LBBE
LABORATOIRE DE BIOMÉTRIE ET BIOLOGIE ÉVOLUTIVE

General assembly

Environmental footprint of the LBBE

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Program

- Objectives of the GA
- National and international contexts
- Caveats
- Presentation of the greenhouse gas (GHG) footprint of the LBBE, global results
- Focus on a few sectors
- Open discussion

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Contributors

- Administrative department (Nathalie Arbasetti) and IT department (Bruno Spataro)

- Membres du GTEE :
  - Anouk Necsulea
  - Aurélie Siberchicot
  - Barbara Vuillaume*
  - Bastien Boussau
  - Eric Tannier
  - Etienne Rajon
  - Rémi Fay*
  - Chloé Garambois*
  - Anaïs Larue*
  - Natacha Kremer
  - Philippe Veber
  - Vincent Lacroix

** : PhD student or temporary contracts*

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Objectives

- Set up 3 working groups (WG) for different emission sectors

- Each WG will be able to draw on the footprint assessment to propose measures to reduce the LBBE's footprint in the coming years

- **A person hired with a fixed-term contract will help organize the WGs**

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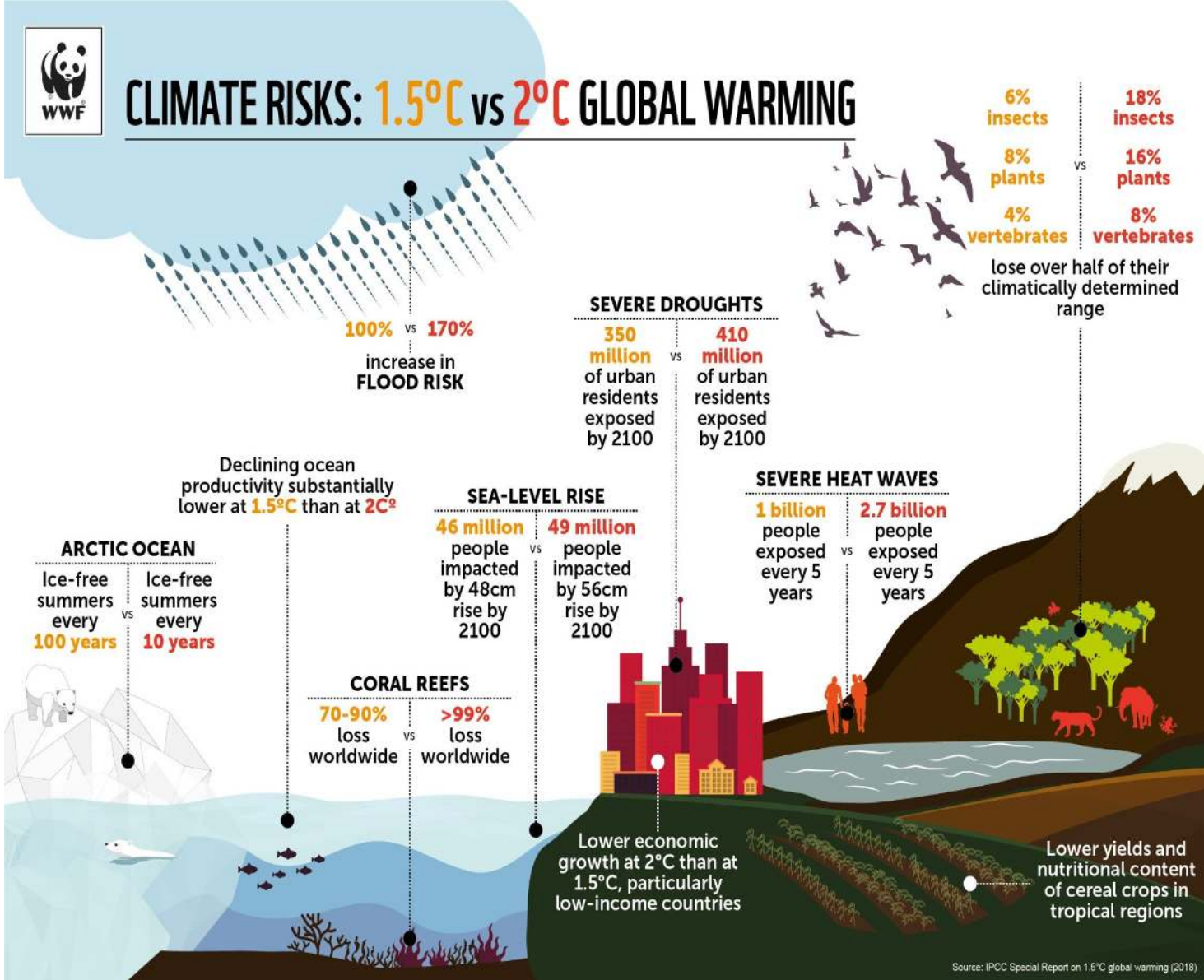
Context



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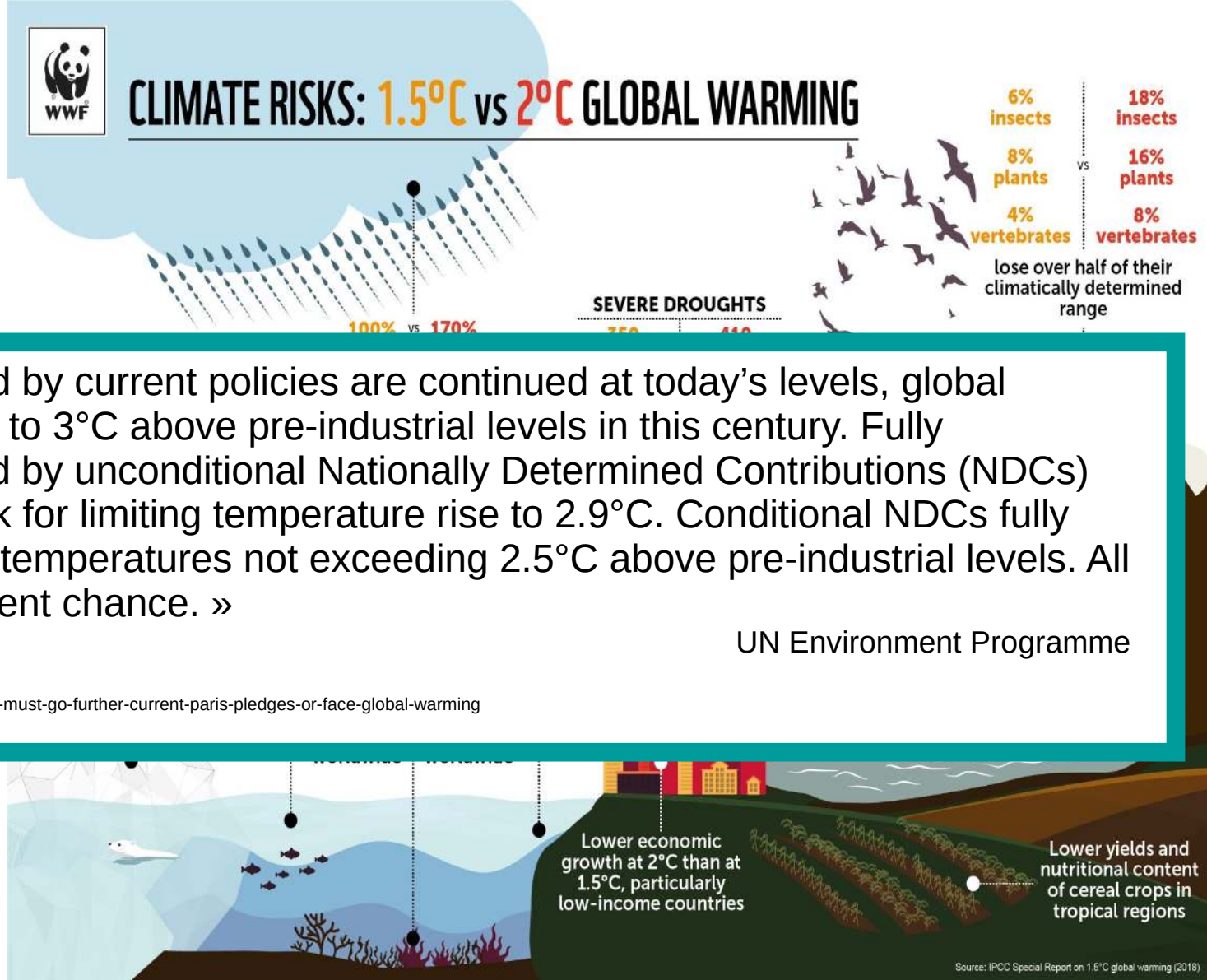


« If mitigation efforts implied by current policies are continued at today's levels, global warming will only be limited to 3°C above pre-industrial levels in this century. Fully implementing efforts implied by unconditional Nationally Determined Contributions (NDCs) would put the world on track for limiting temperature rise to 2.9°C. Conditional NDCs fully implemented would lead to temperatures not exceeding 2.5°C above pre-industrial levels. All of these are with a 66 per cent chance. »

UN Environment Programme

https://www.unep.org/news-and-stories/press-release/nations-must-go-further-current-paris-pledges-or-face-global-warming

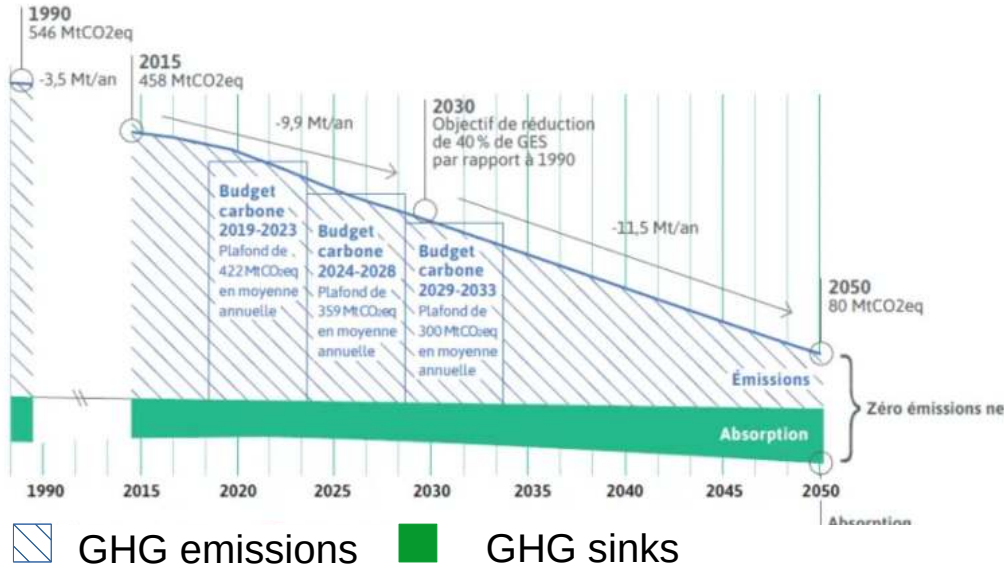
National context

Published 19th December 2018 | Updated 24th October 2024

National low-carbon strategy (SNBC)

- It defines a trajectory for reducing greenhouse gaz emissions up to 2050, and sets short- and medium-term objectives: the carbon budgets.
- It has two aims: to achieve carbon neutrality by 2050, and to reduce the carbon footprint of French consumers.
- Public decision-makers at both national and local level must take this into account.

