

Current Scores:



Previous Scores:



Certification Feedback Report

LMU Genetics Ludwig-Maximilians University of Munich Thursday, January 18, 2024

Your Certification Score:



(100% (6 people) of your lab responded to the survey





My Green Lab presents this certificate to:

Ludwig-Maximillians University of Munich LMU Genetics

for outstanding work in reducing the environmental impact of their laboratory space and for their successful completion of the My Green Lab Certification Program as a **Platinum Level Certified Lab**

in January 2024





James Connelly CEO, My Green Lab

Congratulations!

Dear LMU Genetics Lab,

Thank you for taking the assessment a second time to become My Green Lab Certified. You join the ranks of <u>hundreds of laboratories</u> all over the world that have pursued this certification to demonstrate a commitment to laboratory sustainability and motivate behavior changes within their lab practices. All of us at My Green Lab hope you will stay connected with us and the wider green labs community as you continue your journey to becoming a more sustainable lab. It is a journey of continuous improvement due to the ever-evolving nature of the scientific industry, advancements in materials and products, and the fact that we can learn much about resource efficiency from our millions of scientist colleagues all over the world. If you're willing, we <u>encourage you to share your</u> <u>Certification success</u> with the scientific community. Together, as a team, we can normalize and lift up green labs globally.

Keeping the Momentum Going

Now that you've received your Certification level, you may be wondering about how to keep the positive sustainability momentum going within your lab. Here are a few ideas that have worked at various types and sizes of research institutions that we have worked with:



Facilitate ongoing discussions with your lab – tackle a few more best practices quarterly



Organize periodic challenges on lab sustainability topics to promote engagement Create knowledge within your lab with fun games like "lab waste jeopardy"



Participate or convene a Green Team at your organization to share best practices and expand impact

Brief Recap of the Feedback Report

This report shows how your lab answered the certification assessment and provides recommendations for how you could focus on continuous improvement between now and recertification in two years. Use this report to have a discussion with your lab about the different topic areas covered in the assessment, both where you did well (and improved significantly since the baseline assessment) as well as where you could focus your energy further.

Within each topic area that follows you will find a chart (example below) with the assessment questions and an answer breakdown for how your lab responded, and feedback that is geared toward continuous improvement. Don't forget to look at the end of the report for your lab's comments. If you'd like to review the Learning Centers again, which were in the Baseline Assessment Feedback Report, you can find those on our website.



Questions where there are a lot of "I don't know" answers are learning opportunities for your lab, and areas to investigate or discuss. Questions where people selected "frequently", "sometimes", or "never" are behavior change opportunities. Take the time to discuss why this activity isn't done all the time and discuss what solutions would help your lab with that change. Review the "Strategies to Improve" sections in this report for specific recommendations from My Green Lab. To learn more about sharing your results with the lab, please watch this short video. Throughout this report you will see links to worksheets, case studies, articles and more. You can access all these documents in this certification section on My Green Lab's website.

How Scoring Works

If you need a refresher on how scoring works, please watch <u>this short</u> <u>video</u>.

My Green Lab Certification & Beyond

There are many additional ways you could deepen your lab's knowledge or engagement with the lab sustainability movement beyond the My Green Lab Certification Program. Take advantage of the free <u>My Green Lab</u> <u>Ambassador Program</u>, or sign up for an <u>Accredited Professional course</u>. The <u>International Laboratory Freezer Challenge</u> happens every January – July and is complimentary to the cold storage best practices covered in the My Green Lab Certification. There are also a growing number of other organizations that do similar work as us in this space that you can connect with, such as the <u>International Institute for Sustainable Laboratories</u>, <u>Beyond Benign</u>, <u>Smart Labs</u>, and more.

You may need to consult with other professionals at your institution to implement some of our recommended best practices, such as your green team, health & safety, building operations, procurement, and more.

Involving these groups in your green lab efforts will help build a culture of sustainability at your organization. Remember that My Green Lab and the wider laboratory sustainability community are part of your team too! If you need additional support from My Green Lab, send us an email at programs@mygreenlab.org. In about two years, even if we don't hear from you, you'll hear from us as we reach out and determine if you'd like to get recertified.

Become an Advocate

Be sure to share your green labs success with My Green Lab through social media or by emailing us at programs@mygreenlab.org.You can also be part of the <u>Million Advocates for Sustainable Science</u> campaign and let funding agencies know that sustainable science is an important topic that should be fundamental to the research enterprise.





The My Green Lab Team



Why These Topics Were Included

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PLUG LOAD

This topic covers all the equipment plugged into outlets in your lab, which accounts for 20-25% of the energy used

in a lab. We encourage you to think about whether all equipment needs to be on and plugged in 100% of the time, and strategies for handling equipment differently.



FUME HOODS

In most cases, fume hoods are the most energy consumptive equipment in your lab. They also contribute

to increased energy load on your lab building's ventilation system if fume hood sashes are left open.



LARGE EQUIPMENT

We ask specific questions about incubators, vacuum pumps, computers, tissue culture hoods, and glove boxes in

this section because these equipment types have unique energy efficiency considerations.



COLD STORAGE

This section covers refrigerators, freezers, and cold rooms, which after fume hoods are usually the most energy

consumptive equipment category in the lab. Your lab can have 10% greater energy efficiency by doing routine maintenance on your units, or save up to 30% by changing your ultra-low temperature freezer's setpoint to -70 °C.



INFRASTRUCTURE ENERGY

In a typical lab, at least half of the energy consumption is related to the air handling system which maintains air quality and

temperature, and another 15% of the energy consumed is from lighting. Being aware of the energy use of your building's infrastructure, and how to work within it, is positive for your institution's energy reduction goals.

WATER



Laboratories consume around 4 times more water than office spaces, with 25% used in lab processes. Being judicious

with fresh water is positive for everyone, as fresh water is a finite resource on our planet.

WASTE REDUCTION AND RECYCLING



Labs tend to generate a large amount of waste, especially plastic waste, which has been estimated at almost 2% of global

plastic production. This section encourages labs to think about alternatives to single-use items, and strategies for tackling the many different types of waste generated by your lab.

