Making ICT sustainable: no technician, nor social solutionism but a « milieu » approach

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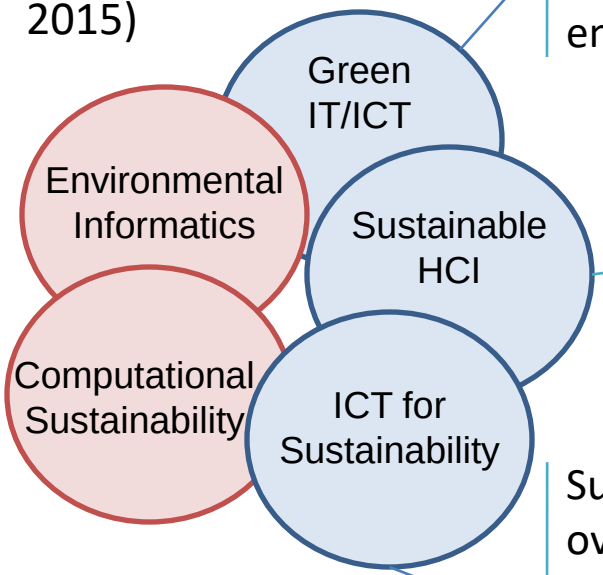
1. Introduction

Making ICT sustainable:
no technician, nor social solutionism but a « milieu » approach

« SOCLOUD »
A sober and open cloud

1. Introduction

(Hilty and Aebischer, 2015)



"the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems [...] **efficiently and effectively** with minimal or no impact on the environment." (Murugesan, 2008)

" 'Sustainability through design': How can the design of technology and interactive systems support sustainable **lifestyles** or promote sustainable **behavior**?

'Sustainability in design': How can technology itself be designed **such that its use is sustainable**? "

(Mankoff et al., 2007)

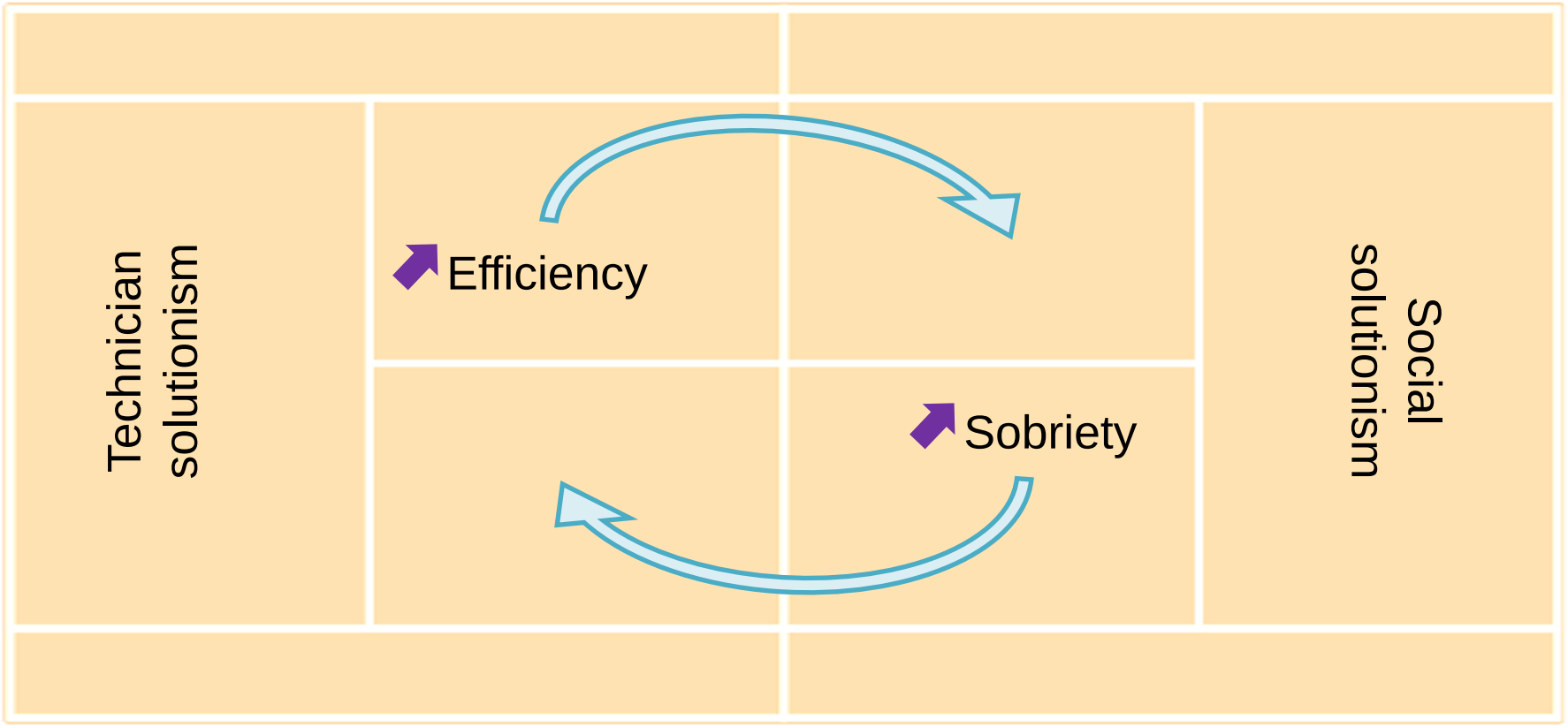
Sustainability in ICT: Making ICT goods and services more sustainable over their whole life cycle, mainly by **reducing the energy and material flows they invoke**

