

LAB CERTIFICATION PROGRAMS ADVANTAGES, UNEXPECTED OPPORTUNITIES, AND THE RISK OF GREENWASHING



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Science for Sustainability



TECHNISCHE
UNIVERSITÄT
DARMSTADT

‘We’re Playing With Fire’: World on Track for 3.1C Warming, UN Report Warns

CRISIS - ATMOSPHERIC CO2 LEVELS | BY MARTINA IGINI | GLOBAL COMMONS | OCT 25TH 2024 | 3 MINS

 EARTH.ORG IS POWERED BY OVER 150 CONTRIBUTING WRITERS



Newly Discovered Fungus Capable of Degrading Plastic

Dr. Annika Vaksmaa explores how microbes may offer a solution to reducing plastic waste in the future.

Article Published: September 3, 2024 | [Kate Robinson speaking with Annika Vaksmaa, PhD](#)



Credit: iStock

... but is resource intensive



Lab buildings
5-10 x energy¹

3-5 x water¹

5.5 Mio t plastic waste
(2014)²

Hazardous chemicals



1. IFMA BENCHMARKING® - Best practices, Newsletter-2020. <https://benchlearning.de/wp-content/uploads/2020/12/IFMA-Benchmarking-Newsletter-2020.pdf>.

2. Urbina, M. A., Watts, A. J. R. & Reardon, E. E. Labs should cut plastic waste too. *Nature* **528**, 479–479 (2015).

Green initiatives: measures to reduce resource consumption

Energy

Water

Waste / Lab material

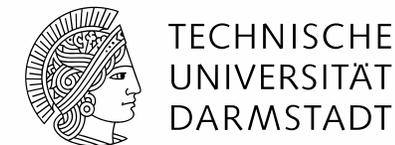
Chemicals

Purchase

IT



Survey on Lab Sustainability Programs



RSC
Sustainability



PAPER

[View Article Online](#)
[View Journal](#) | [View Issue](#)



Cite this: *RSC Sustainability*, 2024, 2, 3383

Lab sustainability programs LEAF and My Green Lab®: impact, user experience & suitability†

Bianca R. Schell ^{ab} and Nico Bruns *^a

How do they work?



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- ❖ Two level login: Admin & user
- ❖ Overview of institution's performance
- ❖ Criteria for each certification level
- ❖ Resources (best practice, publications) +
- ❖ Calculators (cost & emissions)

| Criteria | Supporting Resources | Feedback |
|---|------------------------|----------|
| Category - Equipment | How did you meet this? | |
| Description | | |
| 8. Cold storage, ovens, or incubators are only operated when they are as full as possible. | | |
| Why? | | |
| Most equipment that heats or cools will consume significant amounts of energy. Running half loads can use just as much energy as a full load. | | |

Implement changes & fill out
free-text criteria

fixed
criteria

| | |
|--------|----|
| Bronze | 16 |
| Silver | 17 |
| Gold | 15 |

Bronze



[Click here to submit](#)

16/16

Submit all criteria
of desired
certification level

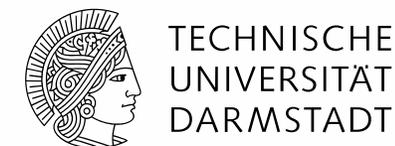


Cross-auditing
with other
research groups



Receive
certification

How do they work?



- ❖ Three level login: Admin, lab lead & user
- ❖ Overview of institution's performance
- ❖ certification level acc. to percentage
- ❖ Resources (best practice, publications) +
- ❖ Calculators (cost & emissions)

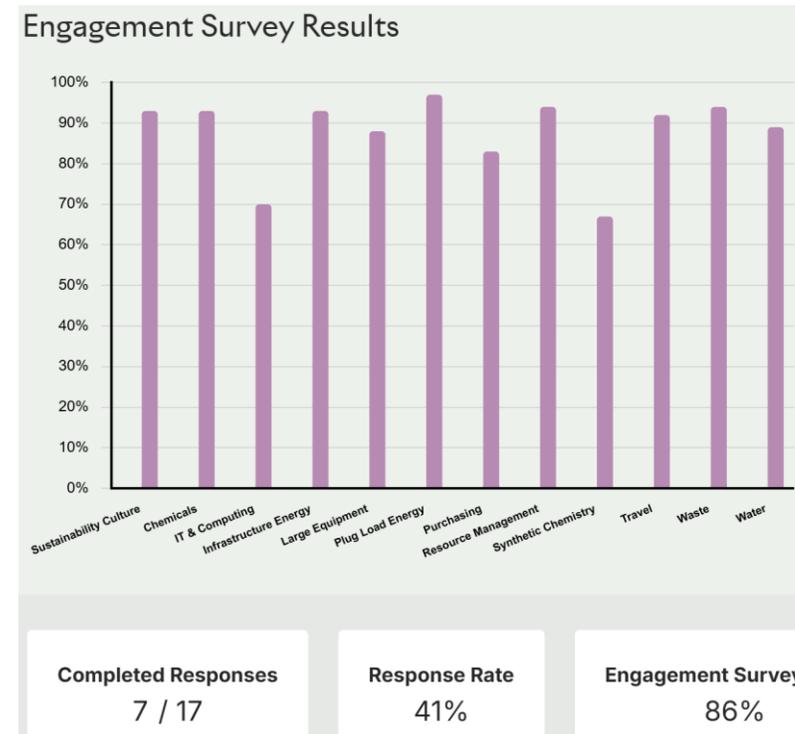


My lab group maintains a record of lab materials in our cold storage units using an inventory management system, freezer map, or similar option.

- AGREE STRONGLY
- AGREE SOMEWHAT
- DISAGREE SOMEWHAT
- DISAGREE STRONGLY
- I DON'T KNOW
- NOT APPLICABLE

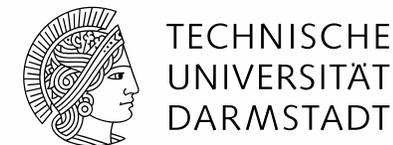
Lab Lead starts Assessment Tool to understand where the lab is at, has access to resources etc.

50 % of lab members fill out multiple-choice Engagement Survey



Lab Lead has overview over response rate, responses, performance, savings

How do they work?



- ❖ Three level login: Admin, lab lead & user
- ❖ Overview of institution's performance
- ❖ certification level acc. to percentage
- ❖ Resources (best practice, publications) +
- ❖ Calculators (cost & emissions)

