SELS

Sustainable European Laboratories

Making Science Sustainable

Martin Farley - Sustainable Research Manager (UCL)

2050 – UK net zero

News story

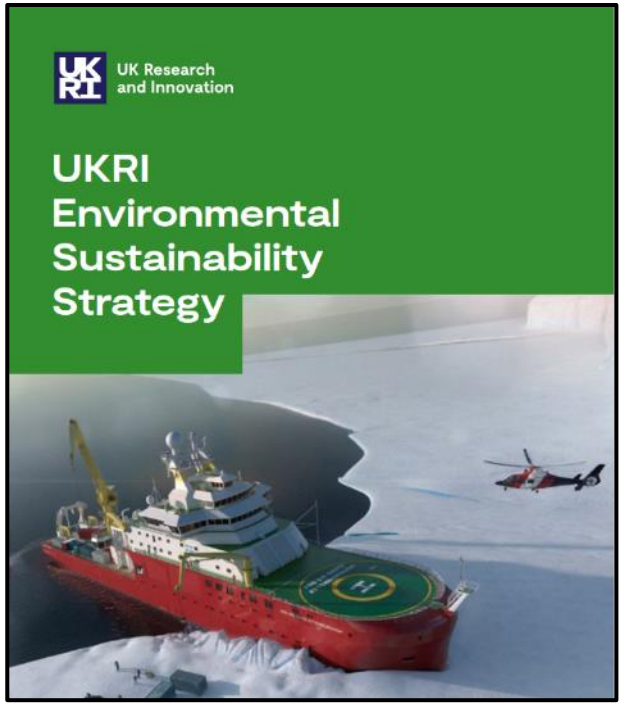
UK becomes first major economy to pass net zero emissions law

New target will require the UK to bring all greenhouse gas emissions to net zero by 2050.

Published 27 June 2019
From: Department for Business, Energy & Industrial Strategy and The Rt Hon Chris Skidmore MP

2040 – NHS net zero

2030 – UCL net zero



Press release

Third of UK's biggest companies commit to net zero

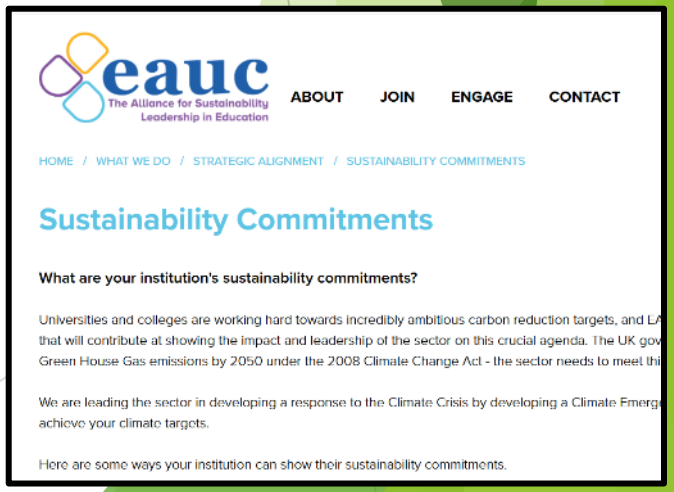
30 of the UK's FTSE100 companies have signed up to the United Nation's Race to Zero campaign.

From: Department for Business, Energy & Industrial Strategy and The Rt Hon Kwasi Kwarteng MP
Published 30 March 2021

