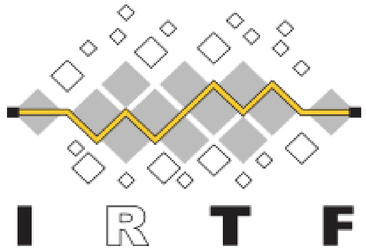
Proposal for a new RG

SUSTAIN RG
Sustainability and the Internet



Ali Rezaki, Eve Schooler, Michael Welzl

Side Meeting @ IETF 121 – Dublin

Wednesday, Nov 6th, 2024

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This session is being recorded

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- See RFC 7154 (Code of Conduct) and RFC 7776 (Anti-Harassment Procedures), which also apply to IRTF

Goals of the IRTF

- The Internet Research Task Force (IRTF) focuses on longer term research issues related to the Internet while the parallel organisation, the IETF, focuses on shorter term issues of engineering and standards making

- **The IRTF conducts research; it is not a standards development organisation**

- While the IRTF can publish informational or experimental documents in the RFC series, its primary goal is to promote development of research collaboration and teamwork in exploring research issues related to Internet protocols, applications, architecture, and technology
- See **“An IRTF Primer for IETF Participants”** – RFC 7418

Administrivia

Remote participation:
https://ietf.webex.com/meet/ietfsidemeeting2
Meeting materials: https://github.com/rezaki-ali/IRTF_SUSTAIN_RG
Shared notes:
https://docs.google.com/document/d/1lPcUkIZqjmwv3Nx715WqH1FqI8kJ5QwuM7bUESX26fQ/edit?usp=sharing

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Timeline

- **July 2024:** Idea for SUSTAIN RG germinates
- **Sept 2024:** Co-chair coordination, charter drafted
- **Oct 2024:** GitHub repository established
- **Nov 2024:** Feedback solicited: IESG, IAB, E-impact, GREEN WG
- **Nov 2024:** Academic co-chair added – welcome Michael!
- **Nov 2024:** Feedback solicited: broader IETF community, e.g., HotRFC, IRTF Open, many hallway discussions, RG co-chairs, side meeting

- **Post-IETF next steps:** incorporate latest feedback to hone charter further, submit to IRSG chair for review, then for IAB review

➔ go/no-go decision

Agenda

1) **14:30 – 14:45 Intro, RG Status, Motivation**
   Presenter: Eve Schooler (University of Oxford)
   Slides: https://github.com/rezaki-ali/IRTF_SUSTAIN_RG/

2) **14:45 – 15:05 Proposed Charter**
   Presenter: Ali Rezaki (Nokia)
   Slides: https://github.com/rezaki-ali/IRTF_SUSTAIN_RG/

3) **15:05 – 15:15 Dagstuhl seminar report out**
   Presenter: Dirk Kutscher (The Hong Kong Univ. of Science & Technology)
   Slides: https://github.com/rezaki-ali/IRTF_SUSTAIN_RG/

