Climate, environment and ICT’s

Sustainable and Responsible Data Center Ecosystem seminar

22.5.2025

Antti Sipilä, TIEKE ry

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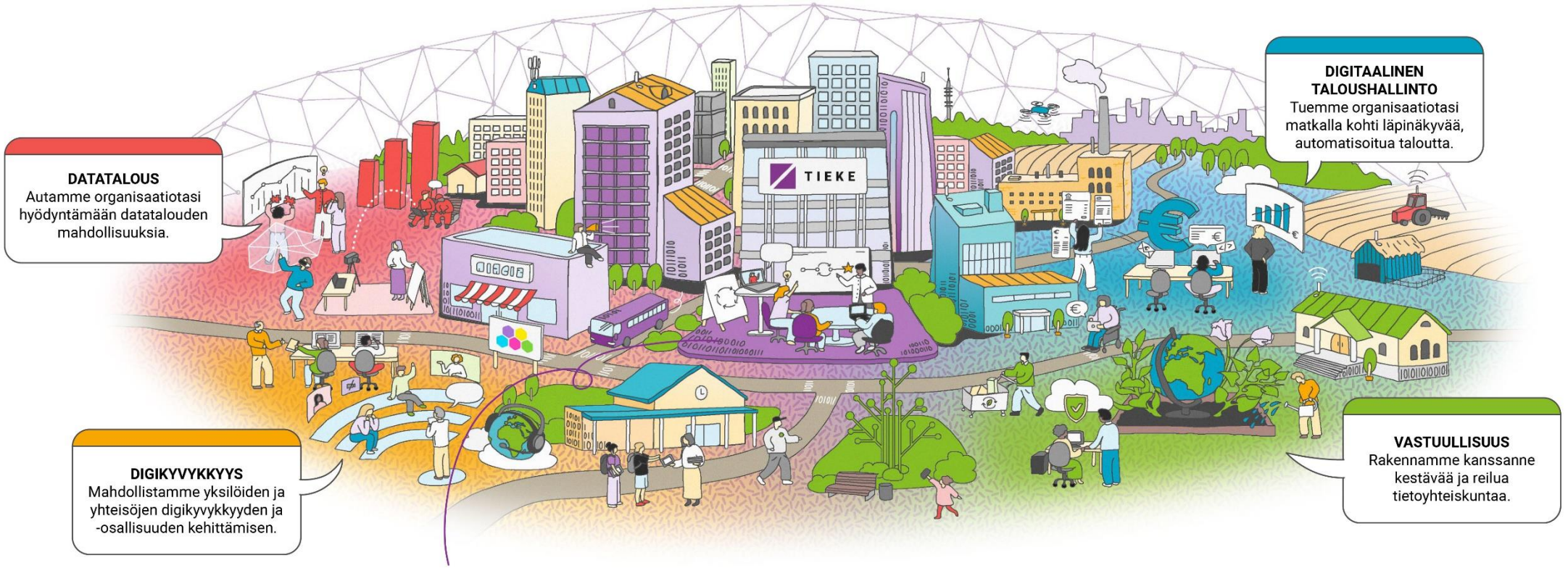
Elinkeino-, liikenne- ja ympäristökeskus

TIEKE

- Founded in 1981
- 14 employees
- Creating a sustainable and humane information society through projects and cooperation with partners
- Ask about membership from tieke@tieke.fi

TIEKE's strategic themes



KEHITTÄMISEN JA KEHITTYMISEN TOIMINTATAVAT

- Laadukkaasti, puolueettomasti, yhteisiin tarpeisiin
- Osaamista kehittäen
- Vaikuttavilla projekteilla
- Paikallisissa ja kansainvälisissä verkostoissa toimien

