# **EuroDIG Workshop 4**

# **Challenges and Opportunities: Emerging Technologies and Sustainability Impacts**

19 June 2024



# Workshop Agenda

Welcome – Session Moderator	Karen Mulberry Sr Manager, Public Affairs IEEE SA
Introduction to EU digital green policies and an overview of key EU areas of interest	Martina Barbero Policy Officer, Next Generation Internet, DG Communications Networks, Content and Technology (CNECT) European Commission
Technical standards development activities and recommendations from Planet Positive 2030	Sigmund Kluckner Chair, IEEE P7801 (SSIT-SC)
Case Study: Sustainable Use of a Smartphone	Prof. Dr. Mario Birkholz, Scientist Technology / High-Performance Si-Technologies IHP
Panel and Q&A	Moderator and Speakers
Closing Summary	Karen Mulberry

## Martina Barbero

Policy Officer, Next Generation Internet, DG Communications Networks, Content and Technology (CNECT) European Commission



# EuroDIG 2024 – Challenges and opportunities: emerging technologies and sustainability impact

. . . . . . . . . . . . . . .

19 June 2024

# **Focus of the presentation**

- The nexus between green transition and digital transformation
- European Commission's initiatives
- Spotlight on the web





The nexus between the green and digital transition



## The Nexus of Green Transition and Digital Transformation 1/2

- Both A European Green Deal and A Europe fit for the digital age are top policy priority for the European Commission (2019-2024)
- Understanding the interplay between green & digital is complex:
  - ICT footprint  $\rightarrow$  2.1 and 3.9% of total emissions; eWaste- fastest growing waste category + growing impact of AI (i.e. +30% on Microsoft CO2 emissions)
  - Green transition may block certain digitalisation patterns (built-in obsolescence, blockchain mining, single-use electronics etc.)
  - But digital transformation can also support climate neutrality. It can reduce 15-20% of total GHG emissions (i.e., 5G consumes 90% less than 4G per data package / for the same set of applications).
- Greening the ICT is a prerequisite to succeed across the two boards.



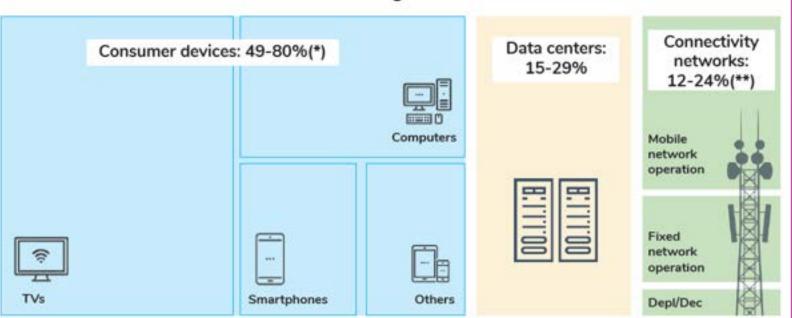
# European Commission initiatives



# More than a decade of EU action and more to come 1/3

#### FIGURE 1.2. Relative GHG emissions of the digital sector, by main components

ICT Sector: 1.5 - 4% of global GHG emissions



Note: (\*) TVs account for 25-50% of devices' emissions, computers for around 25%, smartphones 11-13%. 'Others' includes routers, connected devices, among others. (\*\*) Mobile network operations account for more than 50% of connectivity networks operations' emissions. 'Depl/Dec' stands for deployment and decommissioning, that accounts for 10 percent of total connectivity networks' emissions.

Source: Adapted from WIK and Ramboll (2021) to include estimates by Minges, Mudgal, and Decoster (forthcoming 2022) based on analysis of reported emissions by 150+ international digital companies and analysis of TVs emissions by Freitag et al (2021).

#### ICT accounts for:

- 7-9% of global electricity consumption
- 1.5-4% of global GHG emission
- An increasing amounts of e-waste



# More than a decade of EU action and more to come 2/3

- Since 2013: Codes of Conduct for <u>Data Centres</u> and <u>Broadband Equipment</u>
- Since 2018 <u>European Processor Initiative</u> to develop in low-power processors
- 09.12.21: <u>EU Taxonomy Climate Delegated Act</u> in force
- 18.10.22: Action Plan on Digitalising the Energy System

Develop an energy-labelling scheme for computers and evaluate a possible revision of the eco-design regulation on servers and data storage products. Explore the possibility to develop common indicators for measuring the environmental footprint of electronic communications services.

