

# **A journey across the environmental materiality of digital services**

FOSDEM 2024 – Energy: Reimagining this Ecosystem through Open Source devroom

# Speakers



Benoit Petit  
Member @ Boavizta  
Co-founder @Hubblo

*bpetit@hubblo.org*



David Ekchajzer  
Member @ Boavizta  
PhD student @ Paris Saclay  
Co-founder @ Hubblo

*da.ekchajzer@hubblo.org*

# Boavizta



- NGO based in France (1901 law)
- 250+ members
- private companies, public organizations, universities, independent researchers, freelancers, ...
- Provide public and open methods, data, tools and knowledge about the environmental impact assessment of ICT
- Through open-source, open-data & open-science process

## Environmental materiality of FOO software

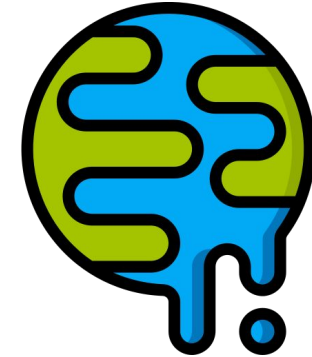


FOO APP



Environmental

accounting



Environmental  
materiality

# Today's perimeter



*End-user equipments*

*Network*

*Datacenters*



*Manufacture*



*Transport*



*Use*



*Waste*





**Why open source ?**

## Because it's a democratic necessity

**THE GREEN  
NEW DEAL  
FOR EUROPE**

*Political  
orientations*



*Environmental  
labeling*

# Because of the poor quality of the available assessments

Normalized carbon impact of LED panel (kgCO <sub>2</sub> e/inch)	
Dell (PAIA)	11.4 to 26.7
Lenovo (PAIA)	5.7 to 24.5
HP (Other)	3,3 to 8,6
NegaOctet	2.94
Base Empreinte (ADEME)	≈ 2.7





