Towards a just transition in research

The Case of an International Mixed Research Unit (unité mixte internationale – UMI) : UMI SOURCE

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Introduction

Urgency of **transitioning to decarbonized research**...

... Or even a **sustainable transition of activities**, integrating:

- **Environmental** dimension (Cluzel et al. 2020)
- **Inequalities** within research (Mathieu 2024, 2023)
- **Quality** of research (Gonzalez-Marquez 2024)

Carbon footprint: a crucial tool for decarbonization pathways.

Measures the **cost** of activities, but what about the **benefits** ?

Problem statement: How to develop fair and equitable inter-branch cooperation, taking into account North-South disparities, as well as the impact of research activities themselves on the carbon footprint?

I. An original context: an International Joint Unit (UMI)

CEMOTEV
Centre d'études sur la mondialisation, les conflits, les territoires et les vulnérabilités

UVSQ université PARIS-SACLAY

SOURCE
Soutenabilité et résilience

UVSQ université PARIS-SACLAY

IRD Institut de Recherche pour le Développement FRANCE

Since February 2022, **CEMOTEV** (UVSQ, UPSaclay) and **UMI Résilience** (IRD) have become the International Joint Unit for Sustainability and Resilience – **UMI SOURCE** (UPSaclay, UVSQ, IRD).

4 branches : Côte d'Ivoire, France, Madagascar, Senegal.

Development Studies: pluralist **economics**, **geography**, **sociology**, **social psychology**.

Challenges of an unprecedented research coordination with Southern partners in Africa, notably by overcoming research endowment inequalities:

- ***Structural endowments***: funding, publication resources, infrastructure *(Waast et Gaillard 2018, UNESCO 2021, Mwelwa et al. 2020)*.
- ***Scientific visibility and recognition***: access to journals, marginalization, subordinate roles *(Carbonnier et Kontinen 2015, Keim 2010)*.
- ***Epistemic injustice*** : predominance of Western research models, devaluation of Southern researchers, gender inequalities *(Fricker 2007, Kleiche Dray 2018)*.

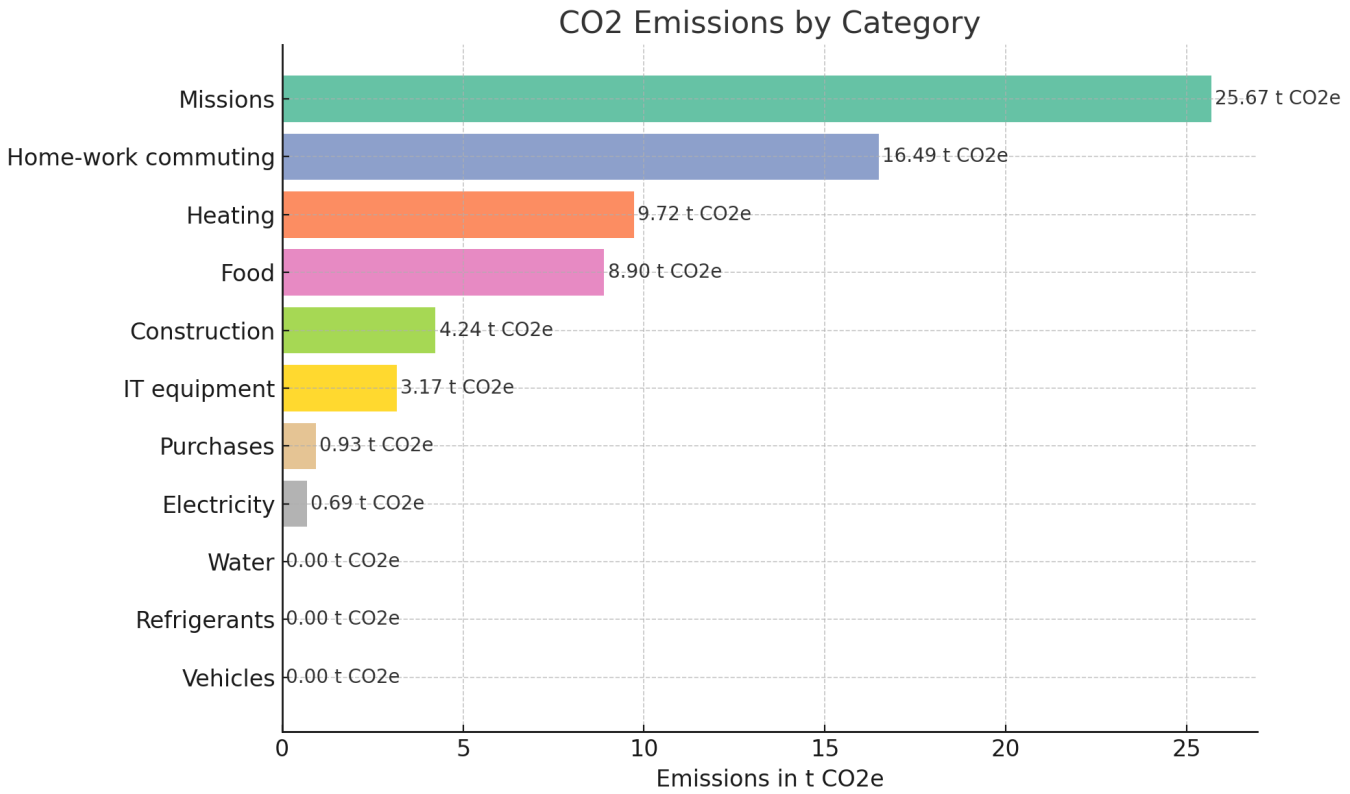
II. The carbon footprint (CF) of UMI SOURCE (1/3)