4) **15:15 – 15:30 Open Discussion + Poll to gauge interest**

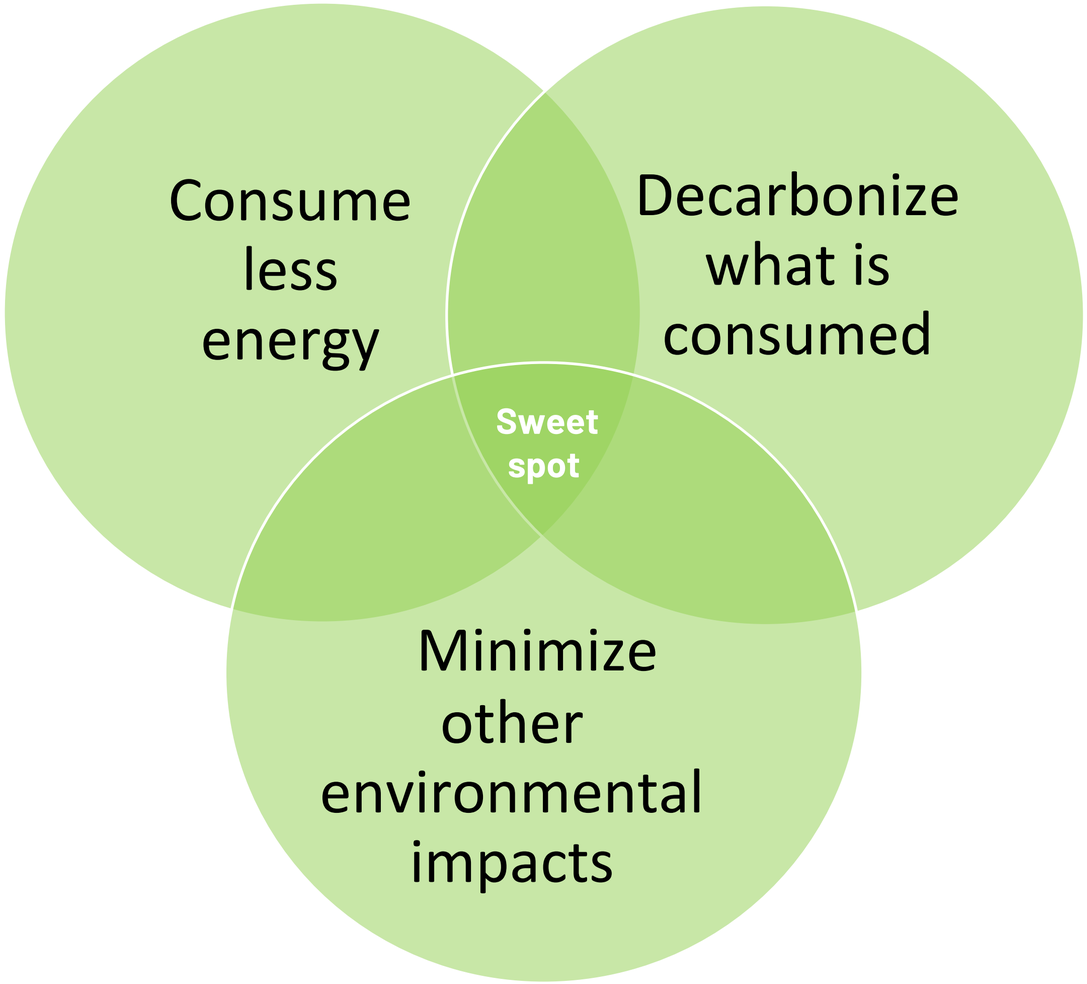
Side Session Goals

- Solicit feedback to help sharpen and focus the charter
- Poll audience to gauge interest

Backdrop

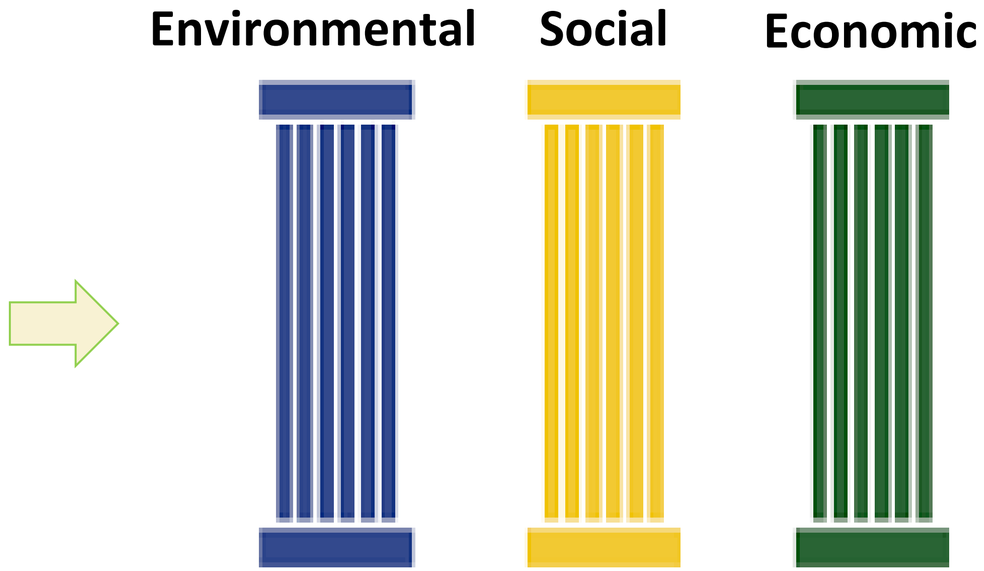
- Urgency to address UN IPCC recommendations
  - 1.5C degree threshold - minimize climate change impact
- Timeline to reduce GHG emissions
  - 50 % by 2030
  - 100 % by 2050
- ICT contribution to GHG emissions sizeable and growing
  - Network impact rivals Data Center
- Exacerbated by growth of AI

Traditional Environmental Sustainability Goals?



Broader Sustainability Pillars

"Meet the needs of the present without compromising the ability of future generations to meet their own needs."