# Energy footprint

*An unstoppable growth*

# Perimeter



*End-user equipments*

*Network*



*Datacenters*



*Manufacture*



*Transport*

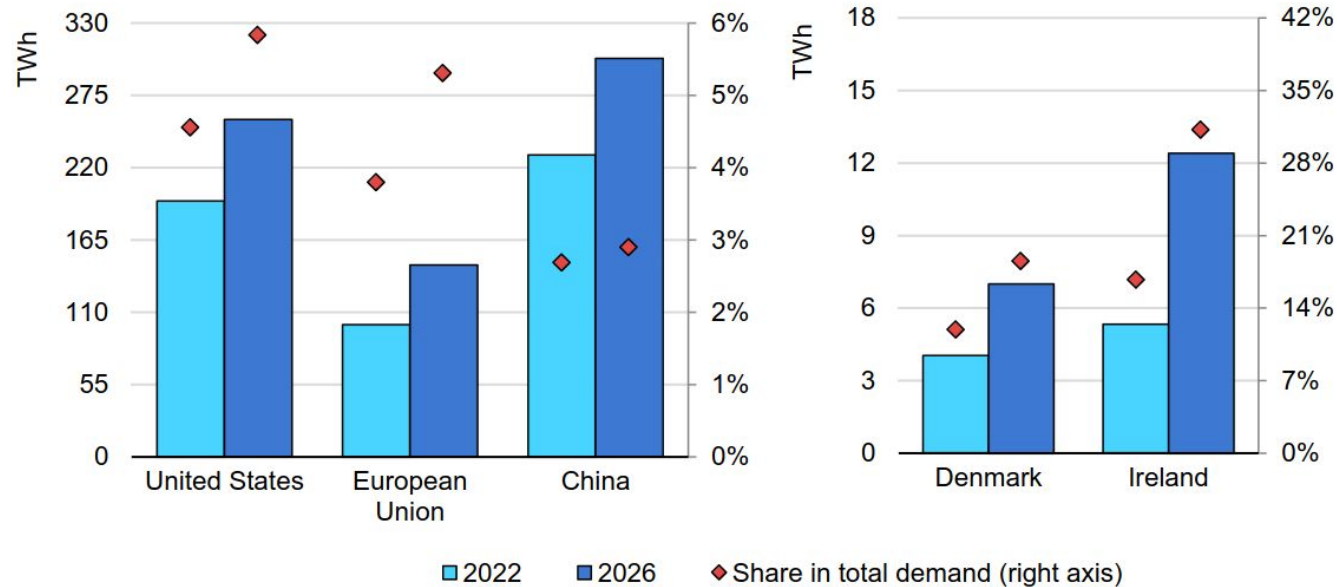


*Use*

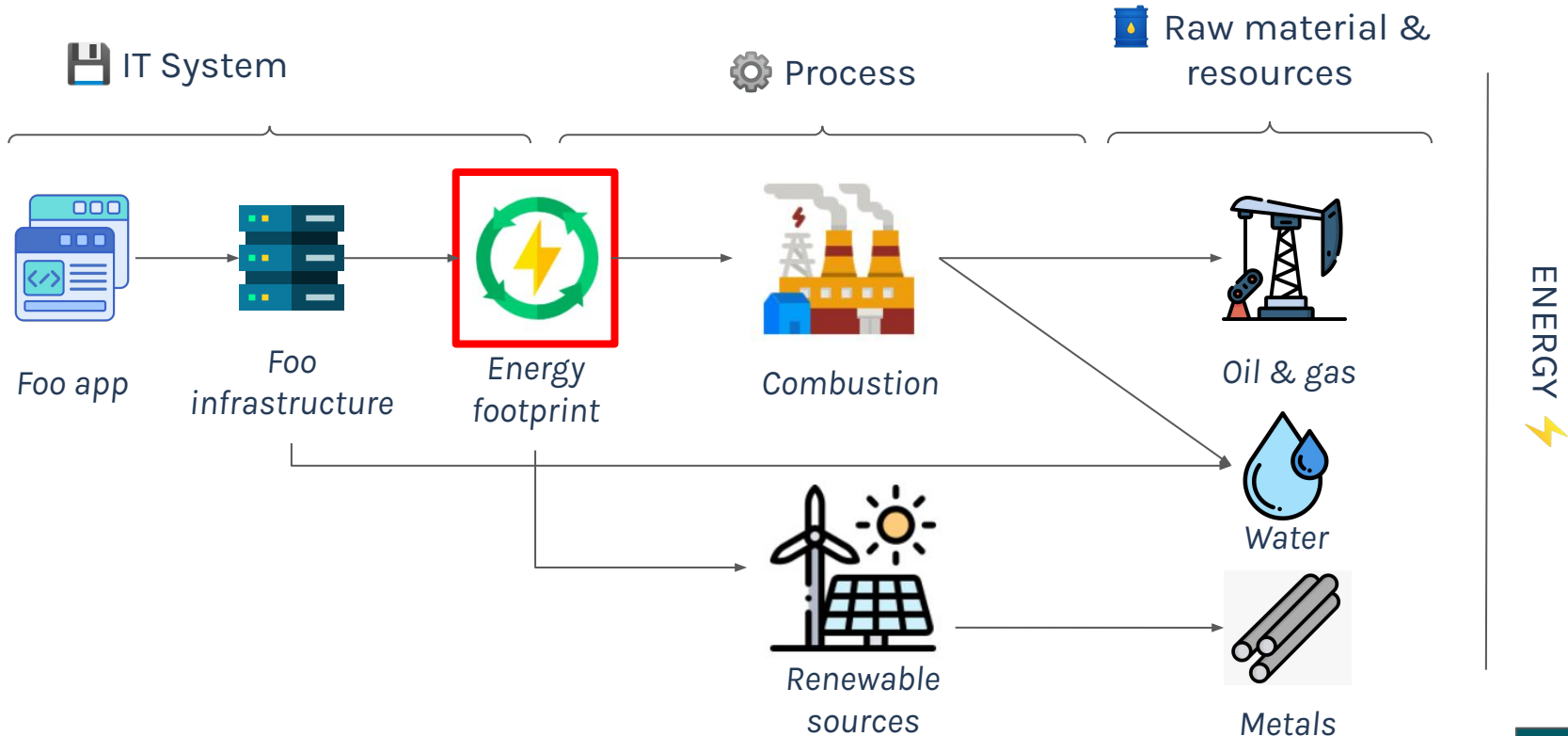


*Waste*

Estimated data centre electricity consumption and its share in total electricity demand in selected regions in 2022 and 2026