1. Methodology

- Measurement exclusively of the **France branch**: in Saint-Quentin-en-Yvelines, **Guyancourt** (78280).
- Assessment for the year **2022**.
- Work carried out as part of a **tutored project** with Master's students (M1 and M2) in Economics and Development and Sustainability Evaluation (UPSaclay).
- Following the methodology developed by **Labos1point5** (Mariette et al. 2022).
- Data on **buildings**, **purchases**, **IT equipment**, and **missions** were collected directly from UVSQ and UMI SOURCE records.
- **Commute** and **food** data were obtained from a survey conducted among members of the France branch.
- Staff in Paris-Saclay 2022: **5** researchers, **17** teacher-researchers, **3** technical and administrative staff (ITA), **10** PhD students/postdocs.
- Total: **35** (excluding associated researchers).

II. The carbon footprint (CF) of UMI SOURCE (2/3)

2. Results



The carbon footprint of UMI SOURCE in 2022 totals **69.80t CO2e, equivalent to 1.95t CO2e per person.**

Complies with the Paris Agreement target of 2t CO2e/person (Cluzel 2023), but this includes both personal and professional emissions: we are **barely under for professional**.

The « **Missions** » category represents the highest emissions contributor: it includes exclusively air travel, not internal trips by car, for instance.

II. The carbon footprint (CF) of UMI SOURCE (3/3)

3. The CF measures costs, but what about the benefits?

- For the UMI, where the core of its activities relies on collaborative research with Southern branches and field missions: **how can the benefits of these carbon-intensive activities be integrated?** Can the CF be adjusted by incorporating potential benefits?

- Towards a **"heliocentric" model of scientific research** (Gonzalez-Marquez et al., 2024): shifting the focus of research valuation from articles, considered the central engine of science, to scientific processes and work.

- Proposal to revalue various research mission activities that **create value**: (1) Field surveys; (2) Training for young researchers and senior researchers; (3) Conferences/Seminars; (4) Supervision of theses, especially for Southern PhD students; (5) Creation and sharing of data; (6) Scientific publications.

- Several possible indicators:

(1) A **composite indicator** integrating an adjusted carbon footprint and additional dimensions, or;
(2) Proposal for a detailed form where mission participants would check the corresponding mission objectives
→ Result: **Radar chart** with different scientific production profiles based on researcher profiles.