Evolution of GHG emissions and sinks in France between 1990 and 2050 (in $MtCO_2eq$). CITEPA inventory 2018 and SNBC revised scenario (carbon neutrality)



https://www.ecologie.gouv.fr/politiques-publiques/strategie-nationale-bas-carbone-snbc

National context

« Before the end of 2024, all higher education and research operators are required to build or update a sustainable development and social responsibility master plan (DD&RS).

The “eco-responsible public services” circular of November 2023 specifies regulatory targets to be met, including:

- 100% of government employees trained in ecological transition
- 30% reduction in business travel expenses compared to 2019
- 30% of outbound air travel compared to 2019
- 25% of IT and telephone equipment re-used per year
- 25% less food waste than in 2023
- 25% reduction in energy consumption by tertiary buildings
- 15% drinking water consumption »

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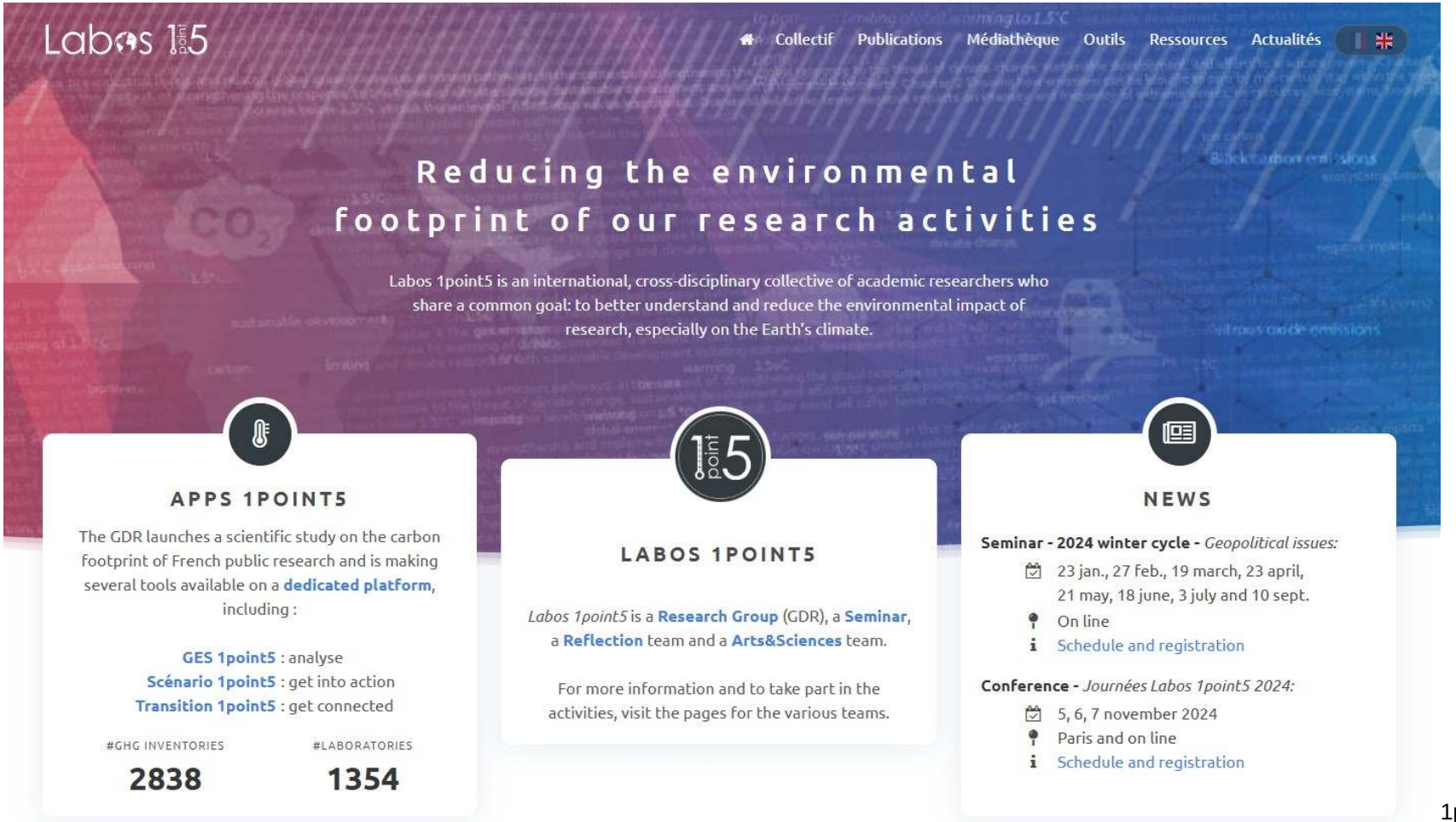
National context



1point5.org/

International context

Home | About Us | What UCL does | Take Action | Search by Topic | News and Events | Case Studies | Contact Us

UCL Home » Sustainable UCL » Take Action » Staff Action » LEAF

LEAF - Laboratory Efficiency Assessment Framework

LEAF is a standard set by UCL to improve the sustainability and efficiency of laboratories. Join the 85 global institutions already taking part and help address the climate and ecological emergencies through your science.

https://www.ucl.ac.uk/sustainable/take-action/staff-action/leaf-laboratory-efficiency-assessment-framework

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my green lab.

HOME ABOUT PROGRAMS IMPACT LABORATORIES RESOURCES SPONSORSHIP
PARTNERSHIPS MGL SUMMITS THE BEAKER (BLOG) EDUCATION

International context

My Green Lab is fundamentally and permanently improving the sustainability of scientific research. As a non-profit organization, we were formed to unify and lead scientists, vendors, designers, energy providers, and others in a common drive toward a world in which all research reflects the highest standards of social and environmental responsibility. Run "for scientists, by scientists," we leverage our credibility and track record to develop standards, oversee their implementation, and inspire the many behavioral changes that are needed throughout the scientific community. Though My Green Lab focuses solely on laboratory environments, we believe our activities will excite similar changes across other industries, and in the private lives of the millions of people who spend their time in labs.

Our work has been featured in *Science*, *Nature*, *Women in Science*, *Medium*, and *Sustainable Brands*. Our efforts have been celebrated by the Department of Human Health and Services, the Sustainable Purchasing Leadership Council, and the International Institute for Sustainable Laboratories (I2SL).

STRATEGIC PLAN (2021-2023) | CARBON IMPACT OF BIOTECH & PHARMA STUDY | MY GREEN LAB PROGRAMS

https://www.mygreenlab.org/about.html

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Caveats, 1/2

- Scope: LBBE-Doua, University + CNRS budgets
- GHG balance is calculated using GES1.5, as for other French laboratories
- The calculation of a GHG balance is based on conversion factors (euros → $kgCO_2e$), mainly
- Data acquisition and processing are tricky
- We share information that we consider sufficiently reliable to motivate reduction actions
- Not all sectors have the same footprint; all must participate

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Caveats, 2/2

- We will suggest some draft ideas
- These ideas can be improved:
  - Individual / collective action tension
  - GHG footprint / quality of life at work tension
  - GHG footprint / academic freedom tension
  - GHG footprint / scientific excellence tension
  - Practical difficulties, staff needed

Caveats, 2/2

- We will suggest some draft ideas
- These ideas can be improved:
  - Individual / collective action tension
  - Practical difficulties, staff needed

Seize these issues in the WGs!
As part of these WGs, you can help the LBBE to develop effective and fair measures.