Submit

My Green Lab
may ask proof
of some
criteria

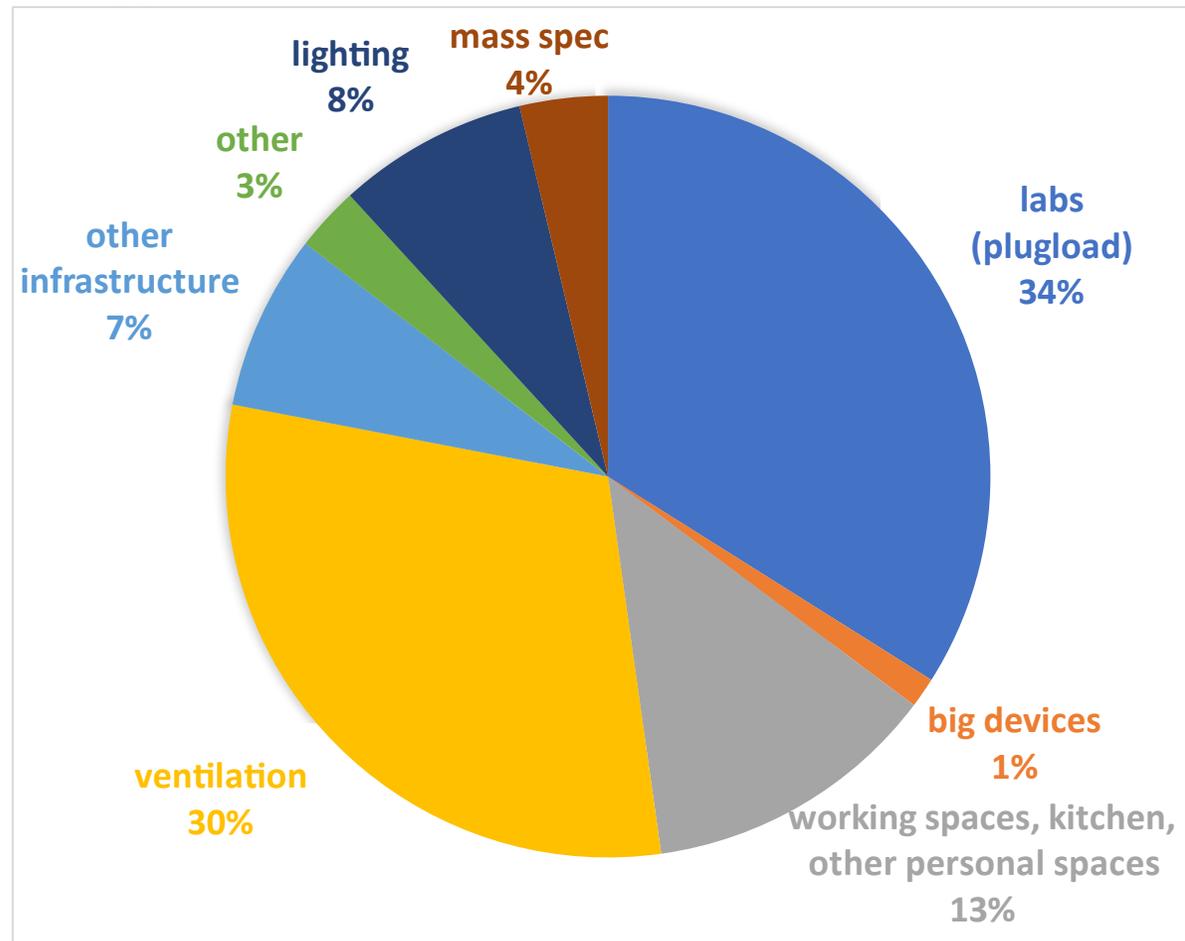
score

| | |
|----------|------|
| Bronze | 40 % |
| Silver | 50 % |
| Gold | 60 % |
| Platinum | 70 % |
| Green | 80 % |



Receive
certification

Advantages - Impact



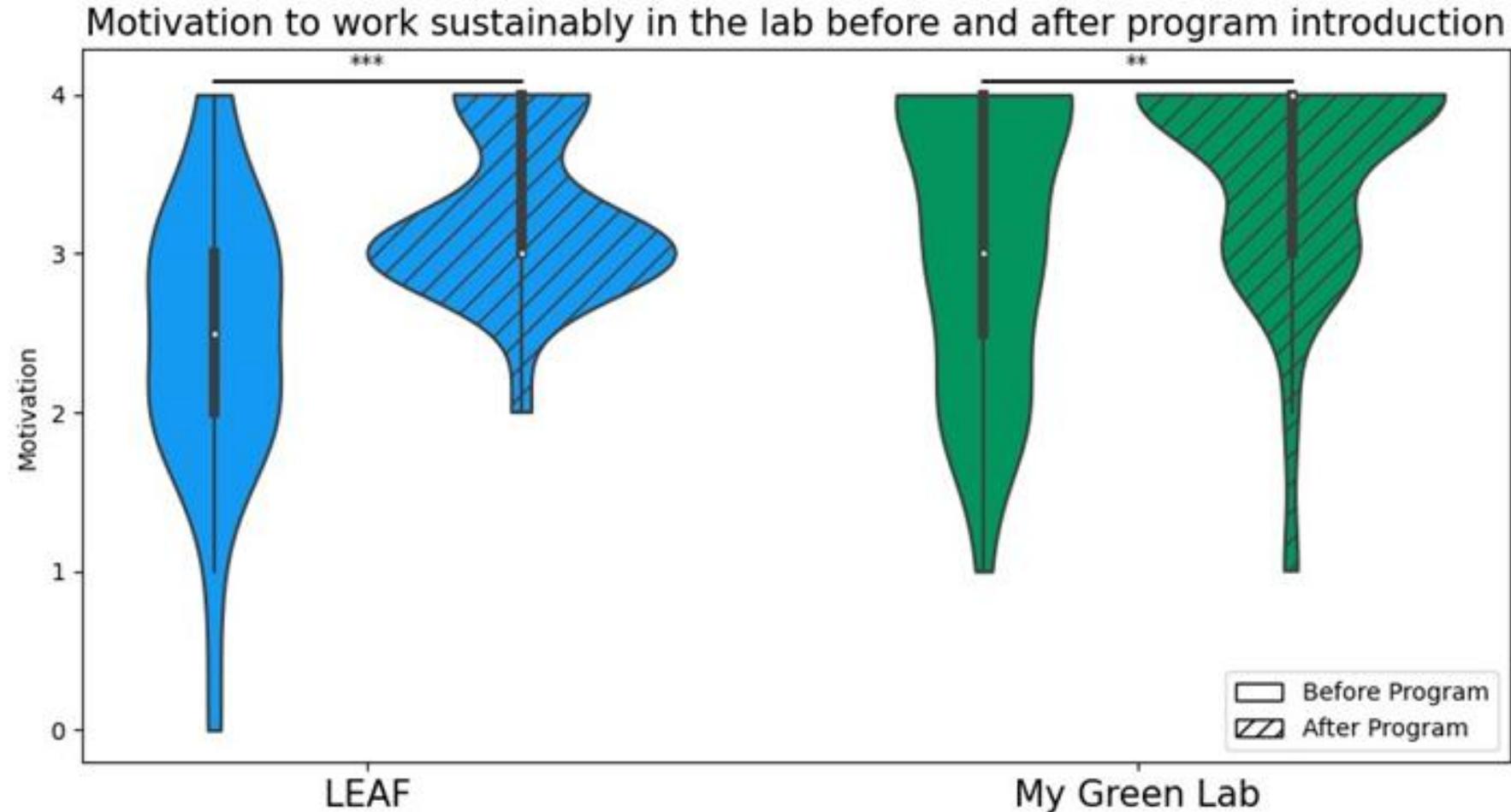
Energy consumption life science building ML, University Konstanz, 2023, own data

- ✓ Provide adequate tips for reducing purchase impact:
 - ❖ reuse of single-use plastic-ware
 - ❖ sustainable purchase
 - ❖ optimised use and recycling of solvents
 - ❖ Improving life time of / give second life to devices

- ✓ Adequate tips for reducing main energy consumers:
 - ❖ ventilation
 - ❖ lighting
 - ❖ plug load equipment