RESOURCE MANAGEMENT



Save resources, time, and money by managing your lab's materials effectively. Keeping inventories, maintaining lab

systems, sharing resources when possible, and implementing positive lab policies can go a long way to your lab being more sustainable in this area.

PURCHASING



What your lab or organization chooses to spend money on directly influences the laboratory product market, and

contributes to the energy, water, and materials that your lab consumes. Smart purchases with an eye on resource efficiency ensures that you support greener manufacturers and reduce your environmental footprint.



GREEN CHEMISTRY

Chemical use is unavoidable in scientific research, but we can critically examine our usage by applying the 12 principles of

green chemistry to our lab protocols. This helps uncover how to reduce, swap out, and properly design the use of chemicals for experiments and manufacturing.



COMMUNITY AND ENGAGEMENT

Sharing your experiences, methods, tips and ideas with your colleagues is one of the most important ways to keep the

Green Labs movement going strong, while also building a stronger culture of sustainability within your lab.

TRAVEL



Whether you're attending a conference or choosing how to get to work, there are important decisions you can make to

reduce your carbon footprint.

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Community

Answer Distributions

	Does Not Apply	l Don't Know	Never / N	o Sometin	nes Frequenti	y Always / Yes	Current Score	Previous Score
							I	
We have nominated a point	person for sustainability the la	in Ib		10	00%		100%	100%
We have roles and responsib	ilities for our sustainabili activitie	ty es		10	00%		100%	84%
We have a process to ensu	re sustainability measure are up to da	es te	40%		60%		60%	53%
We provide training on lab si to new hir	ustainability best practice es and visiting researche	es rs		10	00%		100%	68%
We use reusable kitchenwa spaces and wh	re in lunchrooms or share nen hosting group activitie	ed es		10	00%		100%	100%
We	participate in a Green Tea	m		10	00%		100%	84%
Personnel using commo trained on si	n equipment or spaces a ustainability best practice	re 2s		10	00%		100%	68%
We have engaged gr	oups outside the lab in o sustainability effor	ur ts 17%		33%		50%	49%	43%
l know and understand my c	ء organizations sustainabili ومع	ty 17%			83%		100%	84%
l understand things l can do to	o support my organization sustainability goa	ns Is		10	00%		100%	100%
	,0		100 C				•	

Strategies To Improve

Your organization has done some excellent work to ensure there's a strong culture of sustainability, great job!

- Your organization has done an excellent job assigning a point person for sustainability. This person will help ensure best practices are followed and is an extremely important piece of continuing to build the culture of sustainability in your lab, and the company!
- It's great that you've set up the roles and responsibilities within the lab team! Having this team in place is an important part of ensuring the team keeps working on the goals you've established moving forward.
- Your sustainability projects will likely need maintenance over time. Discuss an interval that works for your lab (such as every six months or every year) to check in on your lab's sustainability practices, update anything that needs attention, and identify new sustainability priorities. Someone

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can set a calendar reminder so this happens on a regular schedule. Items that should be revisited on a regular basis are lab signage, protocols, equipment settings, onboarding processes, and participation in your wider institution's green labs efforts.

- Great job on ensuring that you have a process to ensure sustainability in place. Have the team set up and maintaining the projects related to sustainability is quite an accomplish. Continue to ensure that the team strives towards continuous improvement and continues to meet on a regular basis.
- Good job on training new hires and visiting researchers on lab sustainability best practices. Ensure this practice continues moving forward.
- Great job ensuring that reusable mug, utensils, and dishes are being used.
- Great job setting up a Green Labs Team! Continue to add members as necessary and share your knowledge with other team members that aren't part of the Green Labs Team.
- Great job training personnel the best sustainability practices on using common equipment! Ensure that training continues as new people are introduced to common equipment.
- It often takes a team to make lab sustainability a reality at research institutions. As relevant, engage Environmental Health & Safety, Purchasing, your Store Room, Building Maintenance/Operations, the Office of Sustainability, and administrators in your department or institute to assist with the sustainable best practices you wish to see in your lab and at your institution. What starts as a passion or interest of a few individuals can grow into wide culture change across a research institution.
- Nice job learning about your organization's sustainability goals and how to support them. Stay current if those goals happen to evolve and ensure that new personnel are informed of this information as they're hired.



Waste Reduction and Recycling

23

Answer Distributions

Does Not Apply	oon't Know	Never / No	Sometim	es Frequently		Always / Yes	Current Score	Previous Score
	1							
We have recycling bins for our lab materials			10	0%			100%	53%
We know what materials can be recycled in the lab and how to sort them properly	17%			83%		92%	51%	
We take advantage of product/material return programs offered by vendors	17%	17%	17%		50%	69%	49%	
We use take back programs for packaging in our labs	17%	33	3%		50%		60%	25%
We preferentially select suppliers who offer product and packaging take-back schemes	17%		50%			33%	75%	26%
We recycle gloves when feasible		67	7%		17%	17%	3%	3%
We have conducted a waste audit to identify our waste streams, and will divert/minimize them		50%		3	3%	17%	19%	20%
We have implemented solutions to minimize the lab's waste streams or divert them	17%	17%		6	7%		80%	20%
We recycle batteries that can be recycled			10	0%	1		100%	51%
We use a reusable alternative to ice or dry ice	17%	17%	17%		50%		43%	38%
We recycle solvents when possible	17%	17%	17%	17%	3	33%	55%	19%
We repurpose, surplus, or donate equipment, supplies and/or chemicals	33	3%	17%		50%		56%	9%
We reuse disposable plastic and glass items and		50%			50%		85%	70%
We understand the labeling requirements for the	17%			83%			92%	83%
We throw only biohazardous waste into the		50%			50%		85%	70%
We have guidelines for separating chemical waste	17%			83%		92%	83%	
streams. We have guidelines for separating hazardous waste from non-hazardous waste	17%		83%				92%	83%

Strategies To Improve

Congratulate yourself for doing well in a difficult category - waste and recycling is often confusing and frustrating, but with a little effort and the suggestions below your lab will soon be earning top marks.