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LBBE GHG footprint, 2023

CARBON FOOTPRINT

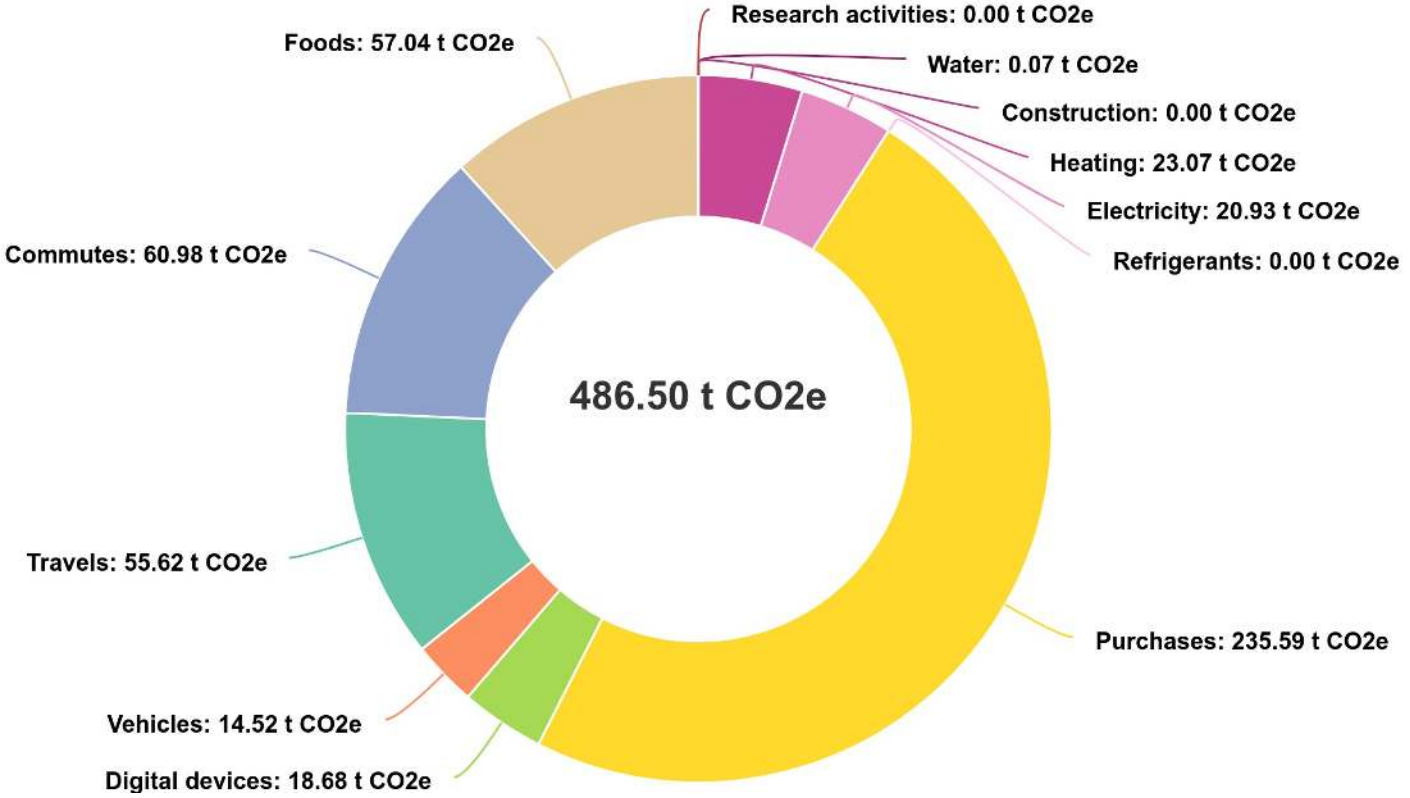
486.50 ± 39.10 t CO2e

CARBON FOOTPRINT *PER CAPITA*

2 427 ± 198 kg CO2e

CARBON INTENSITY

81 ± 7 g CO2e / €



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LBBE GHG footprint, 2022

CARBON FOOTPRINT

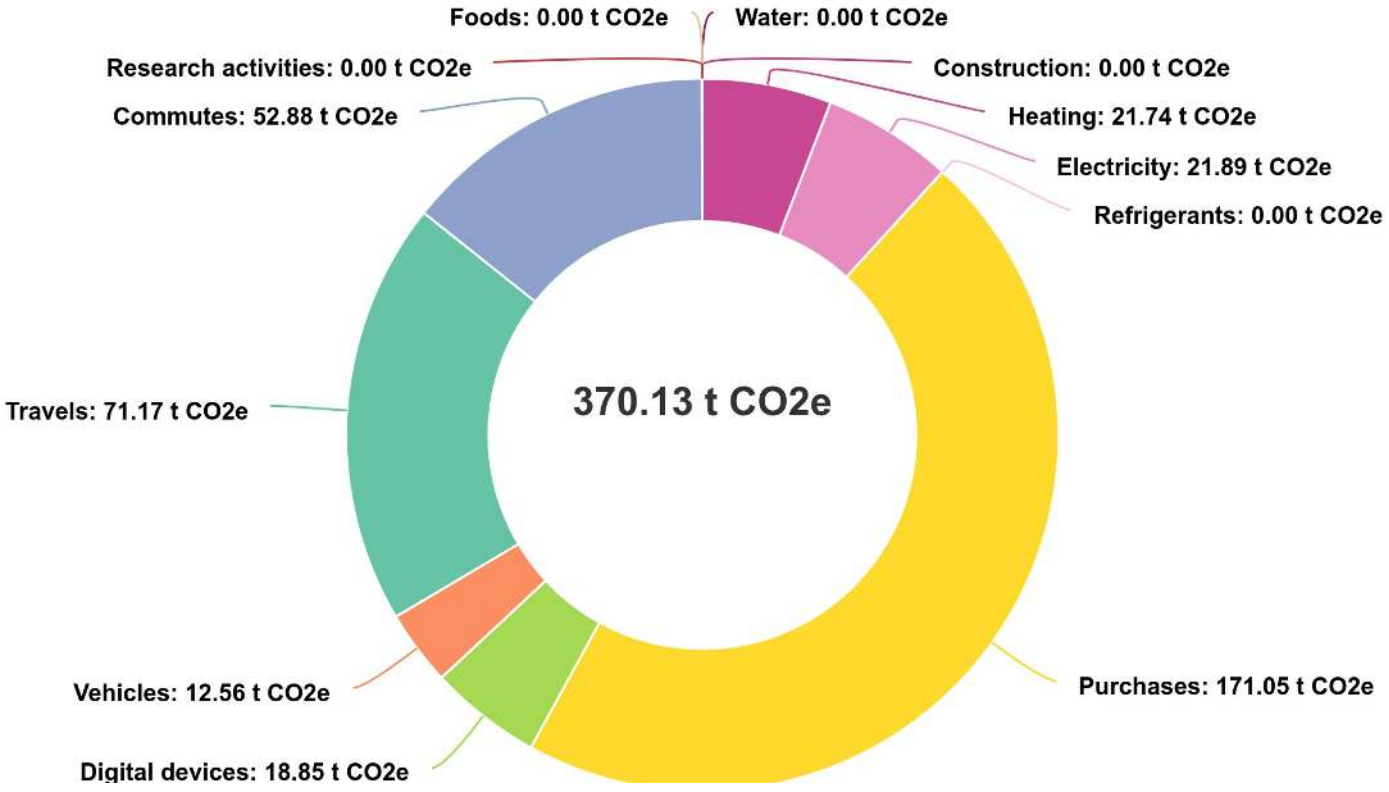
370.13 ± 34.57 t CO2e

CARBON FOOTPRINT *PER CAPITA*

2 416 ± 228 kg CO2e

CARBON INTENSITY

62 ± 6 g CO2e / €



LBBE GHG footprint, 2021

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CARBON FOOTPRINT

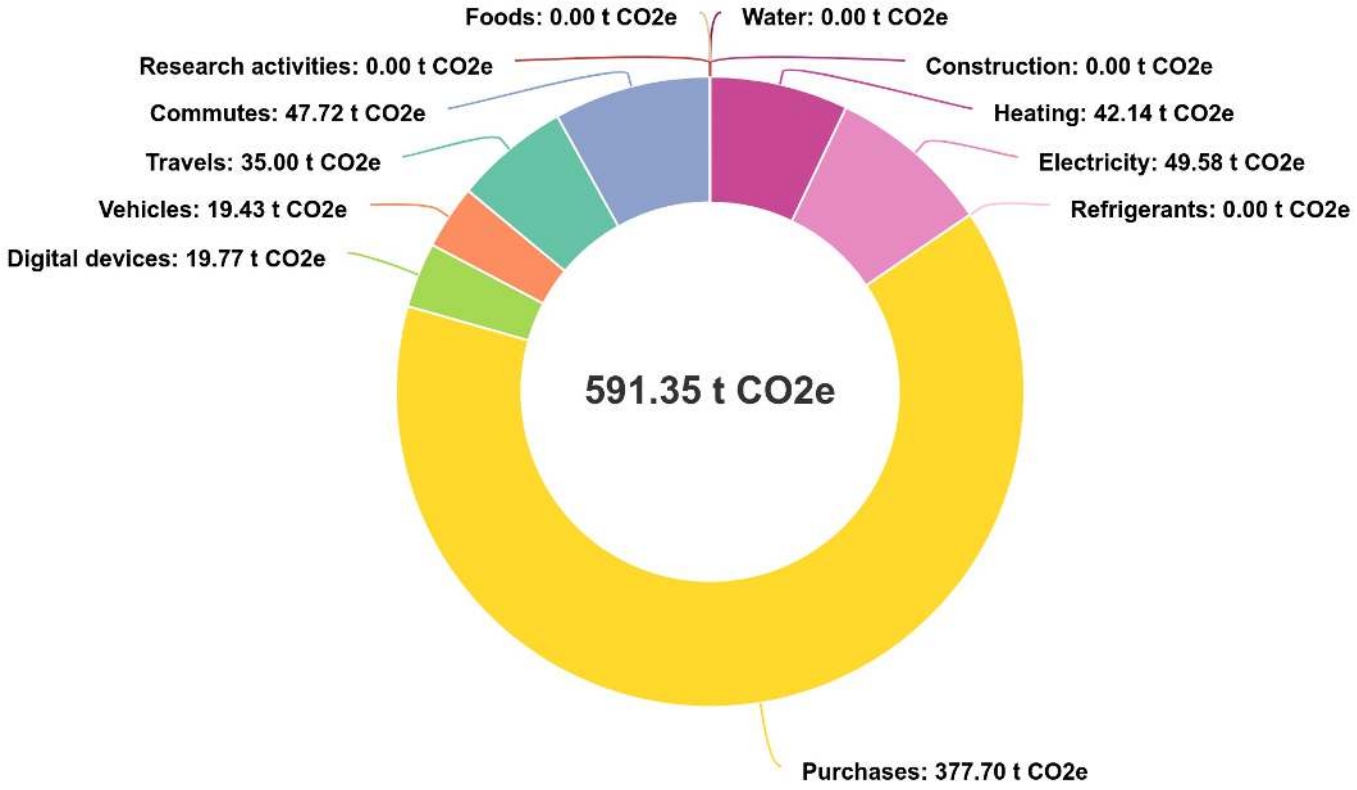
591.35 ± 56.59 t CO2e

CARBON FOOTPRINT *PER CAPITA*

3 882 ± 376 kg CO2e

CARBON INTENSITY

99 ± 9 g CO2e / €



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Program

- Objectives of the GA
- National and international contexts
- To keep in mind
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Home-work commutes
Food

Some estimations
Existing support measures

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Home-work commutes and food

#RESPONSE	RESPONSE RATE	CATERING RATE
96	47 %	42 %

Home-work commutes and food

- **Commutes**: 61 $TeCO_2$
  - UCBL1/CNRS: funding available for low-carbon transportation
  - Car sharing: Karos

Home-work commutes and food

- **Commutes**: 61 $TeCO_2$
  - UCBL1/CNRS: funding available for low-carbon transportation
  - Car sharing: Karos
- **Alimentation**: 57 $TeCO_2$
  - Alimempreinte