# From energy to materiality



ENERGY ⚡

# Tooling and methods for evaluation

PowerAPI

Perf



Scaphandre

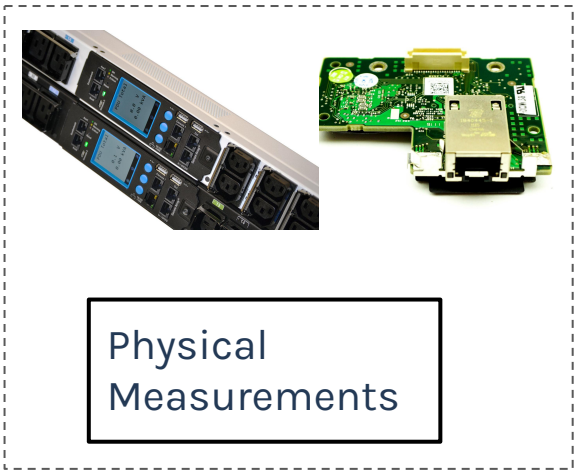


PowerJoular

Kepler

PowerTOP

 BoaviztAPI



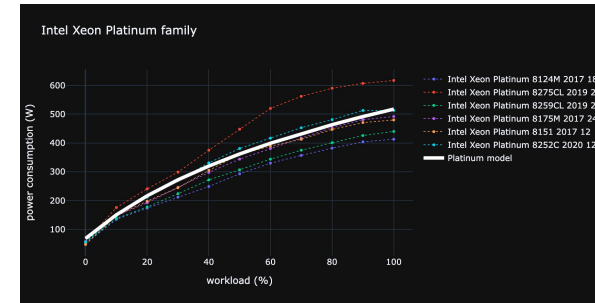
Physical Measurements

nvml

powercap

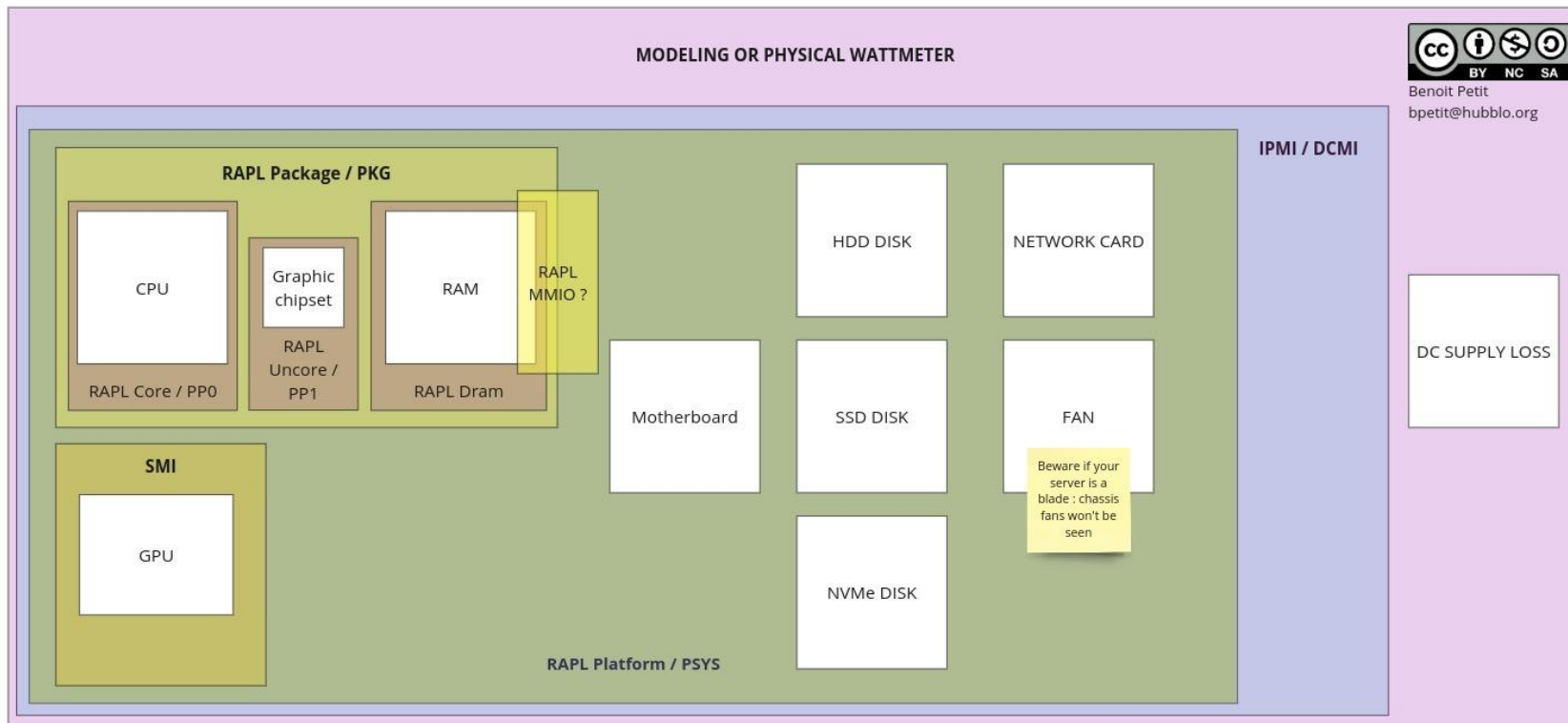
Nvidia SMI Intel/AMD RAPL

Software Measurements



Modeling

# Limits of software tooling

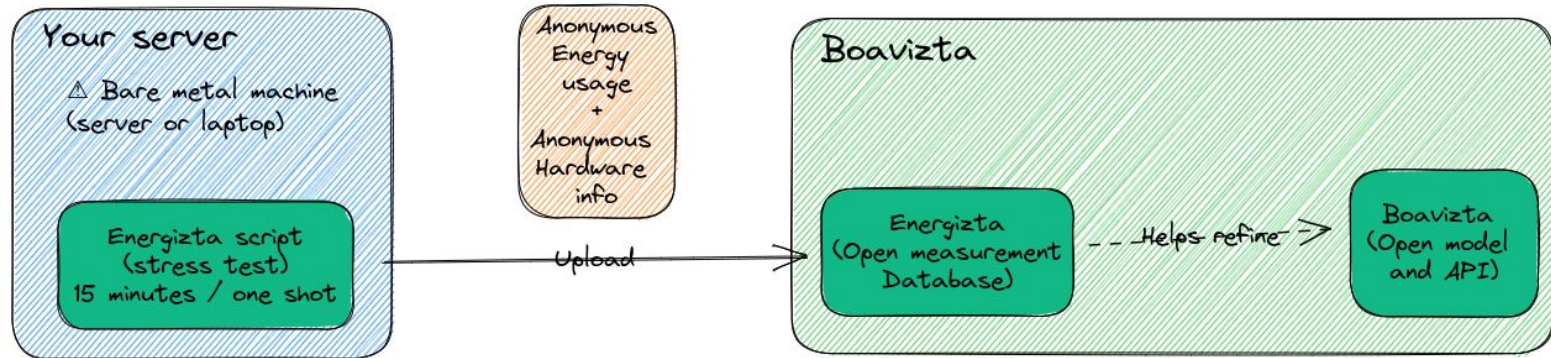


Benoit Petit  
bpetit@hubblo.org

This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

