# Executive Summary

Carbon Accounting of Research Activities in the School of Life Sciences

## Context

In autumn 2019, **Zero Emission Group** has opened a new pole dedicated to carbon accounting. It expressed the will from students to learn engineering skills to face the climate issues of the coming decades.

In the same period, the **SV Sustainability** office expressed the need to monitor the environmental impact of the School's research activities.

Since data about EPFL consumable goods' climate impact were not available, it was the opportunity for Zero Emission Group to collaborate with SV and propose a first comprehensive carbon accountnig study. For the sake of quality, **Quantis** supported the analysis with consulting hours, and **Act4Change Lab** financed it.

Two SV laboratories opened their door for the study: **Van der Goot and Oates Labs**

*By*

*Partners*

## Methodology

*System Boundaries*

| Scope 1 | Scope 2 | Scope 3 |
|---|---|---|
| • Electrical heating<br>• Natural gaz heating | • Oil heating<br>• Electrical appliances | • Commuting<br>• Travel<br>• Consumer goods |
| Direct emissions | Indrect emissions from electricity | Other indirect emissions |

*Scopes 1 & 2:*

Heating: The heating consumption in the AI building is given by EPFL. We apply a volume ratio to determine the lab consumption from the building's. Finally, the carbon intensity of heating is defined based on EPFL's heating primary energy mix.

Electrical appliances: The method used consists in obtaining the inventory of electrical devices in both labs, visiting them to observe the power of each device and estimate the time of use for each.

*Scope 3:*

Commuting: EPFL Sustainability is providing the average commuting distance per person (15 km). They also give the proportion of transportation modes used in commuting at EPFL. Using Mobitool, we determined CO2 factors for each mode, and computed the impact proportionnally to the number of people in the lab.

Travel: Atmosfair provide an annual study to the SV School with the CO2 impact of flights in the faculty according to 4 different profiles of people. We only have to multiply the number of people from each profile with its corresponding CO2 factor from flights.

Consumer Goods: Similarly to electrical appliances in scope 2, we obtained an inventory from labs, this time containing all the purchases except machines from the scope 2 inventory. IT goods were divided into sub-categories with corresponding CO2 factors. Non-IT goods were attributed to conversion factors depending on their material and mass.

## Challenges:

1. The animal facility and washing facility were not included into the study.
2. Lab visits weren't enough to monitor precisely the power and time of use of machines.
3. We didn't have access to personal data about travel.
4. Inventories are very time consuming to analyse from scratch (mass and materials had to be investigated online for each item).

## Opportunities raised by the challenges:

1. We plan to realise an LCA of the animal facility during the semester.
2. EPFL should form green teams that would be rewarded for going into labs and monitoring the power consumption profiles with meters.
3. The SV School is currently obtaining rights to use these data strictly for research purpose.
4. The SV School has started to involve suppliers to obtain CO2 information in the inventory. Moreover, a calculator is being developed by the SV School to avoid time consuming data acquisition.

# Results

### *Heating*

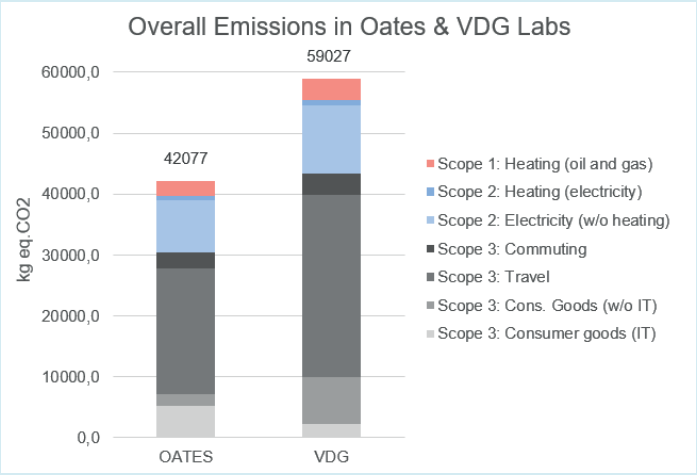
- CO2 fom heating only represents **7 to 8%** of total emissions.
- Oil, gas and a heat pump were used for heating. The **heat pump remains the less polluting**.
- Only 3 months of **natural gas** heating accounted for almost **50%** of annual heating emissions.