- It's great to see that your team has a good handle on what items can be recycled and how to sort them. So that all team members are aware make posters, hold a meeting, or send an email to ensure that your group is aware of the items that can be recycled and where they are to be collected in your lab.
- Use manufacturer 'take back' programs, such as those for pipette tip boxes, as well as programs which accept used packaging. <u>Corning</u> will take plastic packaging, <u>Sigma Aldrich</u> and <u>NEB</u> reuse polystyrene containers, and some sales reps will locally collect pipette tip boxes and cartridges.
- Try to buy specifically from manufacturers that offer programs to reuse or recycle goods and packaging. Remember, you are voting every time you spend a dollar make sure your support is heard.
- If feasible for your institution, look into recycling gloves. Logistics vary and safety measures will need to be taken, but glove recycling continues to be an effective engagement program in lab sustainability.
- Conduct a simple audit of your lab space to get a better idea of the types and quantities of waste you're producing. Involve your waste/facilities group, as well as safety, and use our <u>handy template</u> if you like!
- Once you know your lab's largest and most impactful waste streams, implement measures to minimize or even eliminate them.
- Nice job recycling batteries when possible. Keep investigating to determine if there are any additional batteries that can be recycled.
- Look into alternatives for ice or dry ice, such as Lab Armor beads, freezable tube holders, or ever reusing gel packs!
- If possible, recycle the solvents that your lab uses you'll save not only resources, but money as well.
- When your lab has extra equipment, supplies or chemicals, look for ways to donate them to other researchers. Waste and EHS can help you internally, or look for external options like Rheaply!
- Reuse plastic and glass items that are meant for single use when you can, such as centrifuge tubes or HPLC vials.
- It's very important to understand the guidelines for sorting all waste in your lab, but especially hazardous and chemical items. Ensure that you only dispose of hazardous waste in the biohazard/burn bin, as improper sorting leads to more resources and energy being used to separate and dispose of materials and chemicals downstream.

Resource Management

Answer Distributions

	Does Not Apply	l Don't Know	Never / No	Sometim	es Frequently	y A	Always / Yes	Current Score	Previous Score
	We maintain an invento	ry 17%			83%			84%	100%
We check our inventory	before making purchases prevent over-purchasii	to 17%	17%		67%			94%	90%
We notify other collea	agues when we have exce materials to sha	re		83%			17%	75%	65%
We use material	s in a "first in/first out" poli	cy	33%		67%	1		100%	69%
Materials th	at can expire are well-labele	ed	33%		67%			90%	75%
We share equipment rath	er than purchasing duplica	te		10	0%			100%	80%
We use a shared s	supply of common reagent chemicals and supplie	s, 17%			83%			95%	85%
We only use high-pu	rity solvents when necessa	ry 17%			83%			84%	57%
We only have gas supplies of	pen when gas lines are in u	se	33%		67%			67%	100%
We maintain gas lines	and regularly check for leal	<s 17%<="" td=""><td>3</td><td>3%</td><td></td><td>50%</td><td></td><td>60%</td><td>67%</td></s>	3	3%		50%		60%	67%
We have added additiona	al insulation to our large d ice storage containe	ry rs		83%			17%	100%	51%
			-						

Strategies To Improve

The lab has some good behaviors in place when it comes to Resource Management, yet there is still room for improvement before the lab gets Recertified. Focus on the opportunities for improvement below so that the lab can continue to reduce waste of chemicals, supplies and equipment.

- Continue to make lab members aware of the inventory/database in place and make sure everyone knows how to use it. If the inventory has faults, discuss these issues and look for possible solutions.
- Continue to check your inventory before making purchases to prevent over-purchasing.

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- Continue to notify your colleagues when you have excess materials to share. You may want to discuss opportunities for improving your current system of notifying lab members when you have excess materials. Look into using an email distribution list, shelf in the stockroom, or a software platform.
- Make sure you continue to use your oldest chemicals/reagents first to decrease the amount of wasted materials.
- Only use high purity solvents when necessary, as these reagents typically require additional distillation and filtration steps which increases their environmental footprint.
- If you are not actively using a gas line, make sure the line is closed. If needed, post a simple reminder for people to turn off the gas source after use.
- Continue to maintain gas lines and regularly check for leaks. Consider scheduling regular checks on your own or work with your facilities department to get regular maintenance.



Purchasing

Answer Distributions

	Does Not Apply	l Doi	n't Know	N	ever / No		Sometime	es 🔹	Frequ	ently	Always / Yes	;	Current Score	Previous Score
Before purchasing new e check with our institutio	equipment or chemicals, ons surplus inventory syst	we tem			50%				33	3%	179	6	80%	48%
We check for sustainability l	labels such as ENERGY S and /	TAR ACT		33%			33	3%		17%	179	6	42%	32%
We use sustainability l int	labels to help us make m formed purchasing decisi	ore ons		33%			17%	17	7%	17%	1 79	6	36%	16%
We preferentially purchase p waste	products with energy, wa e or material saving featu	ter, ures	17%		3	3%			33	3%	1 79	6	54%	27%
We preferentially purc toxicity or that ger	hase products with redunerate less hazardous wa	ced iste	17%		3	3%				50%			80%	44%
We r	right size the products we	buy		33%					67	7%			90%	75%
	We consolidate ord	lers		33%				5	0%		179	6	65%	48%
We have removed our nar	mes from vendor mailing l	lists	17%		17%			5	0%		179	6	62%	42%

Strategies To Improve

Set a goal to review your lab's purchasing choices over the next two years before recertification. The feedback below will help the lab decrease unnecessary waste and prioritize products with lower environmental impact.

