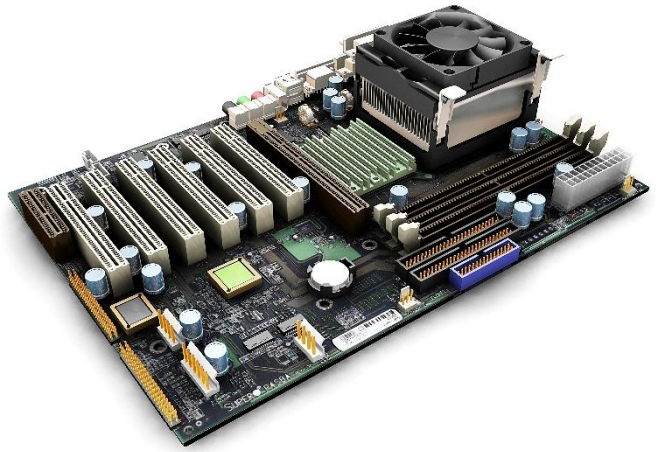
Digital sufficiency

A (relatively) new (but underrated) perspective on digitalisation as a driver for sustainability



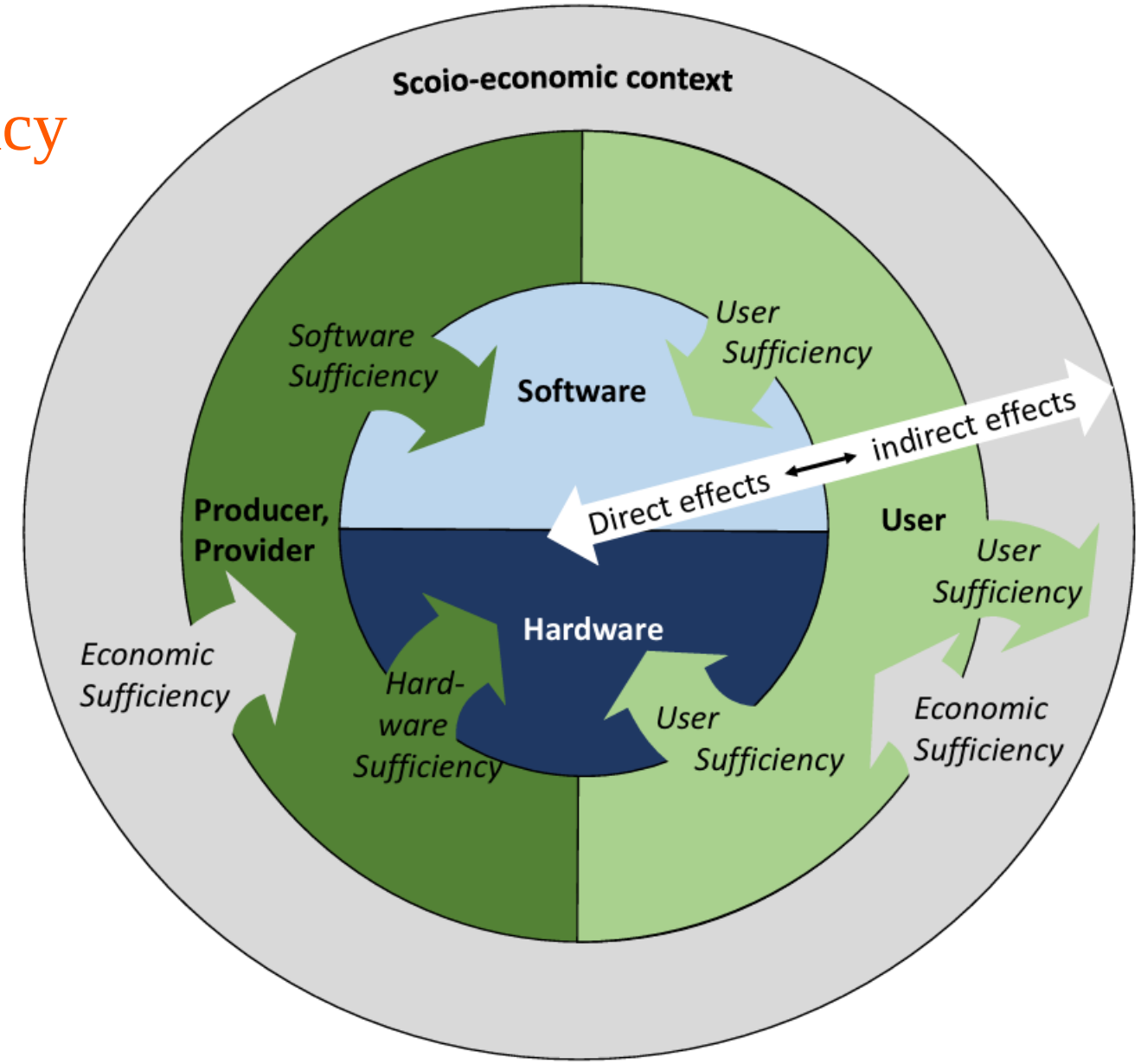
Dr. Vivian Frick
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The concept of digital sufficiency