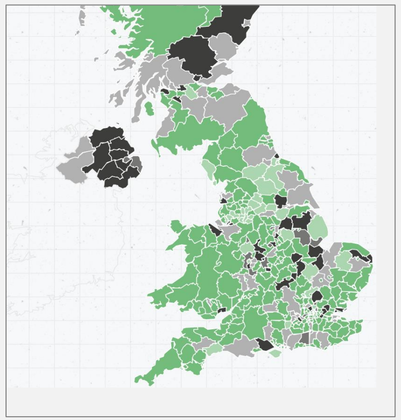
SUSTAINABLE DEVELOPMENT GOALS

Beyond the Technical

Country-Scale Electricity Usage

- Internet networking is on par with many developed nations

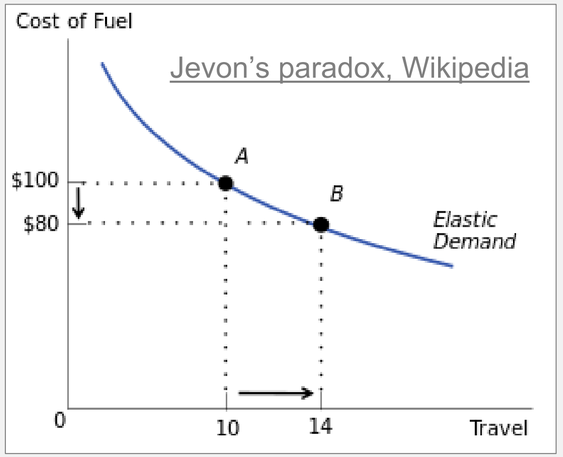
https://carboncopy.eco/local-climate-action



Who/How to effectively, responsibly manage?

Tackling Jevon's Paradox

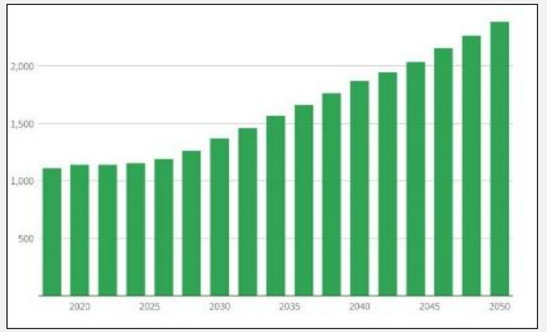
- Increased efficiency
  → Reduced cost
  → Greater usage



How to make efficiency gains stick?

Huge eGrid Growth & Transition

- 2x-4x electricity needed to electrify transportation
- Edge-ification of the Internet AND Renewables
- ICT as a virtual battery when excess renewables



Disruption = Opportunity!

More Internet Sustainability Concerns

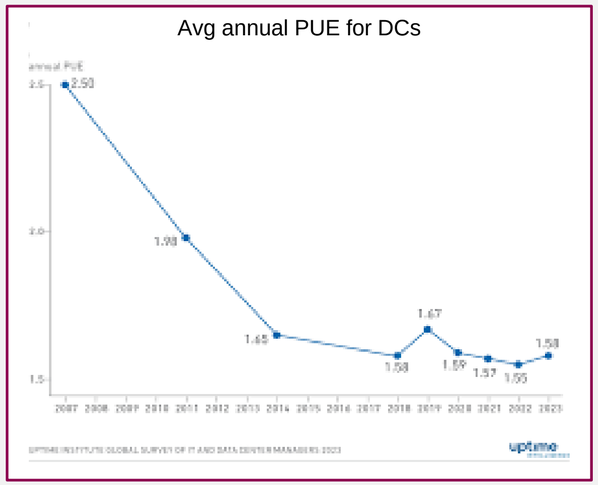
Financial Incentives:, Tax Credits

- A huge lever to incent the (US) infrastructure to transition to renewables

Accelerate the uptake of renewable energy!

Policy Incentives: Standards & Regulations

- DC server power efficiency timelines
- Unintended consequences



Voluntary → Mandated

Ethics

- ***"If country X wants to be a world leader in AI"***
  - **Q:** should they support AI's unbounded use of electricity?
- ***"If AI holds the promise to accelerate innovation"***
  - **Q:** should AI receive special compensation re emissions goals?

