



Purchases dominate the carbon footprint of research laboratories

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GES 1point5, a web-tool to estimate the C footprint of research labs

- Developed by the **Labos 1point5** research network (>250 researchers)
- **Free** and **open-source** web-tool
- **A database** of the C footprint of **research labs** (>700)



Building energy



Transport (long distance, commuting)



Purchases



IT material

Research infrastructure (2023)



GES 1POINT5

<https://labos1point5.org/ges-1point5>

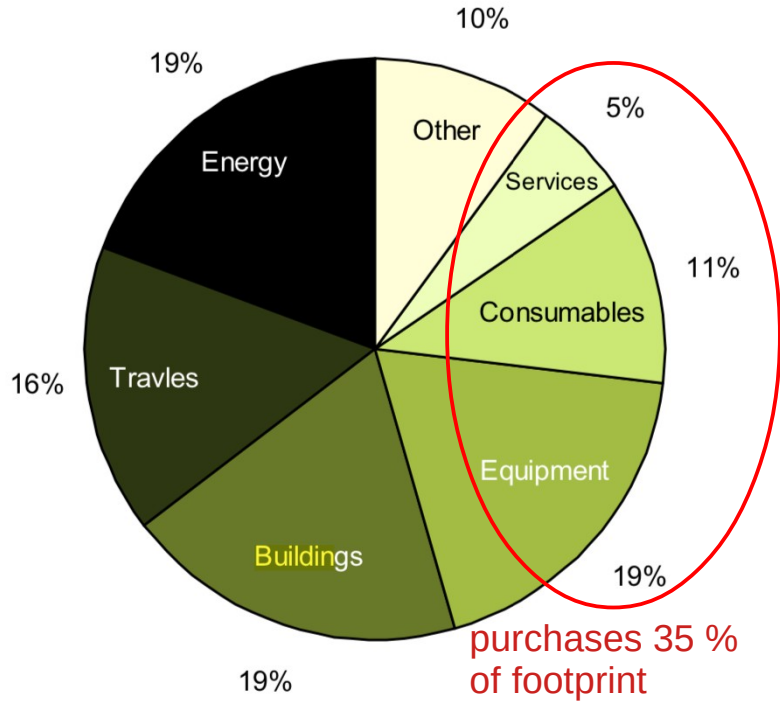
J. Mariette et al, *Env. Res.* 2022



Since 2013, we know that purchases dominate University emissions, but they remain neglected

Carbon footprint

of Norwegian University of Sci & Tech.



However, **purchases are missing** in most **Universities' footprint reports**

Helmets et al, Env. Sci. Eur.. 2021

- Our objectives :**
- Provide an **emission factor database** for research activities
 - Analyze **emissions from research labs**

Larsen et al, *J. Clean. Prod.* 2013



Building the Purchases Emissions in Research 1point5 (PER1p5) emission factor (EF) database

1) Macro approach

EEIO EF from 3 databases

~200 CEDA

~200 USEEIO

~40 ADEME

average

EF PER1p5 macro

linked to 1300 purchases categ.

2) Meso approach

13 meso EFs (CDP)

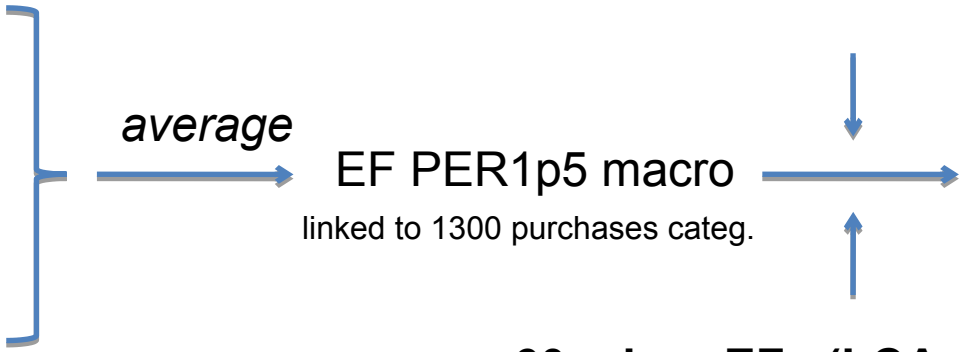
linked to 100 purchases categories

EF PER1p5

60 micro EFs (LCA - ecoinvent)

