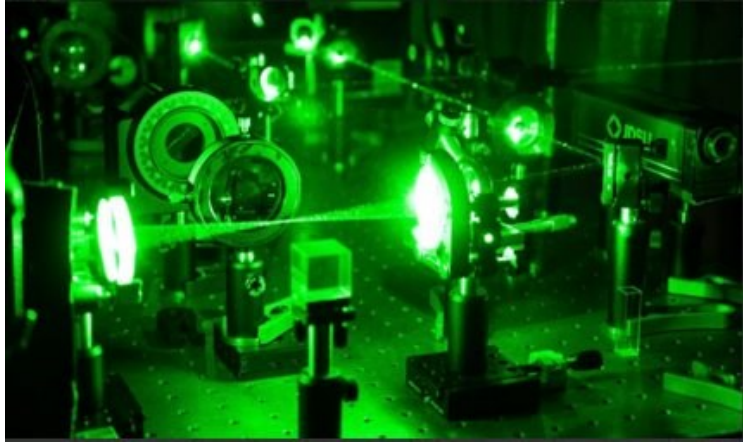


Making science greener: Researcher perspectives & solutions

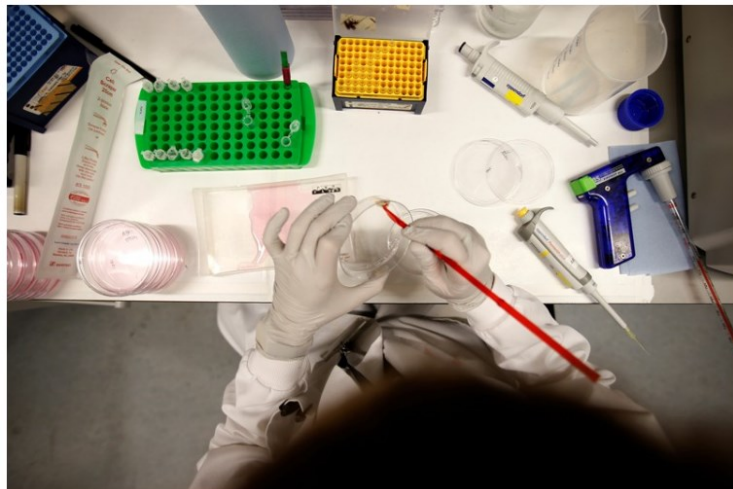
Technician Commitment Signatory Event
12 September 2023
Clare Dyer-Smith



Environmental impacts of scientific research



Server farms are used to train AIs
Tommy Lee Walker/Getty



Energy, water, solvents, reagents,
materials

Supply chain - use - end-of-life

Climate, biodiversity, pollution,
human health ...

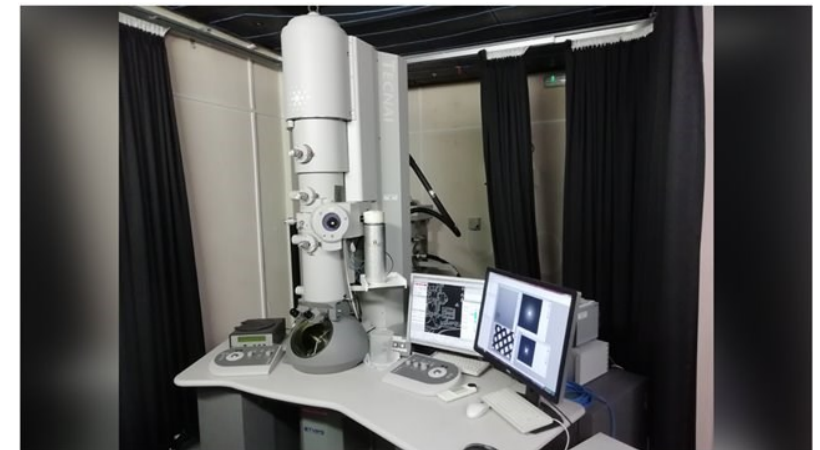
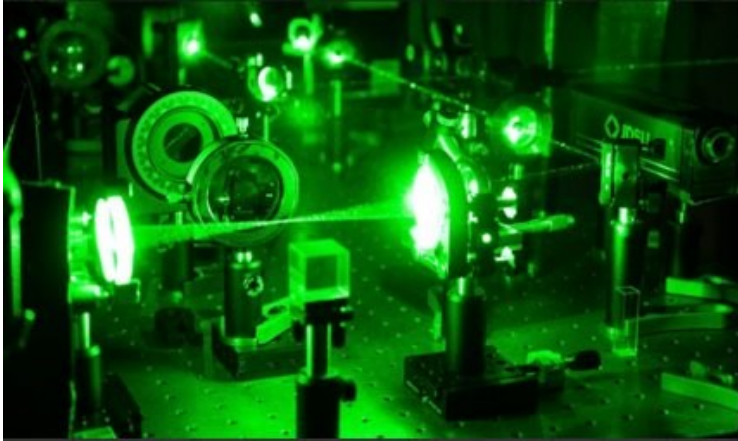