- Continue to use your institution's surplus inventory system to check for equipment and materials that you can get internally, before buying those items brand new from suppliers. Look for ways that you can make checking the system easier, so that this is done more frequently by your lab colleagues.
- Talk with whoever is responsible for purchasing for your lab, or have a group discussion about using the <u>ACT label database</u> to make more informed decisions about what you are buying and using in the lab. You can also use the <u>ENERGY STAR</u> website to consider energy efficient cold storage units, as these are the only lab products that currently have ENERGY STAR certification.
- Talk with your purchasing agent/office and your lab colleagues about whether sustainability can be a consideration when purchasing for your lab. For example, purchasing products that use fewer resources (energy, water, materials) or that are less toxic. In addition, talk with your lab's

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preferred vendors about sustainable alternatives for the products that you buy today - this will push the market to design with sustainability in mind.

- Talk with your lab and whoever does purchasing for your group about order consolidation to reduce packaging, save money, and reduce carbon impacts of transporting materials. Start by discussing options with one of your main vendors, such as reducing delivery to your lab or site one day a week, getting a reduced rate for consolidation, or trialing consolidation of orders with one type of lab product. Then expand from there to other vendors you already use.
- Review the materials your lab receives in the mail, such as magazines, pamphlets, letters, and flyers from vendors and professional organizations. Contact vendors and organizations you don't wish to receive mail from anymore, and remove your lab's name from their mailing lists.



Green Chemistry

50%

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Answer Distributions

	Does Not Apply	l Don't Know	Don't Know Never / No		Sometimes Freq		Always / Yes	Current Score	Previous Score
We have had a group o che	discussion about how gree emistry applies to our wo	n [.] k	50%		17%		33%	44%	19%
We use greene	er alternative tools or guide	25	50%		17%	17%	17%	48%	18%
We use	greener chemicals in the la	b 3	3%	3	3%		33%	51%	36%
We use an alte	rnative to ethidium bromic	le		83%			17%	11%	5%
We avoid	acutely hazardous materia	ls	50%		3	33%	17%	34%	35%
We seek ways to minin	nize chemical or reagent us	ie 3	3%		e	57%		90%	46%
We use E-factor or process waste	mass intensity to measur generated in our protoco	e Is	50%		17%		33%	4%	3%
We use atom econom	ny to identify more efficier reactior	nt IS	6	7%			33%	5%	25%
We use solvent-free	e chemistries or separatior	IS		83%			17%	1%	11%
We have switched to ambie	ent conditions for reactior and protoco	ls 3	3%	17%		50%		75%	19%
We use chemicals	and reagents sourced from renewable feedstock	n is 3	3%	3	3%		33%	51%	3%
We use an alternative	to radioisotopes for labelir	g 17%	17%	17%		50%		74%	85%
We have exchanged mercu	ury-containing devices from the la	m 17%	3	3%		50%		60%	57%



Strategies To Improve

Green chemistry principles will help you not only reduce hazards, but can also help you reduce waste and energy consumption. Use the recommendations below to continue to explore how green chemistry can support your science in a sustainable way. Make sure that everyone has been part of the discussion and understands how green chemistry principles are being used in your lab.

- Continue to have the conversation with your lab about how green chemistry can be applied to your work. As new team members come it, it will be helpful to review and refresh this information. Don't forget, MGL has a <u>guide presentation</u> to help you!
- Make sure everyone in the lab is aware of how you use green alternative tools, such as the <u>Solvent Selection tool from ACS</u>, that can help your lab mates make smart choices that minimize waste and hazards in your lab.
- Try out 'greener' chemicals in lab. If you need guidance, <u>Sigma Aldrich's DOZN</u> tool will help you to plan your experiment in a sustainable way. You can also ask your suppliers about less hazardous or greener alternatives. Examples could be heptanes instead of hexanes, 2-Me-THF instead of THF, or Cyrene instead of DMF or NMP. <u>Here</u> and <u>here</u> are examples of greener biological reagents.
- When running gels, use an alternative to ethidium bromide <u>SYBR Safe</u> and <u>Gel Red</u> are tried and true alternatives, which are not carcinogenic and do not require UV light to visualize.
- Avoid acutely hazardous materials unless absolutely required by your research. Make sure everyone in the lab knows what hazards you have in the lab and work with safety and your lab to minimize or eliminate them. Your commitment to eliminating or minimizing hazards may allow your organization to substantially reduce energy usage after conducting a <u>ventilation risk assessment</u>. Engage your safety and facilities or operations teams in the discussion about how you can support these efforts.
- E-factor is a process other than yield to measure the efficiency of a reaction, which helps to pre-identify waste and consider ways to minimize it. Learn more here and use this article to help you evaluate other metrics.
- Atom economy helps ensure that as many starting materials as possible end up in the final product. Talk with the lab about how you might use atom economy, and learn more <u>here</u>.
- Solvent-free chemistries, like solid-phase peptide synthesis, or super critical extraction and fractionation techniques are great ways to reduce chemical usage and waste. Use literature searches to see if there are ways you could incorporate these techniques into your work.
- Share where you are using methods or protocols that don't require heating, cooling, or non-ambient pressures with your colleagues and evaluate other experiments you run today that require non-ambient conditions and use the literature to evaluate if there are any known alternatives.
- Discuss with your colleagues whether they are buying any chemicals from renewable feedstocks, and have a talk with your vendors about options. For example, amylase can be produced through fermentation of agricultural waste, rather than recombinant bacterial production. Letting your vendors know this is important to you, helps them prioritize these options in their development pipeline.
- Continue to discuss alternatives to radio-isotopes with your labmates. Check out <u>this whitepaper</u> for ideas on substitutions that could apply to your lab.
- If you still have mercury-containing devices, talk to your safety group. They can likely help you obtain spirit thermometers and mercury-free light sources for microscopes. Check out <u>this whitepaper</u> and <u>this whitepaper</u> for more information on alternatives.