Establish an EU Code of Conduct for the sustainability of telecommunications networks.



## More than a decade of EU action and more to come 3/3

- European Green Digital Coalition Declaration  $\rightarrow$  39 CEOs of ICT companies with 2040 Net Zero targets have committed to take action for:
  - Investing in the development and deployment of green digital solutions with significant energy and material efficiency that achieve a net positive impact in a wide range of sectors.
  - Developing <u>methods and tools</u> to measure the net impact of green digital technologies on the environment and climate by joining forces with NGOs and relevant expert organizations.
  - Co-creating, with representatives of other sectors, <u>recommendations and guidelines</u> for green digital transformation of these sectors that benefits environment, society and economy.
- <u>Coalition</u> recently published the <u>Net Carbon Impact Assessment Methodology for</u> <u>ICT Solutions</u> delineating requirements for a comprehensive comparison of scenarios with and without ICT solutions.



# Spotlight on the web

Z

 $\bowtie$ 

Yor -

(1-

<u></u>



Y

A

What's next? Greening the web – the missing link? 1/3

Infrastructure layer (Connectivity networks, Broadband, Data Centres, Internet exchange points, Telcos ...)

**The Internet** (domain name system, websites, internet standards and protocols, ...) Applications and products (Specific technologies - IoT, AI, Blockchain – industrial sectors, devices, ...)



## What's next? Greening the web – the missing link? 2/3

The Declaration on the Future of the Internet (2022) signed by 70 countries includes in its vision:

- Infrastructure is designed to be secure, interoperable, reliable, and sustainable
- Technology is used to promote pluralism and freedom of expression, sustainability, inclusive economic growth, and the fight against global climate change
- The aim is to "cooperate to maximize the enabling effects of technology for combatting climate change and protecting the environment whilst reducing as much as possible the environmental footprint of the Internet and digital technologies (under 'trust in the digital ecosystem') "

#### A DECLARATION for the FUTURE of the INTERNET

e are united by a belief in the potential of digital technologies to promote connectivity, democracy, peace, the rule of law, sustainable development, and the enjoyment of human rights and fundamental freedoms. As we increasingly work, communicate, connect, engage, learn, and enjoy leisure time using digital technologies, our reliance on an open, free, global, interoperable, reliable, and secure Internet will continue to grow. Yet we are also aware of the risks inherent in that reliance and the challenges we face.

We call for a new Declaration for the Future of the Internet that includes all partners who actively support a future for the Internet that is open, free, global, interoperable, reliable, and secure. We further affirm our commitment to protecting and respecting human rights online and across the digital ecosystem. Partners in this Declaration intend to work toward an environment that reinforces our democratic systems and promotes active participation of every citizen in democratic processes, secures and protects individuals' privacy, maintains secure and reliable connectivity, resists efforts to splinter the global Internet, and promotes a free and competitive global economy. Partners in this Declaration invite other partners who share this vision to join us in working together, with civil society and other stakeholders, to affirm guiding principles for our role in the future of the global Internet.

#### RECLAIMING THE PROMISE OF THE INTERNET

The immense promise that accompanied the development of the Internet stemmed from its design: it is an open "network of networks", a single interconnected communications system for all of humanity. The stable and secure operation of the Internet's unique identifier systems have, from the beginning, been governed by a multistakeholder approach to avoid Internet fragmentation, which continues to be an essential part of our vision. For business, entrepreneurs, and the innovation ecosystem as a whole, interconnection promises better access to customers and fairer competition; for artists and creators, new audiences; for everyone, unfettered access to knowledge. With the creation of the Internet came a swell in innovation, vibrant communication, increased cross-border data flows, and market growth—as well as the invention of new digital products and services that now permeate every aspect of our daily lives.