### *Electrical devices:*

- Electric appliances generate round **20%** of overall emissions.
- **Refrigerants** and **incubators** are key emitters (up to 65% in VDG). **Lighting** contributes to 11 to 14%.
- In **OATES**, due to the **servers**, **IT** contributes to **18%,** and requires **additional conditioning devices.**
- In **VDG, centrifugers** contribute twice more than in OATES.

### *Commuting:*

- Commuting is only responsible for **6%** of total emissions.
- Among commuting modes, **cars** emit **65%** of emissions for only 23% of total commuting distance.
- Achieving a similar distance (17% of commuting), **bikes emit 0 CO2**.




### *Travel:*

- **Traveling generates much more emissions than commuting** in the labs. It contributes to **50%** of total emissions.
- **Professors, MERs and scientific collaborators** are responsible for **84 to 88%** of these emissions.
- **PhDs** emit **8%**, being 20% of the people.

### *Consumer goods:*

- Purchases are responsible for 1**6 to 17% of CO2**.
- In **OATES, IT goods** emit **75%** among all purchases, mostly due to the server, computers and screens.
- In **VDG,** more than 65% of CO2 comes from **chemicals** and **plastisc goods**.

***A climate-neutral society would emit 1 t eq.CO2 per person, while the studied labs lead to 4 t eq.CO2 per person.***

# Recommendations to mitigate emissions in labs:

1. **Travel** represents 50% of total emissions, they should thus be the **first priority** to reduce a laboratory's footprint. Furthermore, **professors, MERs and scientific collaborators** have a bigger lever than PhDs to reduce their professional flights. To this end, scientists should follow the Travel Less Without Loss Guidelines by reflecting about the necessity of the travel, giving preference to visioconferences and prefering train trips to avoid short-distance flights.
2. **Electrical devices** emit 20% of emissions and are therefore significant. On the one hand, purchasing low-carbon electricity can have a direct impact on all the emissions from electricity, but it depends on Swiss energy policy and not on scientists. As **freezers** are big consumers, using them efficiently is key, and avoiding **space heaters** as well. **Daily** actions such as **shutting down equipments, closing hoods, keeping windows closed and saving light** whenever possible can reduce as well emissions if properly coordinnated.
3. **Consumable goods** account for 17% of emissions, and therefore should be seriously considered. Follow wisely the «Reduce, Reuse, Recycle». MIT's Green Chemical Alternative Purchasing Wizard allows to **avoid buying** a new product if an **alternative** one is already available. Encouraging labs to **share goods** or participate in **take back programs** can limit purchase. Many products can be recycled, such as **printer ink, toner cartridges, cell phones, portable electronics, and single-use plastic goods** should as well belong to a **circular supply chain**.
4. In general, **keeping inventories updated** is key to enable efficient lab management.
5. In terms of **commuting, biking** is the **best option**, and coming by **public transport** remains much less carbon intense than by individual car.
6. Although **data** were not included in the study, it is recommended to prefer **sharing workspace on clouds** than sending attachements by email. Collaborating with **climate-efficient data managers** for cloud services is as well beneficial.

Useful links:

Travel Less Without Loss Guidelines: https://www.epfl.ch/schools/sv/wp-content/uploads/2020/03/TLWL_recommandations_EN.pdf
MIT's Green Chemistry Webpage: https://greenlab.mit.edu/chemistry
LabConscious Green Lab Tips: https://www.labconscious.com/green-lab-tips
Guidelines for Green Labs at UPenn: https://www.sustainability.upenn.edu/sites/default/files/Green%20Labs%20Guide_UpdatedSummer2020_v2.pdf