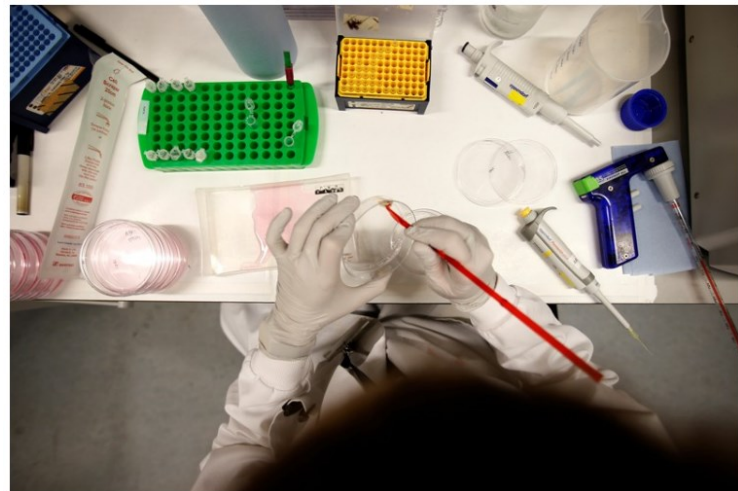
Image: Electron microscope at the ICR's electron microscopy facility

Environmental impacts of scientific research



Examples:

- *Labs typically use 5-10 times as much energy as an office building (can be as high as 100 times)*
- *Bio scientific research produces ~5.5M tonnes plastic waste annually (1.8% of global total)**
- *Supply chain impacts of lab consumables***



* Urbino, Watts & Reardon, *Nature* **528**, 479 (2015)

** Bull et al, *Nature* **604**, 420-424 (2022)

Why should we make research more sustainable?

Positive impacts:

- ✓ Environmental footprint
- ✓ Resource and research efficiency
- ✓ Colleagues and students
- ✓ Research



“We have an opportunity to do things better”