Sustainability by ICT: Creating, enabling, and encouraging **sustainable patterns of production and consumption** by means of ICT

(Hilty and Aebischer, 2015)

Murugesan, S.: Harnessing Green IT: Principles and Practices. IT Professional 10(1), 2432 (2008)
Mankoff, J. et al. : Environmental sustainability and interaction. CHI Extended Abstracts, pp. 2121-2124 (2007).
Hilty LM and Aebischer B (2015) ICT for Sustainability: An Emerging Research Field. In: Hilty LM and Aebischer B (eds) *ICT Innovations for Sustainability*. Advances in Intelligent Systems and Computing. Cham: Springer International Publishing, pp. 3–36.

1. Introduction



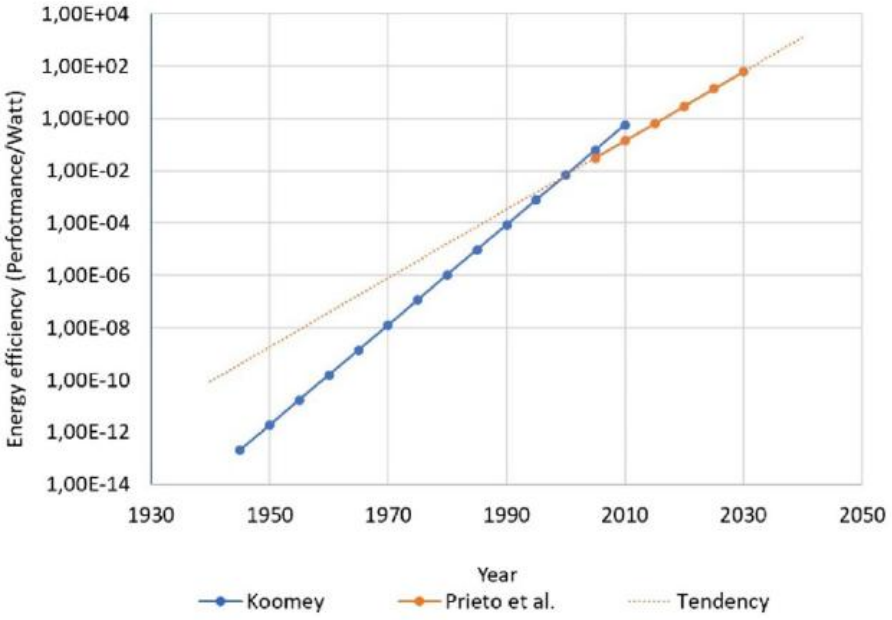
2. TECHNICIAN SOLUTIONISM:
IMPROVING EFFICIENCY

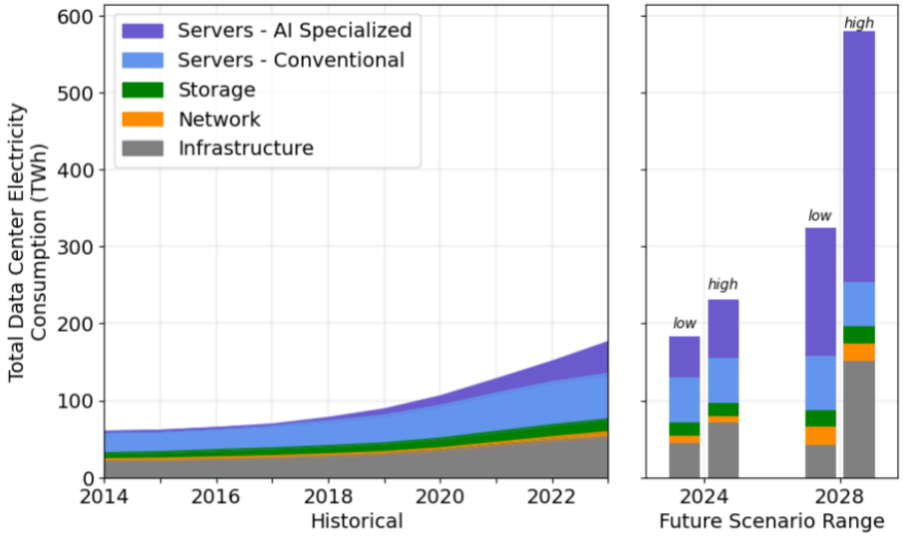
2. Technician solutionism

- **Improving efficiency**

In theory ↗ Efficiency → ↘ Energy & Matter consumption → ↘ Ecological footprint

In practice





[In the US]

Graph on the left from Prieto A, Prieto B, Escobar JJ, et al. (2024) Evolution of computing energy efficiency: Koomey's law revisited. *Cluster Computing* 28(1): 42.
Graph on the right from Shehabi A, Newkirk A, Smith SJ, et al. (2024) 2024 United States Data Center Energy Usage Report. Epub ahead of print 20 December 2024.