TIEKE

Sustainability in information society

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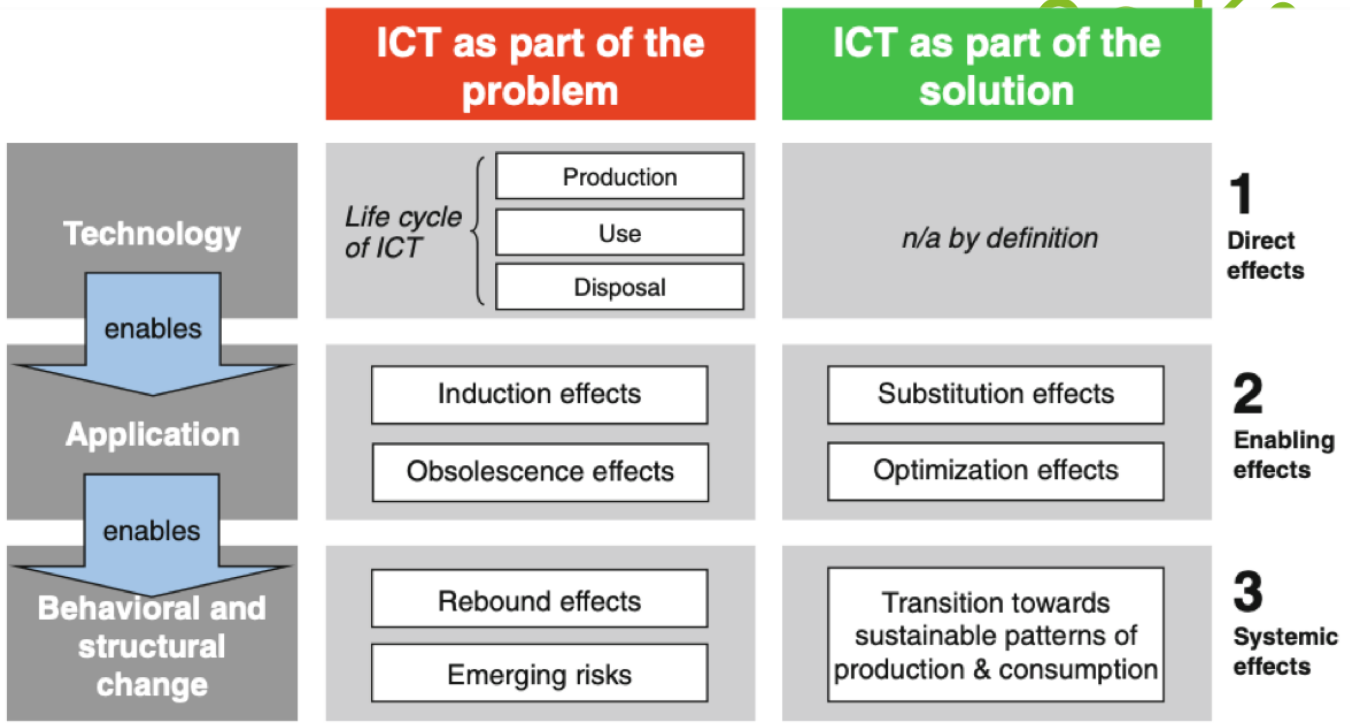
Why Sustainable ICT?

- Negative effects, footprint is large
- ICT's have a substantial handprint
- Effects have different scopes



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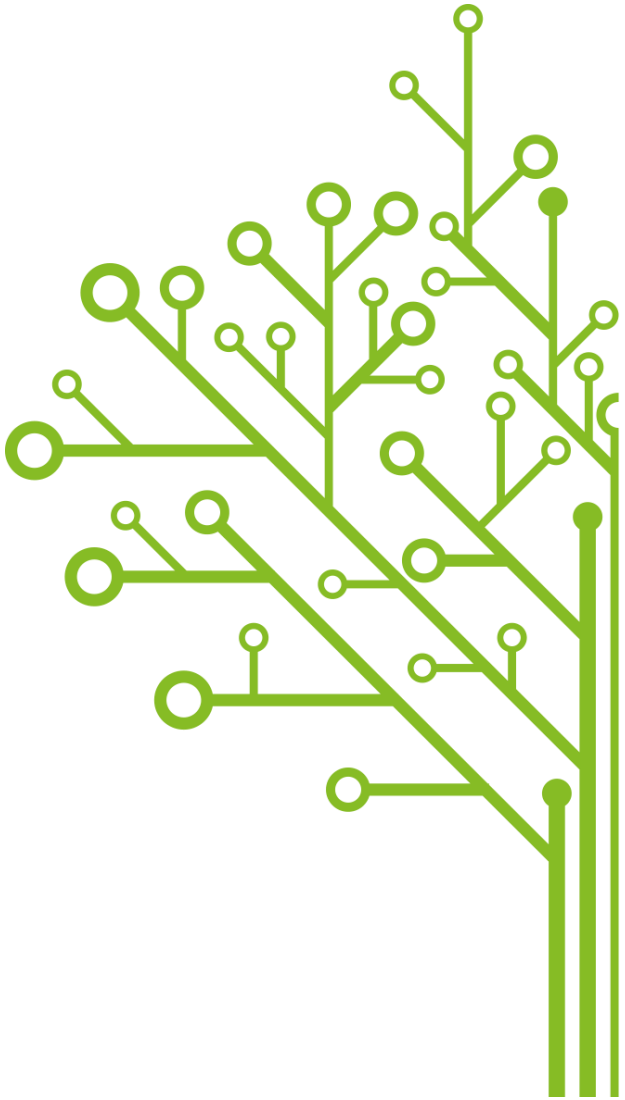
Information Society