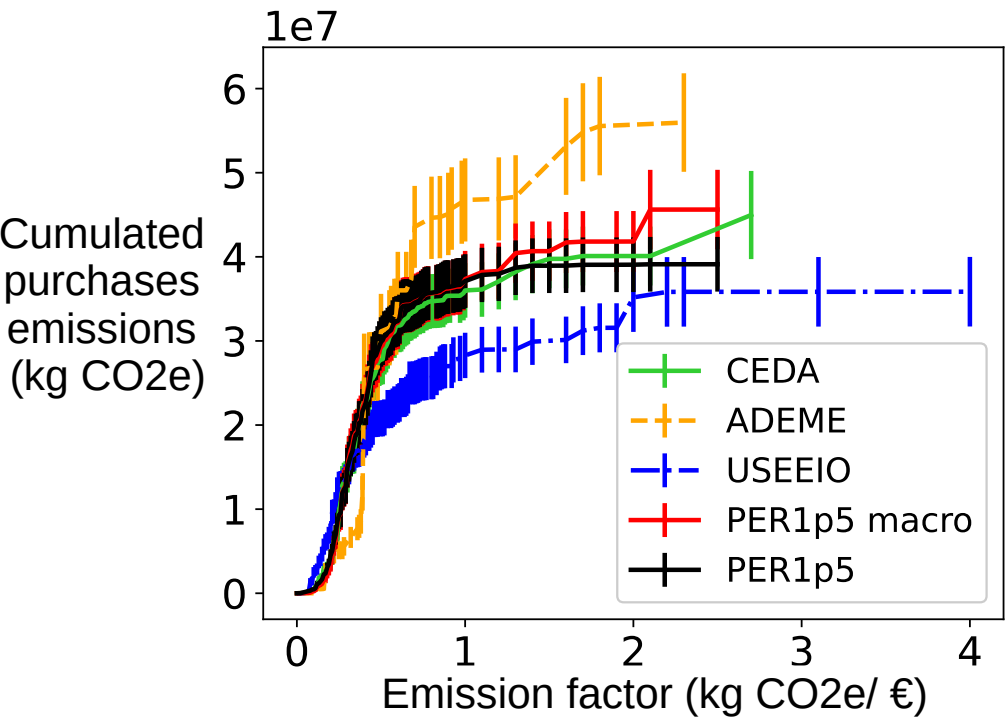
linked to 36 purchases categories

3) Micro approach





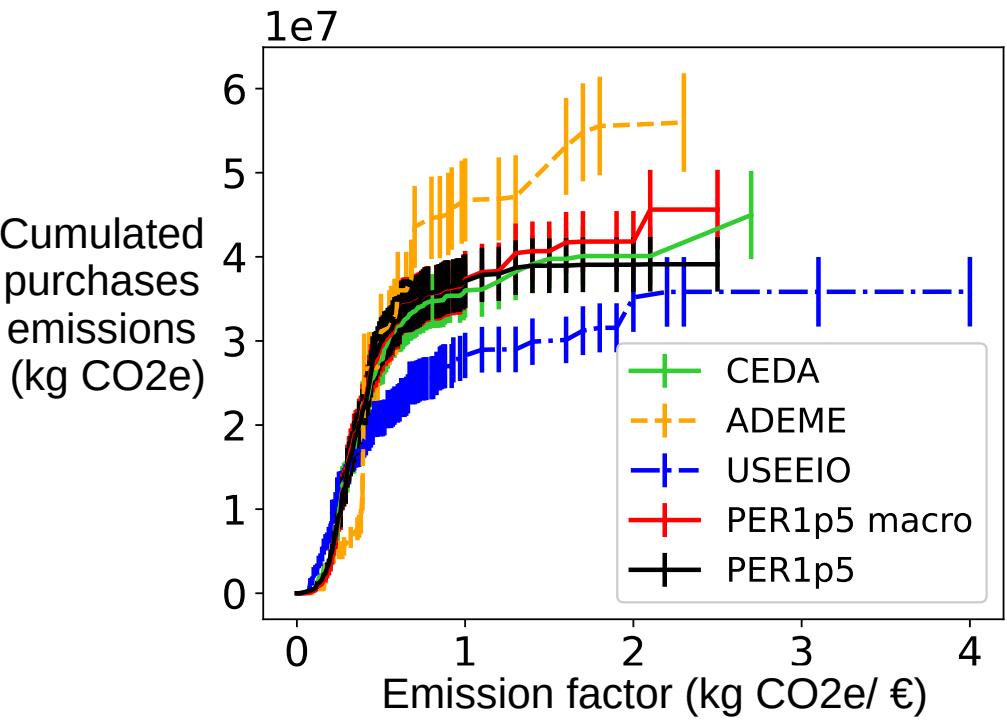
The 3 EEIO database give consistent results