2. Technician solutionism

- **Understanding technician solutionism failure**

⇨ Rebound effect

↗ Efficiency → ↘ Production & Service cost → ↗ Production & Service → Tampering ecological footprint gains

"**higher-order effects** of interventions arising due to **systemic responses** which partially or completely offset potential sustainability gains" (Andrew et Pigosso, 2024, p. 1)

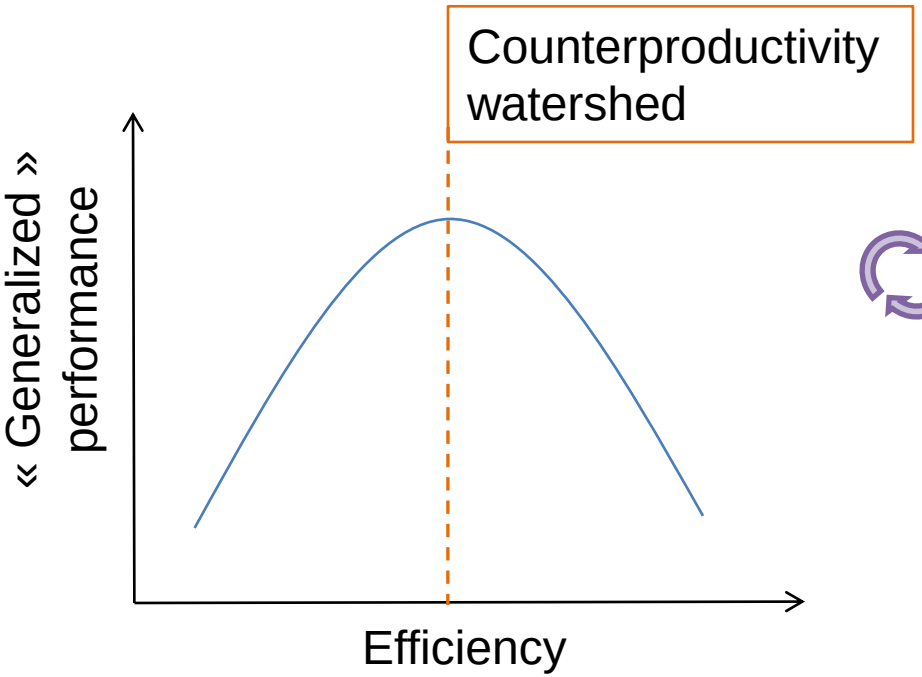
⇨ Moving from technician to social perspective

Andrew E and Pigosso DCA (2024) Multidisciplinary perspectives on rebound effects in sustainability: A systematic review. *Journal of Cleaner Production* 470: 143366.

2. Technician solutionism

- **Understanding technician solutionism failure**

Overefficiency



Emergence of **self-sustained** social control

- Infrastructures structuring the social space
- Self-enforcing social norms

Illich I (1974) *Energy and Equity*. New York, NY: Harper Collins.
Illich I (1975) *Tools for Conviviality*. New York: Harper Collins.