- We are embedded in tech, "fishes in water"
- In modern societies we…
  - Date in Tinder, Bumble etc
  - Keep up with friends in FB, IG, Snap, Whatsapp etc.
  - Order stuff from eCommerce
  - Pay our bills with eBanking
  - Watch our entertainment from streaming services
- There is no sustainable ICT, there is sustainability and ICT is integral part of it in modern society



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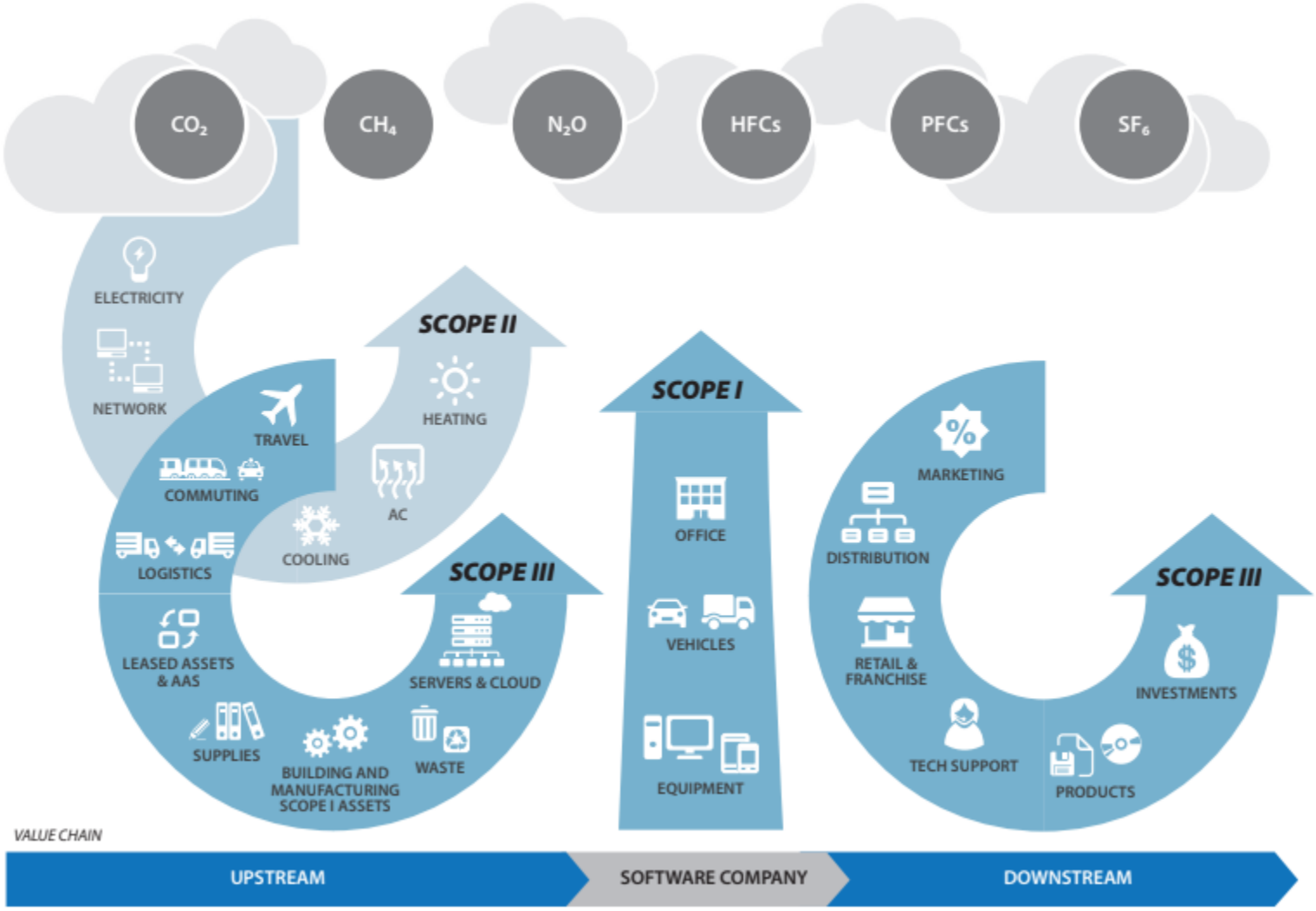
Carbon Footprint