Responsible Accounting

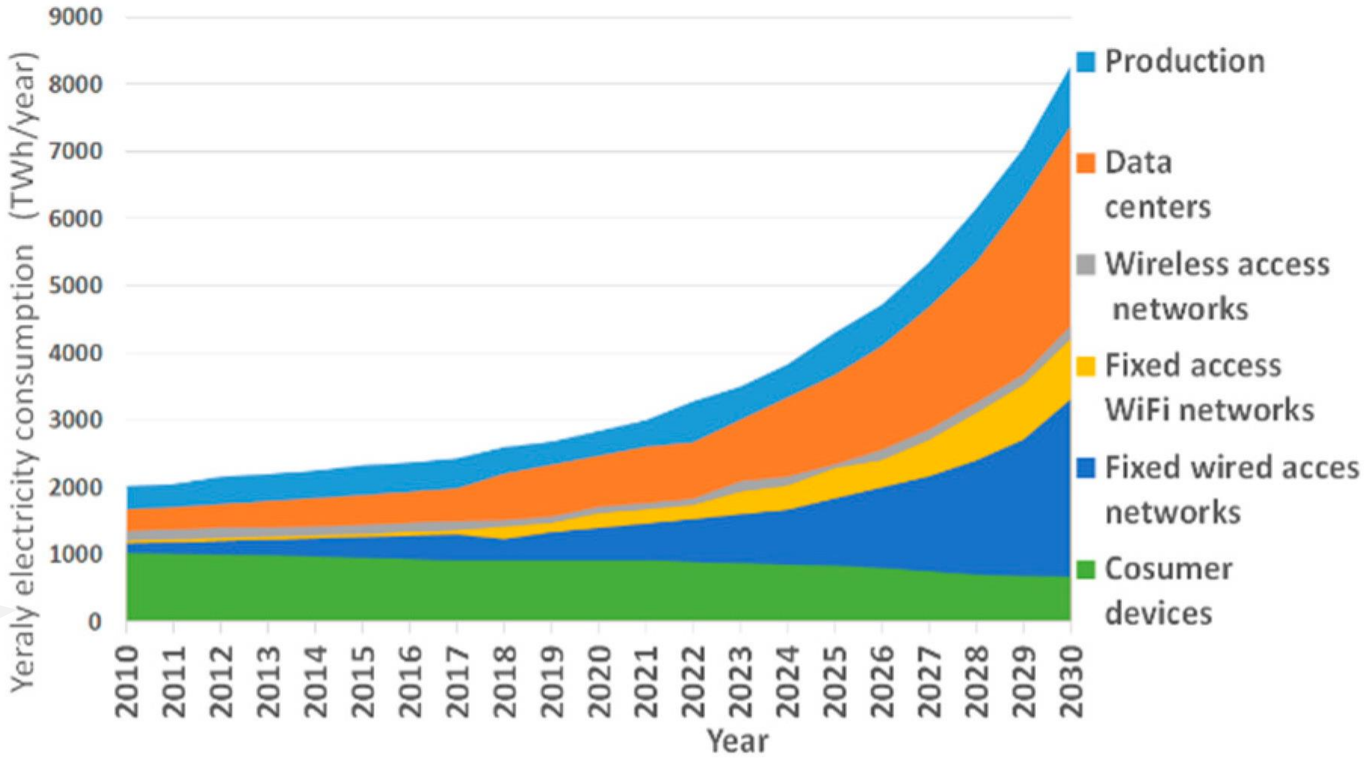
BACKUP

ICT Electricity Usage…Growing Significantly

Q: Measured vs Projected?

US consumes ~4000 TWh/yr

UK consumes ~325 TWh/yr



Information Communication Technology (ICT)

projected energy usage as a percentage of total electricity **is notable!**

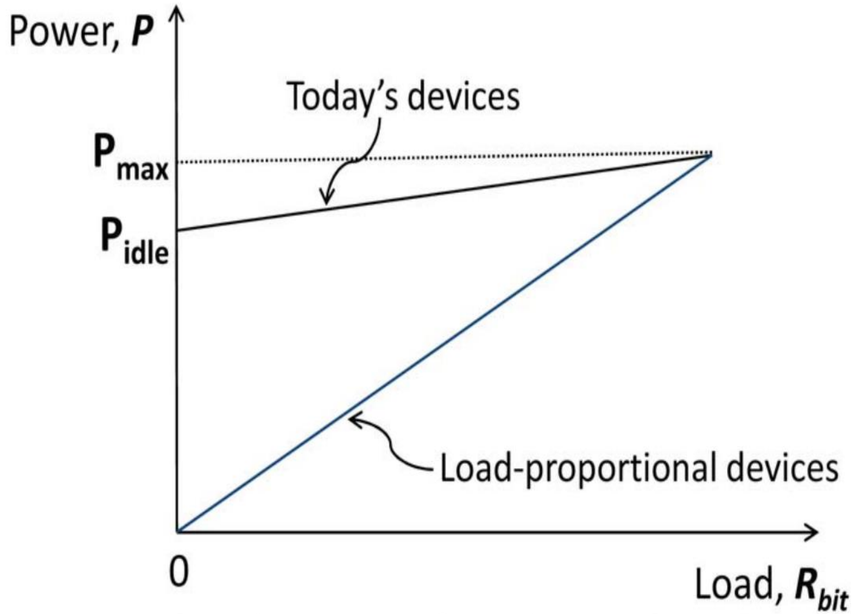
(2%-24% forecasts)