III. For an adjusted carbon footprint (1/3)

Emissions per unit of scientific output (CF/SO) UMI SOURCE

$$\frac{CF}{SO} = \frac{UMI\ CF\ t\ CO2e\ in\ 2022}{Number\ of\ publications\ in\ 2022\ and\ 2023}$$

$$= \frac{69{,}80\ t\ CO2e}{47}$$

$$= \mathbf{1{,}48\ t\ C02e/publication}$$

Emissions per Scientific 'Performance' Index (CF/SPI) UMI SOURCE

$$Calculation\ of\ the\ SPI = \frac{\sum(\frac{H-Index}{SJR\ ranking})}{Number\ of\ publications}$$

$$\frac{CF}{SPI} = \frac{UMI\ CF\ t\ CO2e\ in\ 2022}{Scientific\ Performance\ Index}$$

= 0.83 *t C02e per SPI*

III. For an adjusted carbon footprint (2/3)

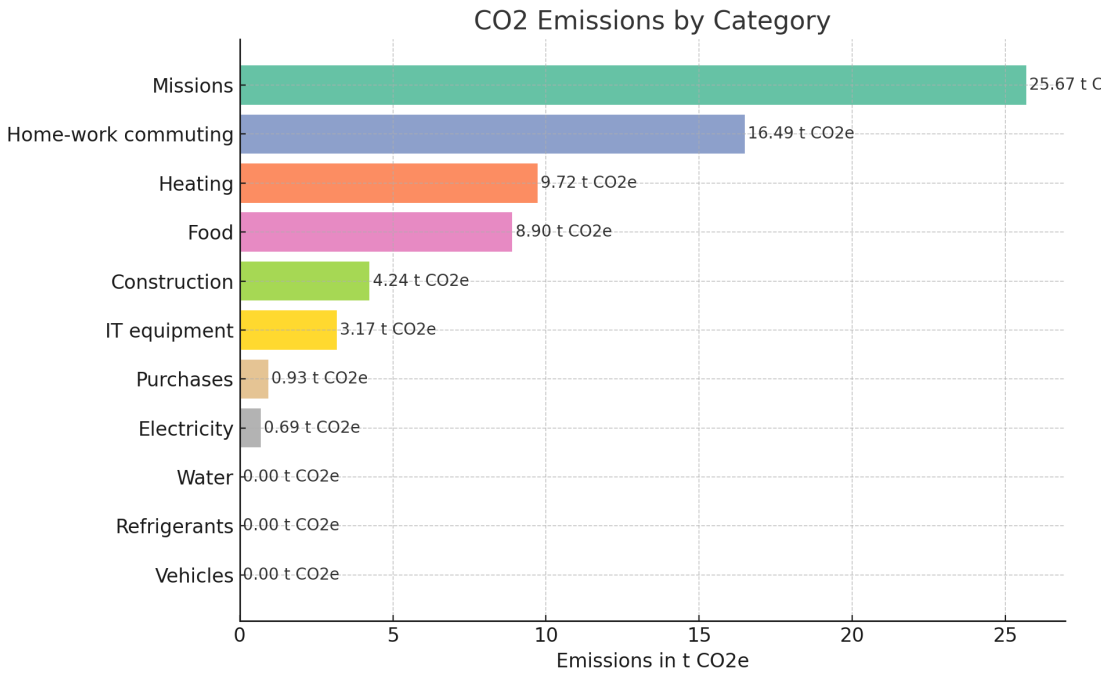
Comparison between UMI SOURCE and a reference lab in economics in 2022				
	Carbon Footprint (CF)	**CF/person**	**SPI**	**Adjusted CF (CF/SPI)**
UMI SOURCE	69.80 t C02e	1,95t C02e/person	83.92	0.83 t C02e
Reference lab in economics	206 t CO2e	1,14 t C02e/person	126.38	1.63 t C02e

Scopes of UMI SOURCE and the reference lab in economics 2022			
	Staff 2022	**Budget 2022**	**Categories**
UMI SOURCE (France branch)	5 researchers, 17 faculty members, 3 technical staff, 10 PhD students/postdocs Total: **35**.	100k€	All from Labos1point5 (until April 2024).
Reference lab in economics	8 researchers, 68 faculty members, 10 technical staff, 95 PhD students/postdocs. Total: **181**.	191k€	All from Labos1point5 (until April 2024).