Vicky Hilborne
RSC Sustainable Labs Case Studies

Researcher perspectives on sustainable labs & research

Q2-3 2021

Science Subject Communities & Sustainability Working Groups

Desk research

Oct 2022

Report & resource hub

Jan 2022

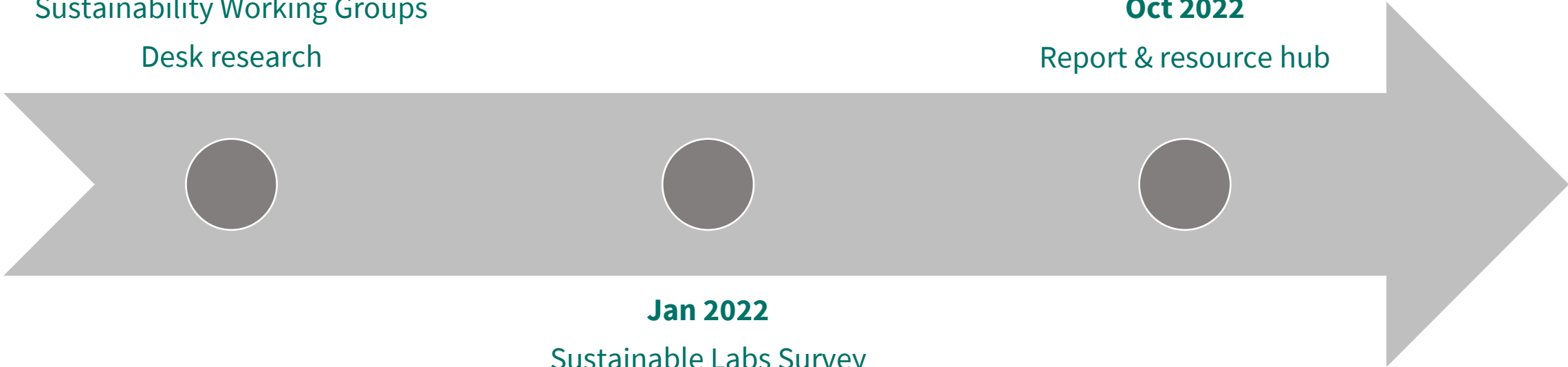
Sustainable Labs Survey

700 respondents

62% international

Academia, industry,

Diverse career stages, roles, fields



Attitudes

- **79% know** how their actions in the laboratory impact the environment
- **84% would like to do more** to reduce the impact of their day-to-day scientific work on the environment
- **63% have made changes** in the last two years to reduce the environmental impact of their research activities, or those of their research group, team or department

Barriers & challenges

“The challenge is so daunting and multidimensional that I think a lot of my peers feel overwhelmed and don’t know where to start. We need to give people actionable information that allows them to make first steps.”

- Experienced manager, Industry, United States

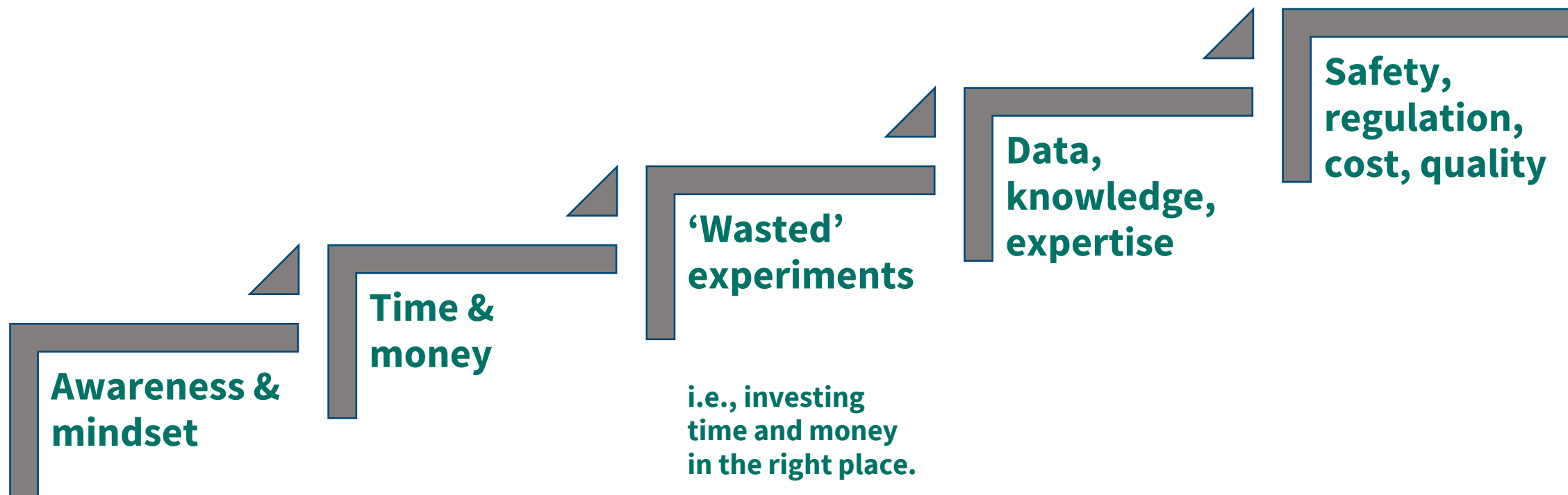
“I can think of many cases where we thought we’d made a positive change to the sustainability of a process, only to have then dug deeper and found that the ‘improvement’ was actually worse because we didn’t fully understand the source or fate of one of the reaction components.”

