The net impacts of internet use

Alan Pears would like you to know that your Zoom meeting is not, in fact, going to destroy the planet. All the CO₂ that's *already* in the atmosphere, however...



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The environmental footprint of various internet apps. Image: Perdue University/Kayla Wiles

of digitalisation. The International Energy Agency has looked at this issue and found that, overall, the net benefits of digitalisation (through energy savings and productivity improvements) usually far outweigh the impacts.

environmental impacts

The graph here provides insights into the worst-case environmental impacts of some internet apps, but it doesn't put them into context. For example, an hour spent on Zoom generates less CO2 than driving a car a kilometre. Avoiding a five-kilometre car trip cuts emissions by more than a two-hour, "worst case" Netflix video.

According to the International Civil Aviation Organization flight calculator, a return flight between Melbourne and Sydney generates 141kg of CO₂. Add another 25kg for 100km of taxi travel to and from airports; the result is equivalent to over 1000 hours of Zoom. Scientists estimate that the indirect climate impacts of air travel, including release of water vapour and pollutants at high altitude and contrails, can double or triple the overall impact relative to the CO₂ emissions. So the gap between flying and Zooming is actually much bigger.

Of course, it's much more complex than this. On one hand, many digital businesses are investing heavily in energy efficiency and renewable energy, so impacts of

internet apps are declining below the worst case shown in the graph. On the other hand, we may spend more time watching movies. But we need to compare our energy use while watching movies at home against what else we might have done in that time! Our ability to maintain longdistance internet relationships may encourage us to take extra flights. Then there is the obsolescence and resource waste driven by frequent equipment replacement without effective recovery and recycling.

How we use the internet also matters: a tablet computer uses about 4 W, while a 4-Star big screen "smart" TV may use 180W (but then, a 7-Star model only uses half of that). There are some digital endeavours that are unambiguously terrible from an emissions perspective: cryptocurrency mining, for example. The Bitcoin network alone has recently been estimated to be consuming 129TWh per year, which would rank it 29th amongst entire countries worldwide. It's a complicated world!

Policy dilemmas as we move beyond renewable energy Australia's Renewable Energy Authority (ARENA) was originally given terms of reference focused on renewable

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energy, a very laudable focus that has delivered great value. But this narrow agenda has meant that ARENA has not funded many important, and potentially more significant, opportunities to develop energy efficiency.

Don't get me wrong: ARENA has done a lot of great work. But a new problem we now face is that the Australian government proposes to broaden ARENA's mandate beyond renewables. This expands ARENA's remit to include a range of measures beyond renewable energy, and that creates new issues.

How can you differentiate between a (good) energy efficiency measure and hydrogen from fossil gas, carbon capture and storage, or a shift from coal-generated electricity to gas? In theory they can all help cut emissions.

Energy efficiency is fundamental to a zero carbon economy, a fact that leading policy makers such as the International Energy Agency repeatedly emphasise. Efficiency frees up money, makes the demand side more flexible, delivers multiple benefits such as health and productivity, and allows renewables to take a bigger share of supply. The fossil fuel alternatives, meanwhile, increase emissions in the critically important next decade by diverting attention and funding from the main game and, in many cases, increasing the emission-intensity of the energy they deliver relative to other options.

Unfortunately our present government chooses to ignore this subtle difference. Fragments of truth allow the government to get away with its political sleight-of-hand. We probably will need some gas for a while rapidly-decreasing amounts using existing infrastructure and gas resources. For a few important emission-intensive processes, carbon capture and storage may, eventually, be one of the least-worst options. So we may need to invest some very carefully targeted money there. This kind of subtlety is way beyond our present political leaders.

Technology not targets for climate action?

Despite our government's hopes, this is not a choice. Technology is important, but you also need real policy commitment, serious program development, deployment, supply chain capacity building and implementation. If our performance standards aren't as tough as those of other countries, inefficient and outdated appliances and vehicles are dumped here. If we don't enforce our regulations, we build a culture of exploitation.

Conversely, if our standards are tougher and innovation is encouraged—not just in technology, but also manufacturing and



The 2021 global carbon budget is 30% lower than the global budget for 1.5°C at the start of 2018 in IPCC's *Special Report on Global Warming of 1.5°C*, and 12% lower than global budget at start of 2020.

Source: Denis-Ryan, A., 2021, "The global 1.5°C carbon budget has reduced by 30 per cent in just three years-trends show we must reduce emissions faster", ClimateWorks, available at bit.ly/CWA30PC. Chart from IPCC, *Global Warming of 1.5°C*; Global Carbon Project.

marketing—we become a testing ground for global leading edge solutions. A lot of effort must also be focused on working out how to select, install and maintain technology. These are policy choices that shape how technology is developed and delivered. Targets and measures that reflect serious commitment to those targets drive policy and business action.

In any case, the timing of technology delivery is important. With the best will and a lot of money, hydrogen and carbon capture and storage won't make much difference for a decade or more, and they are likely to increase short-term emissions. We need results now. And we have technologies that are not being rolled out fast enough. That's about policy, targets and a lot more.

And you thought carbon emissions were a problem: it's much worse

Most public debate on climate focuses on cutting annual greenhouse gas emissions. This is a useful indicator of progress. But it distorts the picture.

This focus masks the reality that it is the heating effect of *all* the greenhouse gases in the atmosphere that matters, not our annual emissions. The concentration of greenhouse gases is the difference between the cumulative release of emissions and the reduction due to chemical breakdown and absorption into the Earth's systems. The higher the concentration of these gases, the more heat that is re-radiated back to Earth instead of escaping to space. This is equivalent to increasing the intensity of the sun, which is why climate scientists measure "radiative forcing" of greenhouse gases (see NOAA/ESRL Global Monitoring Laboratory's "Annual Greenhouse Gas Index").

While the concentration of greenhouse gases in the atmosphere remains well above pre-industrial levels, the Earth will continue to heat up more. The total effective concentration of greenhouse gases now exceeds 500 parts per million (of which carbon dioxide is about 420 ppm), compared with the pre-industrial level of around 280 ppm). When I was at school in the 1960s, my science textbook told me the CO₂ concentration was 313 ppm: there was no mention of it increasing!

There are other complications. The shortterm heating impact of some gases, such as methane (which leaks from coal and gas production) is much higher than the longterm impact that scientists include in most reports. The short-term impact of air pollution damps down global heating: when we clean up our air, we will lose this cooling effect.

Scientists alerted us to our problem in the 1980s, after decades of monitoring, analysis and modelling. We humans have dug a very deep hole for ourselves by failing to stop and reverse the growth in annual emissions. So the concentration of greenhouse gases in our atmosphere has continued to rise.

Stopping global heating requires the concentration to drop a long way. So we need to stop emitting ASAP, and also accelerate removal of greenhouse gases from the atmosphere. We have wasted too much time to rely on natural systems to process the excess greenhouse gases already in our atmosphere.

In this context, a focus on cutting annual carbon emissions to "net zero" by 2050 as a reasonable level of ambition is a false comfort. It is a useful target to focus our initial, belated efforts, but it is not more than a step in the right direction.

As we build capability to cut emissions and remove them from the atmosphere, we will need to deliver a substantial reduction in the atmospheric concentration. Climate scientists and groups like 350.org (350.org.au) have recognised this for a long time.

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