# How to improve ?

## Energizta



<https://boavizta.github.io/Energizta/intro.html>



# Lifecycle footprint

*A more comprehensive perspective*



# Perimeter



*End-user equipments*

*Network*



*Datacenters*



*Manufacture*



*Transport*

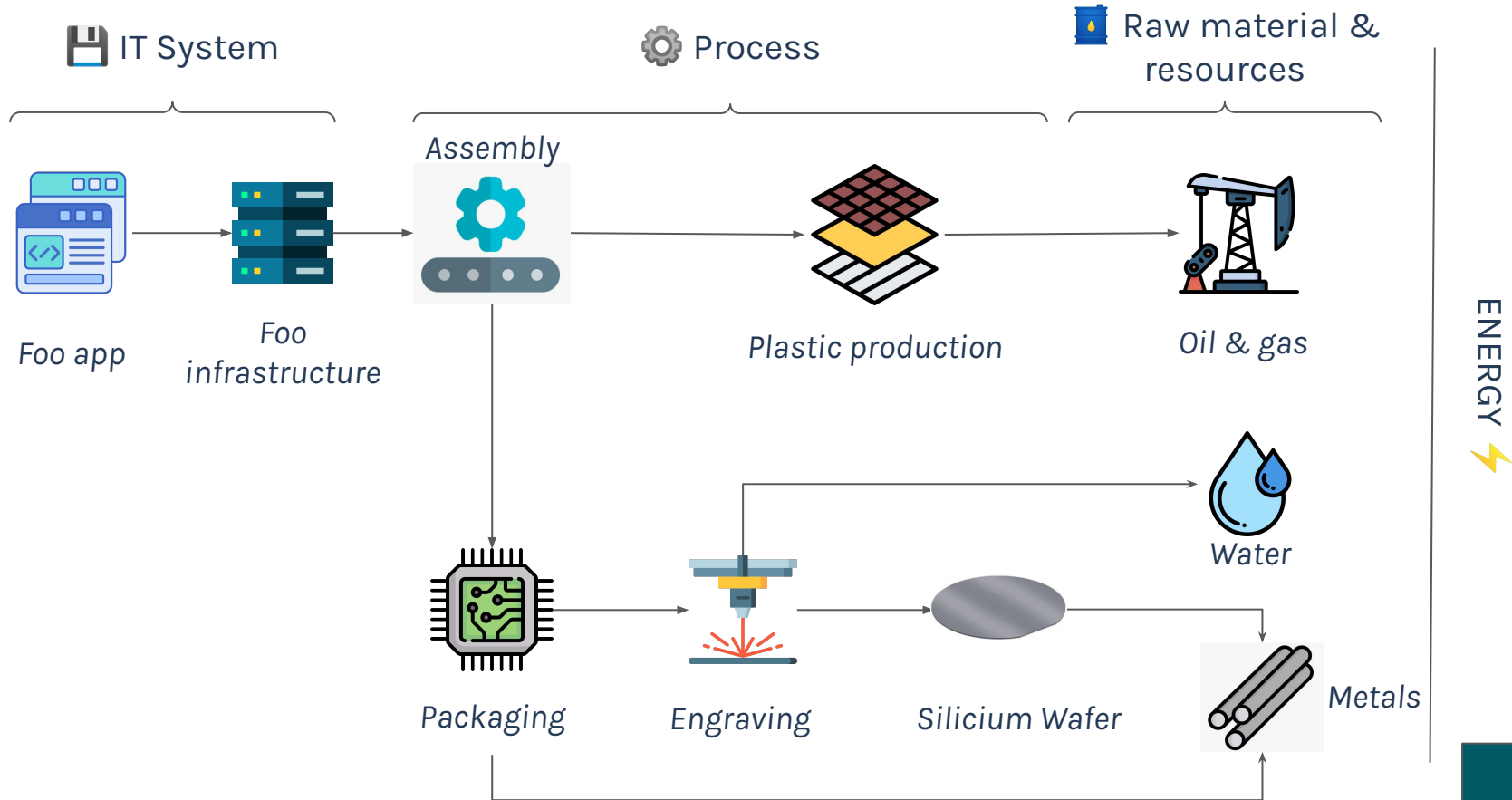


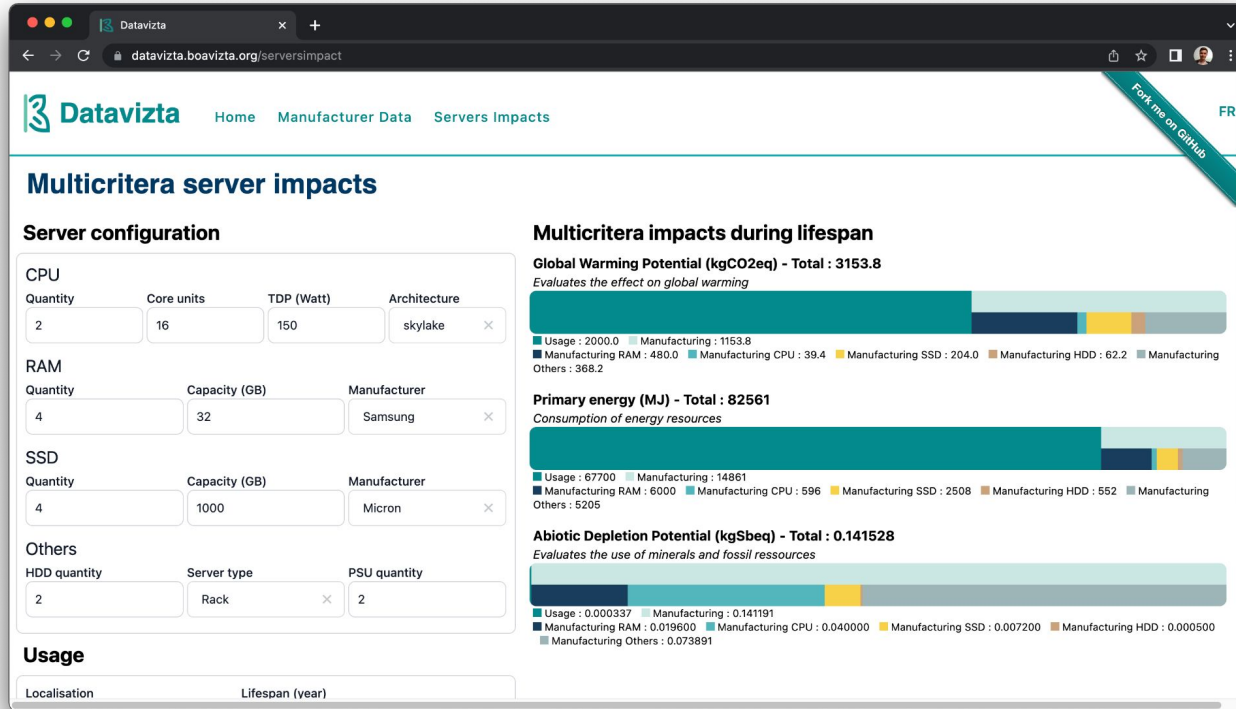
*Use*



*Waste*

# Reconstruct the materiality





**Multicriteria server impacts**

**Server configuration**

**CPU**  
Quantity: 2, Core units: 16, TDP (Watt): 150, Architecture: skylake

**RAM**  
Quantity: 4, Capacity (GB): 32, Manufacturer: Samsung