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Answer Distributions								
Does Not Apply	l Don't Know	Never / No	Sometir	nes F	requently	Always / Yes	Current Score	Previous Score
We turn off the faucets / taps when they are not in use			10	0%			100%	100%
Our faucets/taps have low-flow aerators		50%		17%	17%	17%	36%	13%
We promptly report all water leaks	17%			83%			90%	65%
We have replaced water-vacuum aspirators with sources of vacuum that are waterless	17%	33	%		50%		60%	62%
We do not use single-pass cooling for distillations or other reactions			10	0%			0%	1%
We dont use single-pass cooling on equipment			83%			17%	1%	2%
We have had a group discussion about minimizing water usage	17%			83%			92%	59%
We do not let water sources run longer than necessary	17%			83%	1		95%	79%
We understand which quality water to use for each task			10	0%			100%	76%
We check the efficiency of purified water systems	3	3%			67%		67%	67%
We only run glassware washers when full	3	3%	17%		50%		93%	54%

Laboratory Water

Water



80%

Strategies To Improve

The team is doing well but there's room for improvement still. Implement other water-saving devices and practices to conserve this precious resource.

- Nice job ensuring that faucets and taps are turned off when not in use. This action should be part of the lab culture now and in the future.
- Low flow aerators can reduce water flow from your lab sink by 50%, which prevents annoying splashing but also has the benefit of saving this precious resource. Talk with your institution's building manager, or whoever is responsible for operating your laboratory building about whether there is funding available to support your lab in purchasing low flow aerators for lab faucets.
- Great job promptly reporting all water leaks. A leaking faucet can waste liters of water each day.
- Ensure your lab is no longer using water vacuum aspirators for the creation of vacuum conditions, as this equipment uses a constant flow of tap water to create vacuum. If vacuum is necessary for your lab processes, be sure vacuum pumps or other waterless devices are available for everyone that needs access to them.
- Using tap water to cool laboratory equipment, like lasers, microscopes, etc., is extremely water consumptive. Ensure that if you have any watercooled equipment, that it is on a recirculating water system instead of a single-use or "once-through" cooling system. You will likely need to consult with your institution's Facilities or Operations team to make this transition.
- Great job having a group discussion about minimizing water usage in the lab. Ensure that all team members have been involved with the discussions and new team members are informed as well.
- Great job ensuring that you don't let water sources run any longer than required. Keep up the good work!
- Great job ensuring that the team understands which quality water to use for each task. Continue to periodically reinforce this message so all team members, including new one, are aware of which water quality to use for each task.
- Water purification systems require maintenance to make sure they are running efficiently and that your water is clean. Systems that are not maintained may be using additional energy or water to run. Make sure everyone in the lab is aware of how you are working with the engineering or maintenance team at your organization to make sure your systems are working efficiently.
- Nice job only running the glassware washers when full. Ensure that all team members are aware of this best practice.



Answer Distributions

	Does Not Apply	l Do	n't Know	Never / No	Sometimes	Frequently	Always / Yes	Current Score	Previous Score
We only	y run the autoclave whe	n full	17%	17%		67%		94%	82%
We put autoclaves in	standby mode or turn t off when not ir	hem 1 use	17%			83%		100%	74%
We have replaced au	utoclaves with more efficient	cient ones	17%		67% 17%				21%

Strategies To Improve

You're doing well with efficient autoclave use, but look to implement further sustainable best practices.

- Nice job putting autoclaves in standby mode or turn them off when not in use. Continue to ensure that all team members continue to follow this best practice.
- Medical-grade or steam-jacketed autoclaves use a tremendous amount of water and energy every day. In <u>one study</u>, medical-grade autoclaves were found to use around 700 gallons (2,650 liters) of water and 84 kWh of electricity every day. That is the equivalent of nearly three homes' worth of water and energy consumption. At the very least, you should be retrofitting these units to include a water saving device, but better yet is to upgrade to a research-grade autoclave that can reduce energy and water usage. Water saving devices can come from the <u>manufacturer</u> or a third party, like the <u>Water Mizer</u>. Learn more <u>here</u> on Priorclave's website.



Plug Load

Answer Distributions

	Does Not Apply	l Do	n't Know Never / I		/ No	No Sometimes		Frequently		Always / Yes	Current Score	Previous Score
We have discussed wi	nat equipment can be tur	ned off				10	0%				100%	81%
We turn off	equipment when it is no	t in use			67	%	1			33%	80%	70%
We have checked for a	nd utilize energy saving on our equi	modes ipment	17%		33	%			50%		88%	75%
We have optimized the	e number of pieces of eq	luipm		33%			1	67	'%		90%	85%
We have investiga	ted the energy consump equi	otion of ipment	17%		33	%			50%		3%	5%
We replace equipm	nent with more energy e c	fficient options	17%		1		8	33%	1		95%	38%
		-										

Strategies To Improve

Your lab has made good progress on managing and minimizing energy from all the equipment that is plugged into the wall. Over the next two years, be sure to review new equipment you have brought into the lab and check in with the lab to be sure that your plug load management program is still being used. Below are some more specific recommendations.

- Great job on managing your plug load. Be sure you check up on your system each year to be sure people stay engaged and new equipment is included.
- You have made good progress here but there is still some opportunity for improvement. Unless the equipment must be left on 24/7 (refrigerators, freezers, some incubators), has a complex calibration process, or requires vacuum conditions to be maintained at all times, you can probably power down much of your lab equipment at least some of the time. Use this <u>Sharepoint Resource on Plug Loads</u> to continue to explore possibilities for your lab.
- Checking for and utilizing energy saving modes on your existing lab equipment can lead to greater energy efficiency. Look for built-in timer features, "eco-modes", low power modes, automatic sleep functions, etc. Look to user manuals for your equipment or ask your sales representatives from the product manufacturing company about what energy saving features are present on their equipment.
- You can use a variety of strategies to better understand the energy consumption of your lab's equipment, including metering the equipment yourself or with assistance from your organization, referring to the variety of white papers and databases we have linked to on <u>SharePoint</u>, or by

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asking the equipment manufacturers about the energy consumption of their equipment. In general, unless your lab has a data center, highpowered lasers, or highly sophisticated microscopes, the largest energy consumers in your lab are likely to be your fume hoods, your ultra-low temperature freezers, and other equipment that requires heating or cooling or that generates vacuum. Use knowledge of the largest energy consumers in your lab to prioritize which equipment could be replaced with a more energy efficient option.