- Any strategy aimed at directly or indirectly decreasing the absolute level of resource and energy demand from the production or application of information and communication technology (ICT)
- Indispensible part of sustainability
- Centre question: how can we provide a good life for all within planetary boundaries?

→ social justice



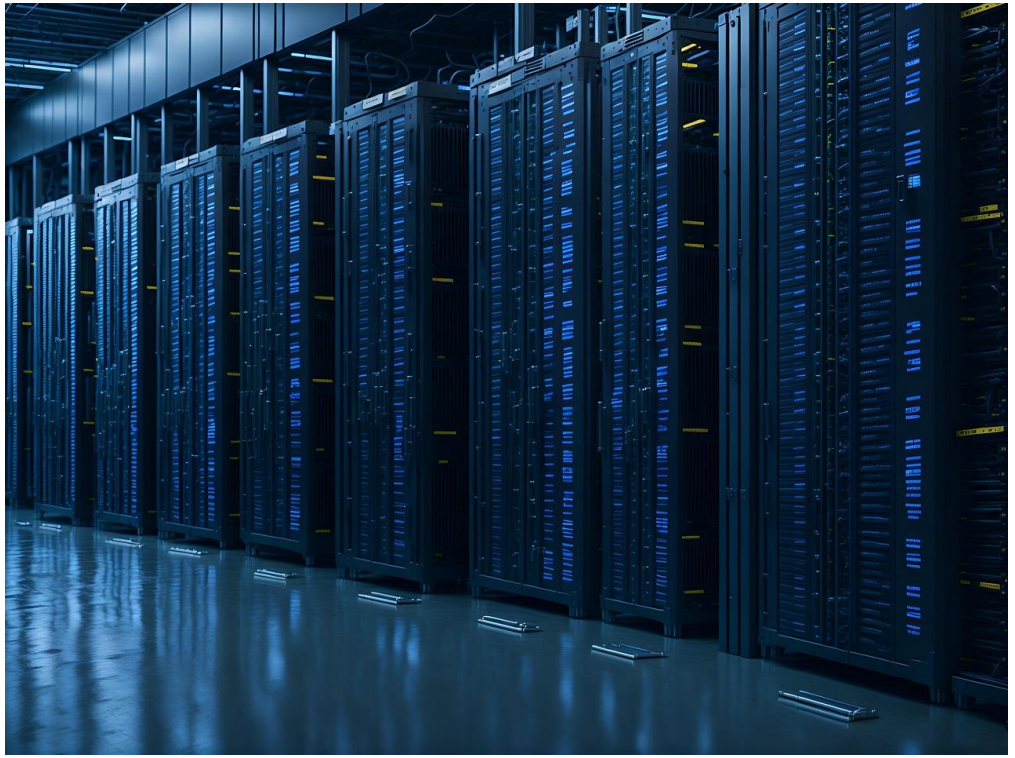
Santarius, T., Bieser, J. C., Frick, V., Höjer, M., Gossen, M., Hilty, L. M., ... & Lange, S. (2023). Digital sufficiency: conceptual considerations for ICTs on a finite planet. *Annals of Telecommunications*, *78*(5), 277-295.