Source: Lorincz, Josip, Antonio Capone, and Jinsong Wu. "Greener, energy-efficient and sustainable networks: state-of-the-art and new trends" Sensors, (2019): 4864.

Sustainable Network Challenges

- **Many Networks are NOT *power-proportional***
  - Same energy expended irrespective of traffic load
- **Network *idle power* is significant**
  - Often very close to max power
- **Networks are vastly *overprovisioned***
  - Few network elements support *sleep states*
- **Networks are not *carbon-aware***

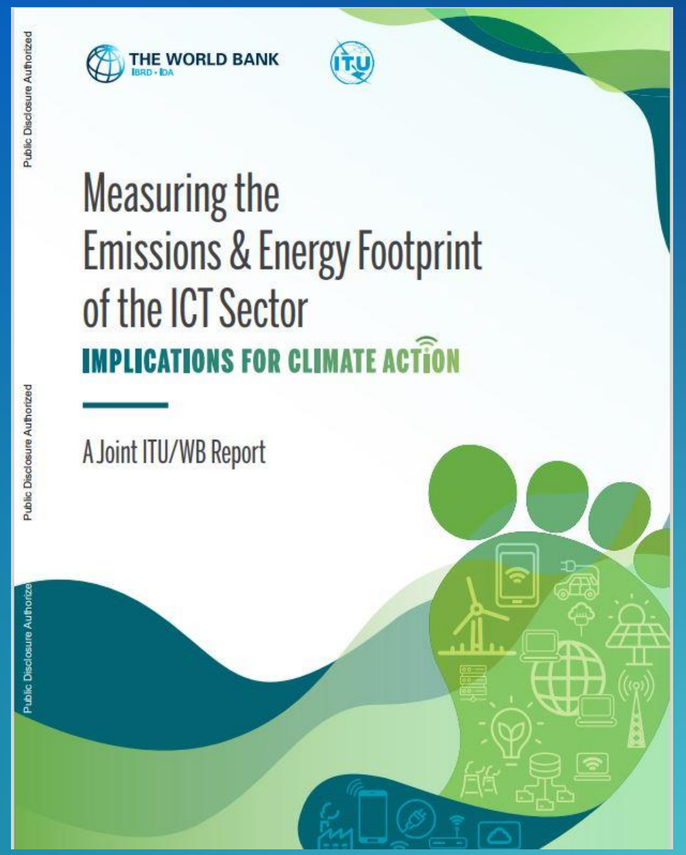
Power Consumption Profile

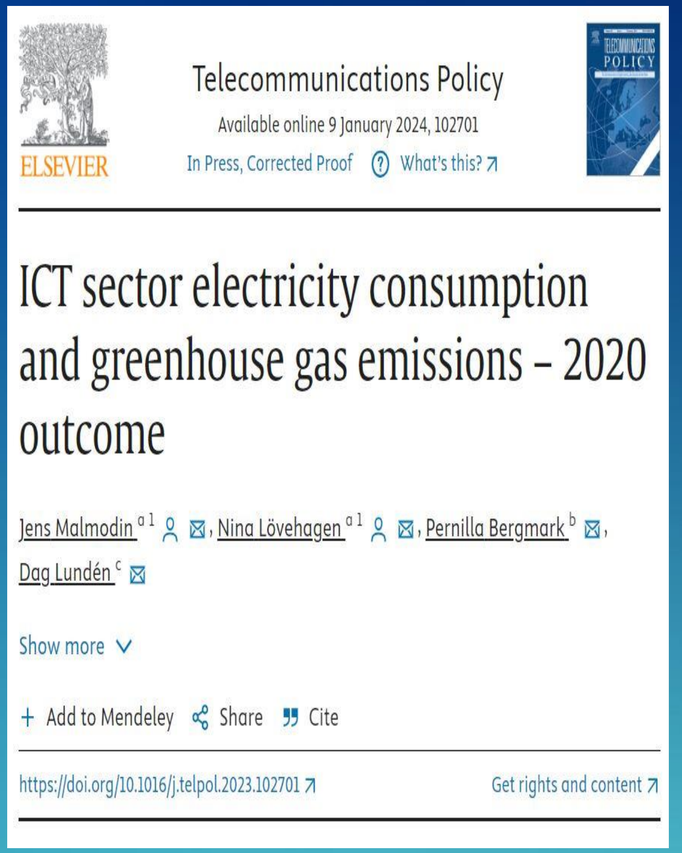


Source: "Modeling Energy Consumption in High-Capacity Routers and Switches", A. Vishwanath et al, IEEE JSAC, Vol.32, No.8, Aug 2014