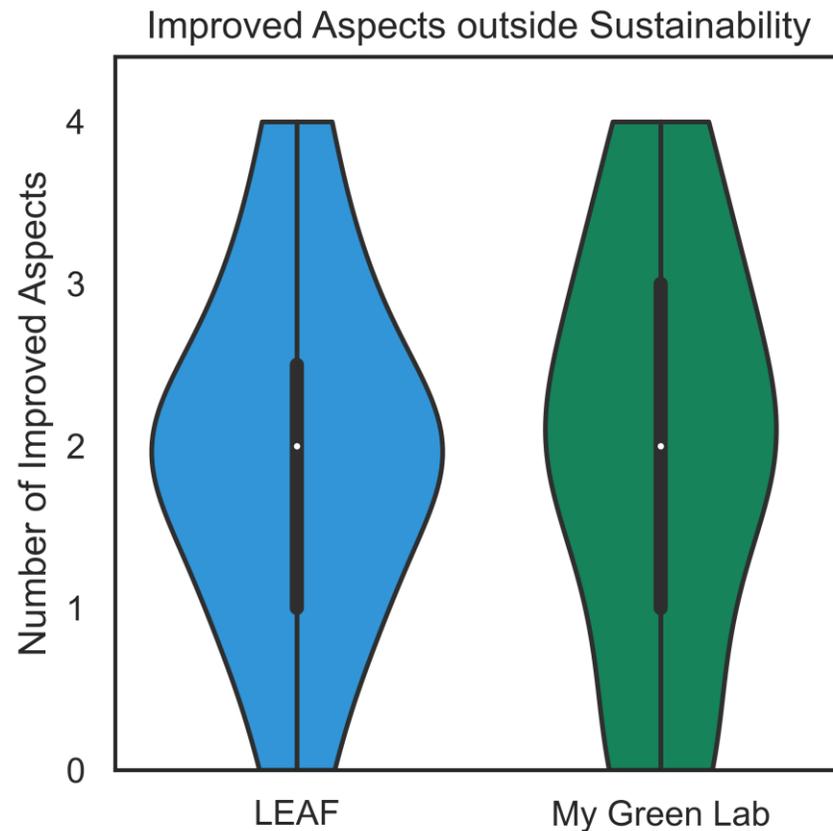


Survey – Motivation



0 = no motivation to 4 = very high motivation

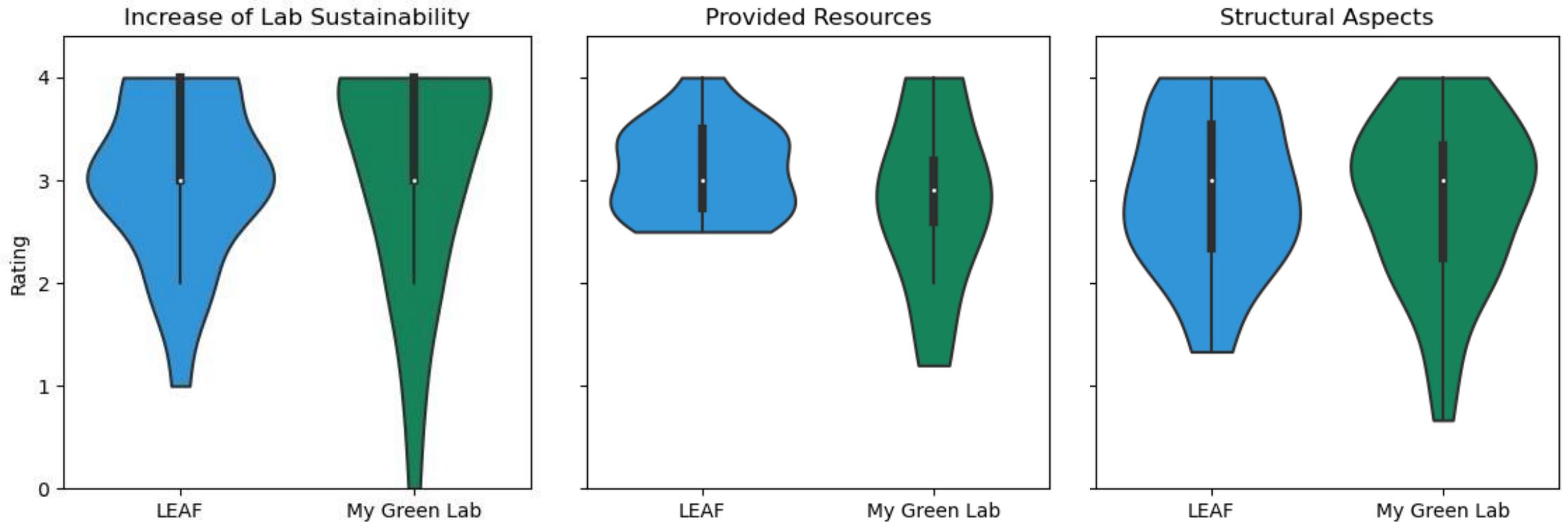
Unexpected opportunities



Improved Aspects
Organisation in lab • Processes • Safety • Teambuilding

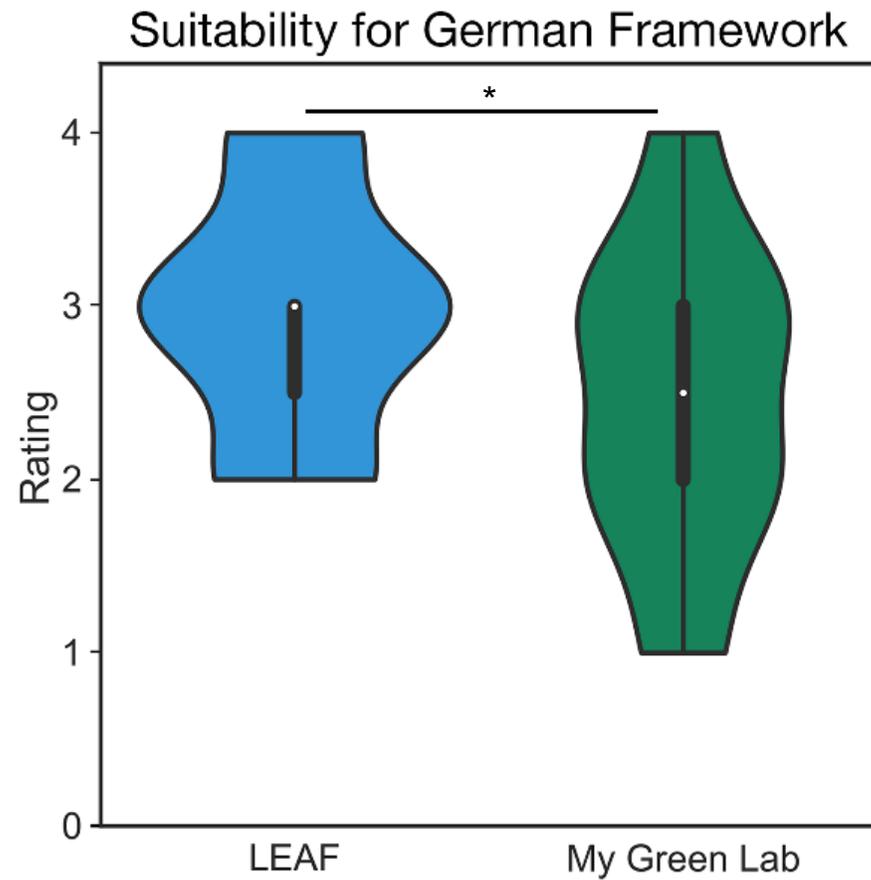
Happy lab members
62% would be very satisfied
working in a 'green lab'
Exchange of good research practices
between labs
(peer audit/ambassador
platform)

Survey – Main Findings



0 = '(liked) not at all/very low' to 4 = '(liked) very much/very high'.

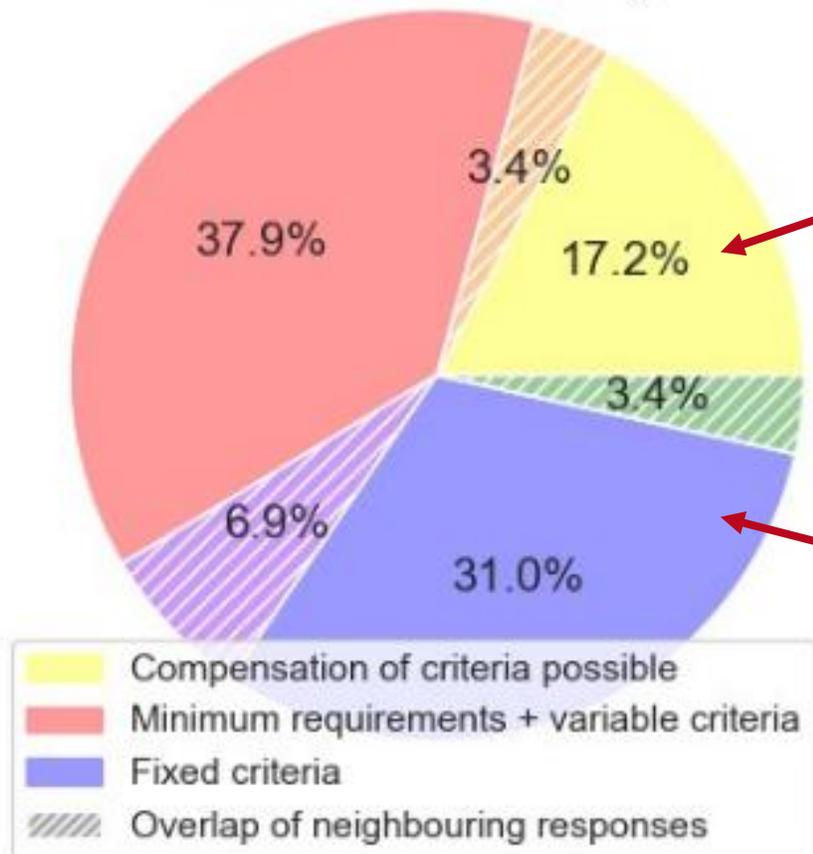
Risks...