- GHG-protocol
- Carbon emission calculations
- Uses CO^2-equivalent
- GHG-protocol
- 3 scopes
- Ownership of emissions?



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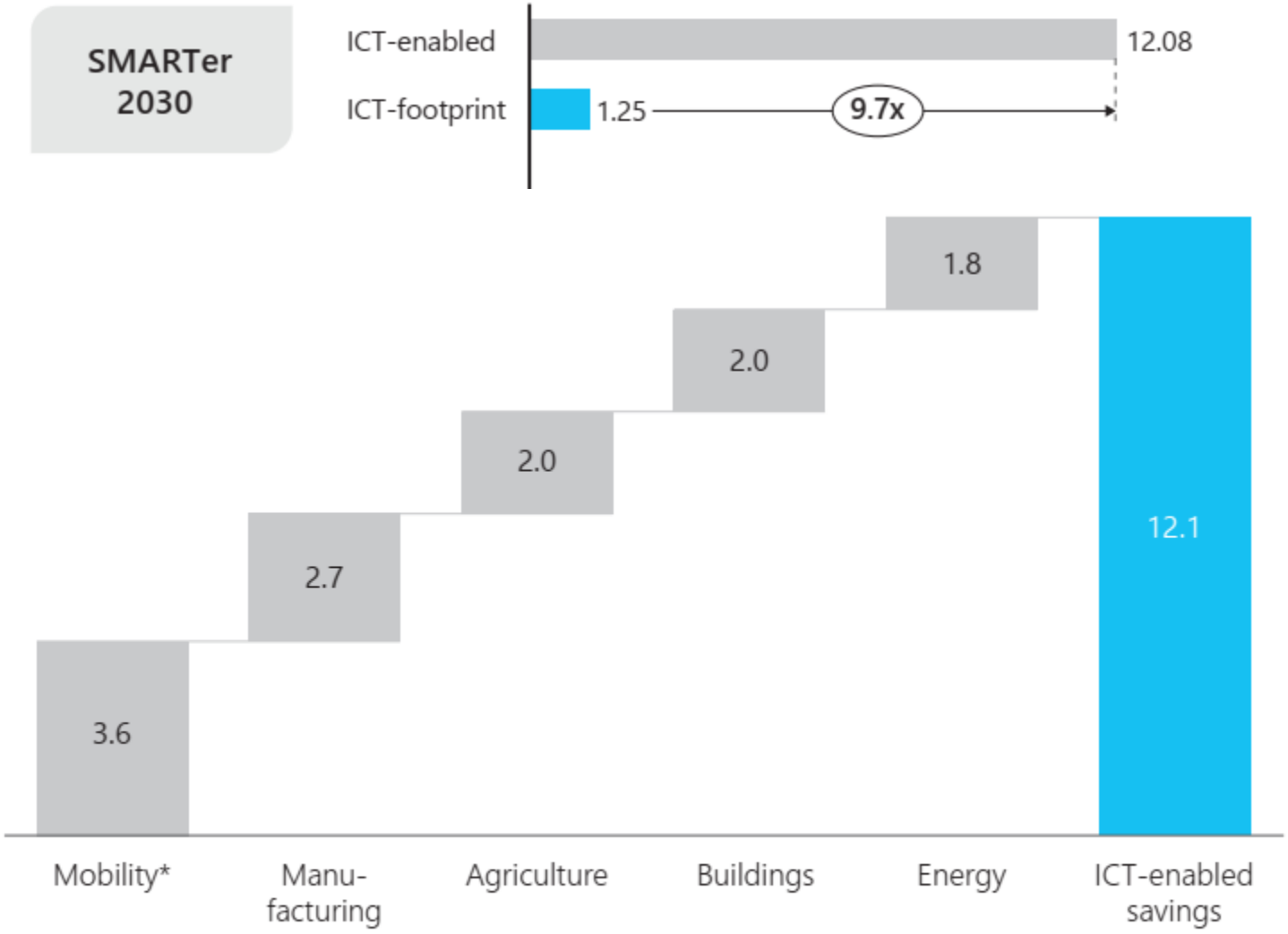
Carbon handprint