Taking stock of sound industry assessments on ICT sector energy consumption & GHG emissions status quo:

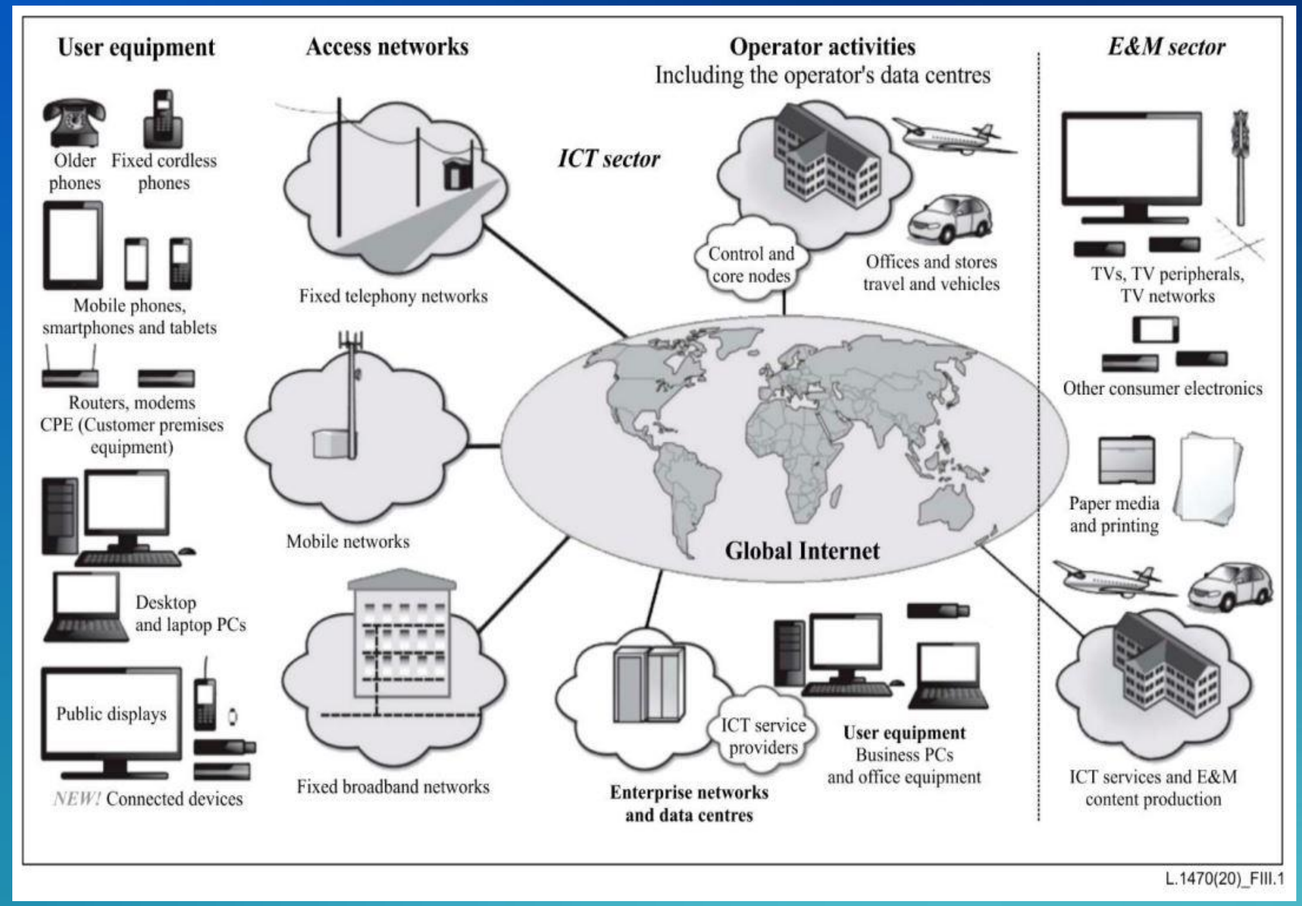
- In 2020, ICT sector used 4% of global electricity and emitted about 1.4% of GHGs.
- ICT sector emissions (%) tend to follow the global trend, somewhat increasing, definitely not decreasing.
- ICT sector has a relatively good renewable energy use.
- Electricity consumption and GHG emissions are not aligned with data growth rates, which are much higher.