**SSD**  
Quantity: 4, Capacity (GB): 1000, Manufacturer: Micron

**Others**  
HDD quantity: 2, Server type: Rack, PSU quantity: 2

**Usage**  
Localisation: , Lifespan (year):

**Multicriteria impacts during lifespan**

**Global Warming Potential (kgCO2eq) - Total : 3153.8**  
*Evaluates the effect on global warming*

Usage : 2000.0, Manufacturing : 1153.8  
Manufacturing RAM : 480.0, Manufacturing CPU : 39.4, Manufacturing SSD : 204.0, Manufacturing HDD : 62.2, Manufacturing Others : 368.2

**Primary energy (MJ) - Total : 82561**  
*Consumption of energy resources*

Usage : 67700, Manufacturing : 14861  
Manufacturing RAM : 6000, Manufacturing CPU : 596, Manufacturing SSD : 2508, Manufacturing HDD : 552, Manufacturing Others : 5205

**Abiotic Depletion Potential (kgSbec) - Total : 0.141528**  
*Evaluates the use of minerals and fossil resources*

Usage : 0.000337, Manufacturing : 0.141191  
Manufacturing RAM : 0.019600, Manufacturing CPU : 0.040000, Manufacturing SSD : 0.007200, Manufacturing HDD : 0.000500, Manufacturing Others : 0.073891



[github.com/Boavizta](https://github.com/Boavizta) :