3. SOCIAL SOLUTIONISM
RESPONSIBILIZING USERS

3. Social solutionism

RÉPUBLIQUE FRANÇAISE

ADEME

opinionway

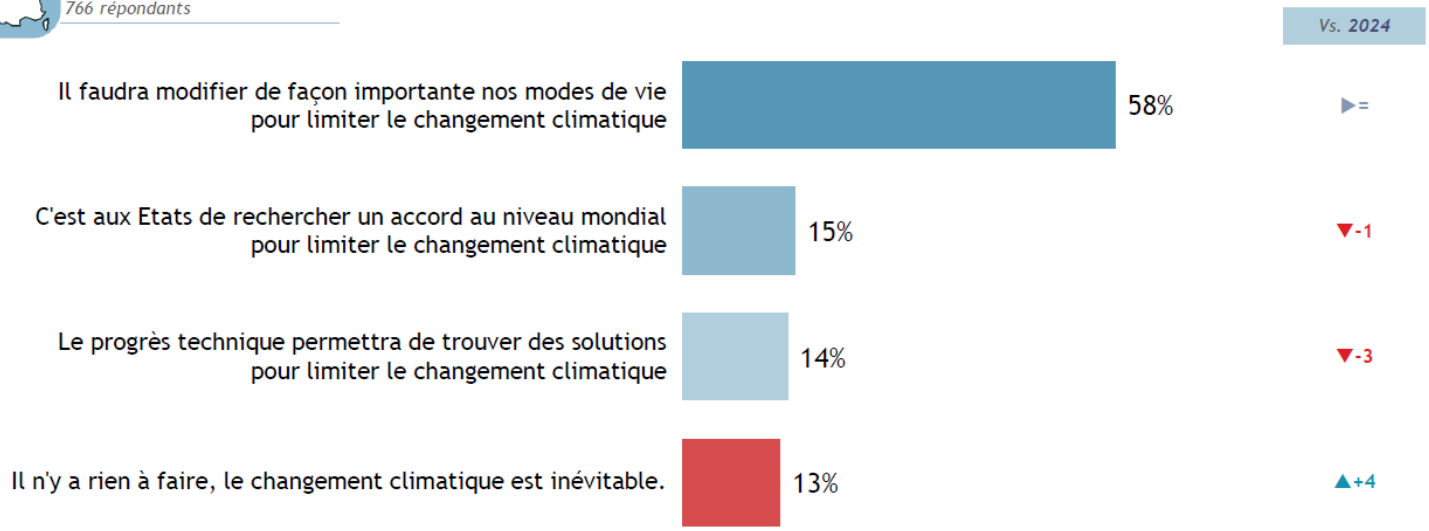
4. **Les solutions pour réduire le réchauffement climatique**
a. Les solutions globales pour réduire le réchauffement climatique

Les solutions face au changement climatique

Q11bis. De ces quatre opinions, laquelle se rapproche le plus de la vôtre ?

L'échantillon a été divisé en deux aléatoirement, la moitié des répondants se sont exprimés sur la question « De ces quatre opinions, laquelle se rapproche le plus de la vôtre ? », l'autre sur la question « Selon vous, qu'est ce qui serait le plus efficace pour limiter le changement climatique ? »

Ensemble des Français
766 répondants



Evolutions présentées par rapport à la vague de 2024

ADEME, Daniel Boy RCB Conseil 2025, 26ème vague du baromètre « Les représentations sociales du changement climatique », Résultats, 182 p.

3. Social solutionism

RÉPUBLIQUE FRANÇAISE

ADEME

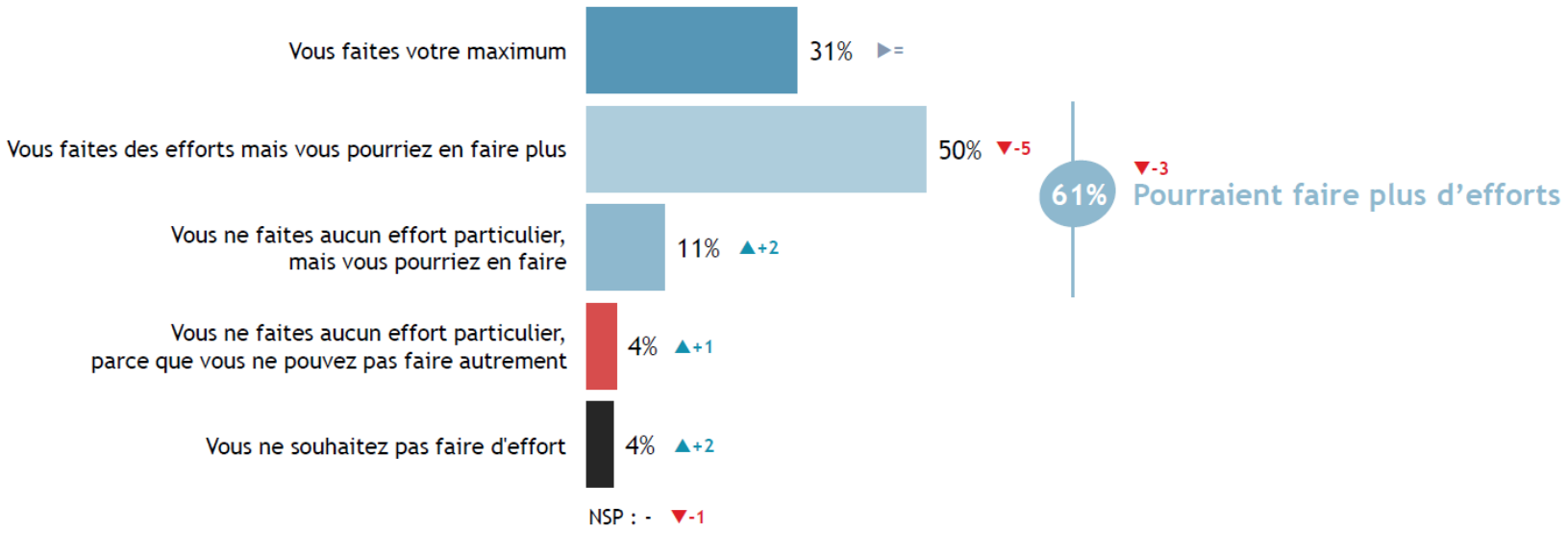
opinionway

4. **Les solutions pour réduire le réchauffement climatique**
b. L'engagement personnel pour réduire le réchauffement climatique

Les efforts réalisés et consentis pour réduire ses émissions

EFFORT. Actuellement, diriez-vous que pour réduire vos émissions de gaz à effet de serre, ... ?

