What do we know about the Internet’s energy usage?

... and: misinformation

Michael Welzl
CO$_2$ footprint magnitude relationships
(totally correct, you’ll see)

Image by Tumisu from Pixabay
Part 1: Nonsense

(to get it out of the way)
Some examples

- (...) the footprint of an email also varies dramatically, from 0.3g CO₂ for a spam email to 4g (...) CO₂ for a regular email and 50g (...) CO₂ for one with a photo or hefty attachment, according to Mike Berners-Lee, a fellow at Lancaster University who researches carbon footprints. These figures, however, were crunched by Berners-Lee 10 years ago. Charlotte Freitag, a carbon footprint expert at Small World Consulting, the company founded by Berners-Lee, says the impact of emailing may have gone up.


- With new data in hand, Berners-Lee estimates that an individual email can be anywhere from from 0.03g CO₂ to 26g CO₂.

  https://sedna.com/whats-the-carbon-footprint-of-your-email/

- 1 email = 1g carbon = 0.000001 tonnes CO₂ per email

  (Source: Mike Berners-Lee)


- Mike Berners-Lee, a respected professor on the topic whose research was used in the Ovo Energy work, told the Financial Times it was based on "back-of-the-envelope" maths from 2010 - and while useful to start conversations, there were bigger questions.

More examples

• “A typical office worker sends and receives around 140 emails per day, which, over the course of a year, creates as much CO2 as flying from London to Bruges or watching 955 movies”: https://www.cwjobs.co.uk/insights/environmental-impact-of-emails/

• “Sending 65 emails is roughly equivalent to driving 1km in a car. (..) Globally, the world’s email usage generates as much CO₂ as having an extra seven million cars on the roads.” https://www.sciencefocus.com/planet-earth/the-thought-experiment-what-is-the-carbon-footprint-of-an-email/

Climate change likely to make us more stupid, study finds

Rising levels of carbon dioxide could affect concentration and decision-making of global workforce https://www.independent.co.uk/climate-change/news/climate-change-carbon-dioxide-intelligence-greenhouse-gas-more-stupid-ucl-study-a8674706.html
This is harmful

- May cause people not to take Internet energy reduction seriously
  - Bad when these people work at funding bodies!
  - Also consider Brandolini’s law (b* asymmetry principle)

- For more, look at work by Jonathan Koomey et al
  - Keynote slides: https://www.koomey.com/post/652805139647840256
  - J. Koomey, E. Masanet: “Does not compute: Avoiding pitfalls in assessing the Internet’s energy and carbon impacts”, Joule 5, 1625-1633, July 21, 2021
Part 2: Reality

*(conservative estimates are better than exaggerations)*
CO₂ footprint of the Internet

• What is “the Internet”? Studies differ widely
  – Age; considerations of: CPE; UE; embodied energy; data centers

• Our IAB paper uses a few sources to arrive at a range of:
  0.5% – 1.17%

• One possible derivation:
  “SMARTer2030 report” states that ICT has a CO₂ “footprint” of 2.7% of global emissions in 2020
  – Numbers from 2012: telecom electricity = ICT / 3
  – If this relationship still holds, then roughly, worldwide 2020 GHG emissions from telecom: 0.9%
Is this a small number?

• From https://ourworldindata.org/co2-emissions:
  – 2021: UK 0.93%, Norway 0.11%

• We’re all asked to reduce our personal CO₂ footprint
  – In Norway, the public press offers a calculator…
  – Population 5.408 million, so very roughly, per-person contribution: 0.00000002%

• If we could reduce the Internet’s power by 10%…
  – From 0.9% to 0.81%... that’s 4.5 M Norwegians 😊
  – Okay… stopping here, it gets a bit silly

• My point is: the potential is enormous!
Back to magnitude relationships

Image by Tumisu from Pixabay

Potential savings via IETF standards?
The end

Questions?