NERC SCIENCE OF THE ENVIRONMENT

2040 – UKRI net zero

EAUC Lists Targets



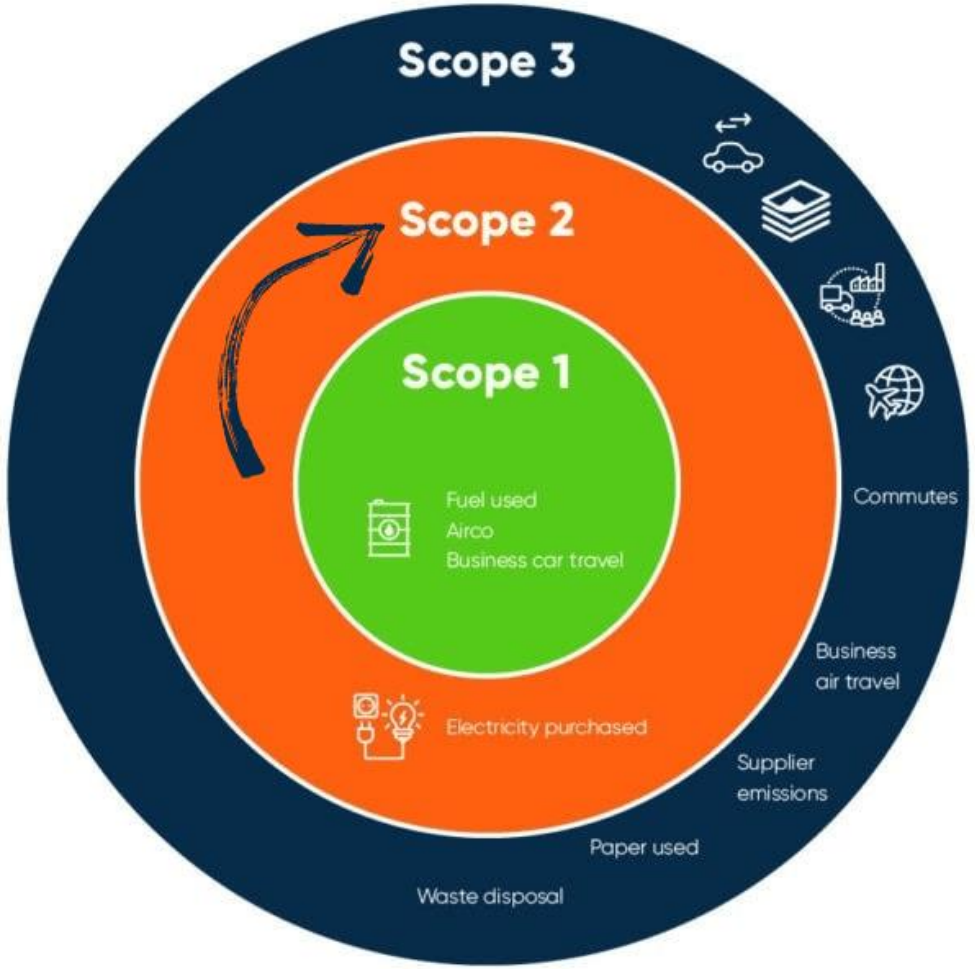
The Challenge – Sustainable Science

- According to UNESCO, spend in global R&D (19.2% between 2014-2018) has been outpacing the growth in global GDP (14.8% between 2014-2018)

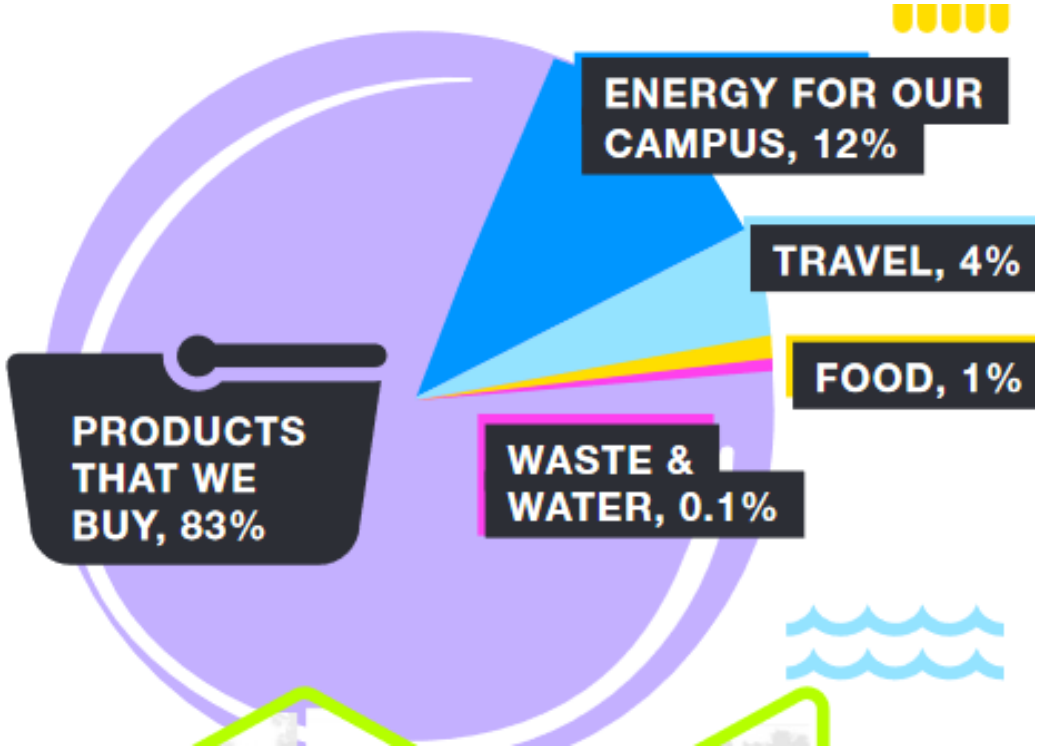
- Scientific output has been increasing 8-9% per annum, meaning all output doubles every 9 years
- Lab facilities use far more energy than average (3-10 x more). Also consume up to 2% of world's plastic waste (2014)
- Total emissions of science could be 100 mega tonnes / annum, which would make it the 40th largest country in the world (on par with Venezuela, or Bangladesh)

