

Computation

Computer processors heat up when at work and their cooling requires substantial energy expenditure.

Hardware production impacts the environment through mining, transport and industrial production.

- **Have a plan.** Bad planning leads to unnecessary work. Estimate optimal running times.
- Estimate the footprint of your computations to make cost/benefit analyses.

Use this tool: www.green-algorithms.org

- Using >16 cores will spike energy consumption and often give only marginal speedups. Don't kill flies with your digital cannons⁷.



TOWARD MORE SUSTAINABLE RESEARCH

Tips and Tricks for Life Scientists



Equipment

- **Shut the Sash!** Fume hoods are a major consumer. Close them as far as possible - it also makes you safer.
- Autoclaves are very energy-intensive. Make sure to use their capacity, and only autoclave what really needs to be sterile!
- Turn off equipment and computers when not in use, especially devices like heat blocks and water baths.
- Check the correct storage temperature for your samples - e.g. your PCR product can be kept at room temperature or 10°C instead of 4°C.

▶ ABOUT US

Come and join us at one of our regular "Greenlab Zurich" meetups! We are a group of PhD students, Technicians, Post-Docs and other lab workers at UZH and ETHZ trying to do our part to make research more sustainable. We are closely working together with the Sustainability Teams at UZH and ETHZ. We have plenty of exciting ideas and are looking forward to hearing yours!

To get in touch, contact us on Twitter [@greenlab_zh](https://twitter.com/greenlab_zh).

References:

1. Earth Overshoot Day Switzerland. <https://tinyurl.com/2yecat5j>
2. UZH 2021 Sustainability Report <https://t.uzh.ch/1fx>
3. Farley & Nicolet, 2022. <https://doi.org/10.1101/2022.01.14.476337>
4. UZH Gerätebörse <https://t.uzh.ch/1i8>
5. Wikipedia: Kraftwerk Letten tinyurl.com/y6eh7kwx
6. <https://www.freezerchallenge.org/>
7. Lannelongue et al., 2021. <https://doi.org/10.1002/advs.202100707>

In Switzerland, we consume our yearly share of Earth's resources every 5 months¹. Many people try to be mindful of this in their personal lives, but sustainability is rarely considered in a laboratory environment.

However, even minor adaptations to laboratory habits can have an impact - without compromising quality! This brochure gives a few practical hints on how to achieve this.

🗑️ WASTE

Fact 1: UZH alone produces 3622 t waste per year, only ¼ of which is recycled².

Fact 2: Reusing labware can drastically reduce the carbon footprint and running costs of your lab³.



Reuse

Often, we cannot avoid single-use materials in a lab. But not everything needs to be trashed after use. Reusing is more efficient than recycling, which is very energy-intensive.

- Reuse and refill your pipette tip boxes.
- Clean and reuse non-sterile plastics e.g. petri-dishes and falcon tubes.
- Exchange equipment or excess reagents with other researchers, e.g. via the *UZH Gerätebörse*⁴.



⚡ ELECTRICITY

Fact 1: In 2020, the UZH consumed 62 GWh of electricity alone², 3x the output of the Letten power plant in Zurich⁵ - and this does not even include heating!

Fact 2: Laboratory equipment at Irchel uses almost ¼ of the total UZH electricity².



Reduce

The best way of reducing waste is reducing consumption. For many experiments, it can be hard to change your protocols, but here are a few ideas:

- Plan your experiments well - avoid unnecessarily repeating experiments or using more consumables than needed!
- Use glass containers instead of single-use plastics.
- Buy concentrated stocks instead of 1x solutions and dilute them yourself.
- Use laboratory inventories to prevent double purchasing and expiration.

Recycle

If you cannot reduce or reuse, recycling is a much more sustainable alternative to burning waste. Check what can be recycled and where on your campus. For example at UZH Irchel:

- Pipette tip boxes, refill racks and non-contaminated single-use plastics to the *Betriebsdienste Irchel* (BDI).
- Ethanol containers and styrofoam boxes to the *Irchel Shop*.
- Paper, Cardboard, Glass, Aluminum and PET bottles are collected on every floor.

Ultra-low Temperature Freezers

The ~200 ULT freezers at Irchel operating at -80°C consume 3-4% of the entire UZH electricity.

There are some ways of reducing this load:

- Adapt the temperature to -70C! This can save up to 30% of energy while keeping your samples intact⁶.
- Organize freezers and keep an inventory.
- Defrost freezers and clean filters regularly.