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Disease, disaster and the internet: Reconceptualizing environmental hazards in the time of coronavirus

ABSTRACT

The internet is made from a vast physical system of cables that stretch unseen across prairies, mountains, oceans, under streets and within buildings. Our online information rapidly flows through this global lattice of equipment every time we send e-mails, play online games, stream Netflix or teleconference with co-workers. With a global society that has recently shifted to living, working and entertaining almost entirely online – to the point of pushing our internet's capacity to its brink – it is worth considering the threat of disease to an industry that has traditionally prepared for a different set of environmental risks. Disasters such as earthquakes, tsunami, power outages and fishermen's anchors have long been considered the leading environmental threats to the internet. But what about a pandemic? This article builds on a visit I took to a Seattle data centre in March 2020, when the city was beginning to go on coronavirus lockdown. As I toured the data centre's earthquake-preparedness equipment, back-up batteries and servers sheltered within protective cages, I could not help but consider if the internet, and the thousands of employees who keep it in operation, were equipped to handle this type of ecological invader?

KEYWORDS

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In early March 2020, I visited Seattle to research the city's historical development of communication infrastructure. As a major Pacific Northwest tech hub – home to companies such as Amazon and Microsoft – the city houses both archives and essential operational facilities. My trip included a tour of a data centre, a type of high-security building in which companies store rows of servers that host the internet's millions upon millions of websites. In this normally bustling city, however, my trip was punctuated by moments of eerie isolation, like standing alone at the base of the Space Needle or meeting Uber drivers who were desperate for riders. Medical professionals were beginning to report that novel cases of COVID-19 were circulating in Seattle, but businesses and restaurants were still open and 'social distancing' had yet to enter people's vocabularies in earnest. The tour of the data centre was on 10 March. The World Health Organization declared the crisis a pandemic the very next day.

Seattle businesses, like the data centre I visited, have been planning for the Big One – the anticipated magnitude-nine Cascadia earthquake that could devastate the Pacific Northwest – but by March, microbes likely posed the most immediate threat to the daily operations of this high-security facility.
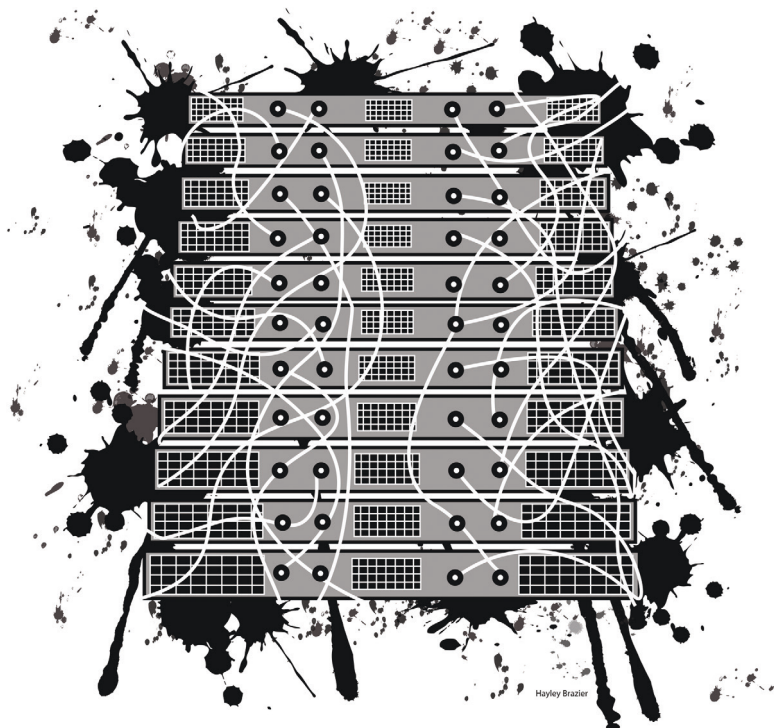

Figure 1: Hayley Brazier, Disease, Disaster and the Internet, *2020. Digital Drawing. Courtesy of Hayley Brazier.*

The coronavirus took many sectors of the telecommunications industry by surprise. The industry has not historically categorized pandemics as a major concern, let alone conceptualized them as a type of environmental hazard that could match the destruction of hurricanes, earthquakes and fires. In the weeks that followed my visit, and as more and more people succumbed to COVID-19, it became clear that a re-evaluation of environmental risks to the internet was in order.

In this article, I reflect on three points relating to COVID-19 and the internet. First, I discuss the environmental hazards that have traditionally threatened internet infrastructure – earthquakes, avalanches, power outages – which vary drastically from the microscopic, insidious power of disease. Second, I consider how the telecommunications industry has responded to the COVID-19 pandemic by implementing safety measures for employees and handling increased online traffic. In the final section, I advocate for researchers to further explore the connection between the environmental footprint of the telecommunications industry and the ongoing decline in global biodiversity. Habitat and biodiversity loss are a major cause of emerging diseases (Keesing et al. 2010: 647). To misunderstand COVID-19 as an unpredictable catastrophe is to overlook the pervasive ecological destruction that likely caused it.

