Emissions from computing and ICT could be worse than previously thought

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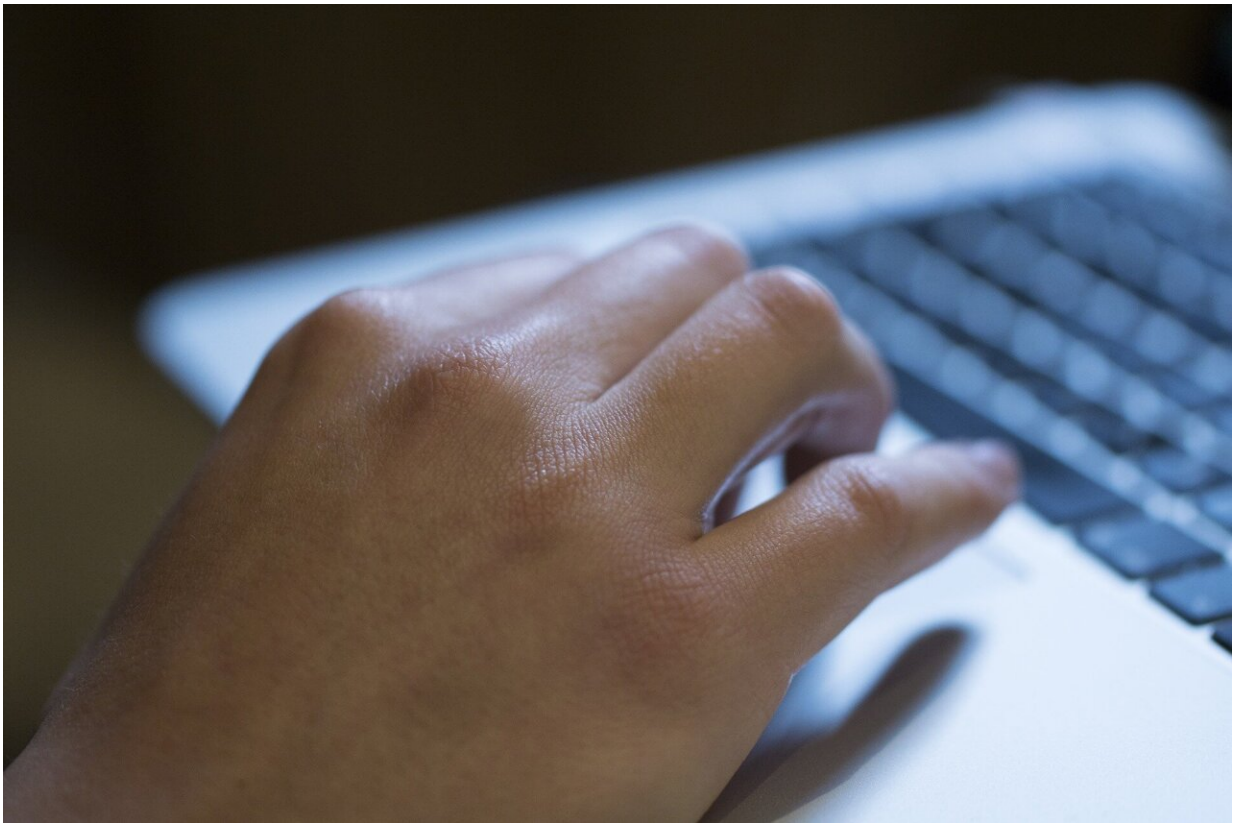

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Global computing could be responsible for a greater share of greenhouse gas emissions than previously thought and these emissions will continue to rise significantly unless action is taken, a new study highlights.

A team of researchers from Lancaster University and sustainability consultancy Small World Consulting Ltd claim that previous calculations of ICT's share of global greenhouse emissions, estimated at 1.8-2.8%, likely fall short of the sector's real climate impact as they only show a partial picture.

The researchers point out that some of these prior estimates do not account for the full life-cycle and supply chain of ICT products and infrastructure—such as: the energy expended in manufacturing the products and equipment; the carbon cost associated with all of their components and the operational carbon footprint of the companies behind them; the energy consumed when using the equipment; and also their disposal after they have fulfilled their purpose.

The researchers argue ICT's true proportion of global greenhouse gas emissions could be around 2.1-3.9% - though they stress that there are still significant uncertainties around these calculations. Although like for like comparisons are difficult, these figures would suggest ICT has emissions greater than the aviation industry, which are around 2 % of global emissions.

In addition, the paper warns that new trends in computing and ICT such as big data and AI, the Internet of Things, as well as blockchain and cryptocurrencies, risk driving further substantial growth in ICT's greenhouse gas footprint.

In their new paper 'The real climate and transformative impact of ICT: A critique of estimates, trends and regulations' published today by the journal *Patterns*, the researchers looked at two central issues—ICT's own carbon footprint, as well as ICT's impact on the rest of the economy.

It has often been cited, and put into policy calculations, that ICT and computing technologies will lead to greater efficiencies across many

other sectors, leading to savings in net greenhouse gas emissions.

However, the researchers argue that historical evidence proves the opposite. That over the years as ICT has become more efficient, ICT's footprint has taken up a greater proportion of global emissions. In addition, ICT has driven wide-ranging efficiency and productivity improvements, but, critically, global greenhouse gas emissions have risen inexorably despite all this.

This could be partly due to so called 'rebound effects' where increased efficiencies result in increased demand.

Professor Mike Berners-Lee from Small World Consulting said: "We know that ICT has an ever growing role in society and brings efficiencies to almost every corner of the global economy. But it's relationship to carbon reduction may not be as straightforward as many people assume. Our work tries to shine a bit more light on that important question."

The researchers point out that to achieve net zero by 2050—a target the planet needs to meet in order to keep global warming below 1.5°C—then:

- Unprecedented co-ordination across the ICT sector and policy makers is needed to formulate a plan to achieve net zero by 2050
- ICT organisations need to have legally binding net zero targets that also cover their supply chain emissions
- With competing demands on ICT such as workplace communications, leisure, Internet of Things, AI and bitcoin mining, in order to prevent run-away data demand, societies may need to consider prioritising some ICT uses above others
- Clear detail is required on a sector by sector basis of the emissions savings that ICT is expected to deliver, underpinned by transparent evidence that includes all related emissions

The researchers recognise that several of the world's technology giants have made statements on reducing their climate footprint, however they argue that many of these pledges are not ambitious enough and industry self-regulation may not be sufficient to bring about the emissions reductions needed to reach net-zero by 2050.

The researchers argue that if global carbon limits were introduced that would eliminate concerns over the 'rebound effects' so that ICT-enabled efficiencies could be realised without additional carbon costs.

They also warn against an over-reliance on renewables in calculations about future ICT greenhouse gas emissions because of limited supplies of vital commodities, such as silver, which are needed to make solar panels.

Dr. Kelly Widdicks co-author of the study from Lancaster University said: "Much more needs to be done by the ICT sector to understand and mitigate its footprint, beyond focusing on a transition to renewables and voluntary carbon reduction targets. We need a comprehensive evidence base of ICT's environmental impacts as well as mechanisms to ensure the responsible design of technology that is in-line with the Paris Agreement."

The team of researchers' next project, PARIS-DE, will investigate which mechanisms are needed to ensure digital technologies are designed to be compliant with the low carbon objectives outlined in the Paris Climate Agreement.

More information: The real climate and transformative impact of ICT: A critique of estimates, trends and regulations, *Patterns*, DOI: 10.1016/j.patter.2021.100340

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