Université Claude Bernard Lyon 1

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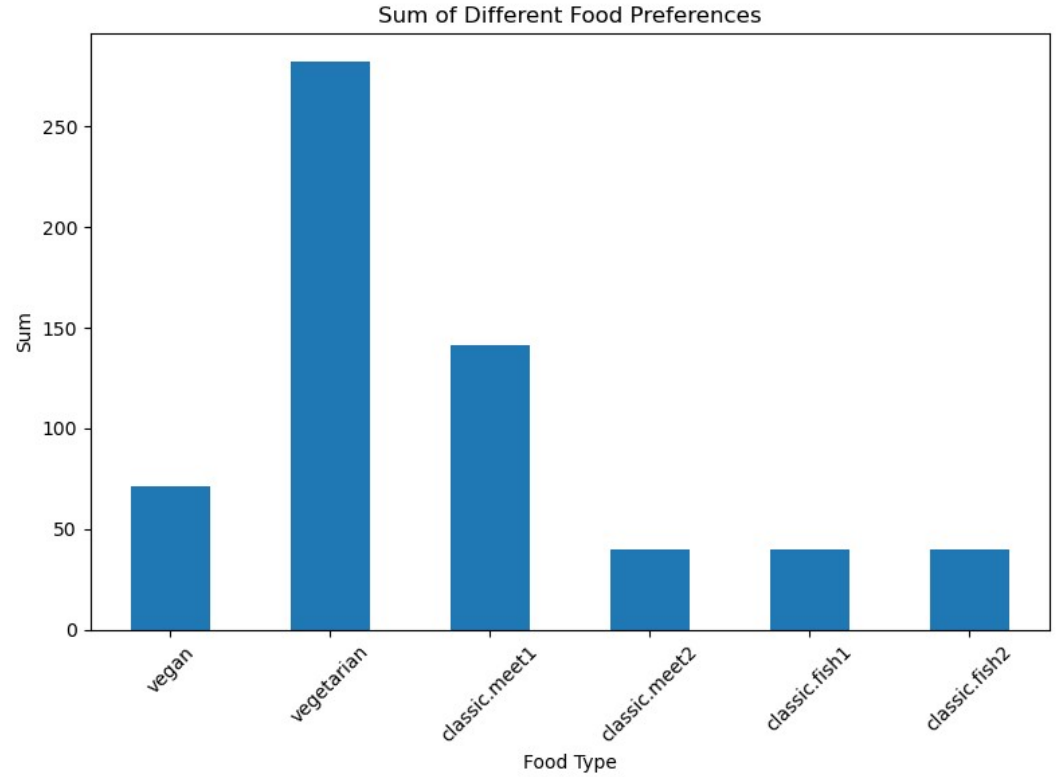
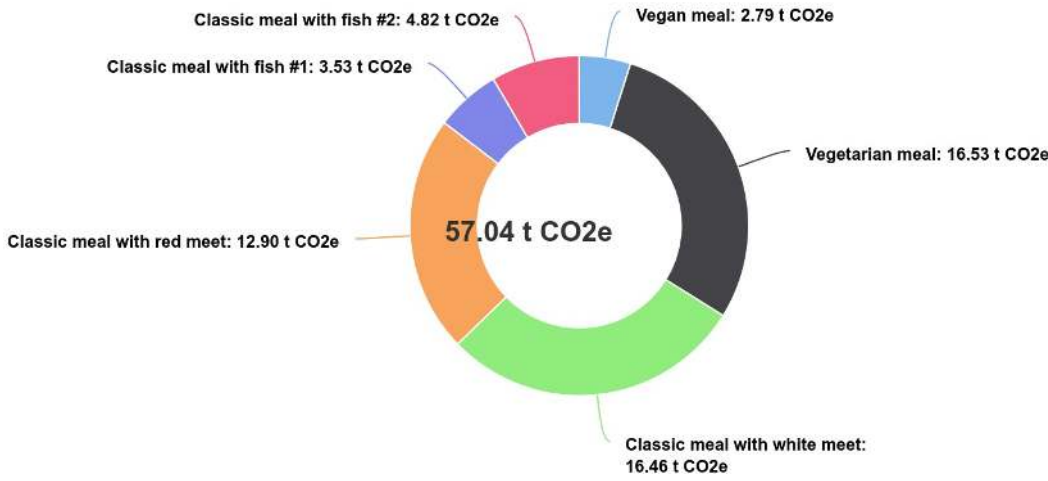
Food

#RESPONSE	RESPONSE RATE	CATERING RATE
96	47 %	42 %





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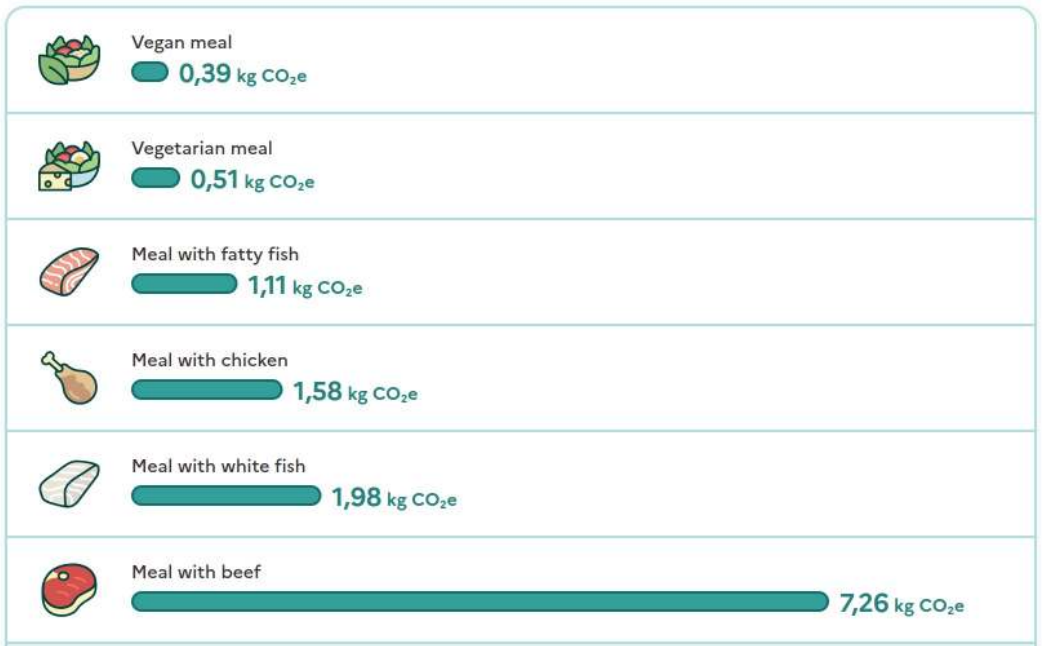
Food

Meals



https://impactco2.fr/outils/repas

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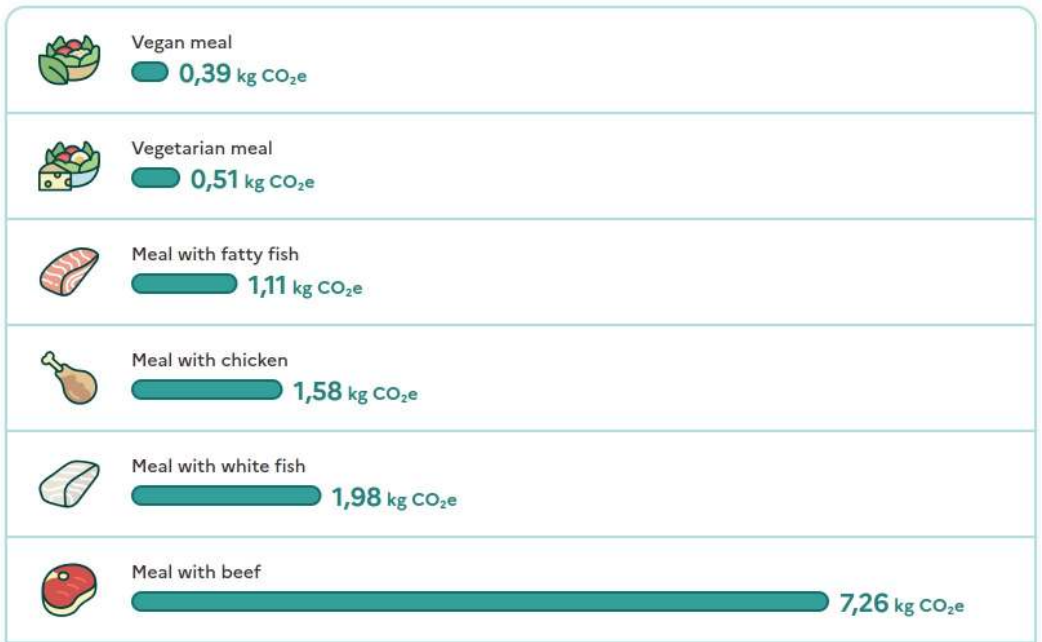
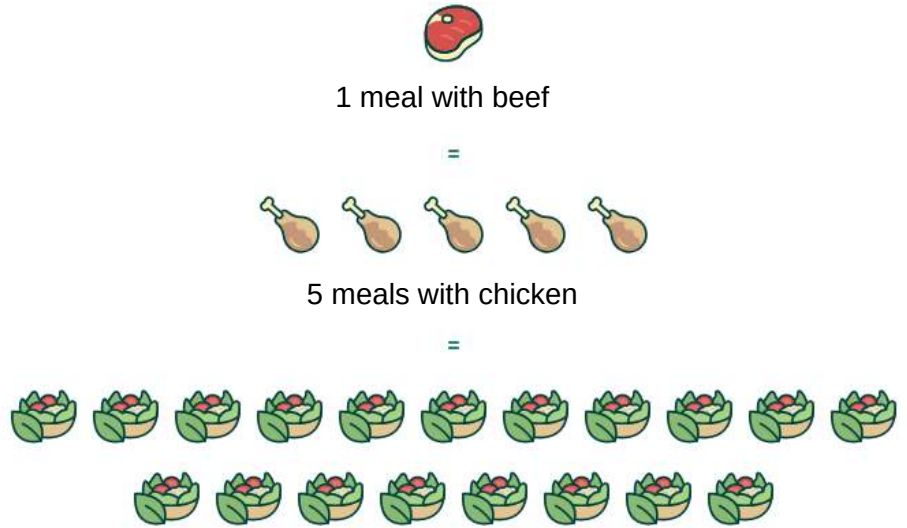
Food

Meals





Comparaison basée sur la quantité de kg CO2e émise.

RÉPUBLIQUE FRANÇAISE
ADEME
Impact CO₂

https://impactco2.fr/outils/repas

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Interested in the footprint of food and commutes?

We have some ideas, to be discussed at other moments.

Come talk to us!

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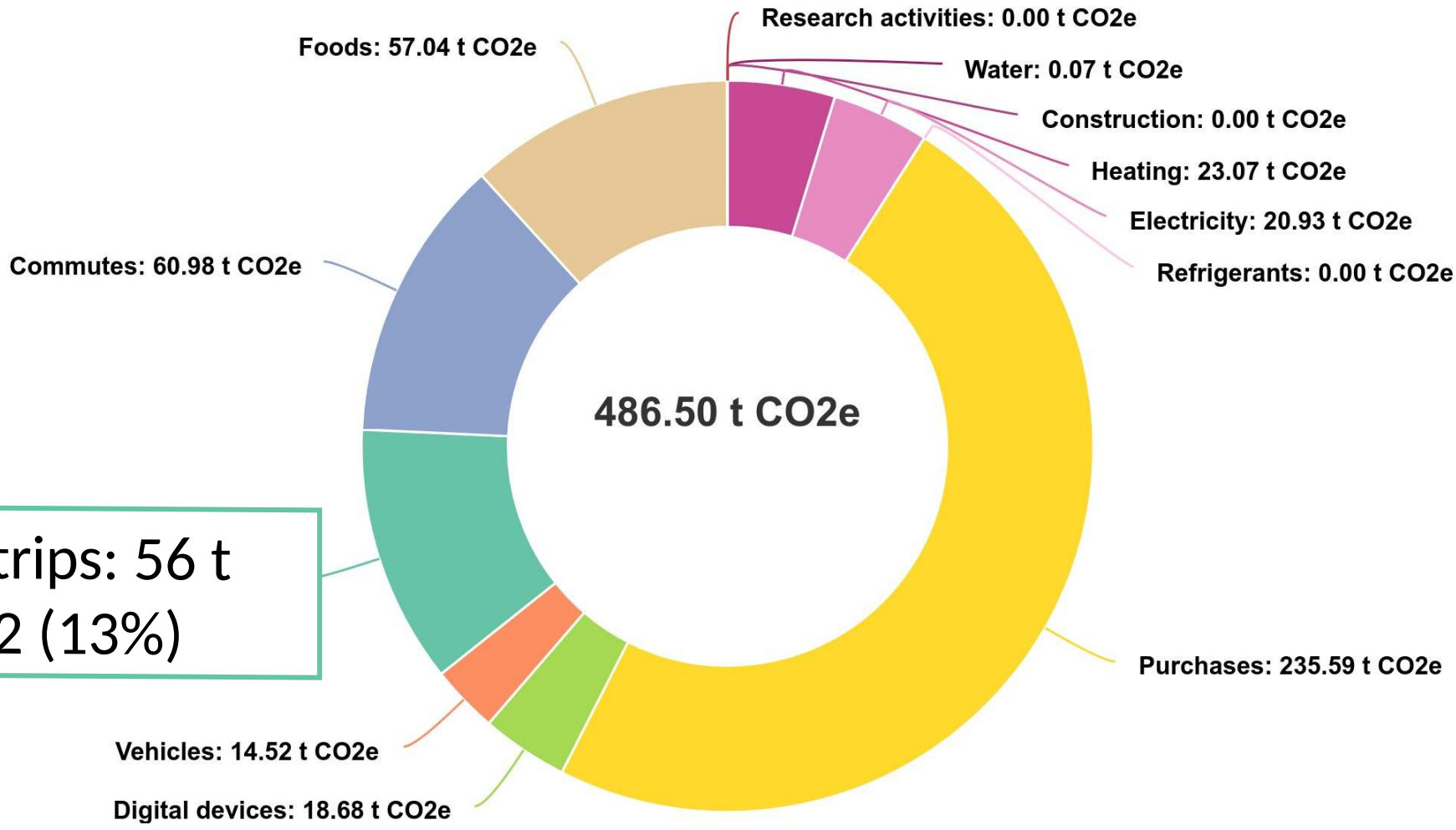
Work travel

estimations of our current footprint and ideas for improvement



Work trips: 56 t eCO2 (13%)