Fume Hoods

Answer Distributions

Does Not Apply	l Don't Know	Never / No	Sometime	es Frequently		Always / Yes	Current Score	Previous Score
We keep fume hood sashes closed			100)%			100%	80%
We don't work in the fume hood with the sash all the way up	17%			83%	1		95%	90%
We dont store chemicals inside the hood	17%	17%		6	7%		85%	65%
We avoid using the fume hood to evaporate chemicals or reagents		50%			50%		85%	58%
We turn off the lights in the fume hoods	17%			83%			95%	85%
We have replaced old fume hoods with energy-efficient models		67	7%		17%	17%	21%	9%
We remove excess equipment from fume hoods	17%	33	%		50%		80%	75%
Our organization checks the air flow of the fume hoods regularly	17%			83%			84%	100%

Strategies to Improve

The lab is off to a good start - but still has room for improvement. Over the next two years, follow the best practices described below to save energy in the lab and keep your researchers safe.

- Make sure to always close fume hood sashes when you are not actively working in them
- Continue to avoid working in the fume hood with the sash all the way up.
- Storing chemicals and reagents in the hood is not only unsafe, but can contribute to toxic materials and fumes being unnecessarily exhausted. Make sure you aren't unnecessarily storing chemicals or reagents in the hood long term.
- Don't use a fume hood to evaporate chemicals like solvents either dispose of them in the proper waste stream, donate them, or try distilling and recycling them!
- If possible, retire older fume hoods in your lab for newer, more efficient, or even ductless models. Low hazard work often doesn't require a standard fume hood!

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- Continue to ensure that excess, unused equipment isn't stored in your fume hoods. This can disrupt air flow, leading to inefficiency as well as safety hazards.
- Schedule regular checks on the air flow of your fume hoods or work with your site operations to check the air flow of the fume hoods regularly.



Cold Storage

Cold Storage Maintenance

Answer Distributions

	Does Not Apply	l Don't Know	Never / No	Sometimes	Freque	ntly Always / Yes	Current Score	Previous Score
							_	
We check door seals ar m	nd replace them in a time nanner if they are damag	ed 17%	17%		67%		68%	35%
We clean or replace the f	ilters at least once per ye	ear	6	7%		33%	37%	4%
We defrost and remo	ove ice from our freezers least once per ye	at ar.		100%			100%	53%
We clean the condenser a	area and condenser coils least once per ye	at ear 17%		50%		33%	3%	3%

Strategies To Improve

Implement a few of the best practices in this category to extend the life of your lab's cold storage units, reduce utility costs for your organization, and protect your lab's samples.

• Cold storage that is properly maintained uses about 10% less energy than equipment that is not maintained. Ensure a cold storage maintenance plan has been developed for your lab that includes regularly checking door seals, cleaning or replacing filters, regularly defrosting units, and cleaning the condenser coils. Establish a schedule for keeping all units maintained, and ensure all lab members know how they can help. View a collection of preventative maintenance resources on <u>Sharepoint</u>.

56%

Sample Management

Answer Distributions

	Does Not Apply	l Don	't Know	Never / No	Sometimes Frequently		Always / Yes	Current Score	Previous Score		
We mair	ntain a record of cold sa	amples	17%			83%		84%	68%		
We periodically e fr	liminate unneeded ma om all our cold storage	aterials e units	17%		67%		17%	70%	55%		
We have evaluated w	hether we can share օւ storage space with	ur cold others			100%			100%	84%		
We do not store s	samples or reagents in conditions than n	colder eeded			83% 17%						

Strategies To Improve

It's clear you are already considering your sample management practices and wish to do well here - great start, but where can you still improve?

- An accurate inventory is beneficial for many reasons: minimize door openings on refrigerators and freezers, which can protect your samples; save time because you know exactly where to look for your samples; an accurate inventory is beneficial for lab safety; and inventories facilitate regular sample clean-outs, freeing up new space in your cold storage units. Ensure your lab has a system in place for keeping record of your cold storage samples for efficiency, safety, and accuracy of your research. There are many different options to explore; choose the one that works best for your lab. Some example inventory options can be found here.
- The most affordable laboratory refrigerator or freezer is the one you don't have to buy in the first place. Schedule time each year for regular sample cleanouts, so unneeded samples can be discarded to make room for new ones. Focus on samples that are duplicate of others, expired, have illegible labels, or are no longer useful to keep stored.
- Continue to share cold storage with neighboring labs at your organization! There are many benefits to doing this such saving lab space, save money for your institution with lower utility costs, save startup funds (for academic institutions), and sharing equipment can even promote scientific collaborations that otherwise would not occur.
- Could any of the samples your lab currently stores at in refrigerators and freezers instead be stored at room temperature? Evaluate room temperature sample storage feasibility for your lab.

Additional Cold Storage Practices

Answer Distributions

	Does Not Apply	l Dor	n't Know	Never / No	Sometimes Frequently			Al	ways / Yes	Current Score	Previous Score
We joined the Free	ezer Challenge in the la	st two years	17%	17%		-	50%		17%	23%	4%
We have evaluated th	e best placement of ou	ur co	3	3%	17%		50%			51%	35%
We have set	ULT freezers to -70 or	higher	17%			8	83%			100%	94%
We have replac rooms to includ	ed or retrofitted cold s e energy efficiency me	torage asures	17%			٤	83%			1%	1%
		,							1		

Strategies To Improve

Great start, but there's room for improvement here. How can you further incorporate the following best practices into your lab's cold storage habits?

- The <u>Freezer Challenge</u> is a great way to make sure you are maintaining your lab's refrigerators and freezers while adopting best practices for laboratory cold storage. If your lab hasn't participated in the past two years, plan to sign up for the next one.
- Refrigerators and freezers reject a lot of heat into the lab environment. Ensure there is sufficient space between, behind, and above cold storage units to dissipate that heat, and ensure the room in which you place your cold storage has enough cooling capability to handle refrigerators and freezers. Equipment rooms and laboratory spaces are good candidates; closets, hallways, and rooms without good ventilation tend to be worse for cold storage. For more information look here.
- Ultra-low temperature freezers can be one of the most energy consumptive categories of lab equipment besides fume hoods. Keep these freezers in mind and consider what other actions you could take to ensure they are running efficiently; changing the set point to -70 C is a great start.
- Talk with your institution's facilities or maintenance team to understand if cold rooms in your building have been upgraded or retrofitted to be more energy efficient. Retrofits or replacements are available that use natural refrigerants or variable speed compressors. Ask if an energy study has been done on your cold rooms, and if not, advocate for energy efficient upgrades at your institution.