0 = not suitable to 4 = very suitable

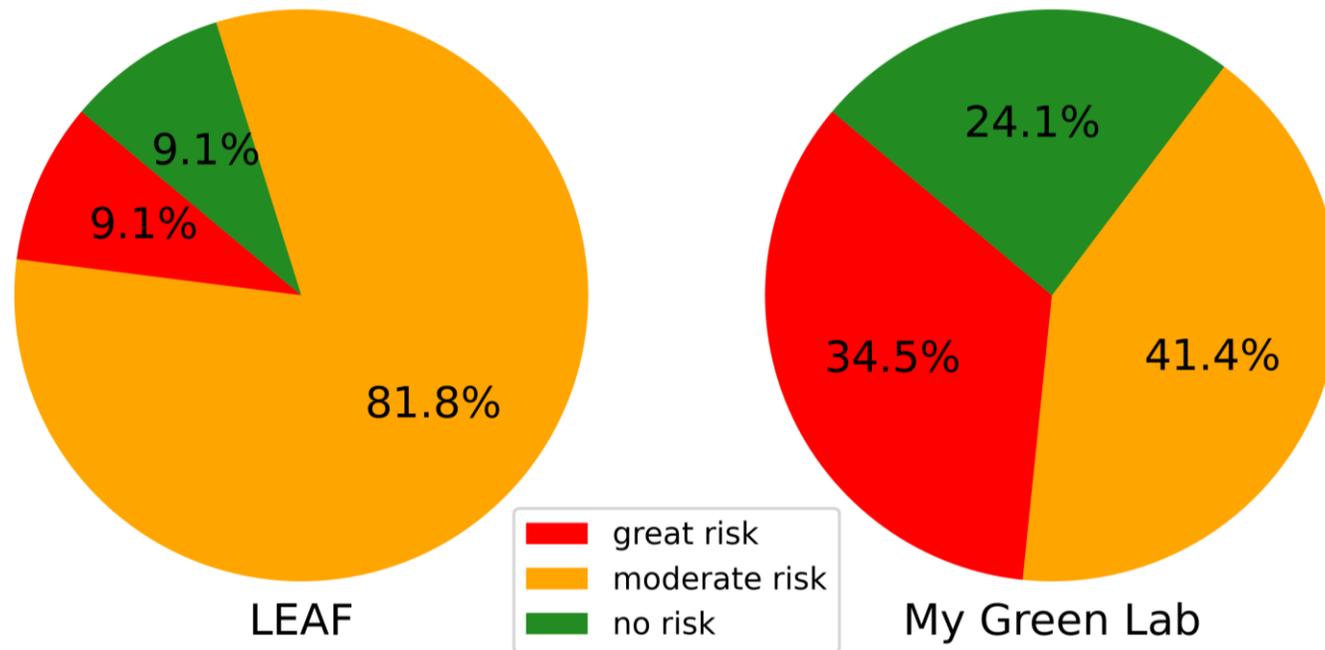
Risks - How certification works

User preference regarding criteria flexibility



Greenwashing Risk & Shortcomings

Perceived Greenwashing Risk



- ❖ External validation?
- ❖ Open-access?
- ❖ Individual prioritization?
- ❖ Maintain progress?
- ❖ Institutional level vs. Lab level?
- ❖ Assess impact?

Improvement since survey



29. I regularly evaluate, remove, and eliminate unnecessary, old, and low priority samples and reagents from cold storage units.

Sustainability Culture 1/3 REQ FIELDS 7.5/11 POINTS

Waste 1/1 REQ FIELDS 5/9 POINTS

Resource Management 0/0 REQ FIELDS 0/7.5 POINTS

Purchasing 0/0 REQ FIELDS 0/10 POINTS

ACTION: P1 Inventory Management
 The lab or procurement team have implemented a policy or process to check existing inventory before placing new orders to prevent excessive or redundant purchasing.

Not Pursuing

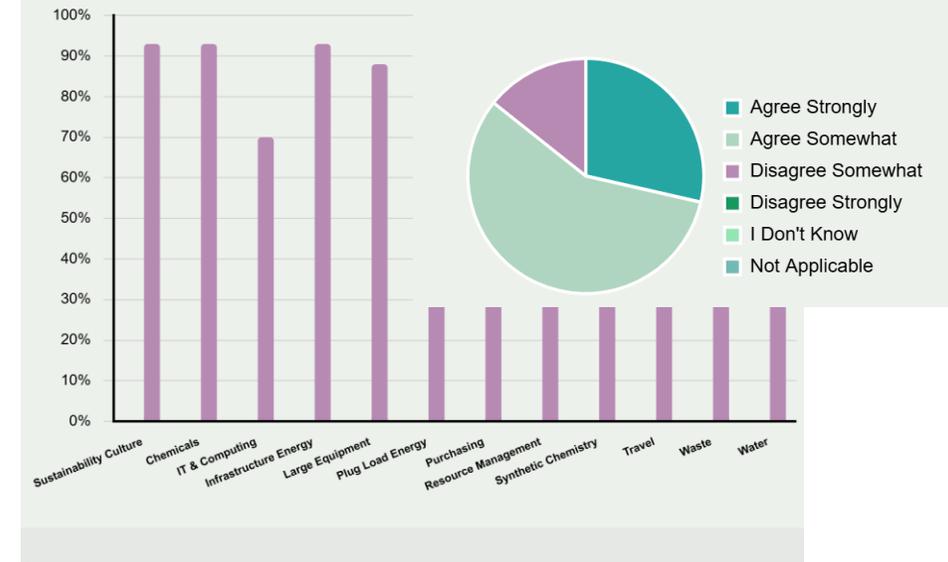
POINTS 0/1 | CORRESPONDING SURVEY QUESTION: 11 | NOT STARTED
 Score: 95.71% (70% Recommended)

My lab group maintains a record of lab materials in our cold storage units using an inventory management system, freezer map, or similar option.

- AGREE STRONGLY
- AGREE SOMEWHAT
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- DISAGREE STRONGLY
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50 % of lab members fill out multiple-choice Engagement Survey

Engagement Survey Results



Completed Responses
7 / 17

Response Rate
41%

Engagement Survey
86%

Lab Lead has overview over response rate, responses, performance, savings

Lab Lead starts Assessment Tool to understand where the lab is at, has access to resources etc.

Summary



Both increase lab sustainability & motivation

- ❖ great emission reduction potential
- ❖ increase in sustainability of lab operations
- ❖ good way to create awareness and educate staff & students



Open-access? Individual prioritization? Greenwashing risk?



Lab Sustainability Tool: Open-access, prioritized, individualized

- ❖ Collection of 120 measures to make labs greener
- ❖ Assigned to research background
- ❖ Meaningful: Impact & Feasibility taken into account

optimizing device operation

Priority: 18

Cost: 2, Effort: 3, Effect: 3

Status: Inactive

Description:

If possible unplug devices if they are not required to be on over night. If an energy saving mode exists it is set up.

Tipps:

Use stickers for devices that can be deactivated/unplugged or that should not be turned off, p. 60

<https://chemrxiv.org/engage/chemrxiv/article-details/6629623491aefa6ce155cb5e>

Fields:

Chemistry, Biology, Physics

Category:

Energiemanagement (general)

Assume responsibility



SPARKHUB

SPARKHUB

A new open-access certification and platform for **greening research**

Researchers, universities, institutions, and some health specialties will find here a standard sector-led approach for their journey towards environmentally sustainable practices

What this means for you...

❖ Educate users



What this means for you...