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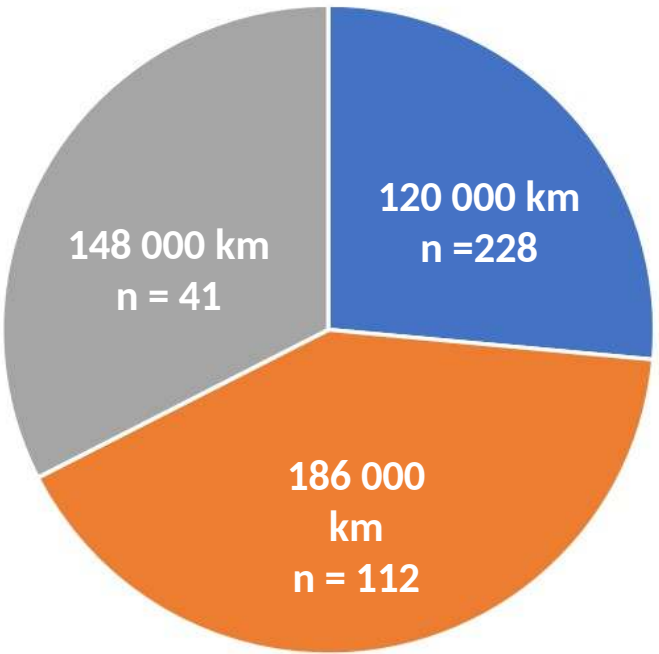
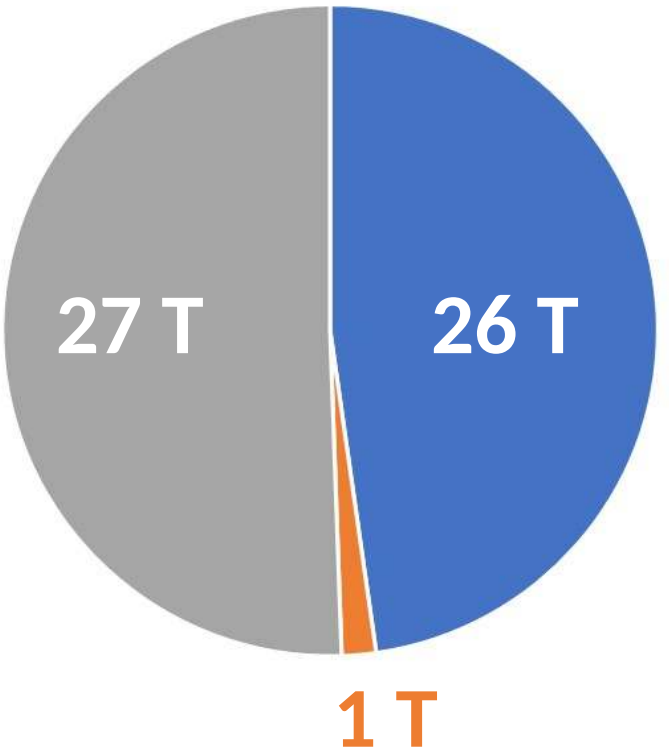
Distances (km)



Emissions (T eCO2)



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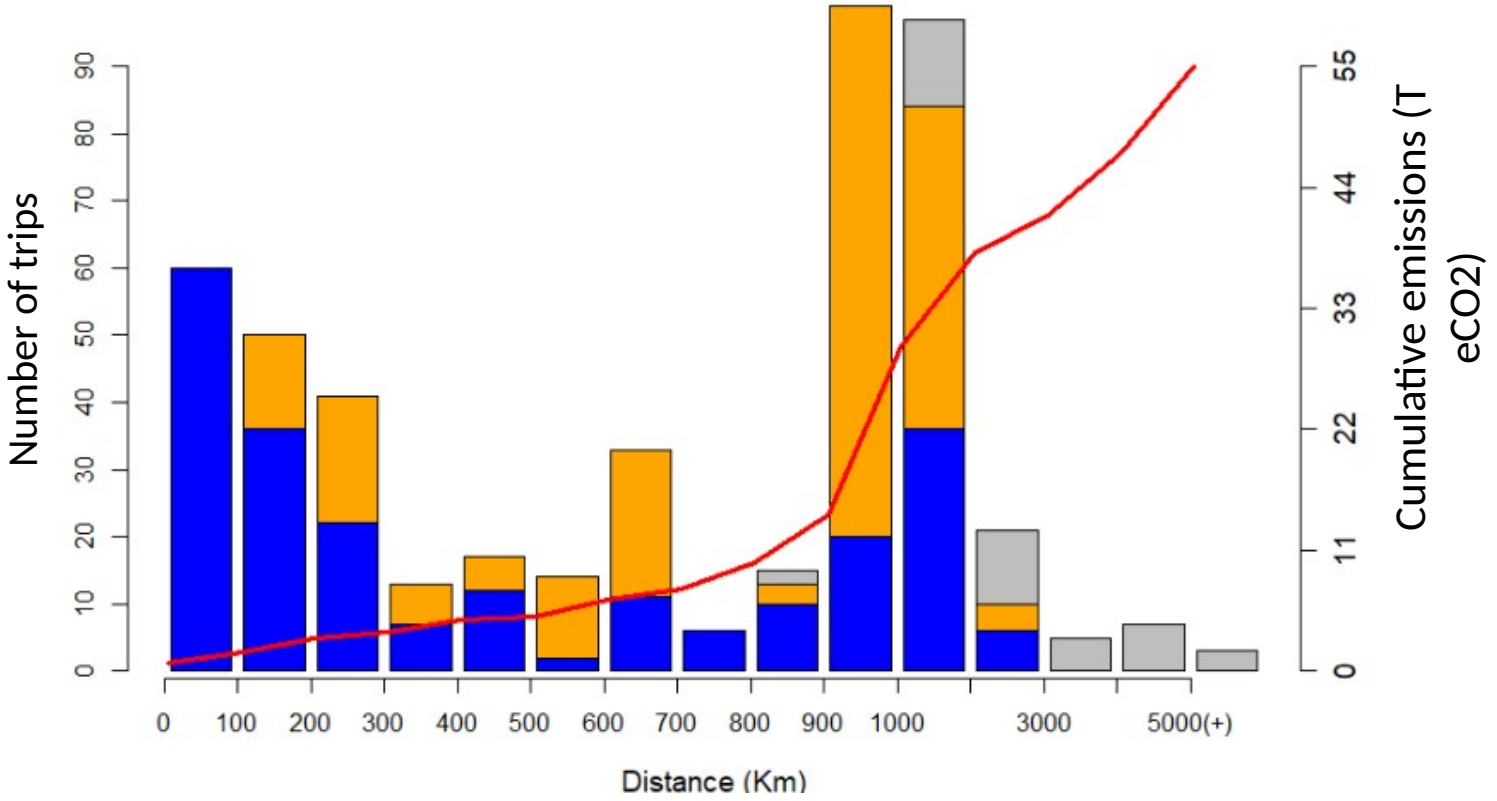

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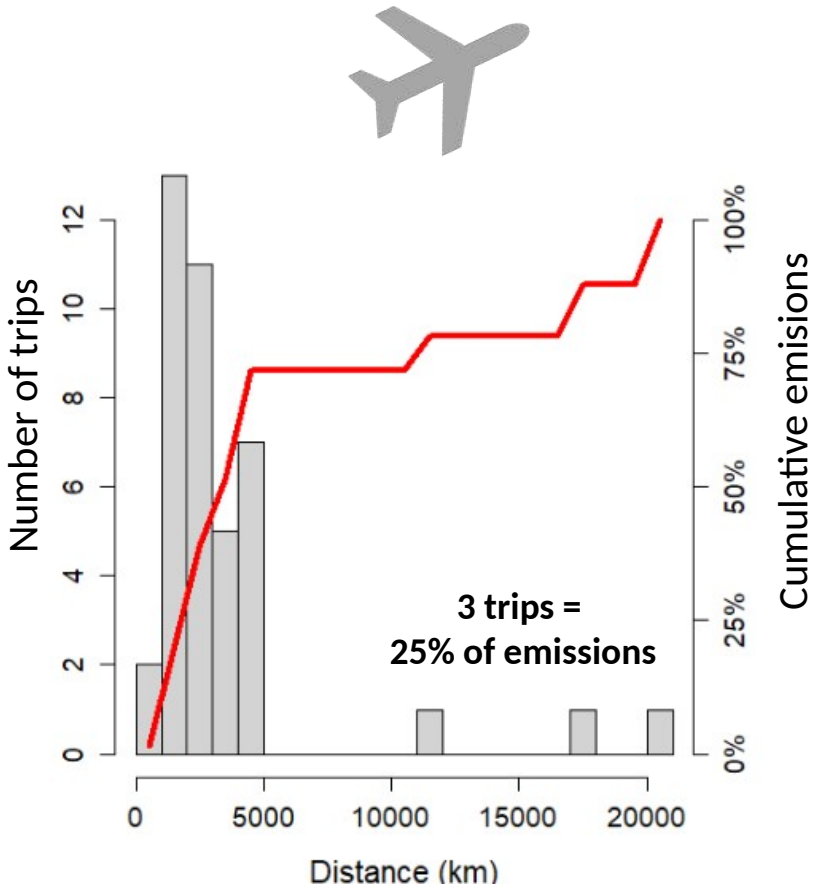