Hardware sufficiency



… aims at extending the product life of devices by…

- producing fewer devices
- designing long-lasting and energy-saving devices
- strenghtening repairability
- improving recovery (e.g., refurbishment, repurposing, recycling)



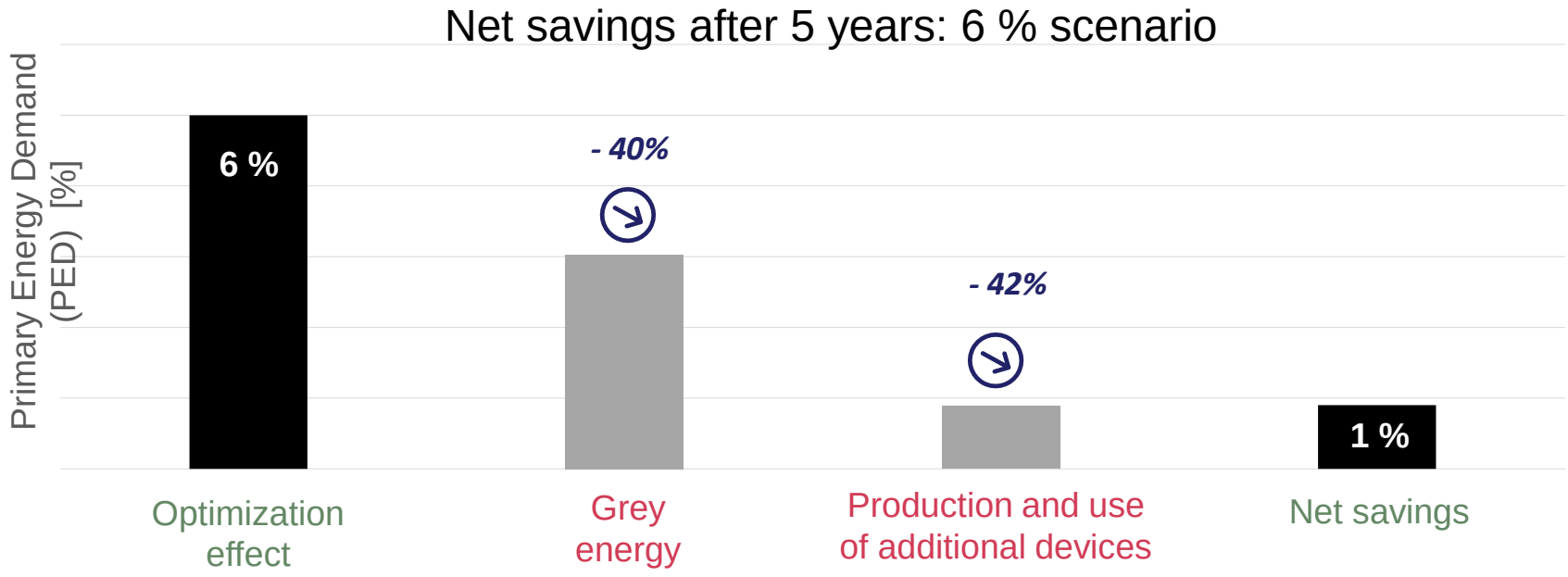
Pixabay; TheDigitalArtist

Case 1: The smart home



- Smart homes have the potential to save energy, mainly through smart heating
- In reality, users compose smart home systems based on further motivations, applying services that increase environmental impact

„a new round of household electrification“ (Ropke 2010)



Pohl, J., Frick, V., Hoefner, A., Santarius, T., & Finkbeiner, M. (2021). Environmental saving potentials of a smart home system from a life cycle perspective: How green is the smart home?. *Journal of Cleaner Production*, *312*, 127845.
Frick, V., Nguyen, T.N., (2021). Energieeinsparung, Sicherheit, Technikbegeisterung und Konsumismus. Eine motivbasierte Typologie von Smart-Home-NutzerInnen in Deutschland. Umweltpsychologie 01/21. 21(1). 19-42.