Ensemble des Français
1580 répondants



Evolutions présentées par rapport à la vague de 2024

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3. Social solutionism

- **User empowering** – facing important difficulty

Figure from the left from Malik M (2024) AfD : les affiches de la haine. In: *Le Grand Continent*. (accessed 3 December 2025).
Figure from the right from Trump declares 'energy emergency,' ends fight against climate change in favor of 'drill, baby drill!' (2025) 21 January. (accessed 3 December 2025)

3. Social solutionism

- **User empowering**
  - Implied moral philosophy
    - Users as **autonomous moral agent**

    Vs.
    - Technology as **mere means**
  - *In reality*
    - Technology may be **inherently** ecologically disastrous

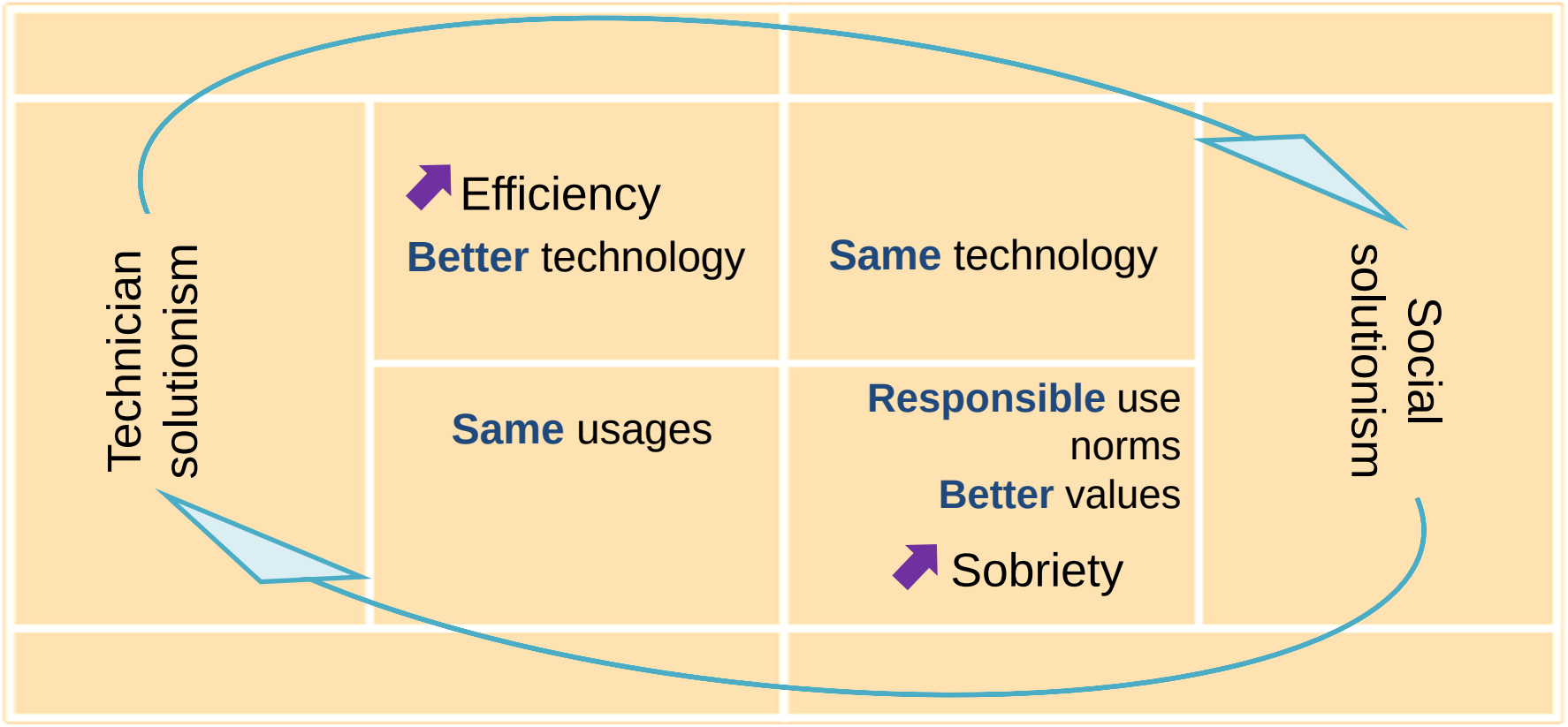
  ⇨ Moving from social to technician condition