- ICT's positive effects in
- Information society, data economy
- Potential is 10x footprint
- Uses CO^2-equivalent



* Mobility solutions consider ICT-enabled improvements to private and commercial mobility and additionally consider the reduced need to travel from various sectors, including health, learning, commerce, etc.

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ICT’s effects

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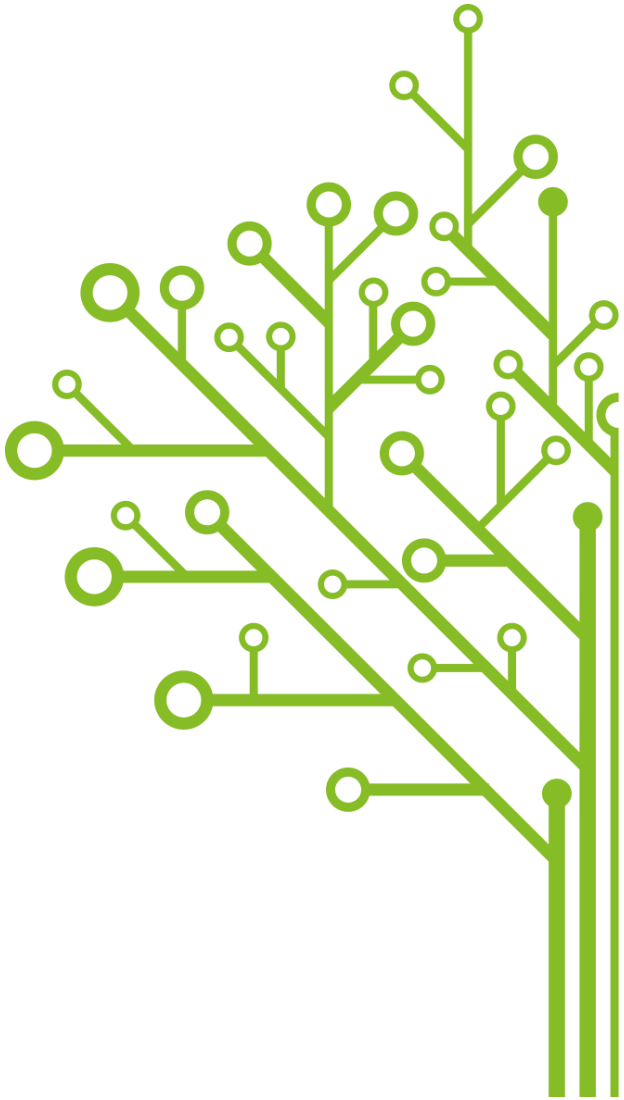
ICT's Climate Effects

- Emissions
  - ICT field: 1,25 – 2,07 Gt CO^2e (2.1 – 3.9 %, EU)
    - Apple: 16,1 M tonnes CO^2e
    - Meta: 14,1 M tonnes CO^2e
    - Microsoft: 14,5 M tonnes CO^2e
    - Google: 14,3 M tonnes CO^2e
  - Bitcoin 65 M tonnes CO^2e
  - Air travel industry ~1.2 Gt CO^2e
  - Global total: ~53 Gtonnes (53 000 000 000 tonnes) CO^2e
- Water usage
  - Datacenters alone use 16,4 billion litres globally
  - Average person in Finland uses 119 litres/day