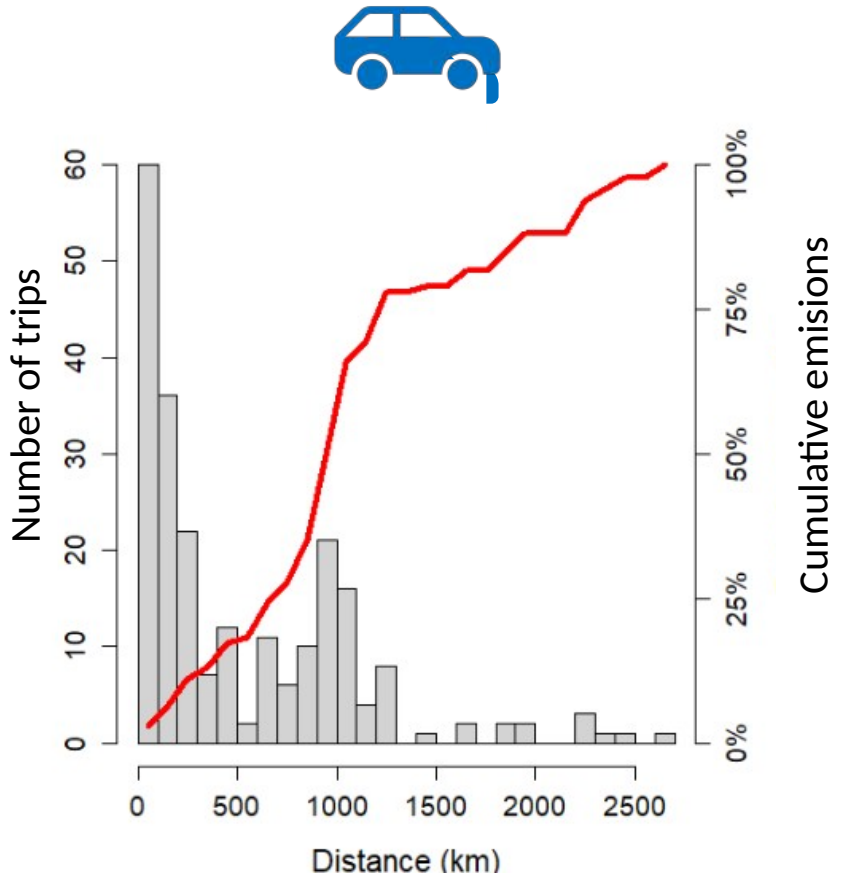

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How can we act?



- **Mobility choice**: shift from car and plane to train, particularly for journeys between 1,000 and 3,000 km.
- **Optimization**: rethink logistics (number of journeys, carpooling)? conferences to be combined with laboratory visits? Field trips to be combined with on-site staff training?
- **Reduction**: three work trips over 10,000 km account for 25% of the aircraft's footprint: long-haul quota at the level of the lab?

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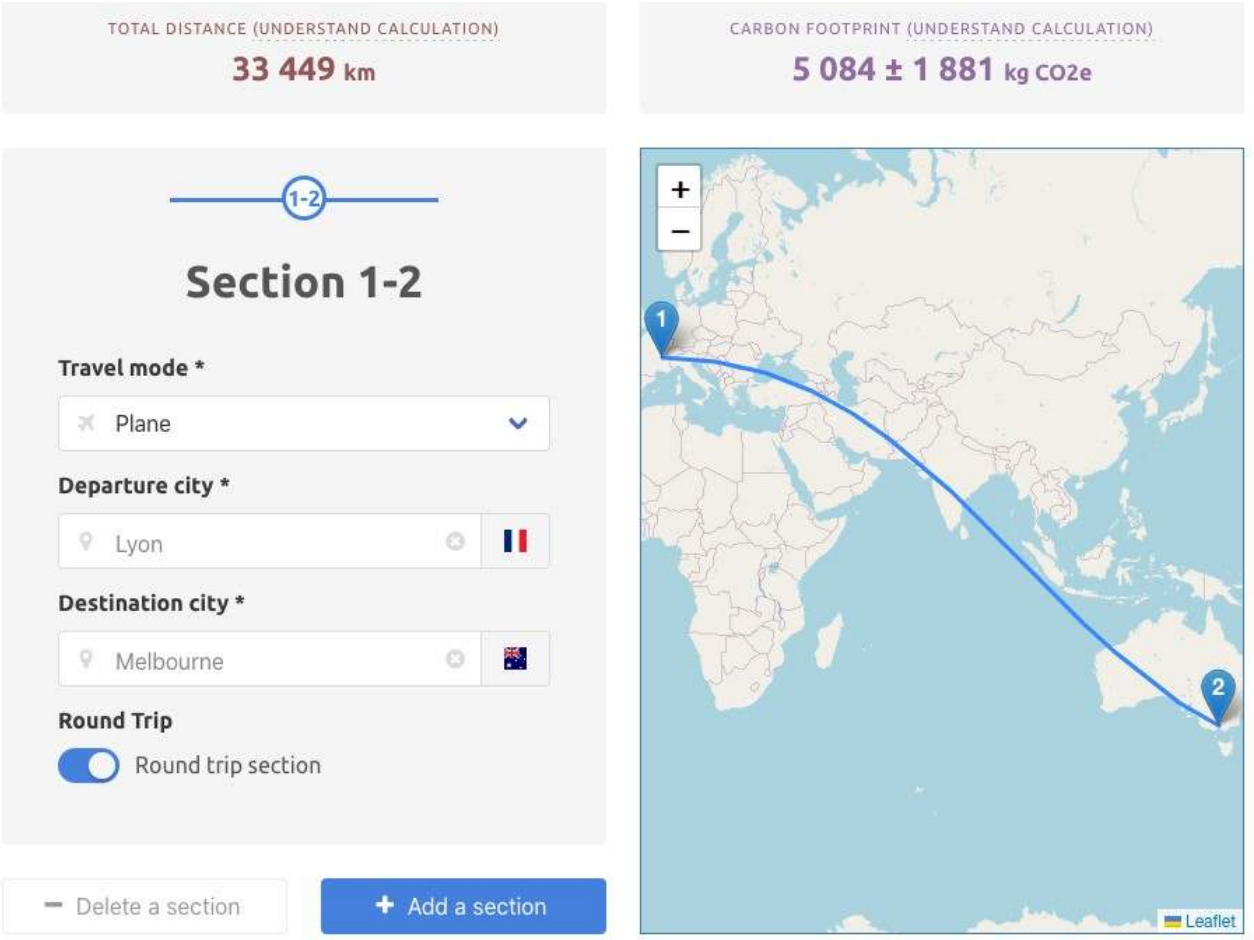
Travel simulator

You can use this simulator to prepare your trip: https://apps.labos1point5.org/travels-simulator



Transportation working group

- Led by person to be recruited in early 2025
- A few meetings per year
- Purchasing strategies for the coming years
- What rules should be proposed at lab level?
- Balance between individual choices and collective organization
- Come and take part!

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Computing hardware

some estimations and ideas to reduce our footprint

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Accounting methodology

- Different, more precise methodology for digital devices (life cycle analysis)

⇒ we will compare different areas within the digital devices sector, not with other purchase types

- Scope can be difficult to define
  - LBBE members use national infrastructures (IFB cloud, CC IN2P3, Jean Zay)
  - LBBE shares its infrastructure (FR, IFB)

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Transport and manufacturing footprint

Type of hardware	**Footprint** (kg eqCO2)	**Lifespan** (years)	**Annual footprint** (kg eqCO2 / year)
Laptop computer	300	3-5	75
Desktop computer	600	7	85
Screen < 24’’	350	>7	50
Screen from 24’’ to 31’’	430	>7	61
Screen > 31’’	590	>7	84
Small server (web)	700	7	100
Computing node	1300	>7	185
Bigmem node (4 To)	6600	7	943
100 To disk storage	2000	5-7 + replacements (25% DD)	350
Raspberry Pi	15	>3 ?	5

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LBBE infrastructure

Infrastructure = cluster + cloud (used by LBBE, FR Bioenvis, IFB)

- Current status (approximate):
  - 1024 cores
  - 20 To RAM
  - 50 To SSD
  - 1800 To disk storage
  - 8 GPU cards
  - 40 servers
- Not including various equipments (data servers, cloud/network controllers)

Infrastructure emissions

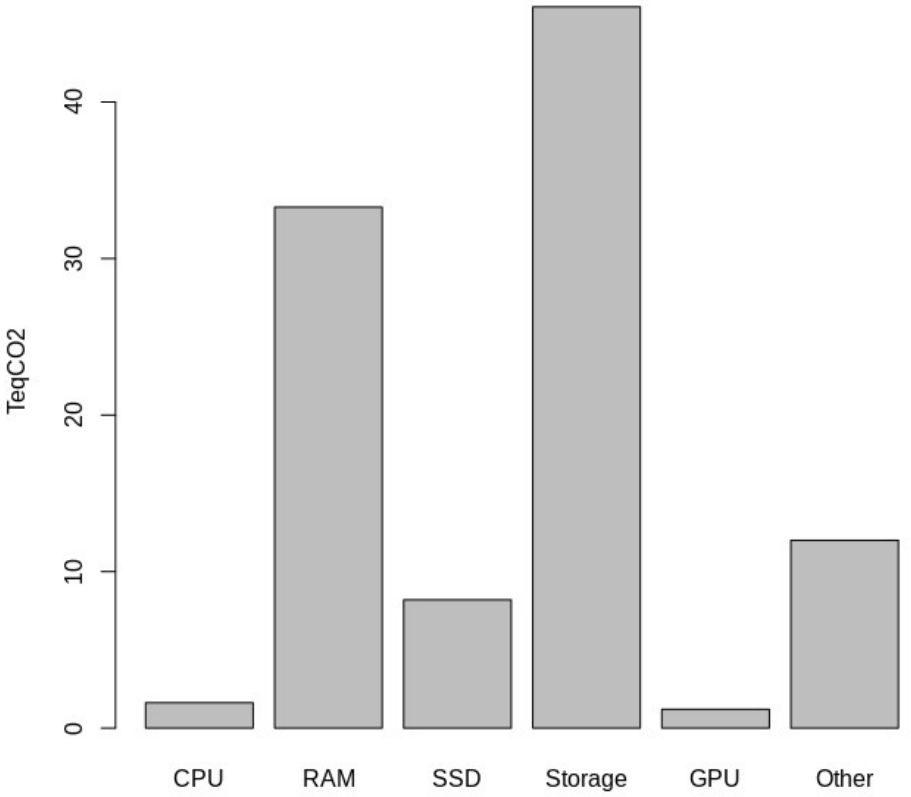
- Total emissions for the establishment of the current infrastructure:

≈ 102 $TeqCO_2$

- Annual emissions for the maintenance of the current infrastructure:

≈ 15 $TeqCO_2$

- Annual electricity consumption in the Omega server room:
≈ 11 $TeqCO_2$



Emissions for workstations

180 individual workstations (typically laptop computer + screen)

- Total emissions for establishing the current stock of workstations:

≈ 125 TeqCO_2

- Annual emissions for replacements/maintaining the current stock:

≈ 21 TeqCO_2

- Annual electricity consumption:

≈ 1,5 TeqCO_2

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How can we act?

