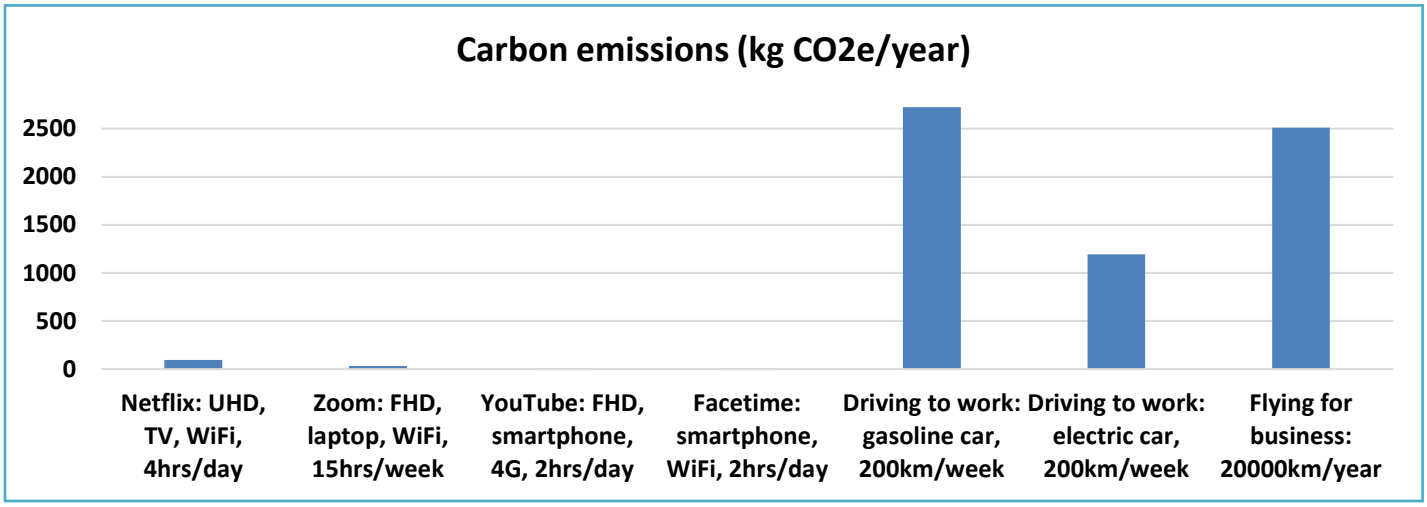
Should you be worried about your digital carbon footprint?



By Kumar Venkat, CleanMetrics 2.0

With so many of us working from home and using services like Zoom to meet with co-workers and customers, an obvious question is whether this trend is good or bad for climate. Add to this all the streaming video we are consuming for entertainment while stuck at home, and the question takes on some urgency.

I have wondered for some time about my digital carbon footprint, and I have worried that my Zoom meetings, nightly Facetime calls with my daughter and my new habit of binge-watching television shows might be adding up to an obnoxious amount of carbon emissions.

The wide range of published estimates have added to the confusion. One recent study triggered newspaper articles that have offered ways to reduce one's digital carbon footprint — such as reducing the video quality of streaming services from high definition to standard definition — without putting the carbon savings in context. For example, how does watching a high-definition Netflix movie compare with driving to a movie theater back in the pre-pandemic days?

The suggestion that got me really worked up though was the one about turning off the camera on Zoom calls to reduce data rates and carbon emissions. After more than a year with minimal human contact, do we really have to forego seeing the person at the other end to save the planet?

My anxiety about carbon emissions reduced a bit after reading a fact check by an analyst with the International Energy Agency that showed that the climate impacts of streaming video remain relatively modest and that some studies have incorrectly exaggerated the impact by up

to a factor of 90. Part of the problem with many studies has been a lack of understanding of how Internet data services work.

As pointed out in a recent paper by Jens Malmodin of Ericsson Research, the crucial error made by most of the incorrect claims is the use of a single energy-per-data figure (kWh/GB). If this figure were calculated for low data rates under older conditions and then simply scaled up to today's higher data rates, it could result in power levels that are not physically possible because the low data rates often include a significant idle power component which doesn't change with data rate.

Armed with this insight and a more logical power model proposed by Malmodin, I have put together an updated calculation of energy use and carbon emissions from fairly intense use of services like Netflix, YouTube, Zoom and Facetime. To place this in context, I have also added to the mix a few activities that are squarely in the non-digital, physical world including commute, travel and consumption of some common foods and beverages. The table below compares the annual carbon emissions from all of these. The numbers on the right are the carbon-equivalent emissions for a full year of consuming the product or service on the left.

Product or service	Carbon emissions (kg CO2e/year)
Netflix: UHD, TV, 4hrs/day on WiFi	95
Zoom: FHD, laptop, 15hrs/week on WiFi	32
YouTube: FHD, smartphone, 2 hrs/day on 4G	4
Facetime: smartphone, 2hrs/day on WiFi	5
Cup of latte: 350ml, 1/day	131
Plastic water bottle: 500ml, 1/day	17
Beef burger patty: 114g, 2/week	191
Driving to work: gasoline car, 200km/week	2723
Driving to work: electric car, 200km/week	1192
Flying for business: 20000km/year	2509

If you were to work from home and spend 15 hours a week on Zoom calls using high-definition video, that is still 85 times better than driving 25 miles roundtrip to work every day. If you had the time to watch ultra-high-definition movies on Netflix four hours every single day, that would have just about the same climate impact as eating a single beef burger patty once a week.

So, let us relax a bit. We are NOT destroying the planet with our exponentially increasing data consumption, because the electricity intensity of Internet data transmission has decreased by half every two years due to more energy-efficient hardware. This is not to say that there are no concerns around our digital carbon footprints. Bitcoin mining — which uses "more electricity

per transaction than any other method known to mankind" according to Bill Gates — is an example of an unsustainable trend.

For the vast majority of us who are just using the Internet for routine work and entertainment, the real carbon footprint problem is back in the physical world.