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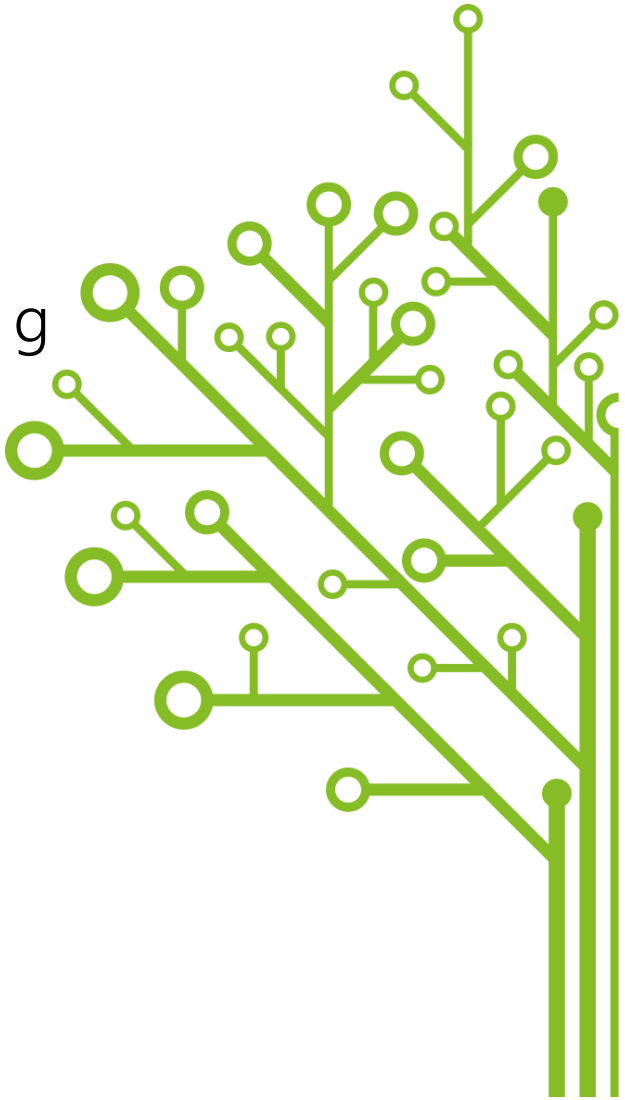
ICT's Climate Effects

- Email
  - Text email ~4 g CO^2e, with pdf/doc~20 g or pic files ~50 g
  - Letter mail (snail mail) by Royal Mail, 20-25 g/kirje
  - eInvoice and structured messages less than 1 g CO^2e
  - Total emails send in the world approx. 7 400 billion
  - Average car: 180 g/km, 45 emails = 1 km by car
- Average search engine query 0,1 – 0,2 g CO^2e
- One ChatpGPT query 4,3 g CO^2e
- Whatsapp msg 0,2 CO^2e, text msg 0,014 CO^2e



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ICT's Environmental Effects

eWaste

- Total globally 64,8 milj. tonnia, increase ~2.6 milj. tonnes/year
- Recycling rate 22,3 % globally, 49 % in Finland
- Trending to 100 M tonnes per year by 2038