BoaviztAPI



CloudScanner



BoAgent

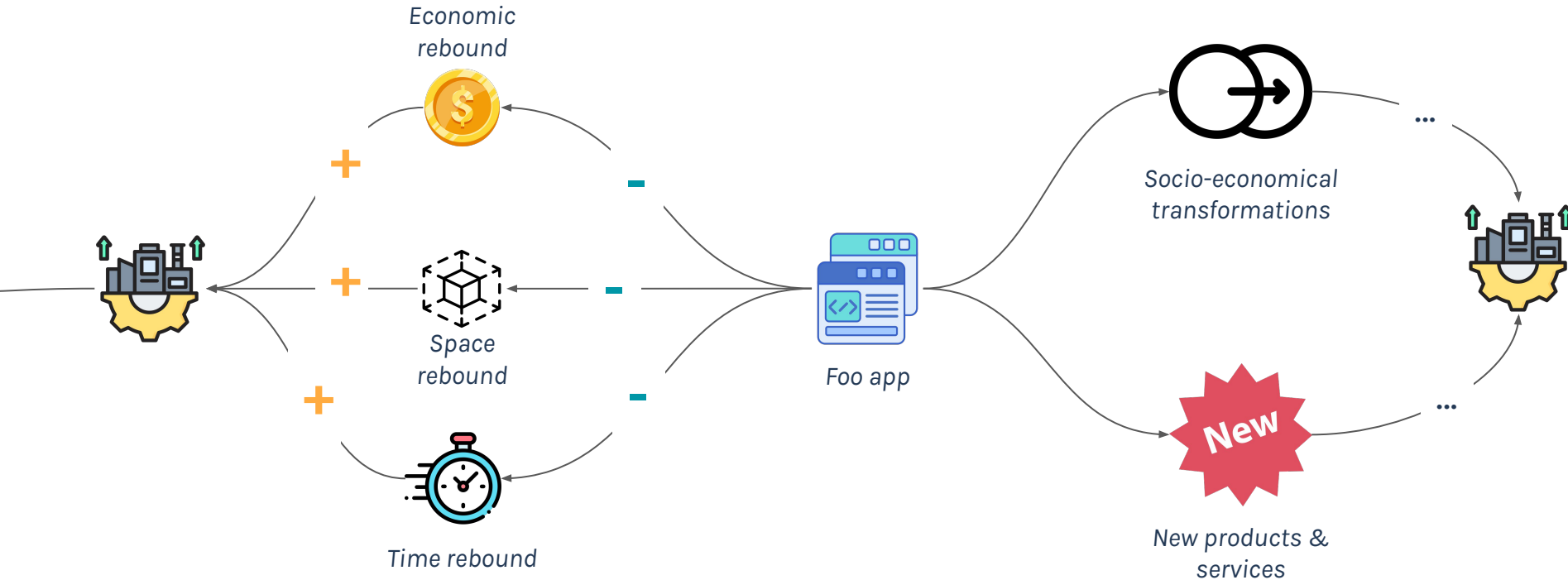
and more...



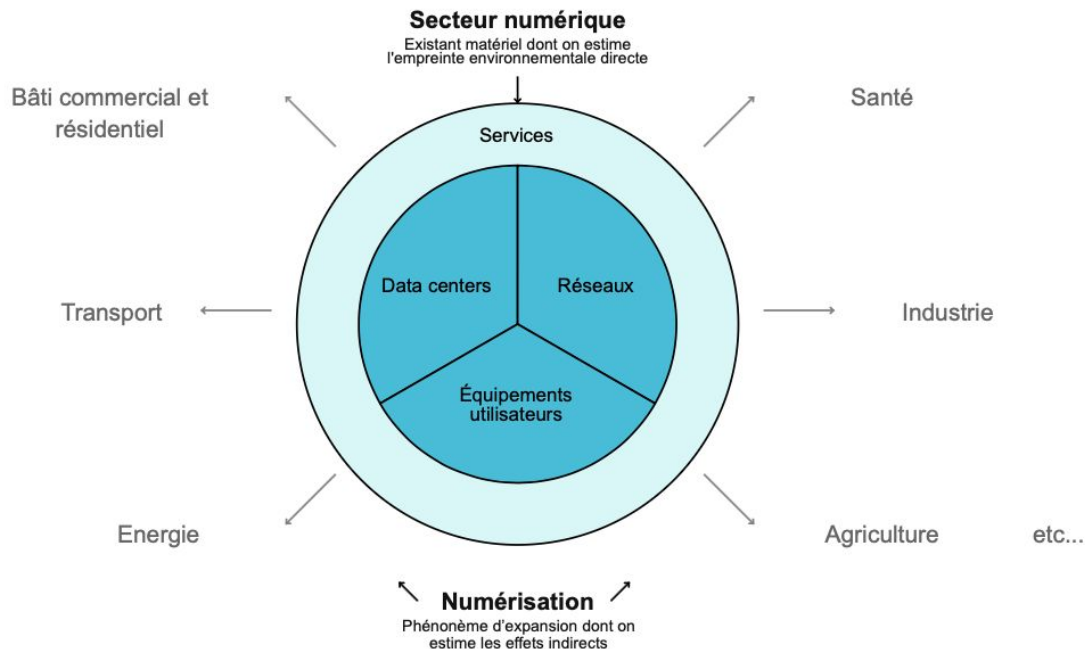


# Systemic footprint

# The materiality through causal mechanism



# Context : Digital vs. digitalization



Pictogram taken from Flaticon credits to freepik, nikita-golubev, bearicons, pixel-perfect, photo3idea-studio

## Thank you for your attention

*Actors in our ecosystems*



Accéder à notre site web :

[boavizta.org](https://boavizta.org)

Discuter sur notre chat public :



Suivre nos actualités :



Contribuer à nos outils :

<https://github.com/boavizta>

