found in a New York City skyscraper. According to Will Knight’s analysis in WIRED (2020a), data centers worldwide already consume about 200 terawatt hours of electricity annually, surpassing the energy consumption of *entire countries*. This demand for energy is only projected to grow, and estimates determine that computation technologies could account for as much as 20% of the world’s electricity usage by 2030, only five years away.

Another factor The Cloud relies on is undersea fiber-optic cables. These cables are thousands of miles long, connecting continents and allowing transmission. This, along with data-centers, are the physical elements that prove the Cloud has a heavy reliance on *finite resources*, and the name “The Cloud” obscures these realities. As Knight notes, the perception of the Cloud as “intangible” diverts attention from its *very tangible* environmental costs and the large energy demands of this technology. He uses a different metaphor than water bottles – training a single AI model can consume as much energy as five cars emit *over their lifetimes*, with some projects requiring up to 2.8 gigawatt hours of electricity, the equivalent of *three nuclear power plants running for one hour* (Knight, 2020b).

These examples illustrate the Cloud as a resource intensive industrial network rather than an abstract concept. Understanding this infrastructure is *critical* to recognizing the environmental implications of our increasing dependence on this technology.

Environmental Impacts of “The Cloud”

Case Study: Environmental toll of a Netflix binge (Burrington, *The Atlantic*).

The Cloud’s environmental footprint is deeply grounded – quite literally – in the materials we extract, the energy we consume, and the waste we leave behind. Let’s consider two crucial dimensions: the lifecycle of toxic e-waste and the hidden environmental distress of our everyday digital habits.

Toxic e-waste is perhaps one of the most enduring legacies of the Cloud. As Stephen Cornford (2022) explores in *Geology of Media*, the materials that power our devices – rare earth elements and refined metals – are engineered to last. Silicon and quartz, for example, are so chemically inert that they may persist in the lithosphere for millennia, fossilizing as what Cornford calls “technofossils.” Imagine the remnants of an iPhone chip or a circuit board carved into future bedrock, showcased like a graptolite (Cornford, 2022, p.461). These durable elements are kind of a paradox to our expendable culture: we toss devices aside in our bedside drawer, yet their materials endure far longer than we could imagine. The journey doesn’t end there; as these materials decompose unevenly in landfills, they leak harmful chemicals into the environment, contaminating land and water systems in irreversible ways. And a telling truth to where e-waste is disposed: approximately 40% of waste produced in the U.S and Canada are being transported to rot in landfills in the Eastern world. “It is legal to export discarded goods to poor countries if they can be refurbished, but much is being sent to Africa or Asia under false pretenses, causing

significant environmental pollution and health risks to local populations” (Vidal, 2013)(Grant, R. and Oteng-Ababio, M, 2012).

Even our seemingly innocent habits – like binging our favorite Netflix series – have their consequences. As Ingrid Burrington points out in her article *The Environmental Toll of a Netflix Binge*, every hour of streaming unleashes “55 grams of CO2 equivalent, similar to microwaving four bags of popcorn”, and while Netflix claims to have taken steps to reduce its Carbon footprint, such a widespread, well-liked, platform will ultimately be unable to counteract the damage (Burrington, 2015). The irony is comically paradoxical: while we escape into digital worlds, our real one takes the punch of the infrastructure sustaining them.

Labor: iSlavery

“Conceptually, the manufacturing mode of iSlavery consists of all the labor force required in the productive processes of digital media industries.” (Qiu, 2016a, p.54). Foxconn is the world’s largest manufacturer of electronics, located in China and known for working with Apple to create iphones, ipads, etc.; it also is a terrifying place to be an employee, or more accurately, an “iSlave”. Why is it terrifying? Well, to start, fifteen young workers attempted to kill themselves by jumping from a tall building, ranging from the ages of 17 to 25. One of them, Mr. Chen, attempted to jump but was stopped, so he cut his wrist instead (Qiu, 2016b, p.54). All of these suicides were blamed on “personal relationships” rather than dehumanizing working conditions. (Qiu, 2016c, p.57)

So, what about working here caused such duress? Not only were workers forced to work overtime by 152 hours per month, but Jack Linchuan Qiu describes the management as a semi-militaristic regime that operates as a *feitoria*: a system designed to extract maximum labor

while minimizing individual autonomy, something Michel Foucault argues is torture. This is not in any symbolic sense; workers at Foxconn practice military-style drills, watched by management ranks explicitly named after Taiwanese military units, such as the “War Intelligence Office.” The facilities themselves resemble literal fortified encampments (Qiu, 2016d, p.60).

The labor practices at Foxconn show us a dark truth about the Cloud: behind what we see as seamless convenience lies a human toll we too often overlook. In the manufacturing mode of iSlavery, the individual is reduced to a *replaceable component*, falling victim to globalized capitalism – a reality Qiu characterizes as one of dehumanization and social domination. When I think about the devices we hold in our hands daily, it’s devastating to realize that they are key contributors to the labor of many workers. These individuals are the invisible force keeping the Cloud floating.

Another case to look into is the mining for Lithium. We know it happens, but who goes through the danger of mining such elements? Robin McKie’s (2021) article explains that there will be an “environmental price to pay for this drive to create a world powered by green technology.”