Over the last two decades, however, we have witnessed serious challenges to this vision emerge. Access to the open Internet is limited by some authoritarian governments and online platforms and digital tools are increasingly used to repress freedom of expression and deny other human rights and fundamental freedoms. State-sponsored or condoned malicious behavior is on the rise, including the spread of disinformation and cybercrimes such as ransomware, affecting the security and the resilience of critical infrastructure while holding at risk vital public and private assets. At the same time, countries have erected firewalls and taken other technical measures, such as Internet shutdowns, to restrict access to journalism, information, and services, in ways that are contrary to international human rights commitments and obligations. Concerted or independent actions of some governments and private actors have sought to abuse the openness of Internet governance and related processes to advance a closed vision. Moreover, the once decentralized Internet economy has become highly concentrated and many people have legitimate concerns about their privacy and the quantity and security of personal data collected and stored online. Online platforms have enabled an increase in the spread of illegal or harmful content that can threaten the safety of individuals and contribute to radicalization and violence. Disinformation and foreign malign activity is used to sow division and conflict between individuals or groups in society, undermining respect for and protection of human rights and democratic institutions.



# What's next? Greening the web – the missing link? 3/3

#### Some initial thoughts:

- Greener websites: widespread adoption of industry code of conducts and raising industry standards (i.e., low energy websites/web design, sustainable DNS hosting, consumer awareness and choice, ...,) building on what already existing (i.e., sustainable web manifesto, web sustainability guidelines from W3C)
- Greener internet protocols and standards: embedding sustainability and environmental requirements in the production of internet standards and protocols (i.e., within Internet Engineering Task Force, Internet Corporation for Assigned Names and Numbers, ...)
- Greener internet governance practices: reviewing Internet Governance community practices considering sustainability and environmental concerns (i.e., quid of regular in person meetings multiple time a year around the globe)





# **Questions?**



# Thank you



© European Union 2024

Unless otherwise noted the reuse of this presentation is authorised under the <u>CC BY 4.0</u> license. For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective rightholders.



## Sigmund Kluckner,

# Chair, IEEE P7801 (SSIT-SC)

# Digital Innovation for & in Sustainability

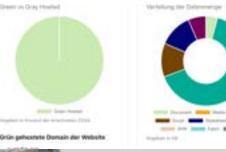
Technology and Standards for a Healthy Planet



# Why sustainability & technology?

What can we do?





#### https://www.eurodig.org/

\*Cleaner Web Score 76.35 Score dieser einzelnen Seite. Onfo

Datenmenge insgesamt

1.857 KB

Berechnete CO2e

0,34 Gramm Entspricht einem Digital Carbon Rating von C. (Info

# Make Technology More Sustainable

- > Circular Economy
- > Right to Repair
- Reduce duplication of work
  Standardization
  Knowledge Sharing of practices (e.g. OBPS)

Sustainable Web:
 Guidelines (e.g. W3C sustyweb)
 Audits (e.g. Cleaner Web)
 Good practices (e.g. streaming autoplay)

# Use Technology for Sustainability

- > Climate Change AI models, projections, ...
- > Digital Twins of the Earth
- > Industry 4.0, IoT, manufacturing improvements
- > Digital Product Passport
- > Online refurbished/used marketplaces, fixing guides, refurbished items

# We need to be fast.

# Where do we go from here?

- > Sustainability by design
- Can Internet policy and tech governance be a lever?
  Website emissions
  Renewable energy in data centers
- > Work together!



# become the future when the putile treatments

Imagine The Future We Can Build Together

- > Planet: Our focus.
- > **Positive**: Our purpose.
- > 2030: Our urgency.
- > 400+ experts collaborated on a vision for our planet









Compandium Insel, Service Dog to construe approaching the VEE Incoment Assessment Income In/941038

 > Two "impossible" goals: Transform Society and Infrastructure to Planet Positivity
 Identify Solutions we need for Planet Positive by 2030



*<b>¢IEEE* 

# Sustainability related standards projects within the IEEE Community (examples)

> P7800: Addressing Sustainability, Environmental Stewardship and Climate Change Challenges in Professional Practice

- > P7801: Technical Knowledge Commons Initiatives and Platforms
- > P7802: Measurement and Verification of Reduction of Greenhouse Gases
- > P7803: Inclusive Sustainable Smart Cities