- Experienced manager, Industry, United States

“Currently, sustainability is not discussed as much as health and safety. This needs to change. As we raise the profile of sustainability it will become more a part of everyday work. At present other drivers, eg cost and quality, feel stronger calls to action.”

- Mid-career scientist, Industry, United Kingdom

Challenges & barriers (high level)



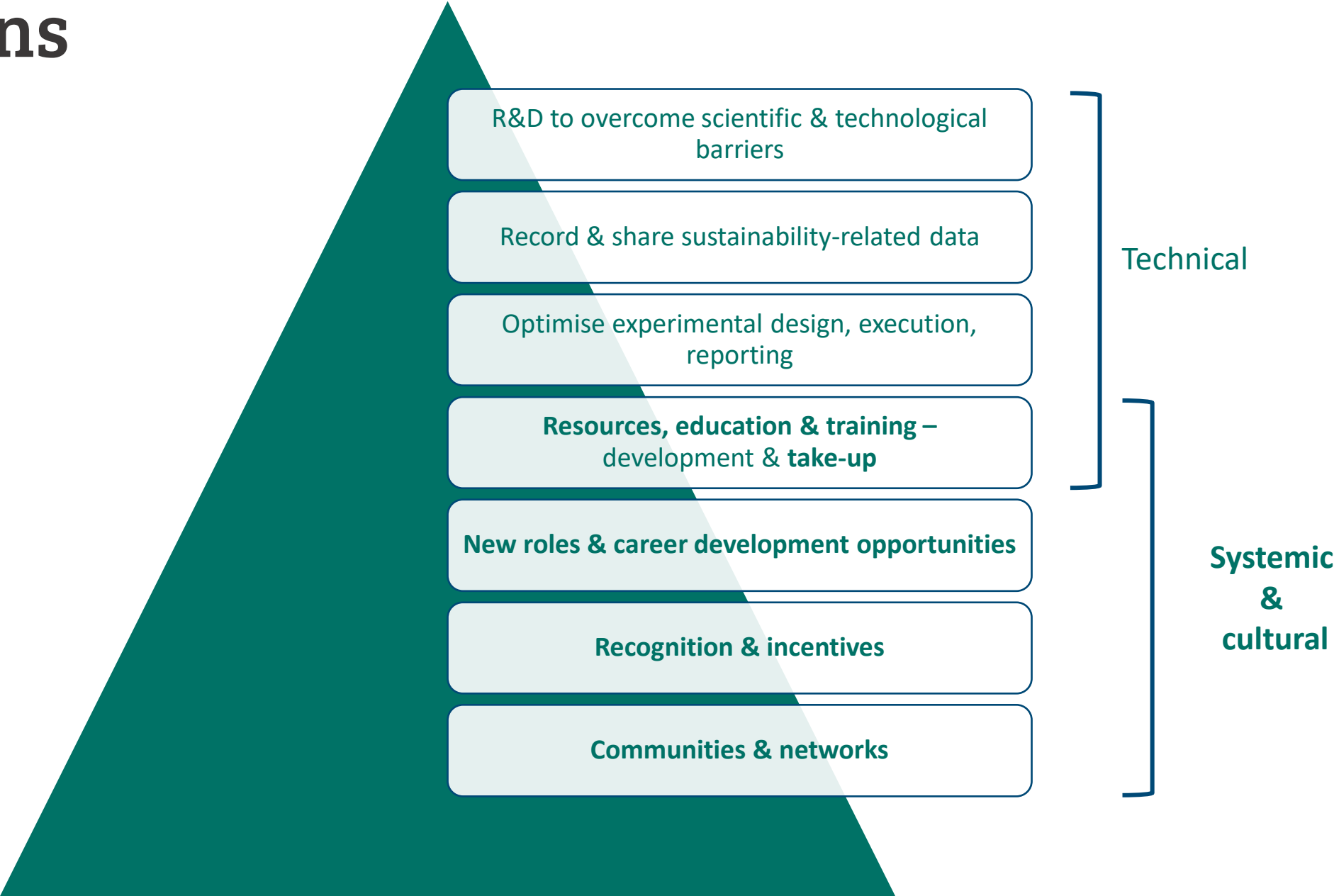
Challenges are context-dependent

- **Resources:** Money, expertise, knowledge
- **Type of research** e.g. wet/dry/computational lab, field, clinic
- **Regional variations** in environmental concerns, mitigation options, regulation
- **Scale** of organisation or lab

“Evaluation of alternative approaches is time consuming and takes resource. As a small company this is hard to justify when staff are working hard just to keep the company afloat. Availability of external advice would be valuable.”