- Reduce disk storage (archives, cleaning up old data)
- Re-evaluate RAM needs in the computing infrastructure
- Share better (no private computing servers, shared lists of available workstations, workstation “store”)
- Delay obsolescence (laptop used 3 more months = 5 % emission reduction)
- Reduce computing time and resources (ask for help)
- Ensure that computations can run on personal workstation

Join the computing WG!

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Purchases

some estimations and ideas to reduce our footprint

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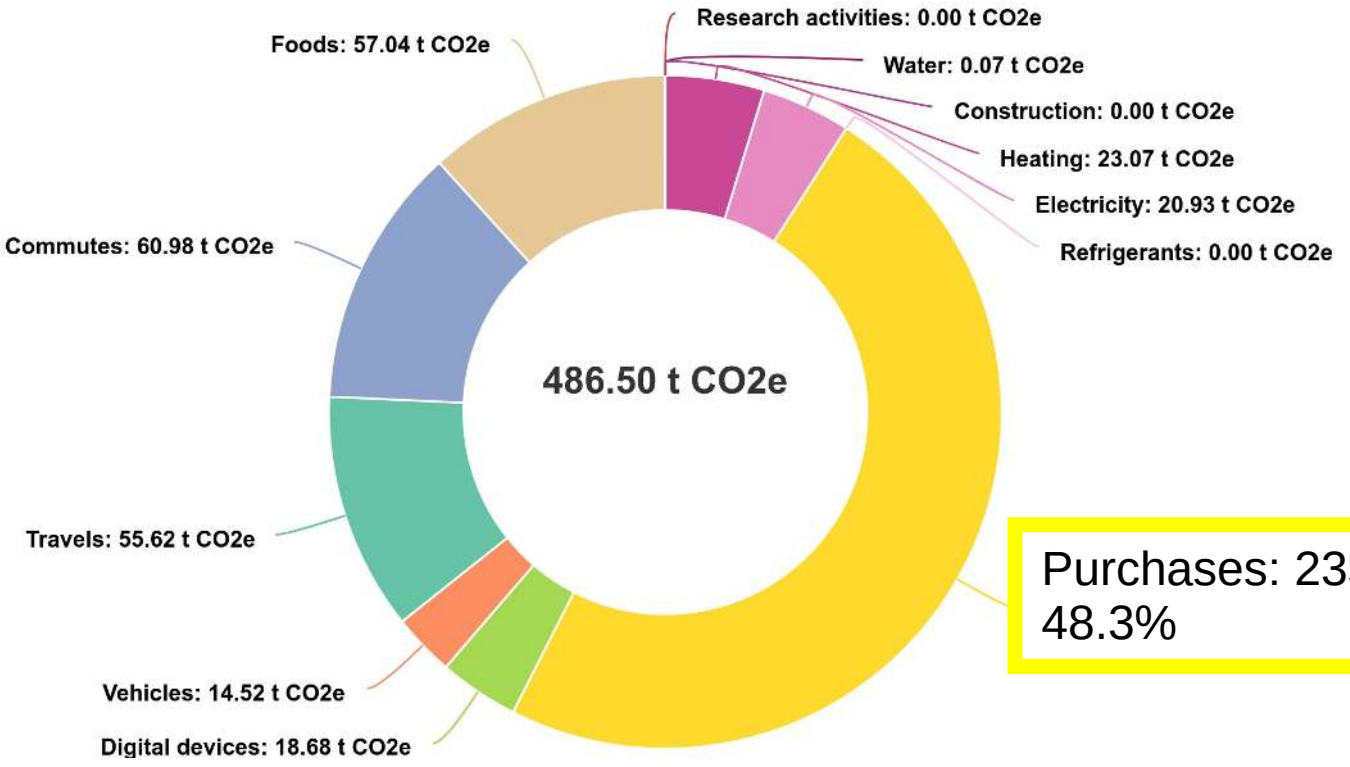
Purchases: 50% of our footprint

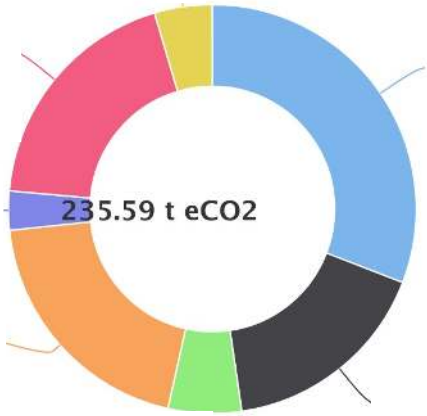


Purchases: 235 t eCO2
48.3%

Purchases

Equipment – Consumables – Life of the lab - Services

Equipments : 20%



Life of the lab: 30%

Consumables : 20%

Services : 17%

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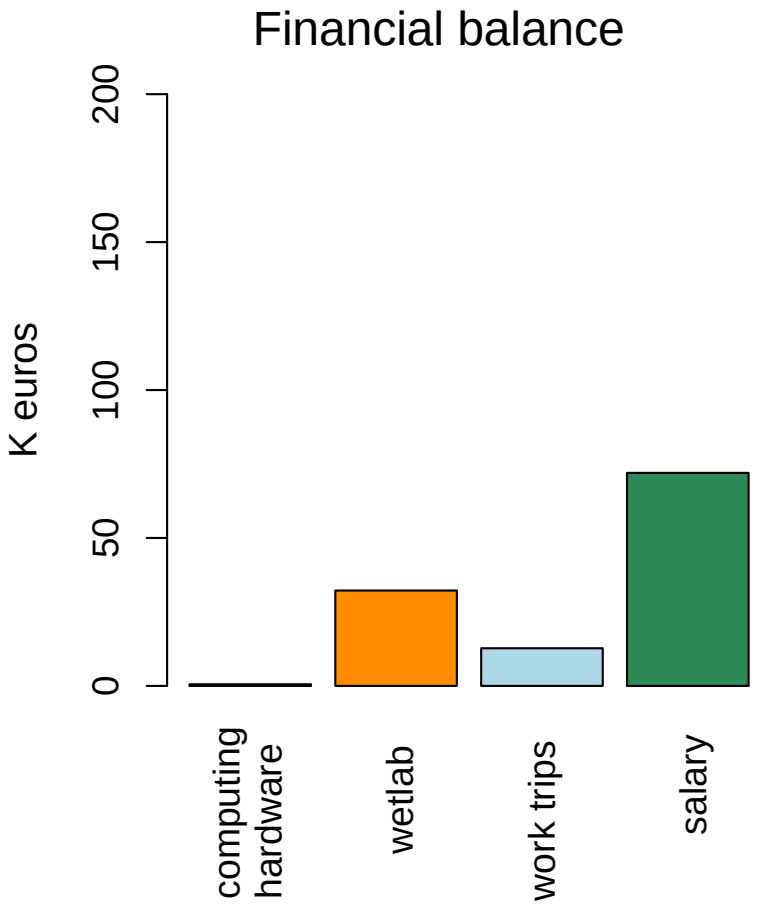
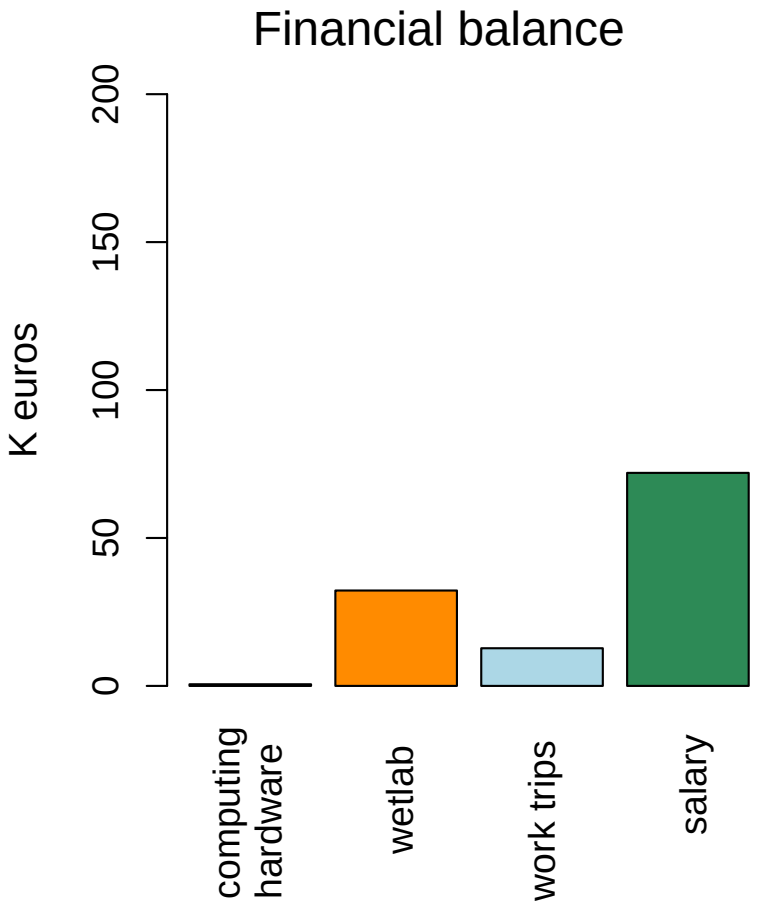
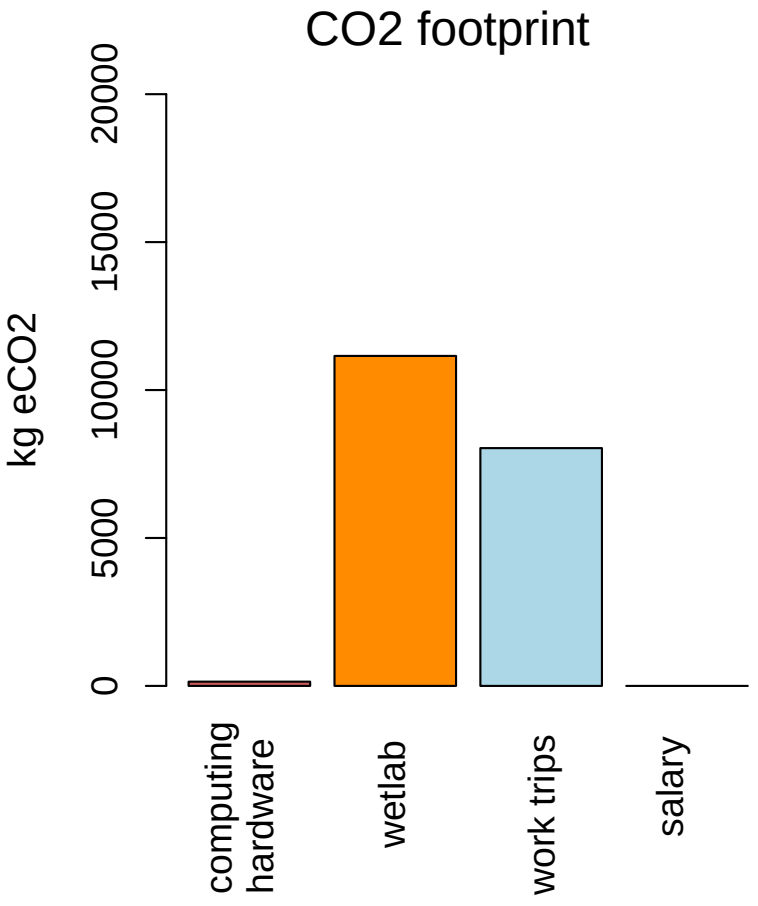
Fieldwork-oriented ANR project