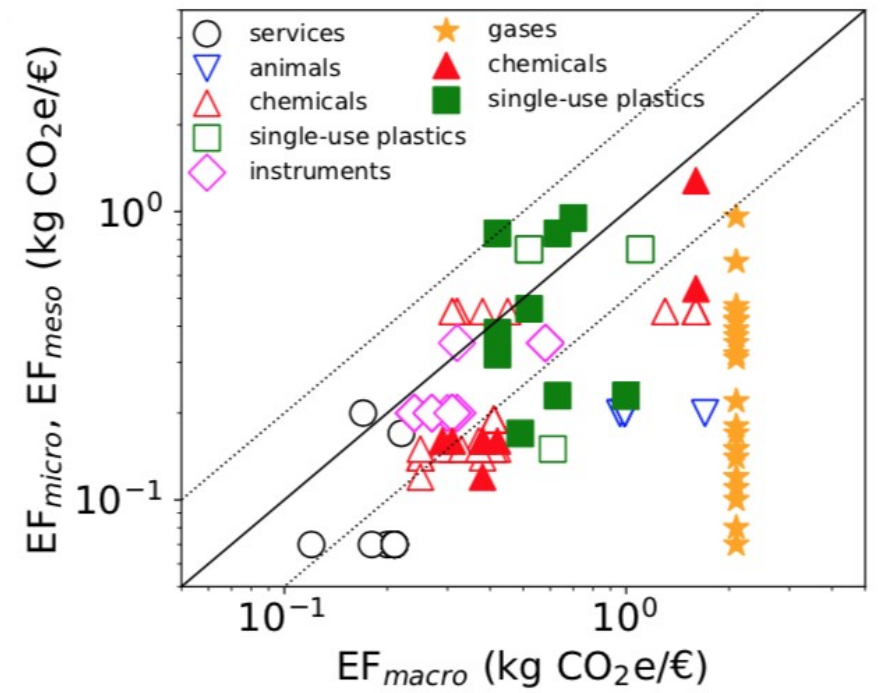
n = 10² labs (3%)
10⁴ researchers (11%)



The 3 EEIO database give consistent results

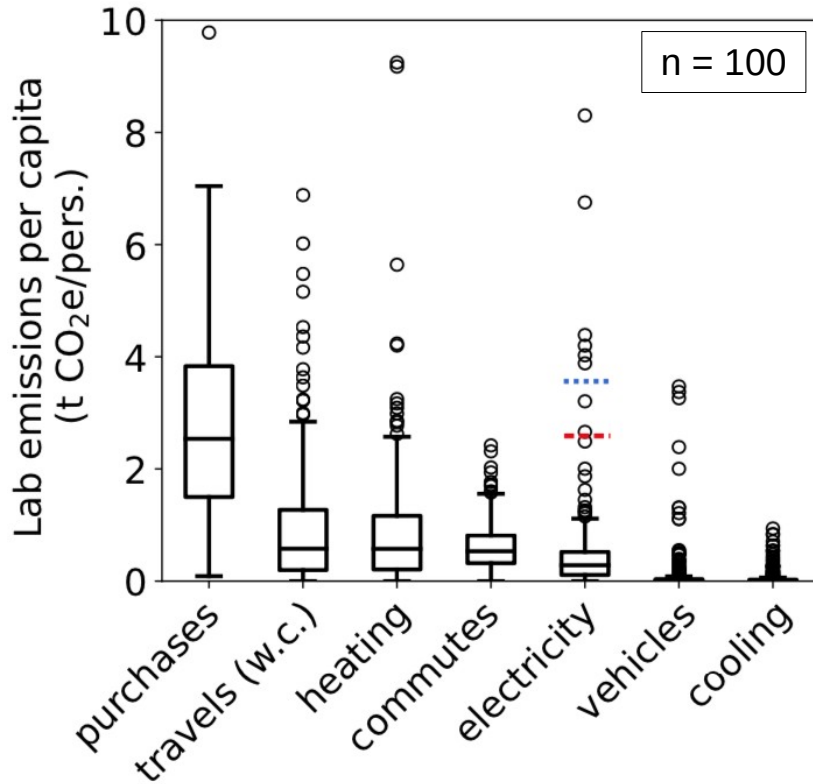


n = 10² labs (3%)
10⁴ researchers (11%)