Mining for the materials needed to create such devices have serious ecological consequences, like Lithium and Cobalt for example. Cobalt is found in the Democratic Republic of the Congo where children as young as seven are mining for the minerals, breathing in fatal dust that causes lung failure while working in collapsing tunnels. Lithium, on the same token, is mined by pumping vast quantities of water to extract lithium from ores, lowering groundwater levels and creating toxic chemical leaks that poison communities (McKie, 2021).

As I analyze the material and environmental realities of the Cloud, it’s important to include these real, human stories. The digital devices aren’t just products, but are the physical product of a

system that values profit over human life. By acknowledging the labor practices ingrained into the Cloud's system, we're taking a small step toward unpacking its broader societal implications.

Techno-colonialism

Techno-colonialism is when powerful countries, or large tech companies, use their advanced technology to take advantage of less developed regions. This, in turn, creates a relationship where these less technologically developed areas form a dependency on powerful nations. As Sareeta Amrute so aptly put it, "A colonial relationship is: hierarchical, extractive, and exploitative, [uneven, and malevolently paternal]" (Amrute, 2019a).

All five of these characteristics above can be applied to technology, and is therefore, colonial. Data is indeed hierarchical when we think about social media and applications. The companies that produce this tech also product a superiority complex that Meredith Broussard names "Tecno-chauvinism", which describes "the belief of a small group of fairly homogenous people located primarily in Silicon Valley that they are the best people to deploy a small set of algorithmic applications to administer human life". And these presumed hierarchies can be applied amongst all categories, sexes, races, religions, etc. of people: Broussard claims that "Indian engineers trained at the Indian Institutes of Technology also share this faith in each other as upper-caste men, and in the algorithms they create as superior" (Amrute, 2019b).

The second, extractive, we have already discussed in terms of the elements needed to be extracted from the earth to create our modern technology. The third, exploitative, we also already discussed regarding the unfair treatment of humans in the Eastern world when it comes to labor and mining. The fourth, uneven, we covered when discussing the Western world's usage of land in Asia and Africa for their e-waste. And finally, the fifth characteristic, "malevolently

paternal", meaning the justification of domination through "knowing what's best"; think of how companies often position themselves as guardians of users' interests while actually undermining their agency. For example, tech companies frequently implement "features" that track user behavior "for your own good" or to "improve your experience," while actually harvesting our personal data that we have little to no control over (Amrute, 2019c).

A Plea for Clean Reset

Although the detriments The Cloud has caused our planet is irreversible, we can still take steps towards a cleaner way of digital life, such as investments in renewable energy through the Information and Communications Technology sector (ICT)(Kirvan, 2025). The ICT sector is a nationwide establishment that encompasses all industries and businesses that are involved in technology: communication companies, software developers, hardware manufacturers, data centers, cloud computing centers, etc. ICT is the digital world's spine – it powers the internet and supports everything from mobile networks to tech in healthcare, education, entertainment, and more.

To begin addressing the environmental, social, and political implications of our digital world, there are many steps that can be taken, of course with the right ambition behind them.

Governments and major players in the data collection industry should be mandated to abide by energy efficient practices, like powering data centers with solar, wind, or other clean energy resources. Furthermore, transparency in regulation is equally as important – companies should be required to report on their energy usage and emissions to create accountability, and if there is any fraud involved, governments should have the authority to sue and/or completely shut them down, instilling a fear-factor. On a day-to-day consumer level, there should be stark warnings on

platforms that consume a mass amount of energy. For example, create a visual water usage meter on streaming platforms or artificial intelligence generators that shows the carbon footprint you are emitting with every scroll or AI submission. Additionally, the global tech industry should take responsibility for ethical labor practices and embed strict regulations on the immorality of worker exploitation. And lastly, in regards to global e-waste, the “Right to Repair” movement should be largely enforced so independent repair shops, or even consumers, should have access to tools to fix their equipment rather than getting rid of it. And on the same coin, companies should be mandated to design products with universal parts and software so repairs can be more accessible via independent shops. This has already taken movement in the EU as the R2RD, Right to Repair Directive, and should be enforced worldwide: “This directive - announced on Feb 2 - is poised to transform the landscape of electronic goods consumption, making repairability a cornerstone of product design and consumer rights. By mandating manufacturers to make their products more easily repairable and to provide necessary parts, tools and information to enable repairs to happen, the R2RD aims to extend the lifespan of electronic devices, thereby reducing waste and encouraging sustainable consumption practices (Molyneux & Oberschelp, 2024).

Last Words

Although “The Cloud” has provided connectivity digitally and become integrated into our day to day lives, its material and environmental realities call for immediate attention. Beneath the tangible metaphor lies a network of resource intensive frameworks – data centers, undersea cables, cooling systems, computing systems, and more – all contributing significantly to environmental degradation, social, and political complications. From toxic e-waste, labor exploitation, detrimental resource extraction processes, and more, the true costs of our digital age

are neither abstract or invisible.

To create a more sustainable digital future, we must be ***ambitious***. Ambitious to become advocates for making a 180 degree change on the ways we handle all aspects surrounding the environment that we rely on. We must be supporters for investments on renewable energy, supporters for stricter regulations on seemingly ungovernable companies, and most importantly, supporters of creating a new image for “The Cloud”, spreading awareness that this is not some divine entity, but is a physical beast mortalizing our environment.

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