    - Any user is taken in a **nest of attachments**

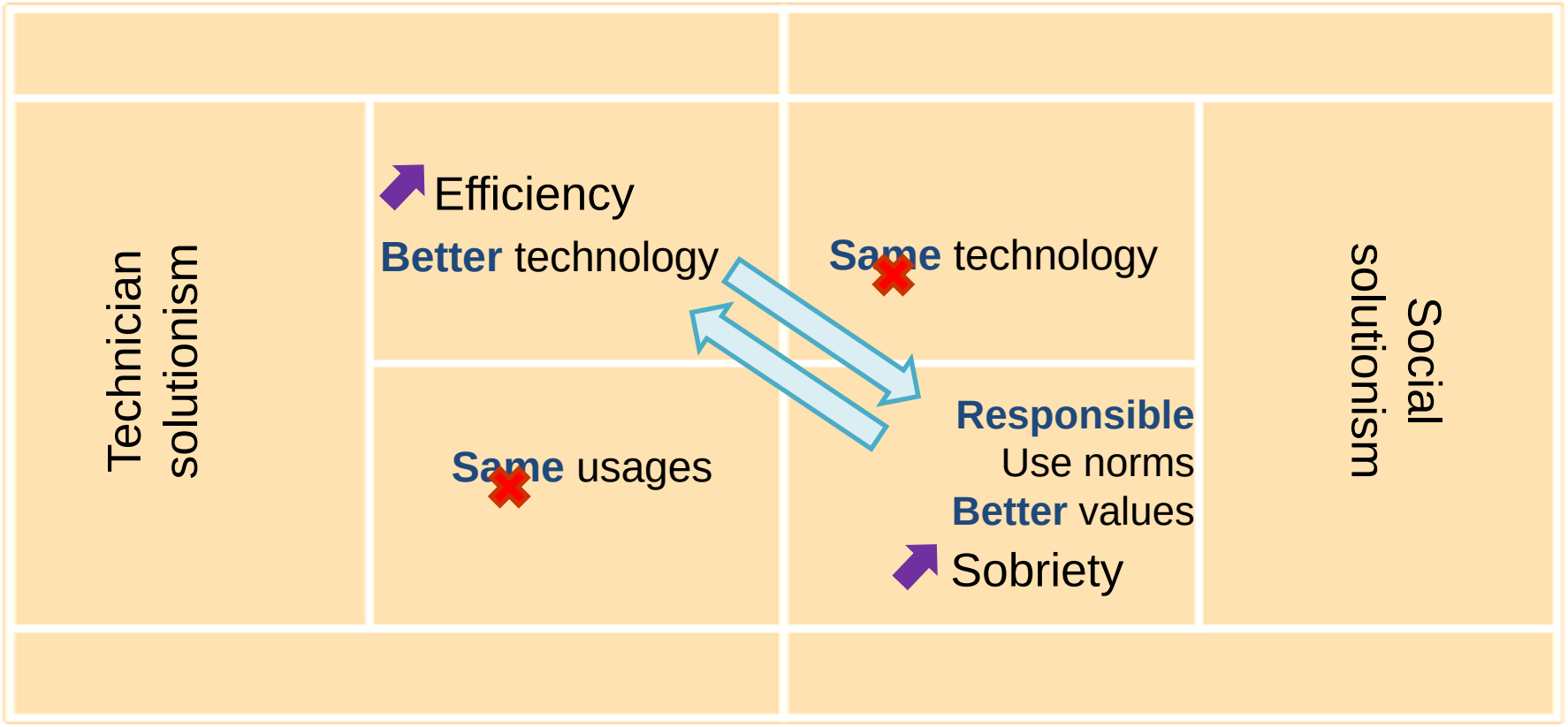
      What sustains her existence ← → What she cares for

Bonnet E, Landivar D and Monnin A (2021) *Héritage et Fermeture. Une Écologie Du Démantèlement*. Paris: Editions Divergences.
Guchet X (2022) *Du Soin Dans La Technique. Question Philosophique*. Innovation et Responsabilité 6. ISTE Editions.