Different ICT domains have differentiated impact

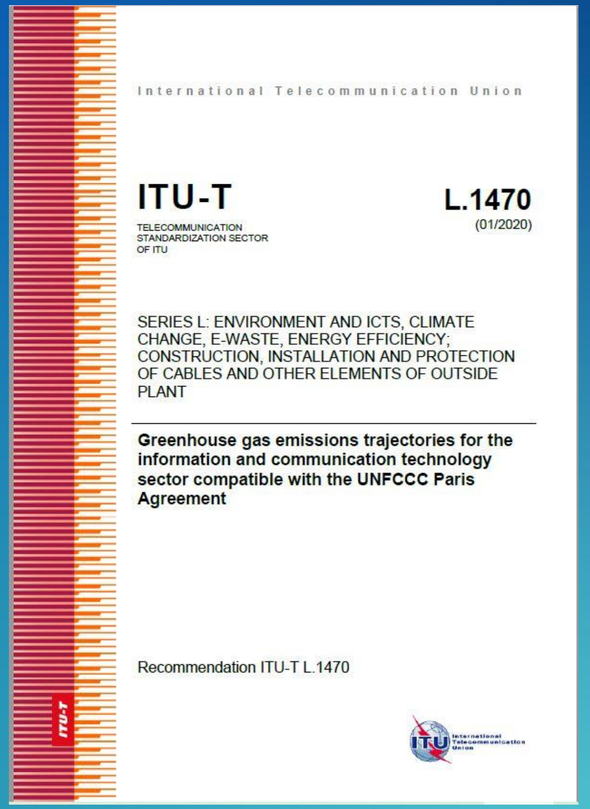
- User devices take up about 57% of sector GHG emissions with 50-50 split in use phase and embodied emissions.
- Networks, mobile & fixed (including core), take up 24 %, with 83 % in use phase and 17 % in embodied emissions.
- Data centers and enterprise networks take about 18 %, with 78 % in use phase and 22 % in embodied emissions.
- Per subscriber energy consumption is stable while emissions tend to decrease due to renewable energy use.

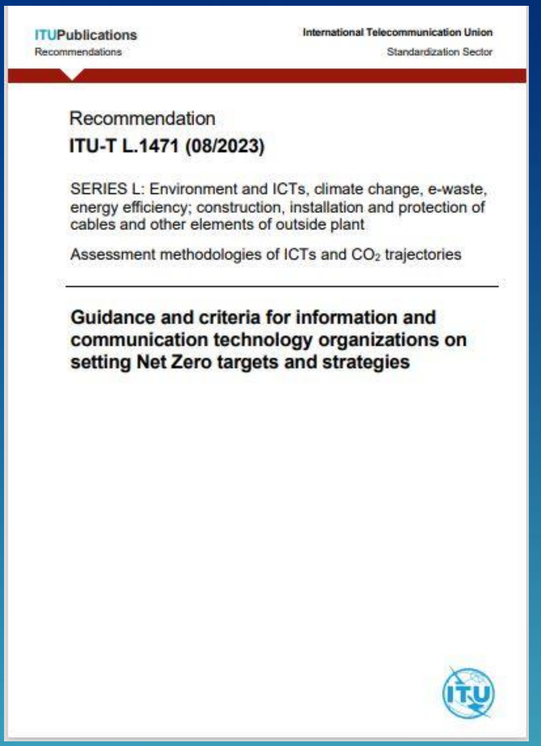


Share of ICTs in global GHG emissions is small: Why then, should we still care?

Why should we care?

- We are seriously off-course to meet the GHG emission reduction targets to meet the Paris Agreement goals: ICT Sector must halve its emissions by 2030 (ITU-T) !
- Most ICT organizations have net-zero pledges, and they are expected (soon required) to report on them.
- Renewable energy transition is not projected to make up for the delta in trajectories.
- One-third of the world population (2.6 billion people) remain unconnected to the Internet. Bridging this divide sustainably is a priority.
- ICT sector is fueling new trends like digital twins, metaverse and pervasive AI which might increase digitalization dramatically.





What should the ICT sector do then?

Actions for the ICT sector

First, we must not let the bathtub in our own house overflow!