Purchases dominate the carbon footprint of research labs in France with strong variability between labs



Note:

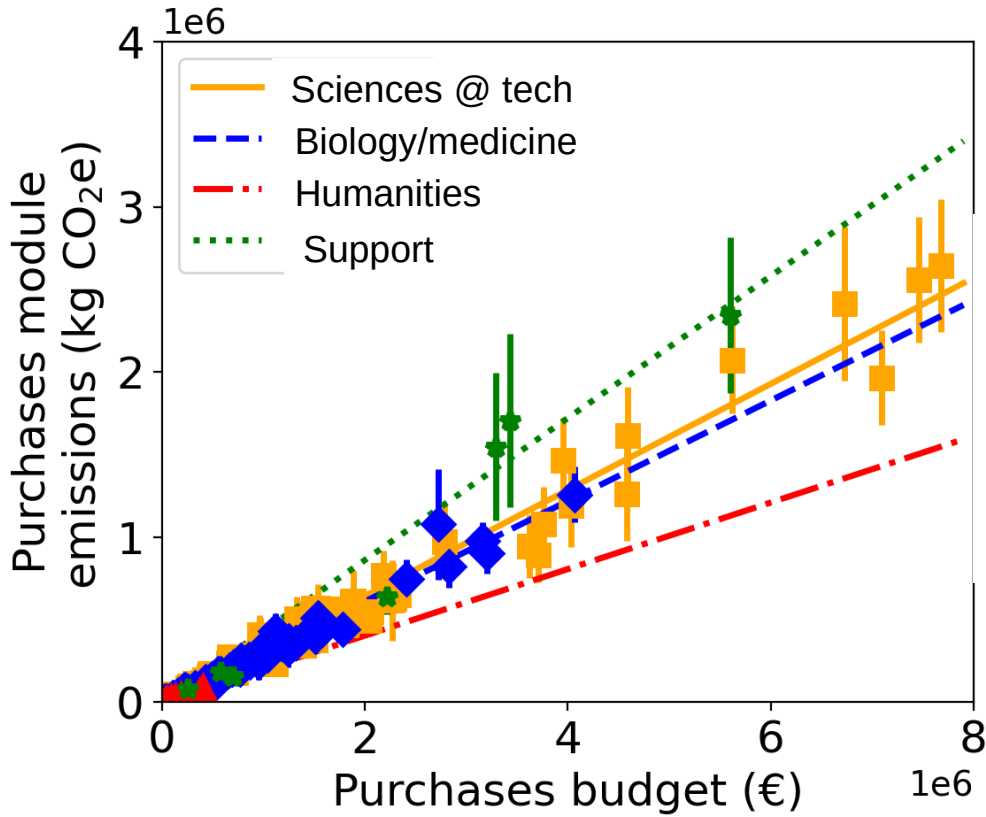
- Over representation of experimental labs vs. theoretical ones
- Infrastructures not-included
- IT incomplete

~ 10^3 t CO₂e / an per lab
~ 6.5 t CO₂e / an per staff
~ **10^6 tonnes** for the sector