- ❖ Address most important criteria in the lab



What this means for you...

- ❖ Address most important criteria in the lab



What this means for you...

- ❖ Address most important with facility management



What this means for you...

❖ Peer Cross-audit labs



What this means for you...

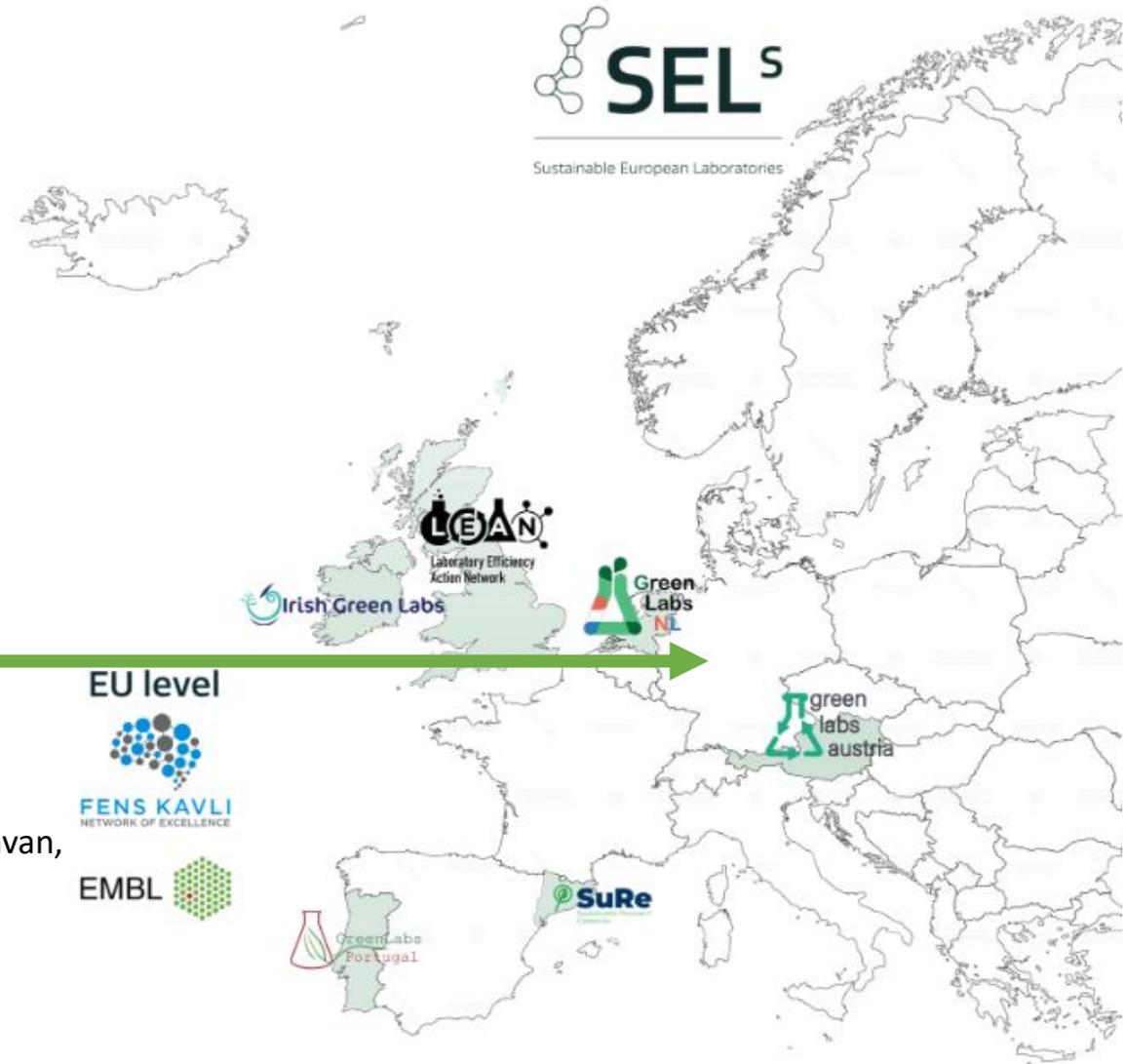
- ❖ Define successes & communicate these
- recognition & positive feedback for lab members



Green Labs Germany

- ❖ Networking
- ❖ Collecting resources
- ❖ Solving problems together
- ❖ Fill the gap

Helena Engel, Doctoral Researcher (DKFZ)
Hollyn G. Hartlep, Sustainability Coordinator (DKFZ),
Sabine Karolus, Sustainable Research Coordinator (DKFZ), Dharanija Madhavan,
Scientific Coordinator, Max Planck School Matter to Life,
Christian Panetzky, Sustainability Coordinator, Max Delbrück Center, Berlin
Marta Rodríguez-Martínez, Sustainability Officer, EMBL,
Bianca Schell, Technical University of Darmstadt/University of Konstanz,
Narasimha Sushil, Climate Protection Manager, Heidelberg University,
Philipp M. Weber, Sustainability Officer, EMBO





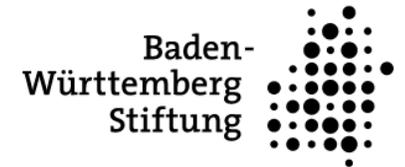
Thank you! Questions?

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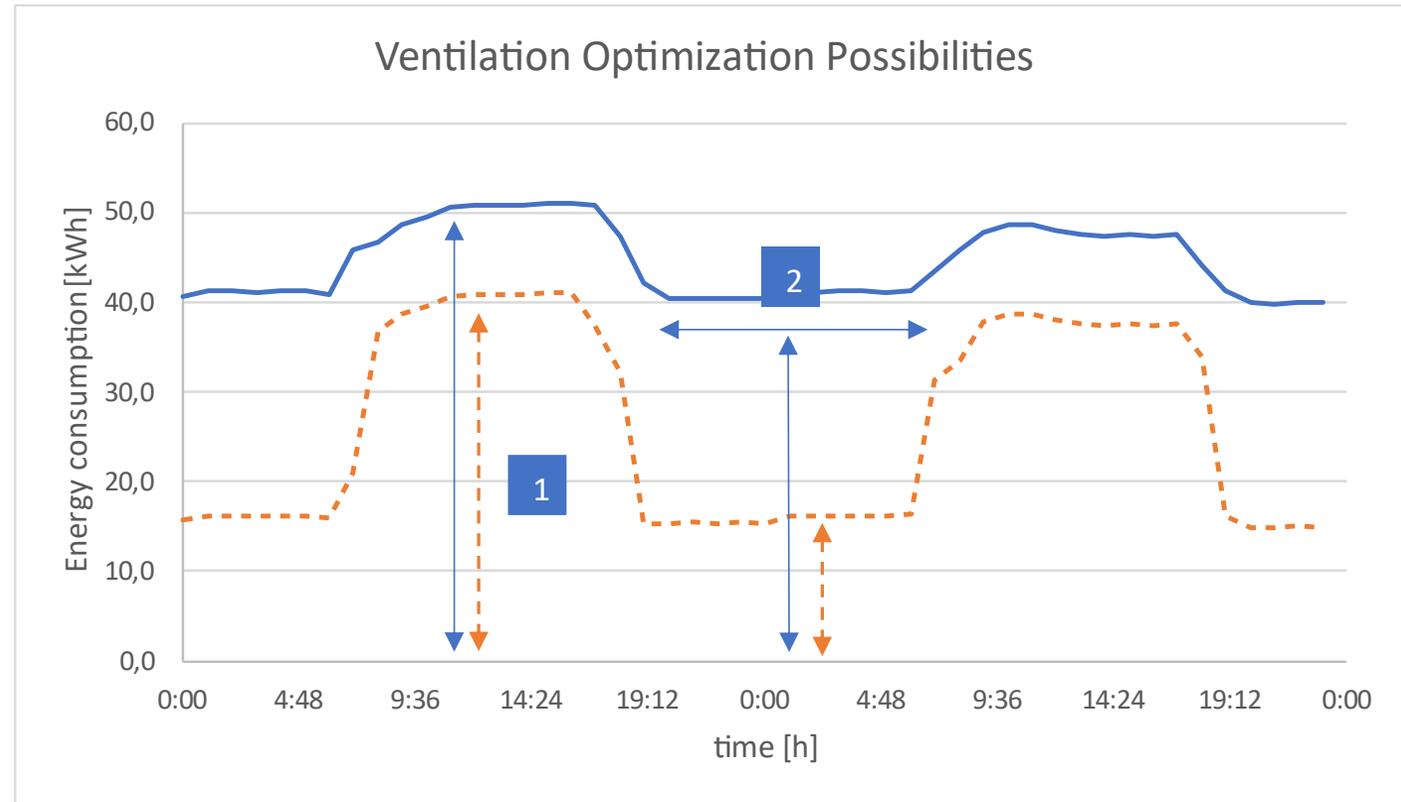
Nachhaltigkeit
Universität Konstanz



How to address most important criteria: ventilation

~25-70 % of lab buildings' energy is ventilation!