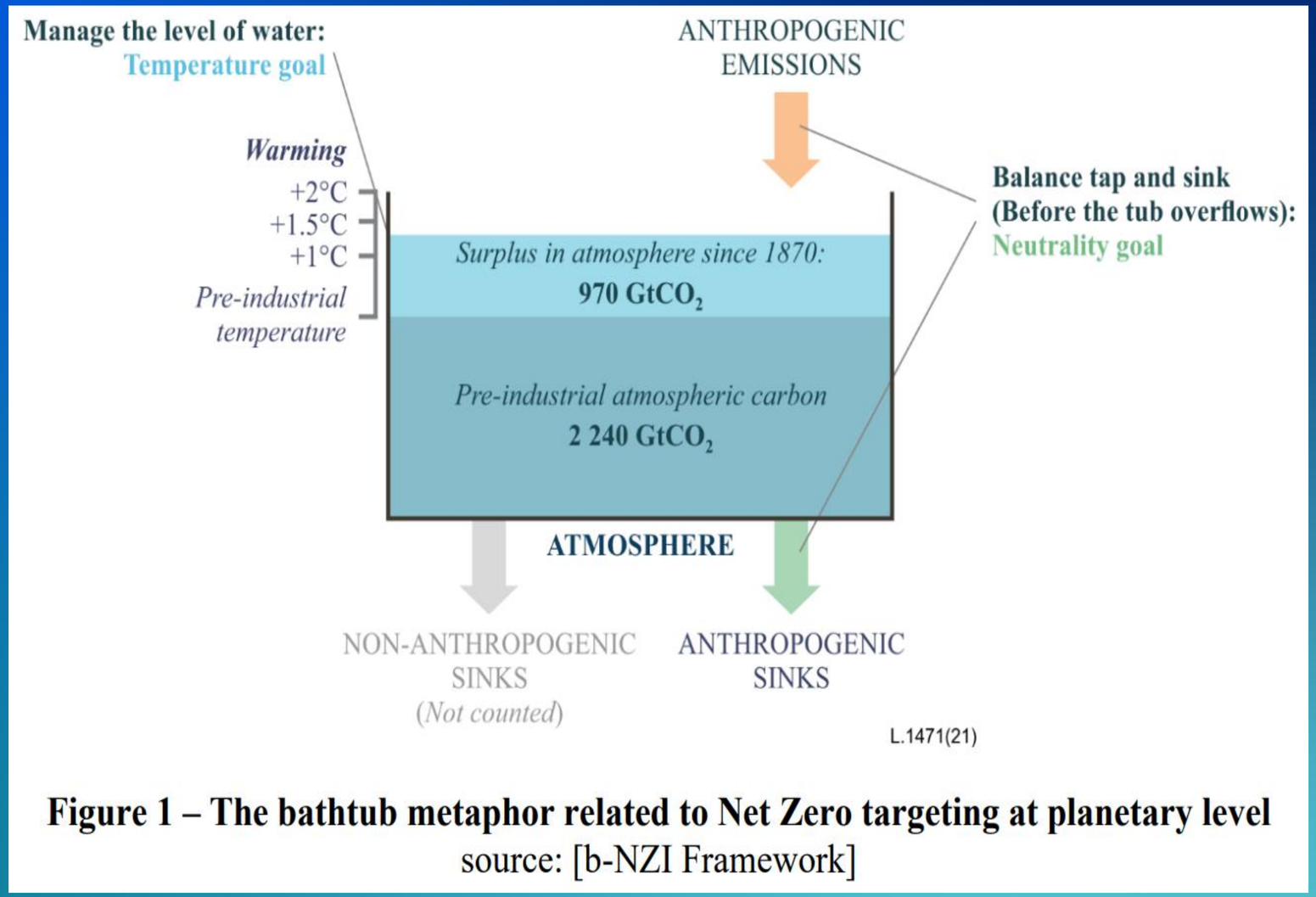


Figure 1 – The bathtub metaphor related to Net Zero targeting at planetary level
source: [b-NZI Framework]

Actions for the ICT sector – ctd.

- We must remember that ICT footprint covers more than GHG emissions: land, water and materials use as well as biodiversity loss are also pushing the planet to its limits and have feedback loops to the climate emergency.
  - That means materials efficiency and circularity matter, as well as how these materials are sourced (land/water use, pollution, species extinction and eco-system degradation)
- ICTs & Internet, being in global supply chains everywhere, punch above their weight when it comes to global sustainability: think enablement!
  - ICTs can help the decarbonization of other sectors as well as in adapting to the already occurring impacts of climate change: think resilience!

Climate change
Biodiversity loss
Geodiversity loss