Software sufficiency



… aims at reducing data volume, traffic, and demand for computing power by…

- designing sustainable software
- minimizing the amount of collected/processed/produced data
- designing software in a way that allows the use of older hardware

Case II: Video streaming



In our 7-day pilot study in 2019 (N = 91), participants used 5 % of their yearly carbon budget only for video streaming.

CO2-intensity of video streaming depends on…

- **Reduce resolution (software sufficiency)**
  - Providers should set a low resolution as default
- **Prolong product lifetimes (back to hardware sufficiency)**
  - impact stems mainly from production and operational electricity demand
- **Reduce size of device (back to hardware sufficiency)**
  - smart TV vs smartphone (factor 10)

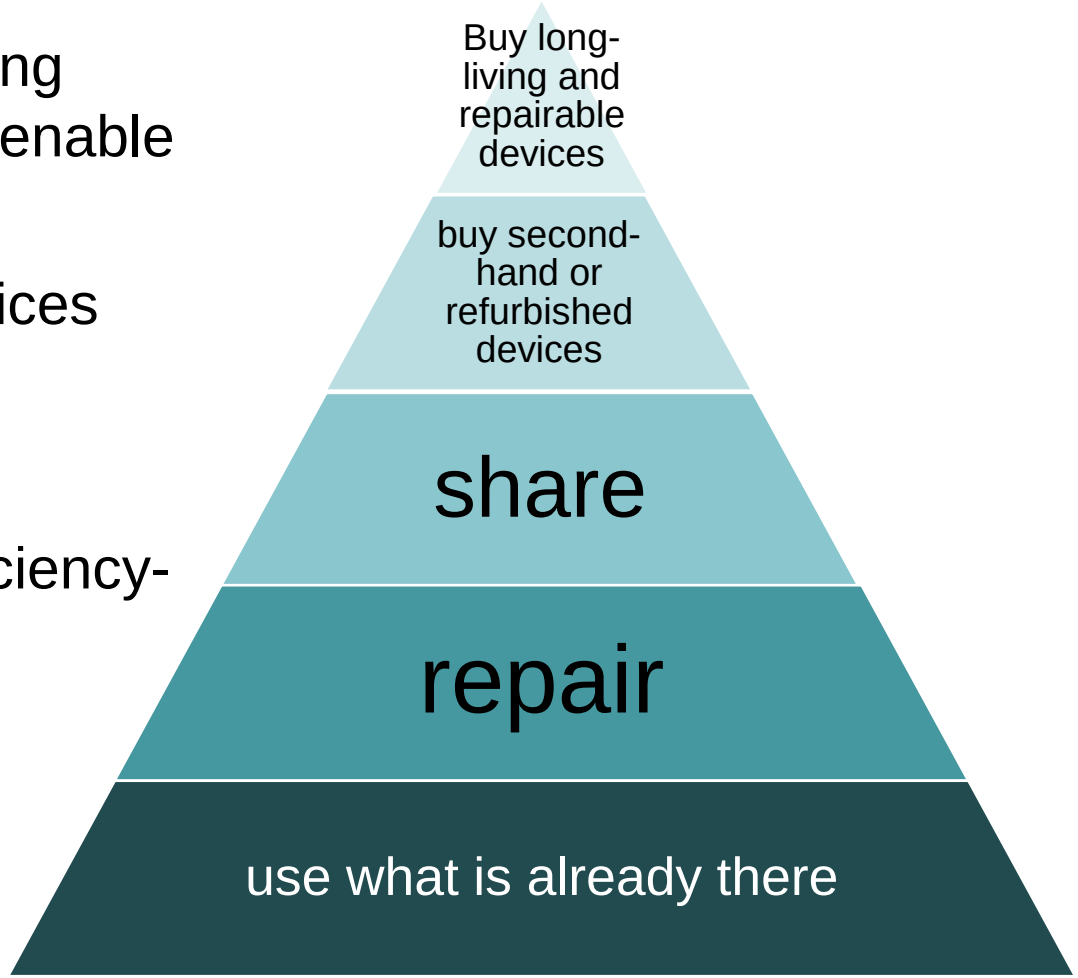
Suski, P., Pohl, J., & Frick, V. (2020). All you can stream: Investigating the role of user behavior for greenhouse gas intensity of video streaming. In *Proceedings of the 7th International Conference on ICT for Sustainability* (pp. 128-138).