1. Reducing air exchange rate in individual labs (daytime)
2. Nighttime setback: Lowering air exchange rates or difference pressure (capacity) at night, reducing day hours
3. User education + optimization



1. Ventilation reduction during working hours

Reducing ventilation rates from 8x to 2-6x per hour

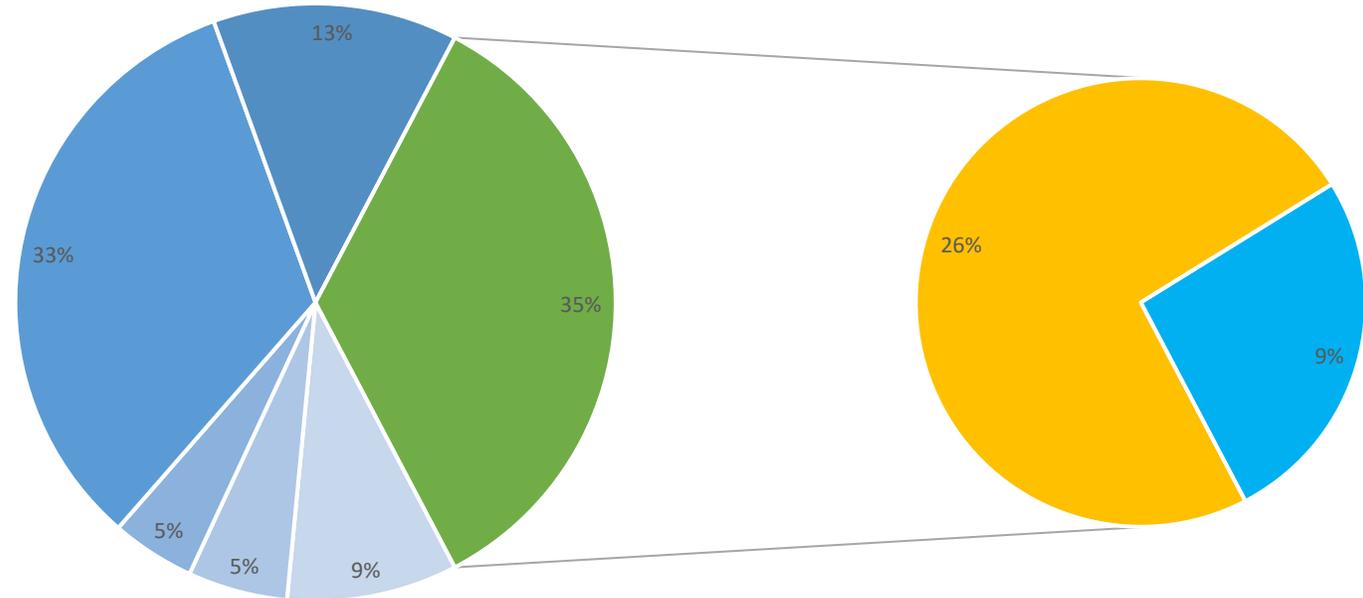
biology laboratories; small quantities of hazardous chemicals

Analytical lab rooms / no preparative work

30% savings* through reducing ventilation rates

*30% of of electricity of ventilation, 9% reduction of entire building electricity consumption

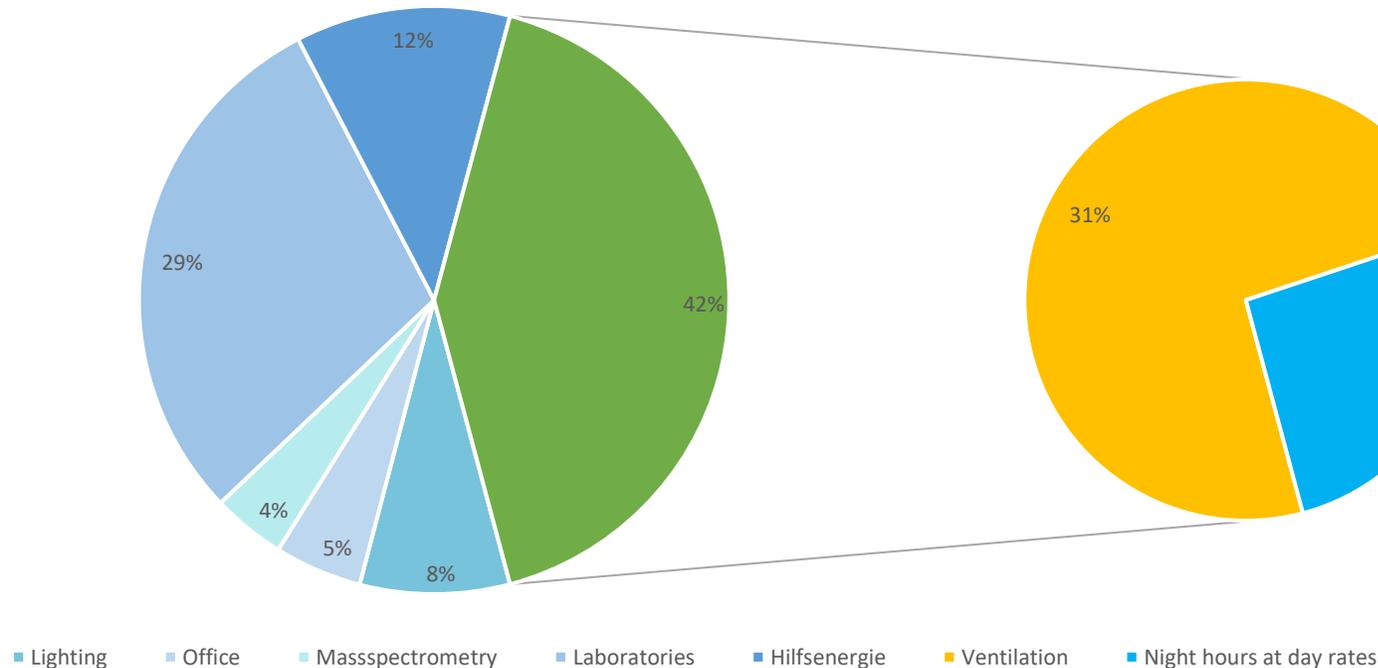
Savings by reducing ventilation rates



■ Lighting ■ Office ■ Massspectrometry ■ Laboratories ■ Hilfsenergie ■ Ventilation ■ 8x vs lower ventilation rates

2. Nightsetback: reduced ventilation rates

Extrapolated consumption without night setback



Reducing ventilation rates from 8x to 3x per hour

26% savings* through nighttime setback (reducing ventilation rates)

*26% of electricity of ventilation, 11% reduction of entire building electricity consumption

Own data, University of Konstanz.