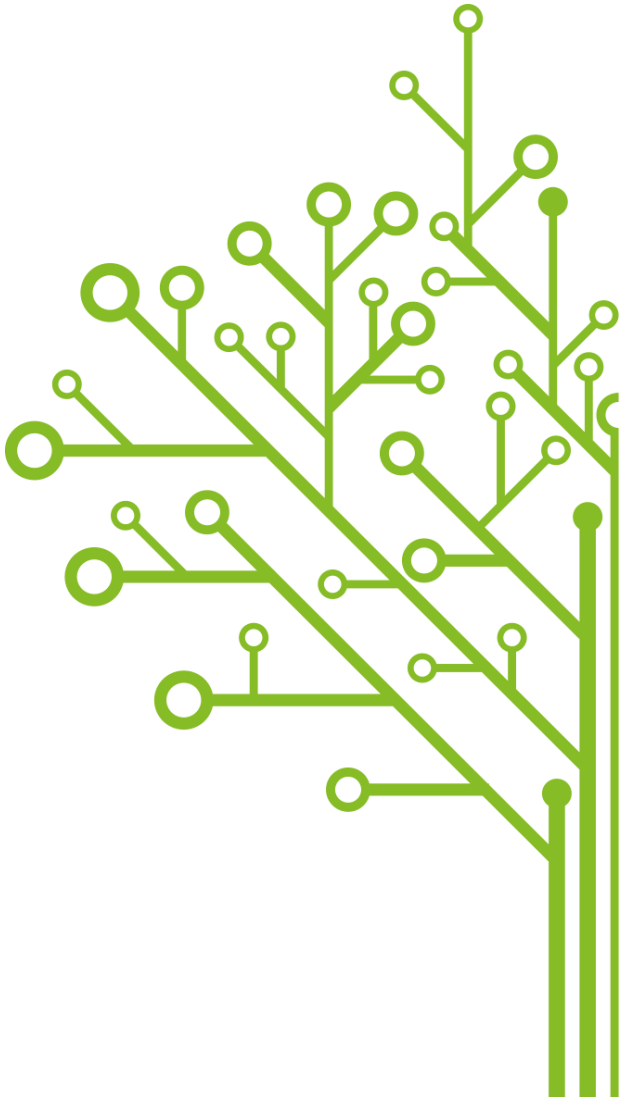
Conflict minerals

- Produced in the most vulnerable parts of the world, t.ex. CAR
- Produced in inhuman conditions, control drives conflict
- Definition: Gold, tantalum, tin, tungsten, (copper)

ICT-waste

- Includes 800-1000 different chemicals
- Many of them toxic (PVC, BFR, CR(VI), light/heavymetals)

RoHS ja WEEE directives in EU



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Green in Practice

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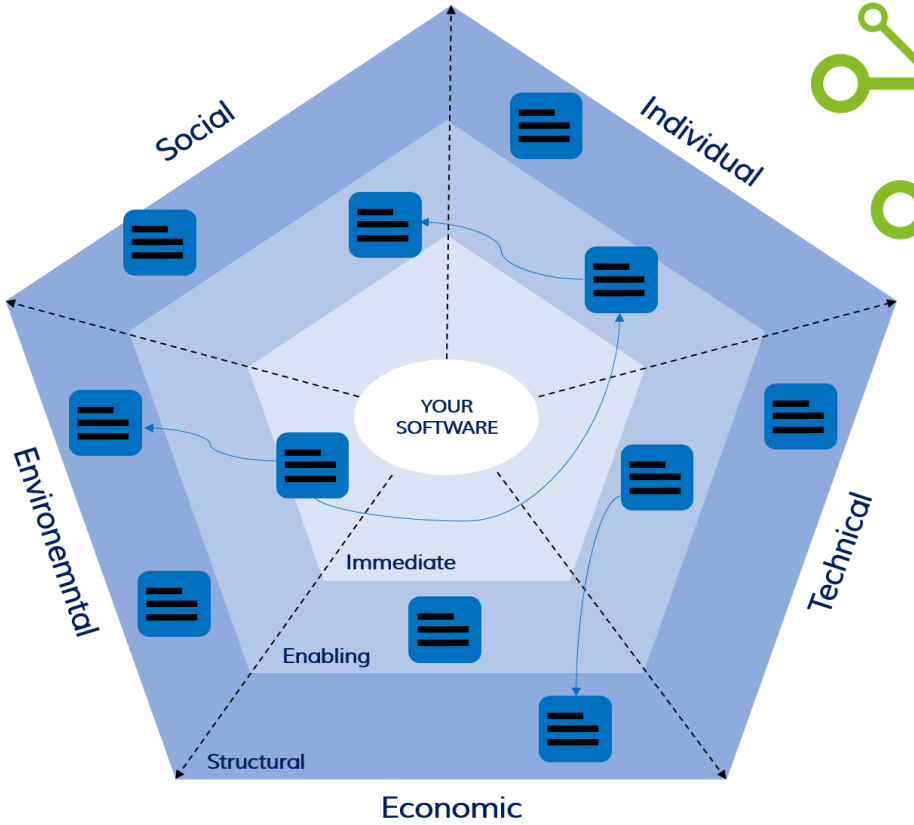
Sustainability in 5D

- Model for design of information systems
  - Environmental
  - Social
  - Economic
  - Human/Individual
  - Technical
- Three scopes of effects
  - Direct
  - Indirect
  - Structural



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Information Systems in 5D

- **Environment** – Usage of power and device resources by the system, e.g. Tech and power demands of AI
- **Economy** – Cost efficiency of information systems for the procurer and the producer, e.g. Apotti
- **Social** – Societal and cultural impacts of the information systems, e.g. AirBnB
- **Individual** – Individual welfare, usability, design, ergonomy etc., e.g. services for aging population
- **Technical** – Ability of the information systems to adapt to changing circumstances and requirements e.g. Nokia phones