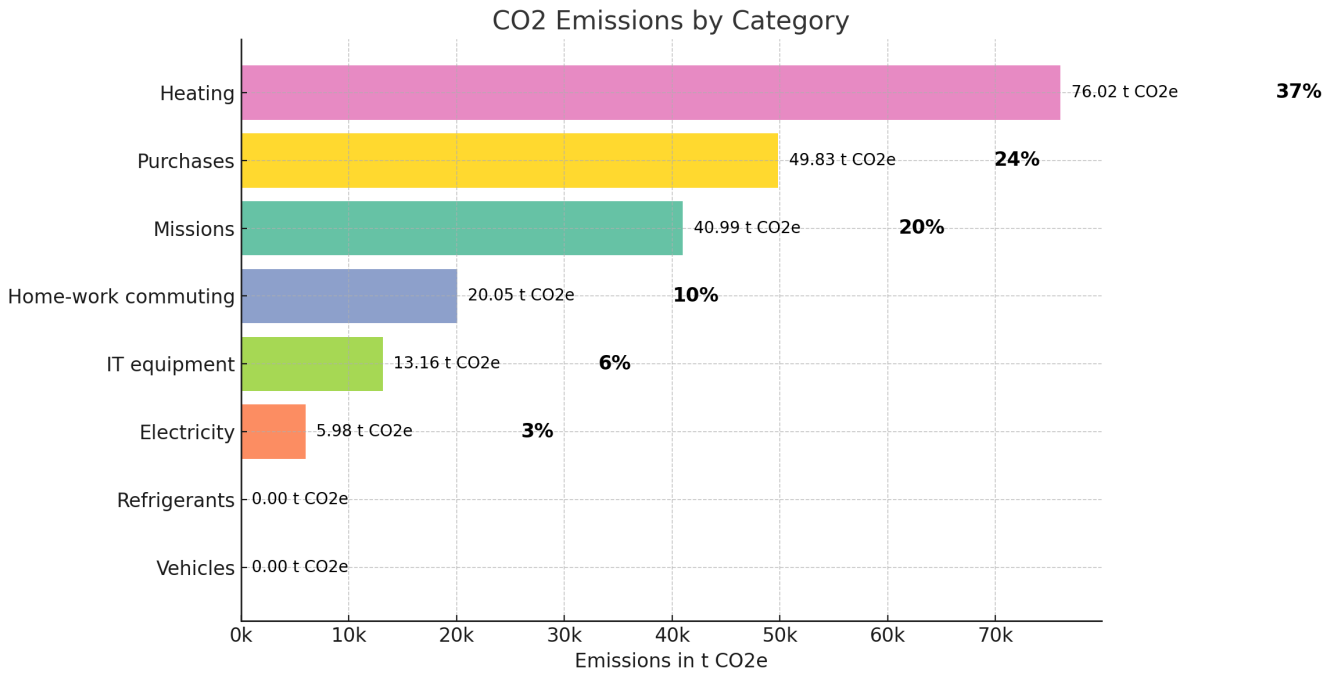
- **CF**: higher in the reference lab is due to its size and different staffing levels, but we note a lower BC/person for the reference lab compared to UMI SOURCE.
- **CF/person**: more efficient for the reference lab than for the UMI.
- **SPI**: better performance for the reference lab.
- **CF/SPI**: UMI SOURCE conducts research more efficiently in terms of CO2 emissions.

- The difference in CF/SPI can be explained by the **differences in emission distribution between the two labs**.
- While heating and purchases are predominant for Lab2, missions (**core of the laboratory's research**) are predominant for Lab1.
- Lab1 emits more in what simultaneously **provides the most benefits**, which can justify the differences in CF/SPI.

Lab1: UMI SOURCE



Lab2: Reference lab in economics



Discussion

1. Environnemental dimension

Measurement of the carbon footprint adjusted for the benefits of certain missions.

2. Integrating research inequalities

How to reduce emissions without affecting research opportunities, particularly for young researchers in the Global South?

3. Measuring the quality of science through the lens of Open Science?

Ensuring the FAIR principles (Findability, Accessibility, Interoperability, Reproductibility). S-index Challenge example.

Towards a Just Transition Indicator for Research (JTR)?

$$Just\ Transition\ Indicator\ for\ Research\ (JTR) = \alpha\ Adjusted\ carbon\ footprint + \beta\ Research\ Equity\ Index + \gamma\ Open\ Science\ Index$$

Conclusion

- The carbon footprint measures costs; can we **incorporate benefits** into its calculation?