User sufficiency



…aims at people and organisations applying digital services frugally and using them to enable sufficiency-oriented lifestyles by…

- purchasing and using devices and services frugally
- prolonging product lifetimes
- applying digital services to pursue sufficiency-oriented lifestyles



Case III: Online marketing & AI

sustain
Sustainability Index
for Artificial Intelligence

- Online environments contain substantial amounts of marketing
- There is a persisting correlation between marketing exposure and consumption level

"Does marketing lead to needs being created, or does it satisfy existing needs? […] If you look at the development of the automobile, or if you consider what an iPhone is: it satisfies needs that, 20 years ago, we didn't even know we could have. So, in my view, this rather suggests that ***marketing creates needs****."*
marketing employee at a medium-sized mail-order retailer

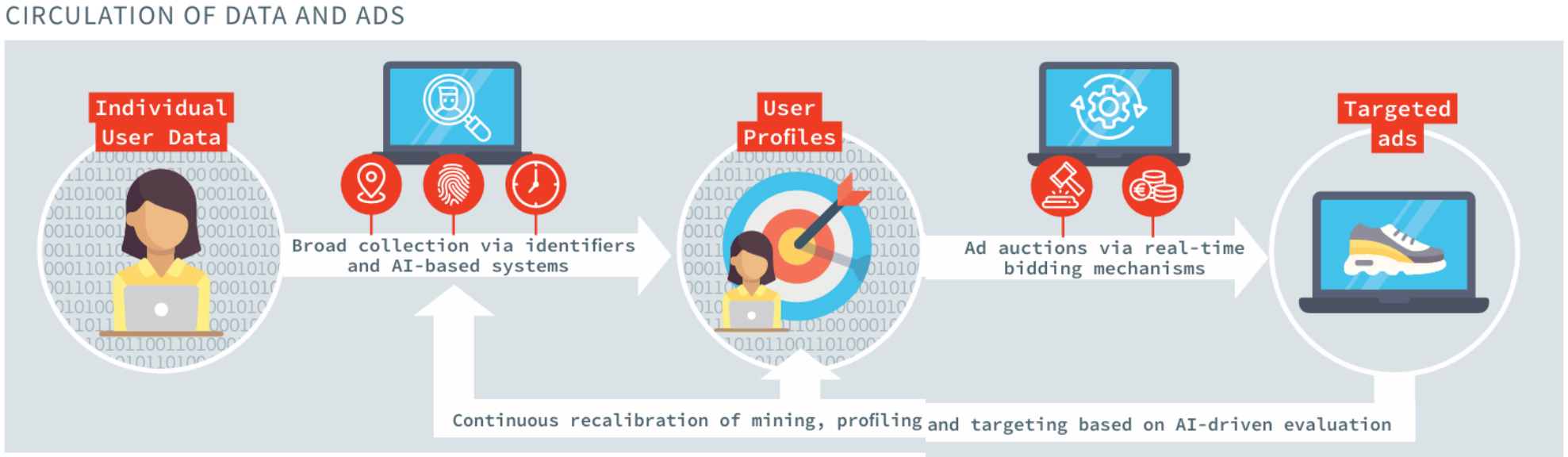
Frick, V., Matthies, E., Thøgersen, J., & Santarius, T. (2021). Do online environments promote sufficiency or overconsumption? Online advertisement and social media effects on clothing, digital devices, and air travel consumption. *Journal of Consumer Behaviour*, *20*(2), 288-308.
Frick, V., Gossen, M., & Kettner, S. E. (2022). Does online advertising stimulate overconsumption?. *Ökologisches Wirtschaften-Fachzeitschrift*, *37*(1), 46-50.
Marken, G., Frick, V., Schmelzle, F., & Meyer, A. (2024). The (Un-) Sustainability of Artificial Intelligence in Online Marketing. *Institute for Ecological Economy Research (IÖW): Berlin, Germany*.