More best practice from MDC Berlin: reduction to 2x/h: electricity consumption of building reduced by ~35%

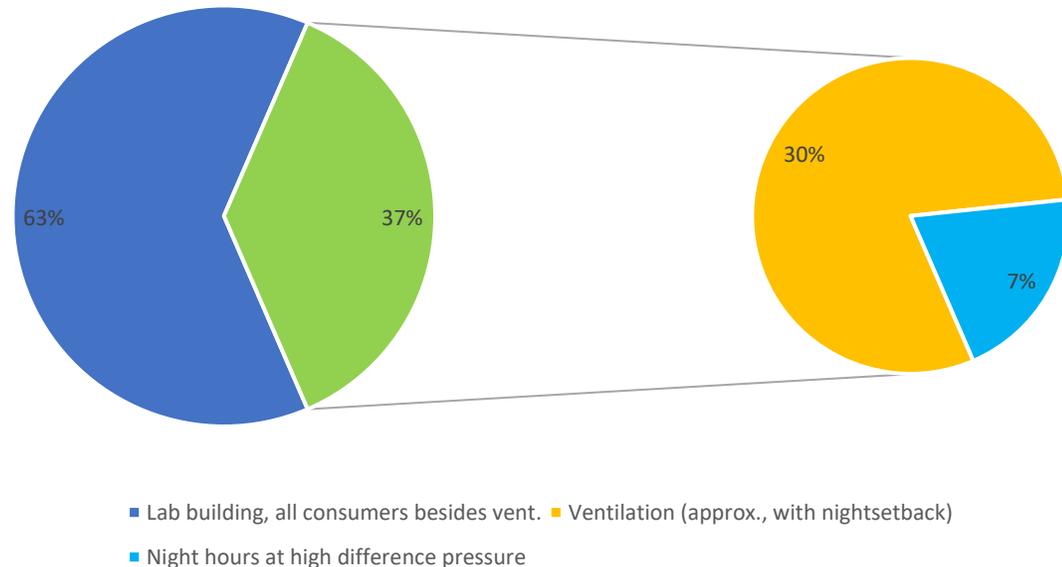
3. Nightsetback: difference pressure

- When reducing ventilation rates at night is not possible (H&S or technical burdens)
- Difference pressure in system can be reduced (capacity of ventilation system for increasing air volume with more fume hoods open)
- Period of real working hours can be evaluated via user profile (air volume of fume hoods can be recorded)

26% savings* through nighttime setback (reducing difference pressure)

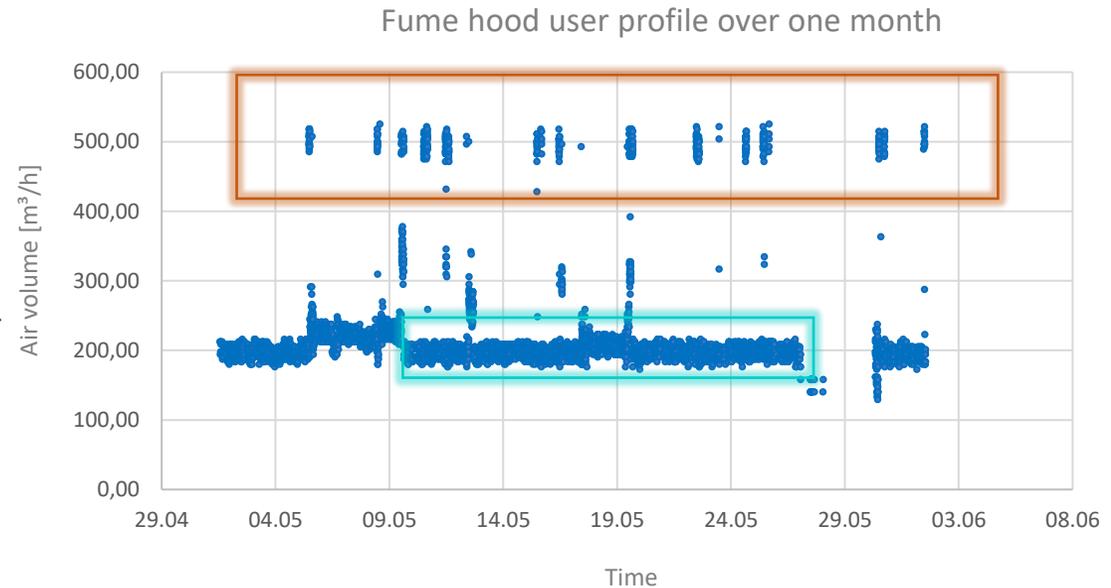
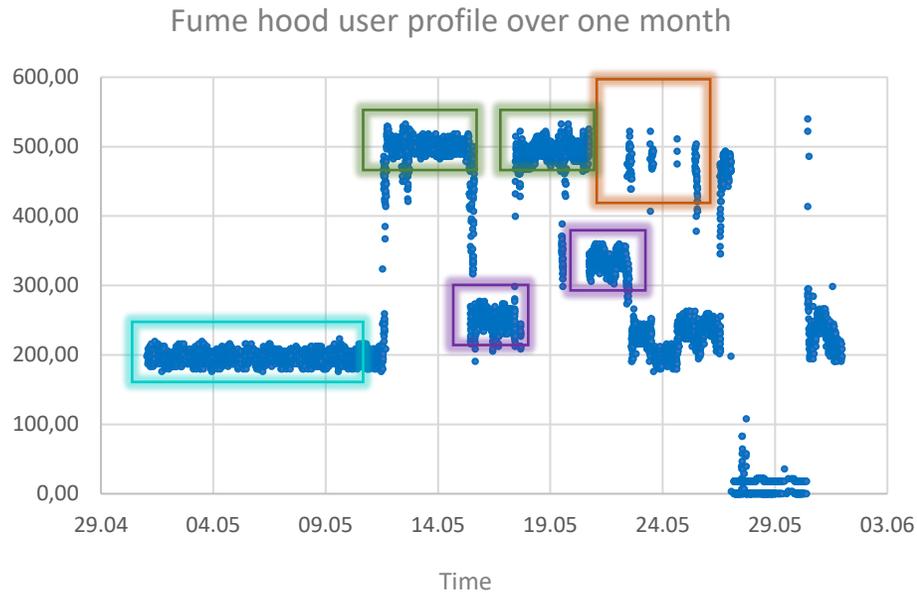
*~26% reduction of electricity of ventilation, 8% of entire building electricity consumption

Calculated energy consumption ventilation with reduced difference pressure at night



Own data, Technical University of Darmstadt. Total ventilation consumption is a rough calculation, building has only one energy counter. Savings through nightsetback were calculated and assessed afterwards, values match well.