- Challenges of integrating **research inequality** and **quality** dimensions.

- This would allow for the **integration** and **valuation** of **various types of scientific outputs**, shifting the perspective on how science is valued.

- The indicator could be visualized as a **radar chart** differentiating research profiles, allowing multiple forms of valuation based on a broad typology of scientific outputs.

Thank you

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Annex 1. SPI data

Lab1 – UMI SOURCE

Journal	Rank	H-Index
The Quarterly Review of Economics and Finance	Q2	66
International Review of Financial Analysis	Q1	91
Journal of International Financial Markets, Institutions and Money	Q1	80
Journal of Coastal Conservation	Q2	52
Journal of Comparative Economics	Q1	102
Journal of Commodity Markets	Q2	26
IAHS-AISH Scientific Assembly	no rank	46
Global Scientific Journal	no rank	no rank
Agroforestry Systems	Q1	92
Revue d'économie régionale et urbaine	no rank	no rank
Finance Research Letters	Q1	101
Ocean & Coastal Management	Q1	107
Resources Policy	Q1	114
International Journal of Global Energy Issues	Q4	29
Energy Policy	Q1	272
International Review of Economics and Finance	Q1	78
Journal of Environmental Management	Q1	243
Bankers, Markets & Investors	no rank	no rank
Sustainability	Q2	169
Empirical Economics Letters	Q2	68
Health Economics Review	Q2	37
Communications Earth & Environment	Q1	37
International Journal of Disaster Risk Reduction	Q1	86
Viruses	Q2	130
Resource and Energy Economics	Q1	82
Revue Réflexions Économiques	no rank	no rank
Mondes en Développement	Q4	13
Revue de Géographie du Laboratoire LEIDI	no rank	no rank
Journal Ethics Economics and Common Goods	no rank	no rank
Revue ESM	no rank	no rank

Lab2 – A reference lab in economics

Journal	Rank	H-Index
International Journal of Game Theory	Q1	45
Social Justice Research	Q3	38
Ecological Economics	Q1	146
Journal of Public Economic Theory	Q2	55
International Economics	Q3	41
Bankers Markets & Investors	no rank	no rank
Journal of Behavioral and Experimental Economics	Q2	51
Fulbright Review of Economics and Policy	no rank	no rank
Asian Journal of Economics and Business	Q4	11
Journal of International Money and Finance	Q1	84
Regional Studies	Q1	107
Mathematical Social Sciences	Q3	45
Œconomia - History/Methodology/Philosophy	no rank	no rank
Review of World Economics	Q2	44
Revue d'économie financière	Q4	18
European Journal of Law and Economics	Q3	26
Revue Economique	Q4	22
Journal of African Economies	Q2	34
Industrial and Corporate Change	Q2	60
Resource and Energy Economics	Q1	92
Labour Economics	Q1	77
La semaine juridique. Notariale et immobilière	no rank	no rank
Journal of Development Economics	Q1	122
Management International	Q4	10
Annals of Economics and Statistics	Q3	30
Behavior Research Methods	Q1	94
Energy Economics	Q1	134
Review of Development Economics	Q2	41
Transportation Research Procedia	no rank	no rank
Revue Française de Socio-Economie	Q4	13
Revue d'économie industrielle	Q4	20
European Journal of Public Health	Q1	94
Bulletin of Economic Research	Q3	32
World Development	Q1	125
New Political Economy	Q2	58
Applied Economics	Q2	73

Annex 2. Publications of the reference lab in economics and CF adjusted

The number of publications for the reference economics laboratory:

- 2023: 63 publications
- 2022: 35 publications

This makes a total of **98** publications for the years 2022 and 2023.

Knowing the CF of the reference economics laboratory as: 206 t CO2e.

$$\frac{CF}{SO} = \frac{Lab.ref.CF\ t\ CO2e\ in\ 2022}{Number\ of\ publications\ in\ 2022\ and\ 2023}$$

$$= \frac{206\ t\ CO2e}{98}$$

$$= \mathbf{2.10\ t\ CO2e/publication}$$

For UMI it was : $\mathbf{1,48\ t\ CO2e/publication}$