Fieldwork-oriented ANR project





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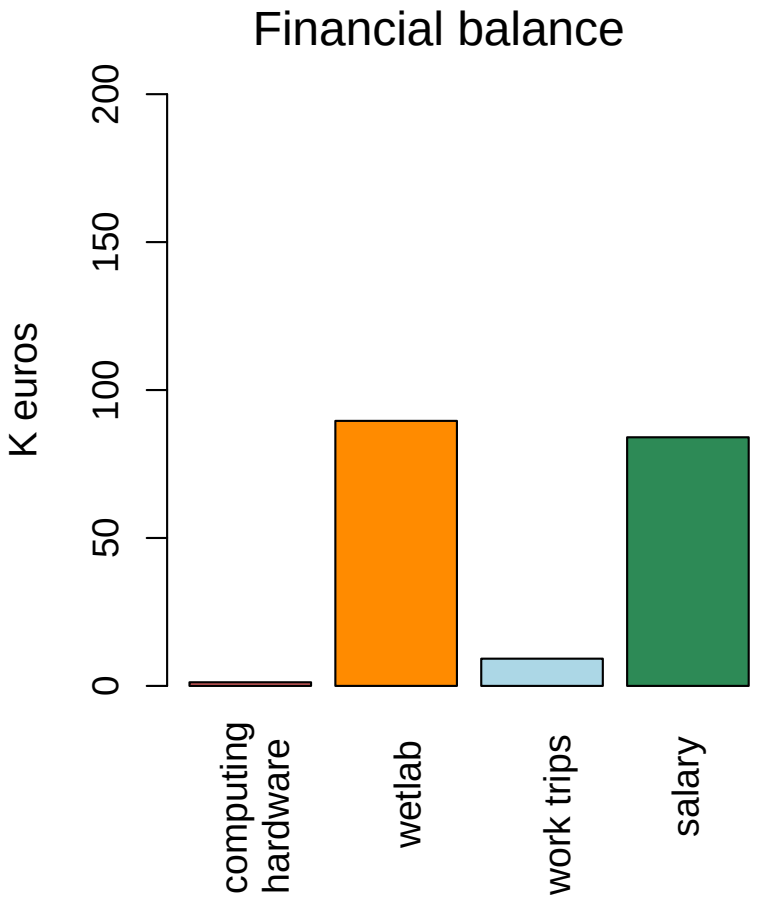
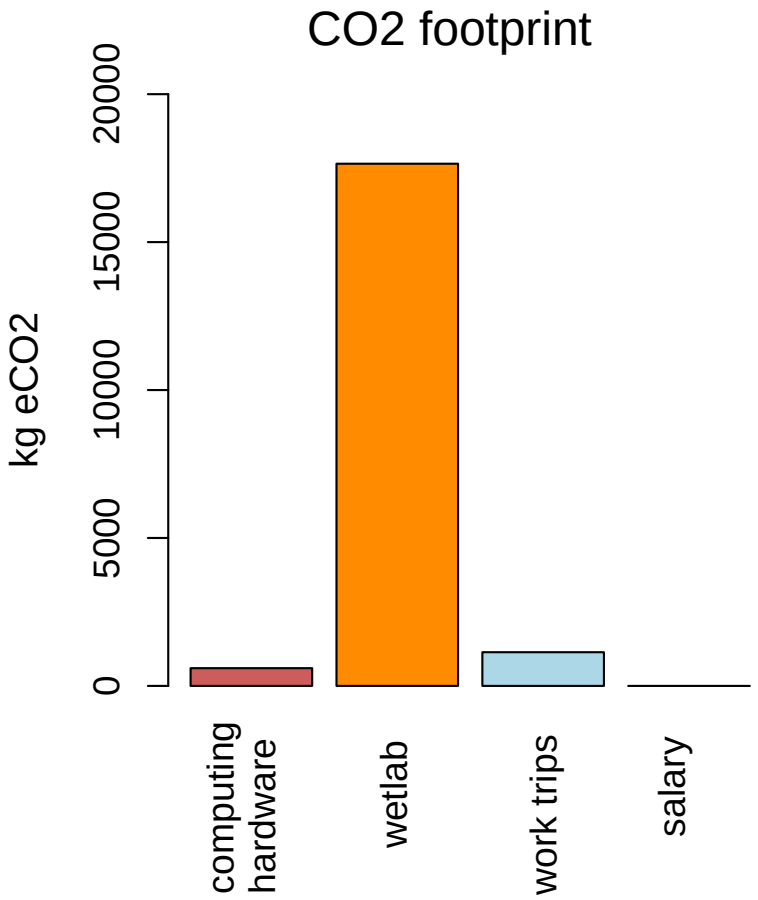
Molecular biology ANR project





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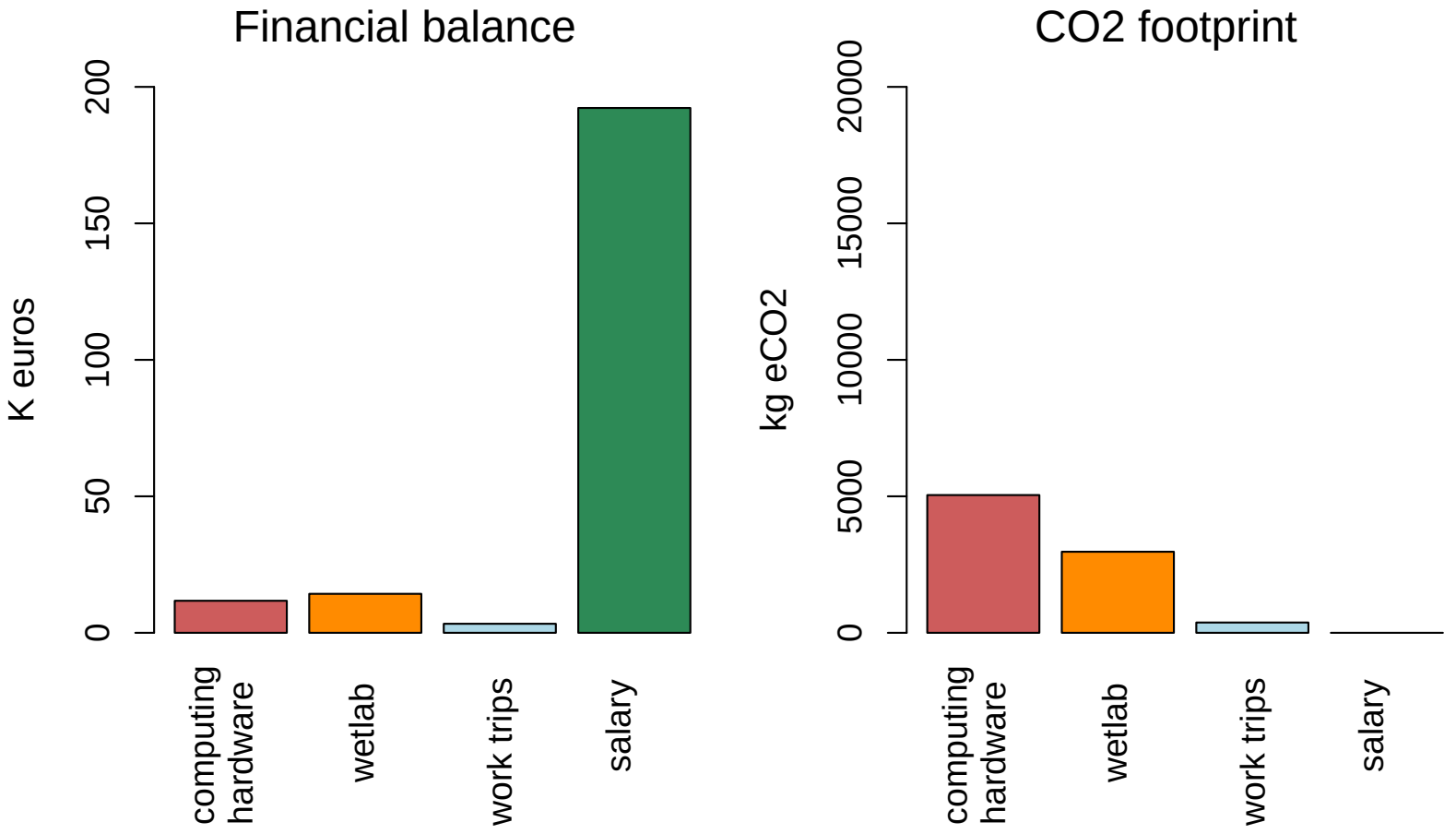
Bioinformatics ANR project



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How can we act?

- **Buy better**
  - Continue what we already do: group purchases, material reuse
- **Buy less**
  - Do we need to produce so much data to address our research questions?
  - Do we need to buy new equipments? Can we share equipments?
- **Hire more people**

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Generate the right amount of data

1- Experimental planning: take advantage of the expertise of the Computing and Biotechnology groups to conduct power analyses before writing the grant application and generating the data.

2- Check if equivalent data already exist and could be reused.

3- Among LBBE-restricted datasets, how many are available on the long term with good quality? What is the required frequency for field work trips?

4- Remove all samples stored in freezers if they haven’t been used for more than X months. X = ?

5- Do not generate data that will not be analyzed.

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Generate the right amount of data

- Given a constant budget, better to hire people to analyze the data than to produce more data
- If buying equipment, check if it can be reused
- Avoid using “leftover” project money to buy equipment

✉Common bank of “leftover” project money?

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Join the 3 WGs !

- WGs coordinated by a person to be hired in 2025
- The WGs can propose and test ideas
- Proposals will be presented to and evaluated by the laboratory council

Molecular biology WG

An example of a proposal:

FREEZER MANAGEMENT

EQUIPMENT USE

PURCHASE AND REAGENT MANAGEMENT

WASTE MANAGEMENT

No further purchase of -80°C freezers

Annual freezer cleanup

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Computing WG

- Reduce shared disk usage
- Do more (or the same) with less (RAM, individual workstation)
- Share better (**no private server,** common workstation “store”)
- Delay obsolescence (laptop used 3 more months => 5% reduction in emissions)
- Reduce computations (optimize code but mind the rebound effect)

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Transportation WG

- Vehicle purchase strategy for the next years: **the next car will be electric**
- What rules can we propose at the level of the lab?
- Can we manage long, multi-mode trips in the lab?
- Balance between individual choices / collective organization

Further discussions in the amphitheater

- Natacha: molecular biology

- Philippe: computing

- Rémi: transportation