# Join us & Thanks!

Sigmund Kluckner sigmund@kluckner.eu

## **Prof. Dr. Mario Birkholz**

Scientist Technology / High-Performance Si-Technologies IHP





Leibniz Institute for high performance microelectronics



# **Case Study: Sustainable Use of a Smartphone**

Mario Birkholz, IHP Frankfurt/Oder and TU Berlin, Germany

EuroDig 2024, June 17th – 19th, Vilnius, Lithuania

Slides will be made available



#### via

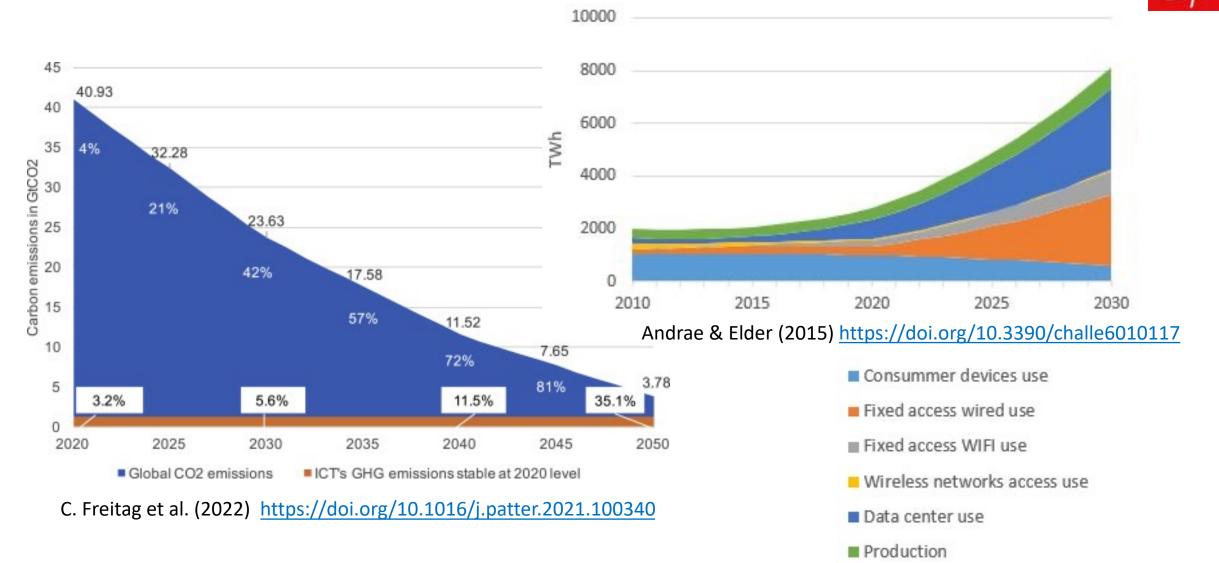
nextcloud on Technical University Berlin

→ <a href="https://tubcloud.tu-berlin.de/s/ZPk5BecenqbLT2Q">https://tubcloud.tu-berlin.de/s/ZPk5BecenqbLT2Q</a>

(shown again at the end)



#### **Energy consumption of the ICT sector**



#### **Everybody has a smartphone**





#### **Compare to Energy Consumptions of Smartphones**



#### CE Delft 2021

Network traffic and data storage of 546 million smartphones in Europe consumed 160 TWh in 2020. (10-17% were due to advertising and tracking by > 1700 apps) https://cedelft.eu/publications/carbon-footprint-ofunwanted-data-use-by-smartphones-an-analysis-for-the-eu/

#### Solar power

Electricity generated by photovoltaics in Europe amounted to 148 TWh in 2020 – a rather comparable amount.

https://ourworldindata.org/energy

Same order of magnitude !?





# Carbon footprint of unwanted data-use by smartphones

An analysis for the EU



This report was prepared by: Meis Uijttewaal, Geert Bergsma, Thijs Scholten

Delft, CE Delft, July 2021

#### How sustainable is this development?



ihp

Measuring against United Nations Sustainable Development Goals (UN SDGs) let us identify 10 out of 17 goals, where the use of a smartphone is in conflict with UN

FIGURE 1 Logos of the UN Sustainable Development Goals and highlighting the ones where smartphones have a critical impact.