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Case IÍI: Online marketing & AI

sustain
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for Artificial Intelligence

"*At least in my field,*
people know that machine learning is energy-intensive"
Data Scientist in an international marketing agency



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Economic sufficiency

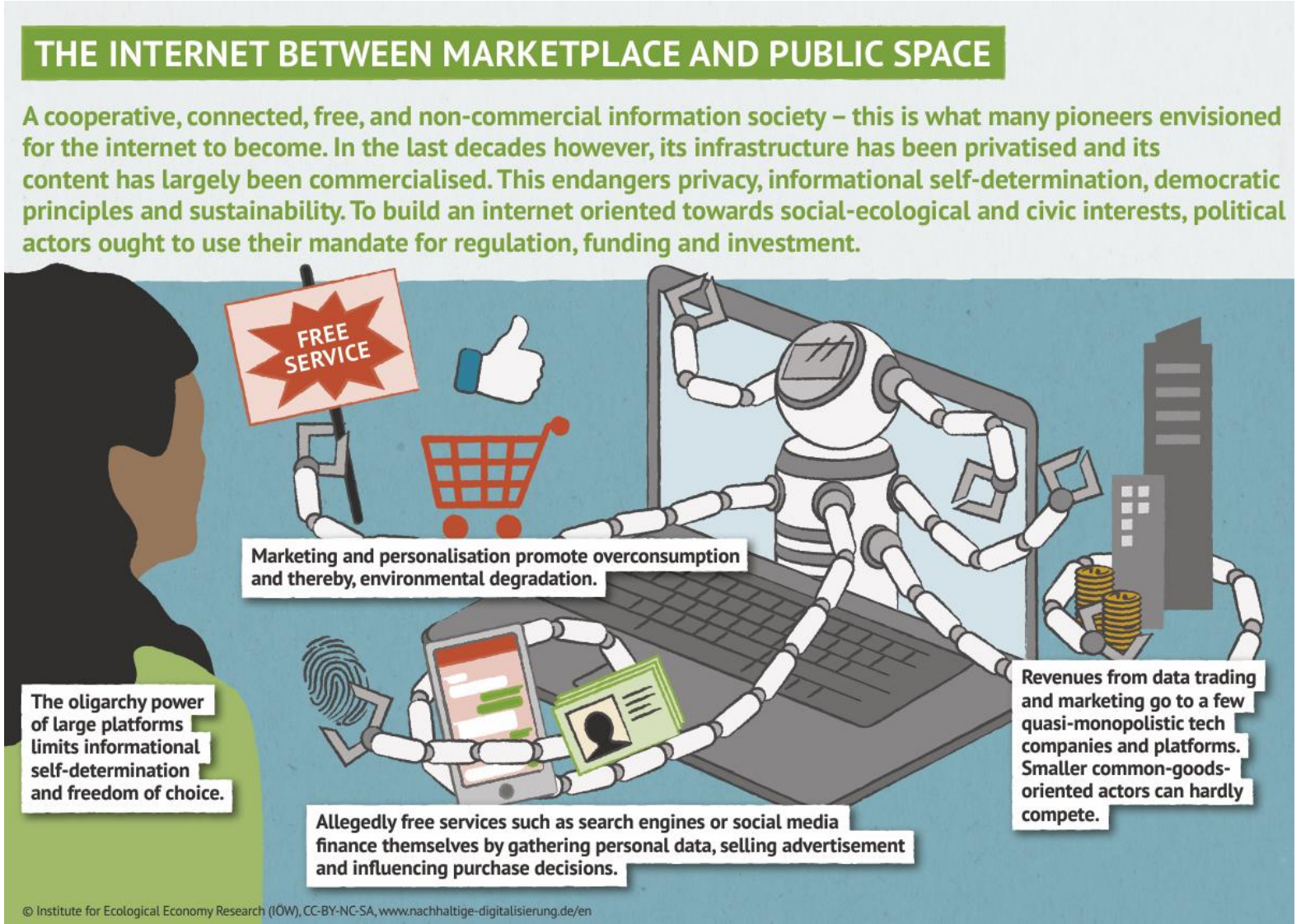


… aims at a transition to a post-growth economy supported by digitalization by…

- fostering circular economies
- scaling up digital non-profit organizations and platform cooperatives
- using labor productivity to reduce working hours

Example IV: Reclaiming the internet as a public infrastructure





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Example IV: Reclaiming the internet as public infrastructures



A “European model” that puts people and the planet before profit
(German Advisory Council on Global Change,WBGU, 2019)

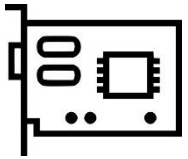
- **Build a sovereign digital infrastructure; public platforms that protect civil and consumer rights**
  - support existing cooperatively-run platforms
- **Curtail platform-power, level playing field for cooperatively-run platforms**
  - e.g., interoperability and open data approaches
- **Enable sustainable business models for digital services**
  - substitute data collection, data trade and advertising business models