Large Equipment

94%

Incubators

Answer Distributions								
	Does Not Apply	l Don't Know	Know Never / No Someti		Frequently	Always / Yes	Current Score	Previous Score
				1				
We dont use incubators as refrigerators		17%		83%			100%	100%
We turn off incubators when not in use		17%	33%		50%		88%	75%

Strategies To Improve

The team at My Green Lab is thrilled to see that you are keeping the environmental impact of your incubators as low as possible.

• Continue the discussion of whether incubators can be powered down in the lab when they are not actively in use. If you can turn them off, make sure everyone in the lab is aware of when to do this.



Computers

Answer Distributions

Does	Not Apply	l Don	n't Know Never / No		Sometimes	es Frequently		Always / Yes	Current Score	Previous Score
Computers and monitors are s sleep mo	shut down or p de when not i	put in in use		50%		50%			85%	69%
We uti	lize a shared p	rinter	10(%	100%	100%		
The printers in our lab are se side	et to default do d and B&W pri	ouble inting	33%		67%			83%	75%	
We only p	rint when nece	essary	17%			83%	95%	85%		
We purchase paper that contai	is chlorine fre ins recycled co	e and intent	17%	33%		50%			67%	18%
We recycle ink and tor	ner cartridges o refillable	or use ones	50%				50%		51%	18%

Strategies To Improve

You are off to a good start with how your lab operates computers & printers, but there is room for improvement. Below are simple steps the lab can take to improve.

- Continue to discuss how your lab could successfully put computers and monitors in sleep mode or shut them down when they are not in use. This will save the lab energy, and your institution money, in the long run!
- Adjust your printer's default settings so that printing is always in black-and-white ink and double-sided. This reduces the use of paper and colored inks.
- Work with your purchasing office and your suppliers to find paper options made with post-consumer recycled content and that are chlorine-free. These options lessen pollution, energy consumption, and impacts on forest resources.
- Verify that everyone in the lab knows how to correctly recycle ink and toner cartridges on-site.



Biosafety Cabinets

Answer Distributions

	Does Not Apply	l Do	n't Know	Never / No	Sometimes	Frequently	Always / Yes	Overall Score	Previous Score
We only	use UV light when nece	essary	17%			83%		100%	80%
We only leave UV ligh	We only leave UV lights on for 30 minutes at most			33%	33%		33%	85%	88%
Weo	close our sashes on our	r BSCs			100%			100%	100%
We t	urn off BSCs when not	in use			100%			100%	74%
We regularly chec	k BSCs for air flow and perforr	d filter mance			100%			100%	100%
								7	

Strategies To Improve

Terrific job! The lab is already taking the necessary steps to reduce the environmental impact of biosafety cabinets and/or tissue/cell culture hoods.

- Only leave the UV light on for 30 minutes maximum when working in the BSC. Check to see if your BSC has a built in timer for this purpose, or discuss options to add an external timer.
- Keep up the excellent practices of a) turning off BSCs when they are not in use and b) keeping the sash closed



Vacuum Pumps

Answer Distributions

	Does Not Apply	l Don't Know	Never / No	Sometime	s Frequ	iently	Always / Yes	Overall Score	Previous Score
We check the fu	nction of our pumps reg	gularly	50%		17%		33%	67%	67%
We use a cold trap in	line to prevent volatiles entering the	s from pump		10	00%			0%	1%
We turn off vacuum	pumps when they are	not in use	50%			50%		100%	100%
We have exchange	d the oil pumps with o p	il-free umps		83%			17%	100%	1%

Strategies To Improve

There's still room for improvement here with your vacuum pumps, but you're off to a good start. What other best practices could your lab try?

• Verify who is responsible for maintaining vacuum pumps at your organization - is it you and your lab, or is a maintenance program provided by another group? Ensure vacuum pumps function is checked regularly.



Infrastructure Energy

Lighting

64%

60%

Answer Distributions

	Does Not Apply	l Do	on't Know Never / No		Sometimes Frequent		Frequently Always / Yes		ays / Yes	Overall Score	Previous Score
									1		
We turn off the light	s when the lab is not in	use.			83%				17%	75%	60%
We turn off lights in s	support rooms when n	ot in use		50%			50%			85%	70%
We turn off overhea	ad lighting when daylig suffic	ht is cient	17% 83%					95%	59%		
We ha	ive upgraded to LED ligh	nting	100%				1%	2%			

Strategies To Improve

You have made some good progress with lighting but there is some room for improvement. Here are some ways that you can improve your lighting best practices.

- Ensure that the lab always turns off lights in the lab and in lab support rooms. Remember, lighting can account for up to 25% of your lab's energy use remind all lab members how important it is to turn off lights in rooms that aren't in use. Do a 'shut the lights' competition or use a <u>sticker</u> to help remind people.
- Upgrading your space to LED lighting will save energy, and it's important to let your facilities teams know that your lab is on board for these installations and upgrades. Check out this <u>best practice guide</u>.