#### Sustainable use of a smartphone and regulatory needs

Martin Kögler<sup>1</sup> | Katharina Paulick<sup>2</sup> | Jürgen Scheffran<sup>3</sup> | Mario Birkholz<sup>4,5</sup>

https://dx.doi.org/10.1002/sd.2995

#### Way Out: Individual Smartphone Settings

Gradual increase in sustainability and privacy – step by step Progress can be monitored by regularly checking battery status

- 1. Swith off WiFi whenever possible, i.e. when you don't need it
- 2. Swith off geolocalization whenever not needed
- 3. Change search engine and use Startpage, Ecosia, Qwant, Duckduckgo ...
- 4. Change browser and use Firefox or Brave with privacy settings given by <u>https://www.kuketz-blog.de/sichere-und-datenschutzfreundliche-browser-meine-empfehlungen-teil-1/</u>
- 5. Apps: increasingly make use of <u>Signal</u>, <u>Matrix/Element</u> or <u>Threema</u> instead of WhatsApp, <u>Mastodon</u> instead of Twitter/X or Facebook, <u>PeerTube</u> instead of YouTube, <u>Pixelfed</u> instead of YouTube....
- 6. Check data outflow and restrict it by making use of <a href="https://www.datarequests.org/">https://www.datarequests.org/</a>
- **7. In case of Android:** un-google your phone by switching to alternative operating system like /e/OS, LineageOS, UbuntuTouch ...



#### **MEGA Political Measures**

**Make Europe Great Again!** Digital Sovereignty of Europe should be in the focus. Great soft- and hardware is being / has been developed in Europe.

**Sustainable smartphones** are available like Fairphone, Shiftphone, ... Should be bought by any European administration as business devices starting top-down from European Commission to set a good example.



Foster OS diversity by supporting /e/OS etc. and introducing open app stores.

Lifetime extension of smartphones through right-to-repair, standardized and exchangeable batteries.

**Real social media** like Mastodon, PeerTube etc. were developed on the basis of W3C's ActivityPub protocol. They should become the standard social media for all European and national institutions.

**Shift humans into the centre** of digitalization, not profits of a few large companies. See Solidproject based on privacy-preserving data "pods" and its implementation in Flanders, Belgium.

**Support FOSS**, for which developers are doing a great job and receive inadequate compensation, e.g. Android-Open-Source-Project AOSP, Mastodon, PeerTube, LibreOffice ...



# Thank you for your attention

# and for taking consequences (at least, I hope)

Prof. Dr. Mario Birkholz Joint Lab Bioelectronics IHP/TUB

birkholz@be.tu-berlin.de



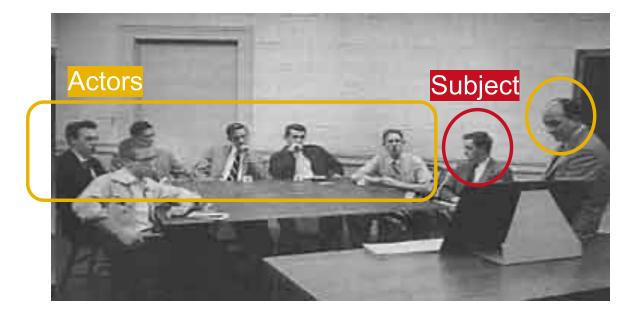
https://mastodon.social/@JLBe

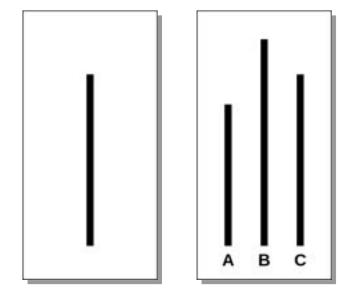
Slides of presentation available via <u>https://tubcloud.tu-berlin.de/s/ZPk5BecenqbLT2Q</u>



#### **Solomon Asch' Conformity Experiments (1950s)**







By Fred the Oyster, CC BY-SA 4.0 https://commons.wikimedia.org/w/index.php?curid=36619962

Aim of the study: to test how many subjects

would change their answer to conform to those of the 7 actors, despite it being wrong

Asch: "That intelligent, well-meaning young people are willing to call white black is a matter of concern."

We are loosing our inner compass and downsize our values, when a majority thinks/behaves different.



# Panel Discussion Q & A