Intermediary milestone



Intermediary milestone



4. INTERLINKED MILIEUX RATHER THAN SOCIO-TECHNICAL SYSTEMS

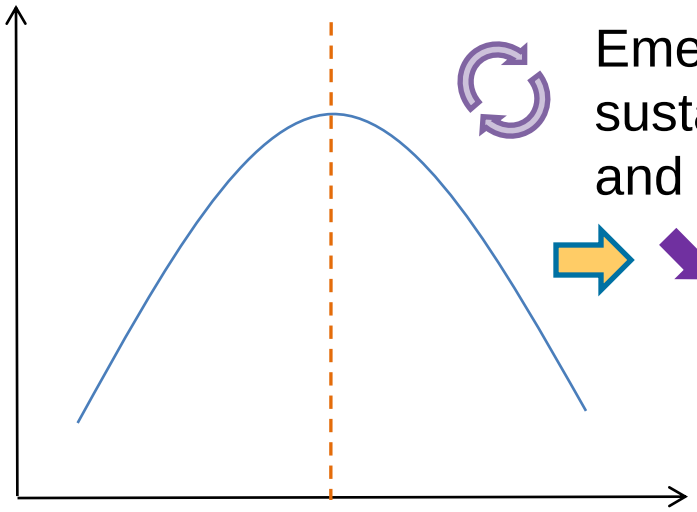
4. Interlinked milieux

- **« Milieux » - Constitutivity**
  - Constitutivity

⇨ Not the same technology, nor the same values

⇨ From sobriety to conviviality

⇨ Preserving autonomy and transformative potentials



Emergence of self-sustained **social norm** and **infrastructure**

⇨ ↘ Autonomy

Path dependency

Triclot M (2024) 'Milieu': portrait d'une notion. In: *Prendre Soin Des Milieux. Manuel de Conception Technologique*. Paris: Editions Matériologiques, pp. 41–78.
Illich I (1975) *Tools for Conviviality*. New York: Harper Collins.

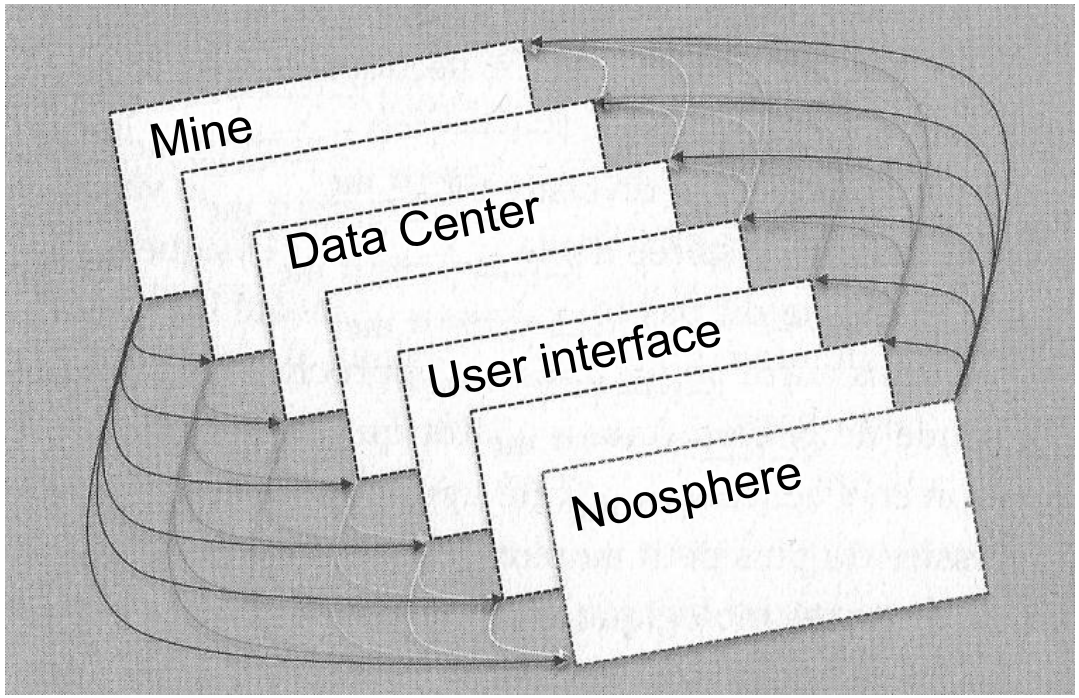
4. Interlinked milieux

- **« Milieux » - Multiscalar**
  - No reproducibility

⇨ Sobriety is **not scalable**

⇨ Demultiply **action points**

Looking for local efficiency spots



Triclot M (2024) 'Milieu': portrait d'une notion. In: *Prendre Soin Des Milieux. Manuel de Conception Technologique*. Paris: Editions Matériologiques, pp. 41–78.