Ventilation

Answer Distributions

Does Not Apply	l Don	ı't Know	Never / No	Sometimes	Frequently	Frequently Always / Yes		Previous Score
We have optimized the ventilation of the lab based on hazard levels		17%		83%			84%	67%
has reduced air changes the lab is not oc	s when cupied		33%		50%		20%	2%
the windows in the lab	closed	17%			83%		84%	90%
Thermostats are not b	locked	17%	3	3%	% 50%			51%
as optimized the tempo of	erature the lab	17%			83%		84%	40%
res are set back when is not oc	the lab cupied		50%		33%	17%	19%	2%
	Does Not Apply ized the ventilation of the based on hazard has reduced air changes the lab is not oc the windows in the lab Thermostats are not be as optimized the tempor of the sare set back when the is not oc	Does Not Apply I Dor ized the ventilation of the lab based on hazard levels has reduced air changes when the lab is not occupied the windows in the lab closed Thermostats are not blocked as optimized the temperature of the lab tres are set back when the lab is not occupied	Does Not Apply I Don't Know ized the ventilation of the lab based on hazard levels 17% ias reduced air changes when the lab is not occupied 17% the windows in the lab closed 17% Thermostats are not blocked 17% as optimized the temperature of the lab is not occupied 17% ures are set back when the lab is not occupied 17%	Does Not Apply I Don't Know Never / No ized the ventilation of the lab based on hazard levels 17% 33% nas reduced air changes when the lab is not occupied 33% 33% the windows in the lab closed 17% 33% Thermostats are not blocked 17% 33% as optimized the temperature of the lab is not occupied 17% 33% ures are set back when the lab is not occupied 50% 50%	Does Not ApplyI Don't KnowNever / NoSometimesized the ventilation of the lab based on hazard levels17%	Does Not ApplyI Don't KnowNever / NoSometimesFrequentlyized the ventilation of the lab based on hazard levels 17% 33% 50% nas reduced air changes when the lab is not occupied 17% 33% 50% the windows in the lab closed 17% 33% 50% Thermostats are not blocked 17% 33% 50% as optimized the temperature of the lab is not occupied 17% 33% 50% Thermostats are not blocked 17% 33% 50%	Does Not ApplyI Don't KnowNever / NoSometimesFrequentlyAlways / Yesized the ventilation of the lab based on hazard levels17% 33% 17% ized the ventilation of the lab based on hazard levels17% 33% 17% ite windows in the lab is not occupied17% 33% 50% 17% the windows in the lab closed17% 33% 50% 50% Thermostats are not blocked17% 33% 50% 50% as optimized the temperature of the lab is not occupied 17% 50% 33% 17%	Does Not ApplyI Dort KnowNever / NoSometimesFrequently $A ways / Yes$ Overall scoreized the ventilation of the lab based on hazard levels17% 33% 33% 33% 84% as reduced air changes when the lab is not occupied17% 33% 50% 17% 20% the windows in the lab closed17% 33% 50% 60% 84% Thermostats are not blocked17% 33% 50% 60% as optimized the temperature of the lab is not occupied 17% 50% 33% 60% the serve as eset back when the lab is not occupied 50% 50% 17% 19%

Strategies To Improve

Lab ventilation should be properly managed and understood in order to keep you safe and save energy. You're off to a good start, just make sure you follow the tips below.

- By talking with your organization's facility or building maintenance teams, your lab can ensure that ventilation is optimized for safety and energy savings. Your commitment to minimize and managing hazards is key to them being able to complete this work. Changing ventilation requirements is the single biggest energy saver your lab can do. Revisit the green chemistry section to explore how you can minimize hazards.
- Keep lab windows shut, even if it's nice outside! Lab ventilation contributes to abut 2/3 of your lab's energy use. Don't let that energy go out the window!
- Make sure none of the thermostats in your lab are blocked by equipment, lab coats, or otherwise.
- Keep the conversation going about optimizing temperatures in the lab. Make sure you understand what your role is in maintaining that!
- In addition to optimizing the daytime temperature, see if your organization has the ability to change the temperature at nights/on weekends by a few degrees to save energy. Just as optimizing the temperature needs your input and support, work with facilities to help them understand what your constraints or concerns are and work together on a solution.

Travel

83%

Answer Distributions

	Does Not Apply	l Don't Know	Never / No	Sometimes	Frequ	uently	Always / Yes	Overall Score	Previous Score
We have posted information on alternative transportation in the area		rnative ne area		100%	68%				
We use alterna	We use alternative transportation to go to work			67%			33%	80%	70%
We use alternative tra	nsportation around or n camp	ear the us/site	50%	50%				85%	80%
We use alternative tra	ansportation when trave	ling for work	33% 67%		90%	75%			
We use teleconfer	encing instead of flying t with coll	o meet eagues	33% 67%				60%	65%	
		5							

Strategies To Improve

You have made a good start! It looks like the lab already has some good behaviors in place for sustainable travel. Here are some additional recommendations to keep the ball rolling to maintain and improve upon your current sustainable travel practices.

- If you're not doing so already, find an alternative transportation option that works for you and start by using that option, even for one day per week. If you're already using an alternative transportation option (public transport, walking, biking, carpooling), share this information with the lab to encourage more to also choose a more sustainable transport option, even just for one day per week!
- If not been performed already, reconsider any in-person events or meetings and determine whether these meetings could be arranged virtually. Research shared manuscript via file sharing platforms to work with national and international colleagues to alleviate need to travel frequently.

Lab Comments

Community	 As part of an university research group, we are not in direct contact with local energy management or safety. This is organised independently and it is beyond our reach - Respondent
Waste Reduction and Recycling	
Resource Management	
Purchasing	
Green Chemistry and Green Biologics	
Water	
Plug Load	
Fume Hoods	
Cold Storage	
Large Equipment	
Incubators	 Change the stacking of incubators to favour similar temperatures in close proximity - Respondent
Computers	
Biosafety Cabinets	
Gloveboxes	
Vacuum Pumps	
Infrastructure Energy	
Travel	



Congratulations!

Fantastic job completing your My Green Lab Certification! We encourage you to celebrate this accomplishment with your lab mates as this is no small feat and requires great effort from everyone in the lab. Don't stop now though, lab sustainability is a journey that benefits from continuous efforts of improvement, but we are here to help!

If you need additional support or have questions, please visit the My Green Lab website at <u>mygreenlab.org</u> or you can email us at <u>programs@mygreenlab.org</u>. Thank you for your involvement in the My Green Lab Certification and we wish you continued success throughout your sustainability journey!

Thank you again for your involvement in the My Green Lab Certification!

Best Regards,



The My Green Lab Team