- Experienced manager,
Industry, United Kingdom

Solutions



Some people already embedding sustainability

	% respondents selecting always	% respondents selecting often
Day-to-day actions (Q11)		
Switch off equipment when not in use to save energy	44	35
Wash and reuse single-use plastics, packaging, or other laboratory disposables	17	22
Close fume hoods to reduce energy consumption	46	29
Share equipment with other groups/teams to minimise downtime	27	33
Consider energy impact of calculations/algorithms before running	9	11
Follow sustainability guidance or frameworks (e.g. LEAF, My Green Lab)	11	14
Measure the energy consumption of equipment to guide decision making	8	11
Purchase more efficient models of equipment	13	21
Reduce water consumption in the laboratory (e.g. using waterless condensers)	20	21

Table 3: Q11 (n=620) and Q12 (n=618). Which of the following measures do you, or does your group, team or department use to reduce the environmental impact of your work? RSC Sustainable Laboratories Researcher Survey 2021.

Individual, local & everyday actions

“We have also started a programme of regular defrosting of freezers in our lab to save energy and inventorying unused chemicals to share with other groups to decrease waste and cost and save on storage.”

- Early career researcher, Academia, Ireland

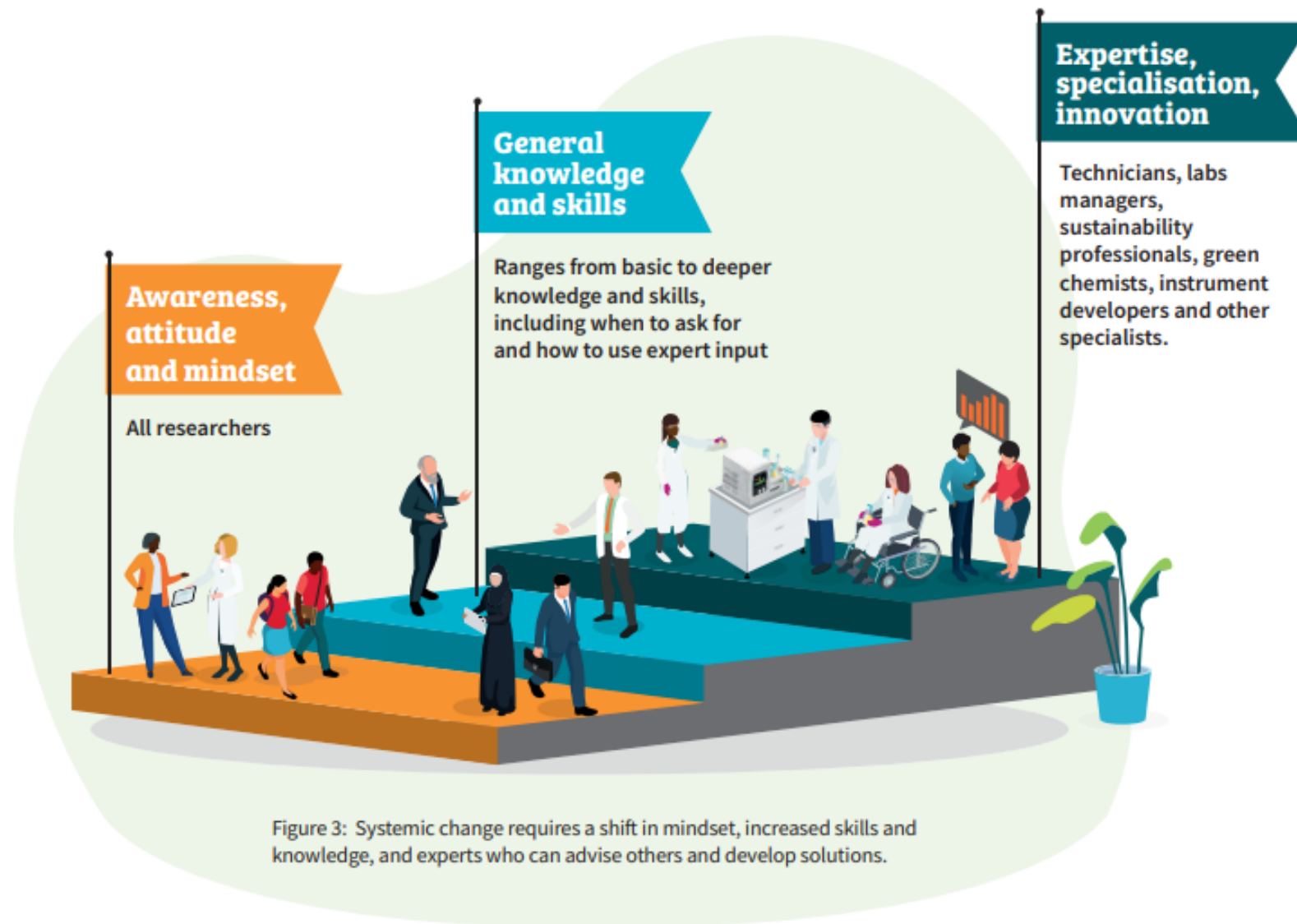
“I regularly go through the labs and switch off equipment or close fume hoods and remind my students to do so too.”

