Greening the Lab Tip Sheet

These are some general suggestions for creating a sustainable laboratory space, compiled from a variety of sources. Implementing any of these measures, or simply being mindful of energy and resource use, will help to create a more efficient lab environment.

Cold storage

- The Laboratory Freezer Challenge, run by My Green Lab, provides suggestions for cold storage management. One CDC lab participating in this challenge saves $10,000 a year.
- Simply eliminating unnecessary samples or sharing freezers with other researchers helps to save space and energy. Defrosting can also help free up space.
- Change or clean filters and exposed refrigeration coils to improve sealing and reduce energy waste.
- Store samples in the ultra-low temperature freezer at -70°C instead of -80°C. Many samples can be stored safely at this temperature, and university labs which have already tried this have made a list of samples successfully stored at 70°C. This can reduce energy consumption by 20-30% and prolong the life of the freezer. Check out the My Green Lab website for more evidence.
- Store samples at room temperature when possible. By doing this, Stanford has both saved energy and reduced costs significantly.

Energy

- A single chemical fume hood can use as much energy as 1.5 households per day — for Variable Air Volume (VAV) fume hoods, shutting the sash when not in use can reduce energy usage by 40% due to the reduced speed of the exhaust fan. VAV systems are also more energy efficient than Constant Air Volume (CAV) systems.
- Replace mercury and metal halide light sources with greener alternatives such as LEDs, light engines, and solid state devices. This provides a more stable and efficient light source.
- Turn off equipment when not in use — lights, chilled centrifuges, ovens, heating blocks, and computers (no screensavers!). Biosafety cabinets should especially be

turned off when not in use, as they can use about half as much power as a household can in a day.
- Replace gas lasers with solid state lasers. Besides increasing efficiency, solid state lasers also last longer and keep rooms cooler, obviating the need for increased AC power.

Green Chemistry
- Follow the [12 Principles of Green Chemistry](#) set out by the American Chemical Society.
- Southern Illinois University offers an [online tool](#) for identifying green chemical alternatives.
- Keep a detailed chemical inventory to avoid over-purchasing chemicals.
- Minimize chemical and solvent use when possible.
- Princeton University has a [list of suggestions](#) for greener cleaning materials.

Waste and Recycling
- Reduce waste! Use glass instead of plastic, coordinate orders with others so you can buy in bulk and save packaging. See the "Suggested Suppliers" for advice on choosing vendors who have reduced their packaging or adopted green practices.
- Recycle what you can: pipette tips, pipette tip boxes, cardboard, conical tubes, centrifuge tubes, glass bottles, ink and toner cartridges.
    - The [Kimberly-Clark RightCycle](#) program offers recycling for nitrile gloves, protective clothing, and safety goggles.
- Be mindful of waste generated by laboratory animals. At Emory University, animal bedding is [composted](#) along with food waste, and the university promises to compost at least 95% of all non-hazardous animal bedding by 2025.

Water
- Only run water-intensive equipment when necessary. Autoclaves can use up to 60 gallons of water per cycle, so consolidate loads when possible.
- Eliminate [single-pass cooling](#) by creating a recirculating water bath or an air-cooled condenser. This can save water and reduce flood risk.

- Install aerators in faucets. This can reduce flow from around 4 gallons per minute to 1.5 gallons per minute. At UC San Diego, this saves 300,000 - 900,000 gallons of water per year.
- Only use deionized water when necessary. It takes 3 gallons of water to make 1 gallon of deionized water.
- Use countercurrent rinsing. Connect multiple rinse tanks to allow preliminary rinses to be conducted in slightly used water, saving the fresh water for the final rinse.

Suggested Suppliers
- Take-Back Programs: Some suppliers offer free or low-cost programs for reducing laboratory waste. Corning will take back all packaging that it ships, while MilliporeSigma will take back styrofoam coolers
    - Tecniplast is a supplier of animal cages with a sustainability commitment and a take-back program
- New England Biolabs has created a 100% recyclable alternative to styrofoam shipping, and has made other commitments to sustainability, such as implementing a freezer program to provide important reagents while minimizing emissions from shipping.
- Energy Star equipment for freezers, refrigerators, and ice machines are considered efficient products for stocking a lab. CU Boulder saves money by using residential Energy Star products as opposed to lab-specific products.
- The Accountability, Consistency, and Transparency (ACT) label measures the environmental impact of lab products. This label provides information on criteria such as responsible production and end-of-life management, and is verified by a third party. ACT labels are applied to equipment, consumables, and chemicals.
    - ACT database: https://actdatabase.mygreenlab.org/

Looking for help?
- My Green Lab
    - A website with multiple resources on green laboratory practices, partnered with ACT and the Laboratory Freezer Challenge.
- Practice Greenhealth
    - A hospital consulting service that provides advice on sustainability in all areas of a hospital. Requires MGH login for complete access.

- [Princeton](#)
    - Princeton University's "Green the Lab" suggestions.
- [BETR Grants](#)
    - "Bringing Efficiency to Research" grants provide assistance with improving laboratory equipment to achieve greater sustainability in lab spaces.
- [International Institute for Sustainable Laboratories](#)
    - An organization focused on connecting environmentally-conscious laboratories and highlighting innovations in laboratory sustainability.