

EPFL labs can now measure CO₂ emissions and focus reduction efforts

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EPFL has developed a carbon emissions calculator that helps research labs better target their reduction efforts. It gives a customized, granular view of a lab's carbon emissions so that scientists can see where they should focus their attention. The open-source program is designed for use at other universities, too.

Research labs are among the most energy-hungry facilities at universities worldwide. According to both University College London (1) and a Swiss initiative called Green Lab (2), these labs require anywhere from three to ten times more power than standard offices of the same size. Scientists at EPFL are aware of this issue and seeking to reduce their carbon footprint – but it's not always easy to know what measures will be effective. For instance, would it be better to forgo a business trip, replace a piece of equipment, cut the lab's power use or update the building's insulation? Existing systems for measuring carbon emissions are hard to apply to research labs owing to the vast range of activities they host. To overcome this obstacle, EPFL has developed a program called CO₂ Calculator through a joint effort involving various departments and research labs. Staff at the sustainability unit spent several months incorporating the many emission sources into the program and running pilot tests at the School's labs. The calculator was released in late September and is already being put to use across EPFL. Other Swiss universities, including the University of Lausanne and ETH Zurich, are also taking an interest.

Comparing carbon emission sources

"What's useful for a research team isn't just knowing their total emissions, but also being able to compare the emissions from different sources," says Agnès Le Tiec, head of EPFL Sustainability. To lighten the data-entry load for users, EPFL's CO₂ Calculator automatically imports much of the data associated with a given research lab, such as its surface area, purchasing history and power use. That means users only need to fill in the specifics, including any trips the researchers take, any specialty products they use, the lab and IT equipment, and any external cloud service providers. Calculations are based on the Greenhouse Gas Protocol – an international standard for carbon emissions accounting.

EPFL's CO₂ Calculator gives scientists a detailed breakdown of their lab's carbon emissions so they can pinpoint where emissions-reduction steps can be taken and measure the effects of those steps from year to year. "It gives us valuable input for making our decisions," says Véronique Michaud, head of EPFL's Laboratory for Processing of Advanced Composites. Her lab took part in the pilot tests and found that one of its biggest emitters was a space heater the team used to keep the room warm enough for running experiments and for the comfort of staff members. The team used the calculator to quantify the problem and add weight to their requests for building improvements.

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detailed emissions data at a level where many decisions are made and shows scientists which measures will bring the most impact.

Sebastian Kahlert, head of ETH Zurich's Net Zero program

Michaud believes that having a common, largely automated emissions calculator is a big step forward. "The next challenge for scientists will be to turn these figures into impactful decisions without losing sight of the main purpose of their lab - to conduct research." The calculator was designed so that other universities can use it as well. Sebastian Kahlert, who heads ETH Zurich's Net Zero program, says: "Because the calculator's results are customized to individual research labs, it provides detailed emissions data at a level where many decisions are made and shows scientists which measures will bring the most impact."

He adds: "To use the calculator at ETH Zurich, we would need to link it to our internal systems and import data on labs' surface area, purchases and power use, for example. We might also need to adjust the equipment database to allow for more lab specific insights. But the most difficult part was already done by EPFL and it is great to be able to benefit from that." According to Le Tiec, "being able to pool our experience and methods means we could further hone our estimates."

Estimating the carbon footprint of a research project

That said, no matter what calculator a research lab uses, it will never know the exact amount of its carbon emissions. Some emissions can't be measured directly, and a calculation is only as accurate as the data available. "To calculate the emissions associated with a piece of equipment's power use or a given journey, you can simply multiply the relevant physical quantity - the number of kilowatt-hours or kilometers, for example - by an emissions factor," says Le Tiec. "But it's trickier for specialized research instruments and chemicals because we might not know exactly where they came from or how they were produced and transported." In these cases, EPFL's calculator generates an estimate based on the associated expenditure, which could give a misleading emissions figure. "It's important to know the assumptions on which a calculation is based," says Le Tiec. "That's why we've made all the standards and protocols that have been programmed into the calculator available to users."

EPFL's CO₂ Calculator contains two features that should also be particularly useful to scientists. The first is CO₂ Project Planner, which estimates a research project's carbon emissions based on the number of people involved, the equipment that will be used, any trips that will be taken and other factors. This can help research groups as they apply for funding, since funding agencies are increasingly incorporating sustainability criteria into their decisions. The second is CO₂ Explorer, which calculates the emissions associated with a specific action - such as a trip or the purchase of a piece of equipment - to inform decision-making. For EPFL's Sustainability team, the calculator is a starting point. "We will now support laboratories in defining and implementing concrete measures and projects to reduce their CO₂ emissions," concludes Le Tiec.

<https://news.epfl.ch/news/epfl-labs-can-now-measure-co2-emissions-and-focus>