INTERNET INFRASTRUCTURE AND ENVIRONMENTAL HAZARDS

If you were to peel back the layers of concrete, grass, dirt and seawater that cover the surface of the earth, it would reveal a subterranean switchboard of cables. Although satellites play a role in telecommunications, nowadays nearly all international traffic travels by way of cables (Starosielski 2015: 2, 53). These cables crisscross the underworld, providing internet connection to billions of buildings and devices that range from data centres to dishwashers. As we walk down the street or fly over the ocean, packets of data pulse through the cables below us, arriving at their intended destination on the other side of the globe faster than the time it takes us to breath in and out. That is the internet, and it is nothing less than remarkable.

The sheer size of the globe's internet infrastructure means that it is vulnerable to many types of environmental hazards. On land, disasters such as earthquakes, floods, fires, tornadoes, bombs or hurricanes have long been considered the leading threats. Cables that run along the seafloor also face risks but, because of the comparative absence of human traffic, are often more secure in the deep ocean than on land. However, companies must protect submarine cables against fishermen's nets, ship anchors, underwater avalanches, earthquakes and rarely, encounters with marine animals (Starosielski 2015: 29, 33, 77; Habib et al. 2013: 631). These environmental risks and the precautions the industry has taken to protect the system are not recent developments. Since the nineteenth century, the global telecommunications industry has done everything within its power to protect its telegraph, telephone and fibre-optic cable lines from acts of God and sabotage.

Reflecting the standards of the larger industry, the Seattle data centre that I toured prioritized the security of its machinery above all else. As we moved deeper into the building, I saw the company's countless servers locked behind a sequence of cages, sealed doors and keypads. The building's natural disaster preparedness equipment was even more mesmerizing. This data centre was prepared for the Cascadia earthquake, which could cause Seattle to severely shake for two minutes (Doughton 2018). The facility has floor-to-ceiling

lithium-ion batteries and generators, which will keep the servers powered up if the electrical supply cuts off. The batteries sit on large springy platforms that will stabilize the equipment while the building shakes. Around the exterior of the facility, the company has run extra routes of fibre-optic cables in the event that a collision with the building severed one of its lines. Yet despite all of the preparation, it is possible that on the day of my visit, I represented a greater risk to the data centre than the magnitude-nine earthquake for which they have been preparing. Even this fortress of a facility is susceptible to the power of germs.

THE TELECOMMUNICATIONS INDUSTRY'S RESPONSE TO COVID-19

Unlike other types of environmental hazards, disease poses no physical threat to the internet's technologies: it cannot cut a cable in two, cause the ground underneath a data centre to shake or flood a power plant. However, compare the sheer force of a tsunami to that of disease microbes. Droplets contaminated with COVID-19 are measured by the micrometre as they travel inconspicuously between human victims (Lewis 2020). Microscopic though they are, COVID-19 microbes have still challenged the internet in two critical ways. Firstly, a great increase in online traffic. When the spread of coronavirus began to dictate that people stay home, there was a correspondingly large jump in internet usage – in some regions, like Italy, growing as much as 40 per cent – which created something of a 'stress test' for telecommunications infrastructure (Heaven 2020; Sverdlike 2020). As the last few months have proven, the internet was robust enough to endure the spike in traffic, although there have been some outages, slow-downs and forced adjustments in certain regions. Within the European Union, for example, video-streaming companies like YouTube and Netflix have purposefully reduced video quality to decrease pressure on the system. Rural and residential communities have experienced some of the worst disruptions because they exist at the end of the road for internet infrastructure, or what is often called 'last-mile' connections (Heaven 2020). Despite these adjustments, there have likely been no significant changes for most people who already had a strong home internet connection before COVID-19 erupted.

COVID-19's second major challenge to the industry has involved its employees, whose work is often considered essential and cannot be done remotely. Data centres require a sizeable in-person staff. Even the most advanced data centres could probably operate for no longer than a day or so without employees in the building, after which it would most likely need to shut down (Fulton III 2020; Sverdlike 2020). Some parts of internet architecture, such as fibre-optic cables running along the seafloor, do operate without staff anywhere near them, but even remote teams of employees monitor the cables resting at the bottom of the sea. When an undersea cable gets snagged or stops working, skilled technicians aboard a cable-repair ship will navigate to the middle of the ocean to fix it. Employees living in tight quarters on cable-repair ships are at risk of fostering COVID-19. Despite their essential jobs, we do not hear as much about these workers on the news. The inconspicuousness of internet infrastructure means that its employees are somewhat inconspicuous, too.

Telecommunications companies have been quick to implement new procedures to respond to this pandemic and be better prepared for the next one. A recently published Uptime Institute report is encouraging critical infrastructure

companies to establish disease procedural plans, which include varying the age and expertise of staff; securing a guaranteed supply of fuel even during shelter-in-place orders; establishing which maintenance can and cannot be deferred; determining which staff can work remotely; storing personal protective equipment and determining which surfaces will need increased cleaning; designating new workspaces to avoid having employees sit too close together; and having a pre-understanding of a building's heating, ventilation and air conditioning (HVAC) system in the scenario that a virus can travel through the vents (Uptime Institute 2020: 7, 11–15).