- Experienced researcher, Academia, China

“We have a sustainability committee driven by PhD students, they use a variety of sources to think about options.”

- Experienced researcher, Academia, Netherlands

Individuals: From awareness to expertise



Opportunities: From individuals to ecosystem



Initial RSC plan

1. Recognition & reward



2. Resources



3. Networks/communities



4. Partnership



5. Advocacy



6. Grants



7. Accreditation



Resources



Themed Collection



Collated Online Resources:

- Tools
- Networks & Forums
- Initiatives
- Opinion pieces
- Case studies



Going greener in the lab: Where can I start?

- ❑ I'll shut fume cupboard sashes when not in use
- ❑ I'll look at ways to reduce, reuse and recycle lab plastics
- ❑ I'll report leaking faucets/taps
- ❑ I'll do an inventory of our lab freezers
- ❑ I'll consider what equipment can be switched off when not in use
- ❑ I'll find out more about energy use and carbon emissions associated with computing
- ❑ I'll see if we can measure how much electricity we use in our lab
- ❑ I'll see if we can measure how much water we use in our lab
- ❑ I'll ask about the sustainability credentials of our lab supplies
- ❑ I'll check out resources to help me select solvents and reagents
- ❑ I'll explore the *12 Principles of Green Chemistry* and how they might apply to my experiments
- ❑ I'll share ideas with colleagues about environmental sustainability in the lab
- ❑ I'll explore opportunities to share equipment with other researchers or groups
- ❑ I'll find out more about green labs programmes and tools
- ❑ I'll work with colleagues to develop an Environmental Sustainability Plan for our lab





Sustainable Laboratories Grant

Our new grant offers up to £10,000 to help you develop, implement and share sustainable practices to reduce the environmental footprint of research.

Applications open 25 September 2023.



**Register your interest
or share this opportunity**

rsc.li/sustainable-labs-grant



WEBINARS

Innovating for the future of sustainable labs

 VOICE OF THE ROYAL SOCIETY OF CHEMISTRY | 2 AUGUST 2023

SOURCE: © SHUTTERSTOCK



Join us on 21 September to find out how labs are evolving to become more sustainable - and hear from some of the people who are driving these important changes

Click the button below to register
21 September 2023, 14.00 BST

[REGISTER NOW](#)



Summary

1. Researchers want to make their work as environmentally sustainable as possible & many are already taking action
2. Complex, inter-dependent & context-dependent challenges
3. Many solutions with opportunities for individuals, organisations & actors across wider research ecosystem

Thank you

<https://rsc.li/sustainable-labs>

science@rsc.org