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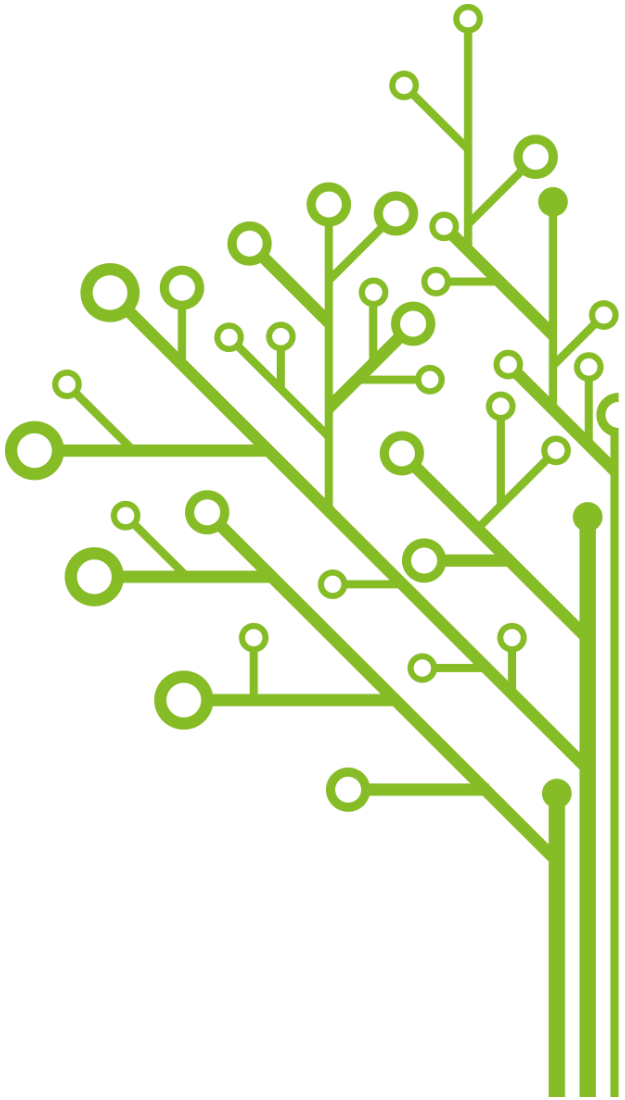
Sustainability thinking

- Sustainable development is not a goal, it is a way of thinking
- Sustainability is a scalable property
- Sustainability is a balance, there are positive and negative effects
- Sustainability is systemic, effects are direct, indirect and structural
- Question: How can I do this more sustainably?



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Data Centers and sustainability

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Climate and environment

- Consumption of energy and resources
  - Energy usage, can it be green?
  - Water usage, can it be mitigated?
  - LCA of equipment and e-waste management
  - Land usage
- Benefits
  - Centralization of computation is effective
  - Controlled environment for equipment longevity
  - Virtualization and cloud computation
  - Virtual economy instead of material consumption

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Individuals and society

- Whose data and who benefits?
  - Electricity costs, do we all pay the bill?
  - Data centers, services and who owns them?
  - What is the purpose and are there strings attached?
  - How does digital overconsumption affect us? –Prof J. Haidt
- How do people and the society benefit?
  - Public cloud under Finnish regulatory oversight and jurisdiction, could it be safer to use this way?
  - New companies, possibilities for R&D and academic co-op
  - Enabling effects, such as backbone network strengthening, more undersea connections to wider world

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Economy

- Refining the centers
  - "Data center is low refinement level ICT" –Prof Manner
  - Most centers are hyperscalers, what is their benefit?
  - Do the economic benefits stay in Finland?
  - Can we build more refined products on them?
  - Can we produce enough electricity?
- Economic benefits
  - Building centers is a boost for local economy
  - Data centers need services around them
  - Direct and indirect tax income
  - Potential for highly skilled labour immigration

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Thank you!

Sustainability is the starting point, it is a way of thinking

Ekosysteemi: https://greenict.fi/
LinkedIn: Sustainable ICT Finland –ryhmä

Nettisivut: https://tieke.fi ja Youtube @tiekery

Tule nykäisemään hihasta virtuaalisesti!

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OULUN YLIOPISTO TURUN YLIOPISTO UNIVERSITY OF EASTERN FINLAND

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