Despite the telecommunication industry's resiliency and its diligent preparation for the next pandemic, it has called for largely reactive measures. Of the many industry-related articles and reports that I have shifted through in the past few weeks, nobody is striking at an underlying question that should draw the attention of this sector and other global industries: severe ecological disruptions most often cause diseases like COVID-19 to develop in the first place. What role, if any, has the telecommunications industry played in the creation of ecological disruptions?

BIODIVERSITY LOSS AND THE INTERNET'S ENVIRONMENTAL FOOTPRINT

'Epidemics typically begin where human relations with animals go awry', writes environmental historian Donald Worster (2020). Diseases are a type of environmental problem, often the result of an ecological disruption to the natural environment that affects the health and resiliency of species. Ecological disruptions may include loss of habitat, insecticide applications, feedlots, monoculture practices in agriculture and the livestock industry, and wetlands removal, all of which can lead to lowered biodiversity and higher extinction rates. In recent decades, the severe strain that human populations have put on the natural environment has disrupted biodiversity to such a degree that animals, under severe stress, can more easily become sick and pass that disease to humans (Keesing et al. 2010: 647, 651). Increasingly, humans are both the victims and instigators of epidemics – no single individual is immune to emerging diseases and no single person is immune from the responsibility of their creation, no matter how small that responsibility may be.

In the wake of COVID-19, the telecommunications industry has an opportunity to ask: in what ways might the internet contribute to environmental disruptions and global species decline? There is no doubt that the explosive growth of the internet has an environmental footprint. Data centres, for example, are thought to use around 1 per cent of the globe's total electricity consumption, a number that jumps to an estimated 2 per cent in the United States. In response to this problem, data centres are now prioritizing energy efficiency as traffic continues to grow (Masanet et al. 2020: 984–85; Anon. 2020). As internet consumers, our decisions to stream movies, video chat and download music have a carbon footprint. The BBC reported that the streaming of one popular music video, which reached 5 billion streams, used an equivalent amount of electricity as the combined energy consumption of Sierra Leone, Somalia, the Central African Republic, Chad and Guinea-Bissau for one year (Griffiths 2020). And what about the billions of cell phones, tablets, laptops, televisions and other internet-connected machines that we purchase and ultimately, throw out? Millions of tons of electronics are tossed away each year, with the potential of leaking toxins such as mercury and lead into landfills and

the surrounding environment (EarthTalk 2015). And yet even when these smart electronics are shipped to places like India and Thailand and recycled for their precious metals, they still leach toxins into the environment that could harm the surrounding rivers, soils and animals (Larmer 2018). The internet does not exist in the clouds – its environmental footprint is real and pervasive.

For every new data centre, cell phone, Netflix binge, video game spree or online meeting, there is an environmental consequence. These consequences are relatively minor when compared to alternative options of entertainment or travel. Nonetheless, cumulative environmental footprints from a global industry like that of telecommunications still have the power to alter natural ecosystems. Over time, it may become clearer how our internet consumption habits relate to global biodiversity and habitat loss. The telecommunications industry's ability to recognize and address its role in the future of climatic and ecological change is an onerous task, but a necessary one. It is not enough to prepare for the next pandemic without also addressing why and how they erupt in the first place. Here is the takeaway: there is a body of scientific literature that demonstrates that human-caused biodiversity decline leads to animal-borne diseases that, in turn, can infect humans (see Jones et al. 2008: 990; Worster 2020). There is also ongoing research that demonstrates the environmental effects of using the internet and internet-connected devices, particularly as a growing percentage of the global population goes online (Griffiths 2020). In the wake of COVID-19, these two fields need to speak closely to each other.

CONCLUSION

When I toured the data centre in early March, I held a narrow conception of the environmental hazards that menace internet infrastructure. It took me weeks to realize that the COVID-19 pandemic was an unparalleled environmental threat to the telecommunications industry. The industry's historical preoccupation with preparing for other types of environmental disasters – earthquakes, hurricanes, fires, warfare, power outages – means it has created a definition of environmental risk that did not always or necessarily include disease. Despite the fast spread of the coronavirus, the industry has implemented measures to protect its employees and keep the internet functioning at a high capacity. But those are only the initial steps. The telecommunications industry, like all global industries, needs to recognize that diseases like COVID-19 are often a by-product of ecological disruptions. The second, and harder step, is for the industry to openly grapple with its role in global environmental systems and the severely high rates of extinction that have come to characterize life on earth in the twentieth and twenty-first centuries (Keesing et al. 2010: 647). COVID-19 has presented an opportunity for the telecommunications industry, and global society more generally, to respond to the reality that emerging infectious diseases have been increasing in our lifetimes (Jones et al. 2008: 990). Over the past few months, individuals have worn masks and social distanced to protect the health of their communities. As we move forward, industries must also account for their role, and their responsibilities, in reducing the likelihood of future pandemics.

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