  - e.g., user fees, micropayment, a “broadcasting fee” model

Frick, V., Gossen, M., Pentzien, J., Piétron, D., & Tangens, R. (2021). Policies to transform the internet from marketplace to public space. *Ökologisches Wirtschaften-Fachzeitschrift*, *36*(O1), 9-14.

Policy approaches for Digital Sufficiency



Hardware



Design standards for longevity, repairability, upgradability, and compatibility

Incentives for redistribution and re-furbishment by producers

Right to Repair; reduced VAT rates for repair services

Software



Extend EU Ecodesign Directive to software products

Sufficiency-oriented data center policies

Higher electricity or carbon taxes

User



Regulation for Privacy-by-design-and default- settings, reduce tracking and other forms of data collection (DSA, DMA, AI Act, etc.)

Regulation for providers to only collect personal data essential for each specific service and to block advertisement by default

Introduce selective advertising bans

Economy

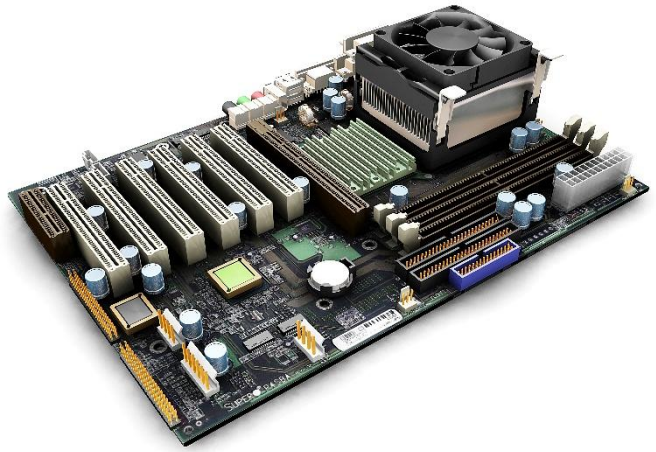


Adapt competition law to address power asymmetries in digital markets

Provide public digital infrastructures withouth advertising, tracking and data collection

selective advertising ban on certain parts of the Internet (e.g., on search engines, social media platforms) to

Thank you.



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16.09.2026