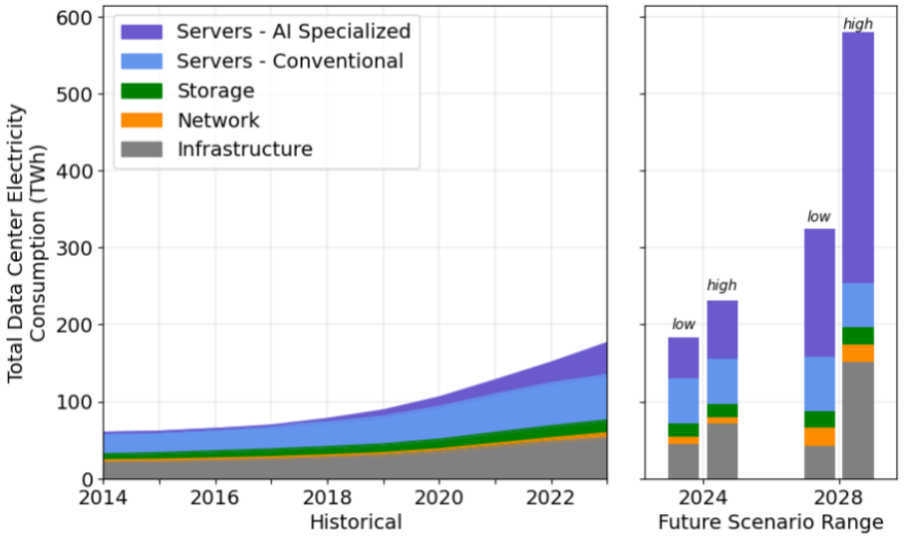
4. Interlinked milieux

- **« Milieux » - Normativity**

ICT is climate-collapsing *by design*

Enquiry on attachments

- What sustains existence
- What is cared for



[In the US]

Triclot M (2024) 'Milieu': portrait d'une notion. In: *Prendre Soin Des Milieux. Manuel de Conception Technologique*. Paris: Editions Matériologiques, pp. 41–78.
Graph on the right from Shehabi A, Newkirk A, Smith SJ, et al. (2024) 2024 United States Data Center Energy Usage Report. Epub ahead of print 20 December 2024.

4. Interlinked milieux

- **« Milieux » - Reflexivity**
  - Design success criteria **cannot be objectified** *a priori*

Rebound effect

Efficiency → Production & Service cost → Production & Service → Tampering ecological footprint gains

Černohorská et al. (2025)

Need to make productive use of time → Use of ICT to fill idle time → Lose track of time → Need to make productive use of time

⇨ Design as a continuing inquiry

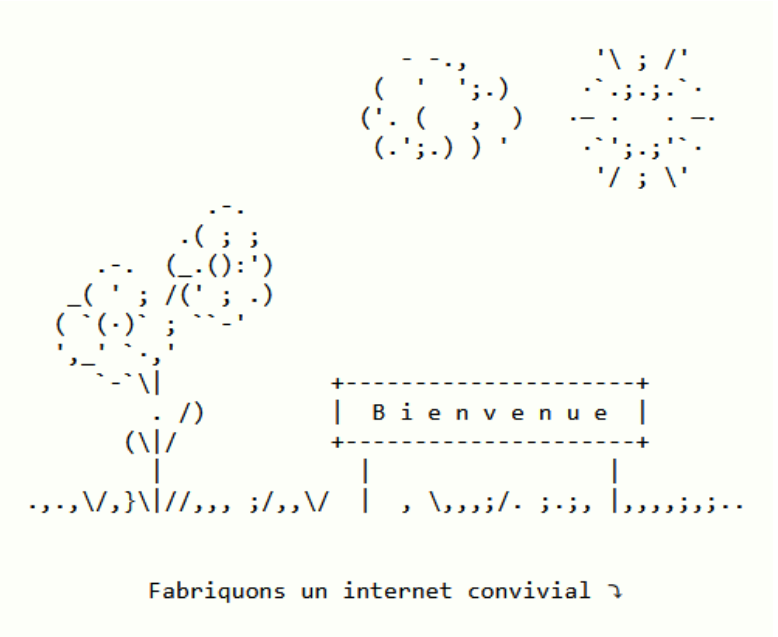
Triclot M (2024) 'Milieu': portrait d'une notion. In: *Prendre Soin Des Milieux. Manuel de Conception Technologique*. Paris: Editions Matériologiques, pp. 41–78.
Černohorská V, Schoetensack C, Klegr T, et al. (2025) How digital technology can steal your time. *Computers in Human Behavior* 169: 108680.

4. Interlinked milieux

Not the same technology, nor the same value

« Zombie » technology
(Nova, 2020)

Infrastructures as archipelago
(Lopez, 2022)



deuxfleurs.fr

Nova N, Halloy J and Monnin A (2020) Au-delà du low tech : technologies zombies, soutenabilité et inventions. *Passerelle*, 14 September. ritimo.
Lopez F (2022) *A Bout de Flux*. Paris: Divergences.
Bottom figure by Aurelio A. Heckert, CC BY-SA 2.0
Screenshot from https://bogdanthegeek.github.io/blog/projects/vapeserver/ (on the 17/11/2025)

Conclusion

Path toward a « milieu » approach

1. **Values** and **technology** have to be **redesigned** together
2. No scalability, but a **multiplicity of action points**
3. Working on and with **local attachments**
4. **Continuing enquiry**
5. Overefficiency poses a **maximum difficulty**

What ways to avoid both technician and social solutionism and at which particular entry points in the ICT infrastructure?

Triclot M, Brault N, Carnino G, et al. (2024) *Prendre Soin Des Milieux. Manuel de Conception Technologique*. Paris: Editions Matériologiques.