J. Mariette et al, *Env. Res.* 2022
M. De Paepe et al, *Biorxiv* 2023



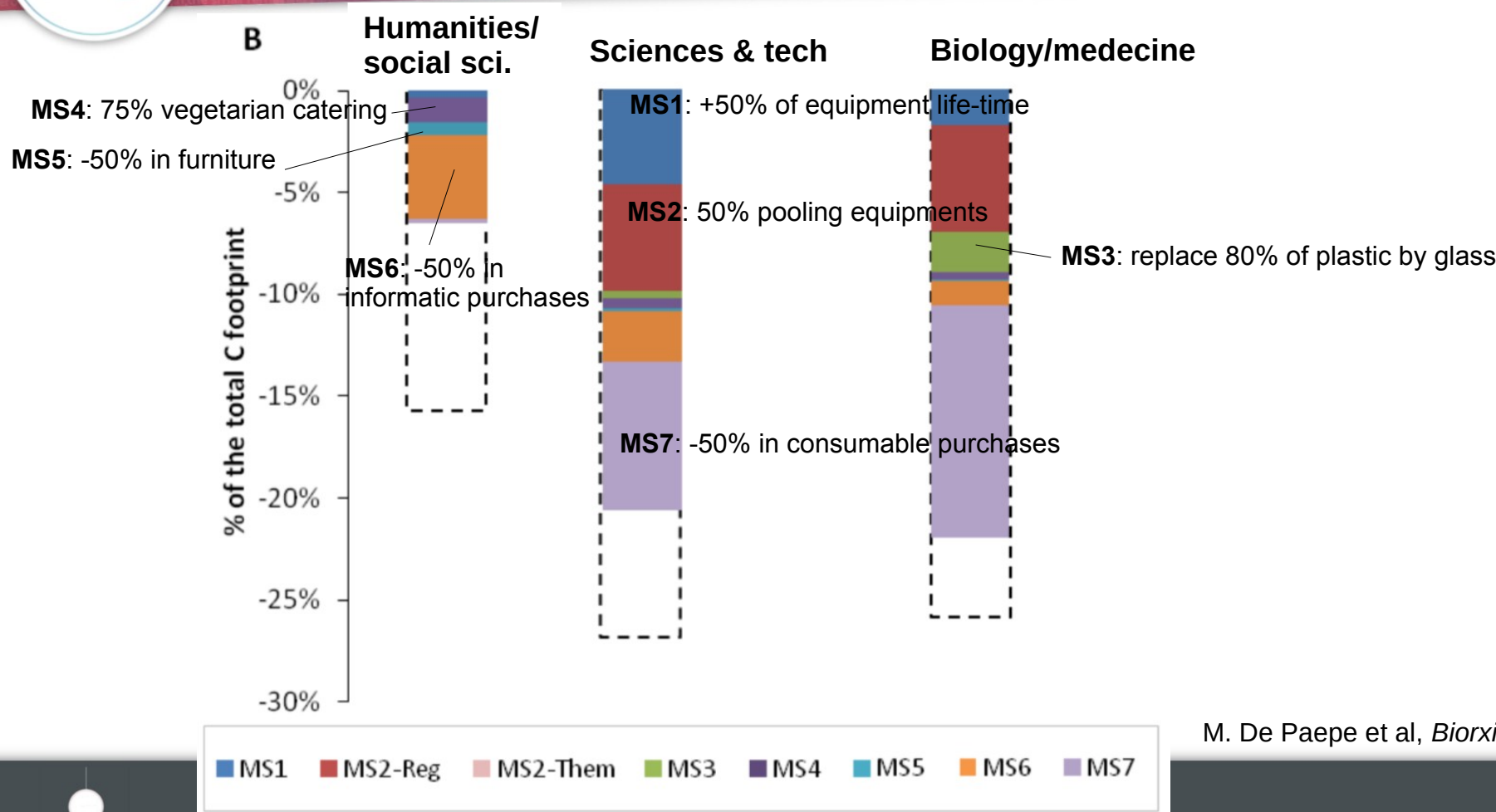
Purchases footprint is proportional to lab budget with differences btw disciplines



Domain	Slope (kg CO ₂ e/€)	R ²
Sciences and technology (ST)	0.32	0.97
Life and health sciences (LHS)	0.30	0.97
Human and social sciences (HSS)	0.20	0.96
Support	0.43	0.96
All	0.33	0.96



Ambitious demand-based mitigation strategies could reduce - 20 % total footprint (and -40 % purchases footprint)



M. De Paepe et al, *Biorxiv* 2023



Conclusions

- ▶ **PER1p5** is a database of emission factors adapted to the research sector
- ▶ The footprint of a research lab is dominated by : i) scientific **purchases**, ii) **heating** and iii) **plane** and commuting by **car**.
- ▶ Reducing purchases footprint questions the core activities of the research work

GES 1point5: <https://labos1point5.org/ges-1point5>

Our preprint : Purchases dominate the carbon footprint of research laboratories.

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