3. User education + optimization: Reduction of misuse of fume hoods



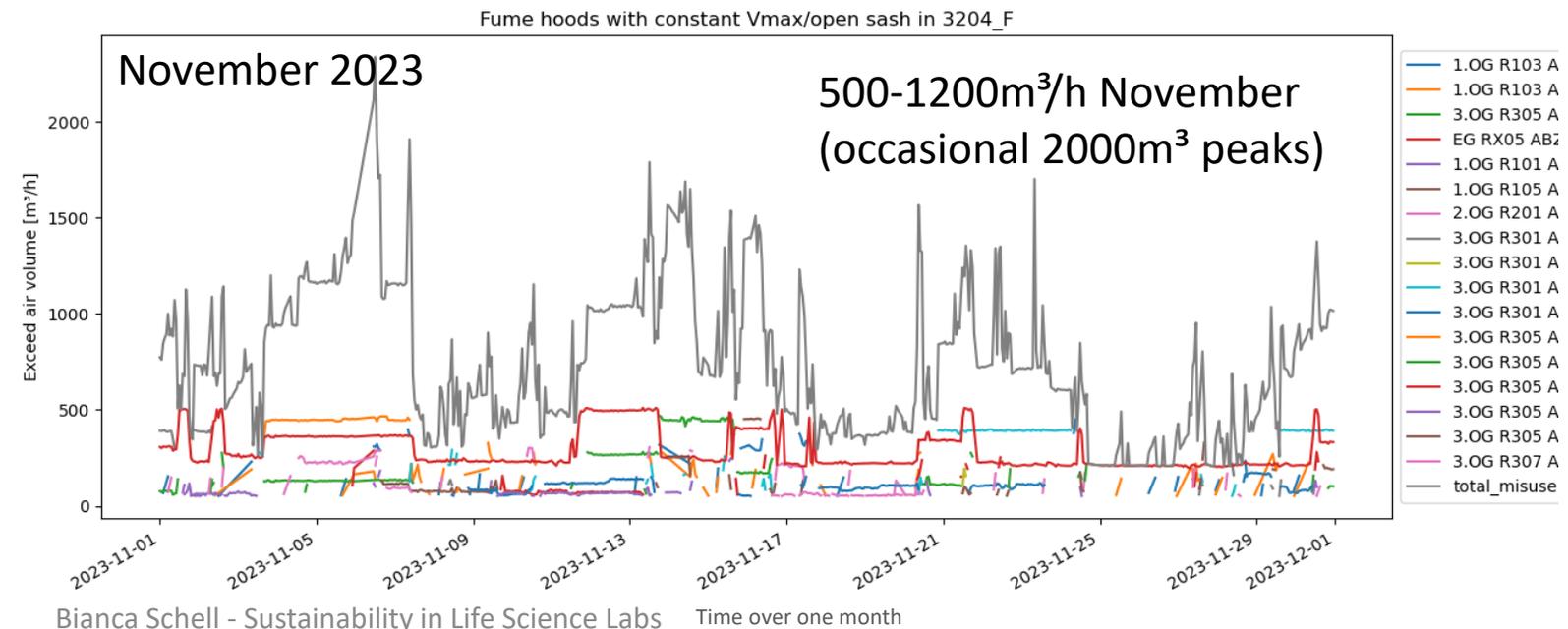
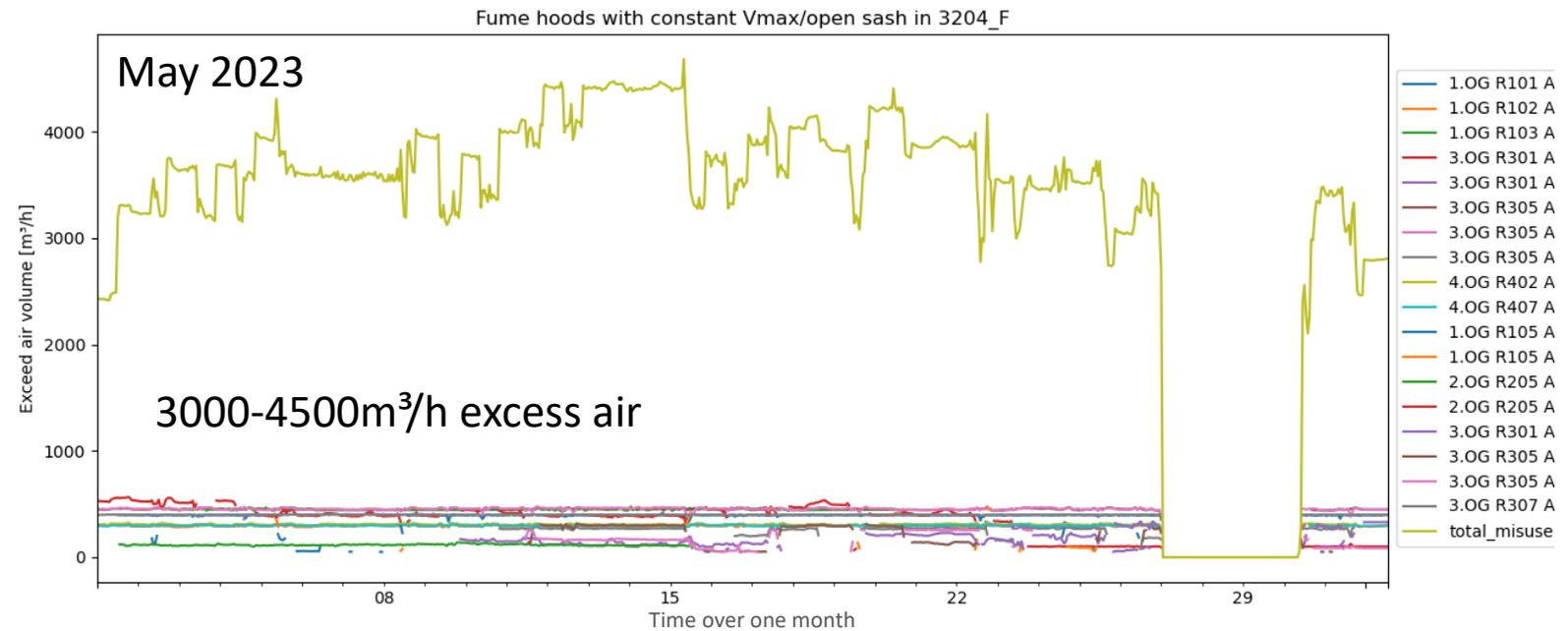
Desired state:

- no Vmax operation (unless necessary)
- Closed sash (front+side)

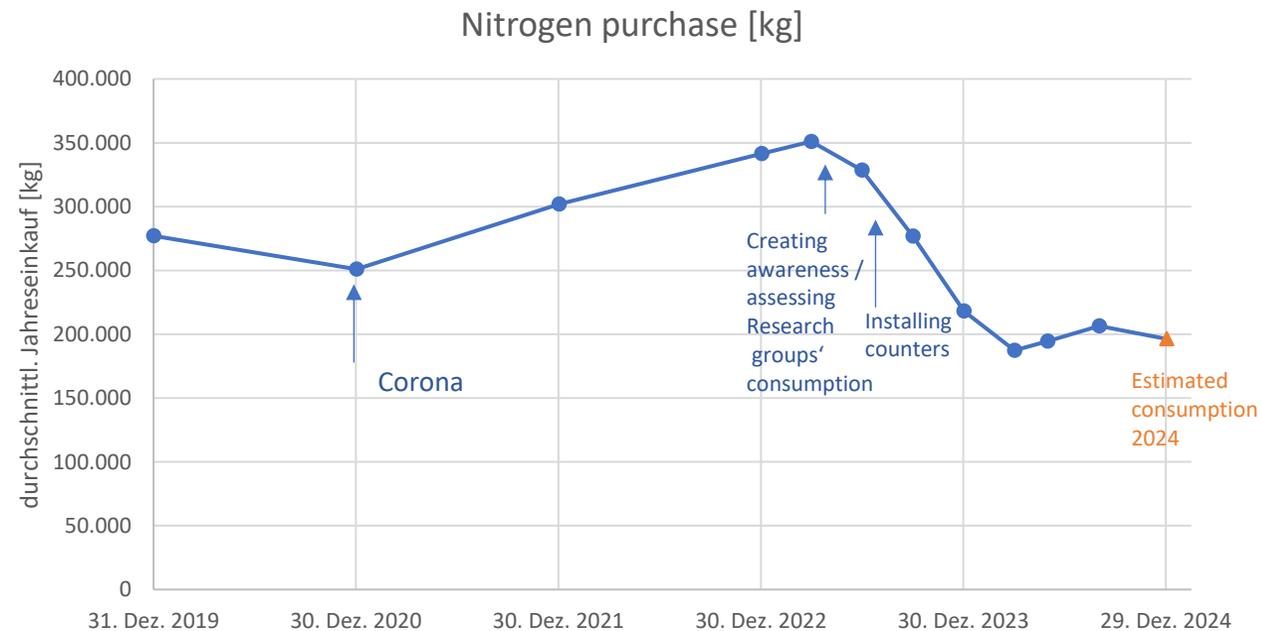
3. User education + optimization: Reduction of excess consumption of air volume

User education

→ Constantly 10% less air volume



Consumption central nitrogen gaseous



Consumption reduced to 54% in 2024 compared to 2022 by creating awareness

savings:

~40000€

45 tCO₂e

(~0.81 kWh per m³ N₂ needed for production, transport excluded)

Decision guidance



| Criterion | LEAF | My Green Lab |
|--|---|--------------------------------|
| Costs | 1,100-2600 £ / institution | 350-500 \$ / lab |
| Responsible staff | One person / lab | Min. 50 % of lab members |
| Research field | Slightly better for chemists | No difference for biologists |
| Adaptability to national/local framework | Local guidance can be added Local comparability better | worldwide comparability better |
| Detail of criteria | Broad | Detailed |