Ref: Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references: Growth Rates of Modern Science: A Bibliometric Analysis Based on the Number of Publications and Cited References. – Lutz Bornmann, Ruediger Mutz, 2014

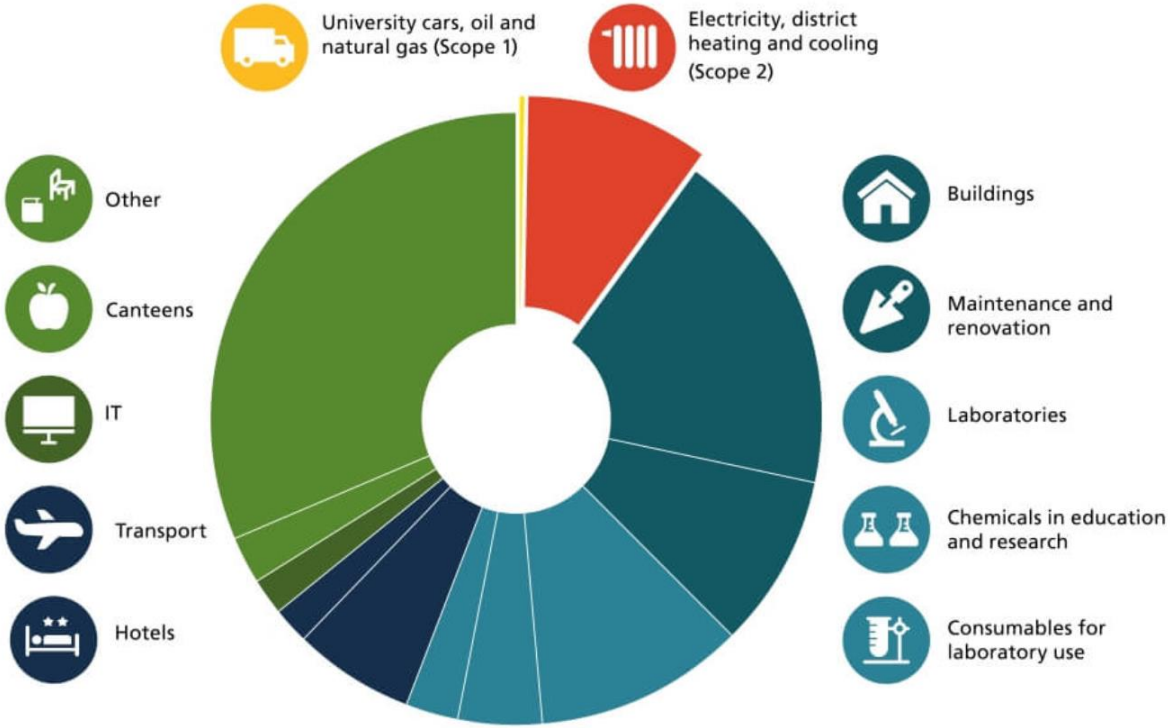
Scopes of Carbon and the future



Total CO2 Emissions from 2 European Institutions



UCL, UK



University of Copenhagen, Denmark

Purchasing

- Currently there is a large gap between standards, i.e. purchasers want metrics of sustainability which simply don't exist
- CO2 emissions are evaluated through spend, not carbon factors
- Long-term, there will be common, transparent, meaningful standards for assessing sustainability in procurement
- Need more independent case studies/comparisons of specialist items

With any sustainability scheme you have to ask: Is it better than what we're doing, where's the evidence, and has it really been thought through?

PLOS ONE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Re-use of laboratory utensils reduces CO2 equivalent footprint and running costs

Martin Farley, Benoit P. Nicolet

Published: April 12, 2023 • https://doi.org/10.1371/journal.pone.0283697

About the Authors

Martin Farley

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ROLES: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing

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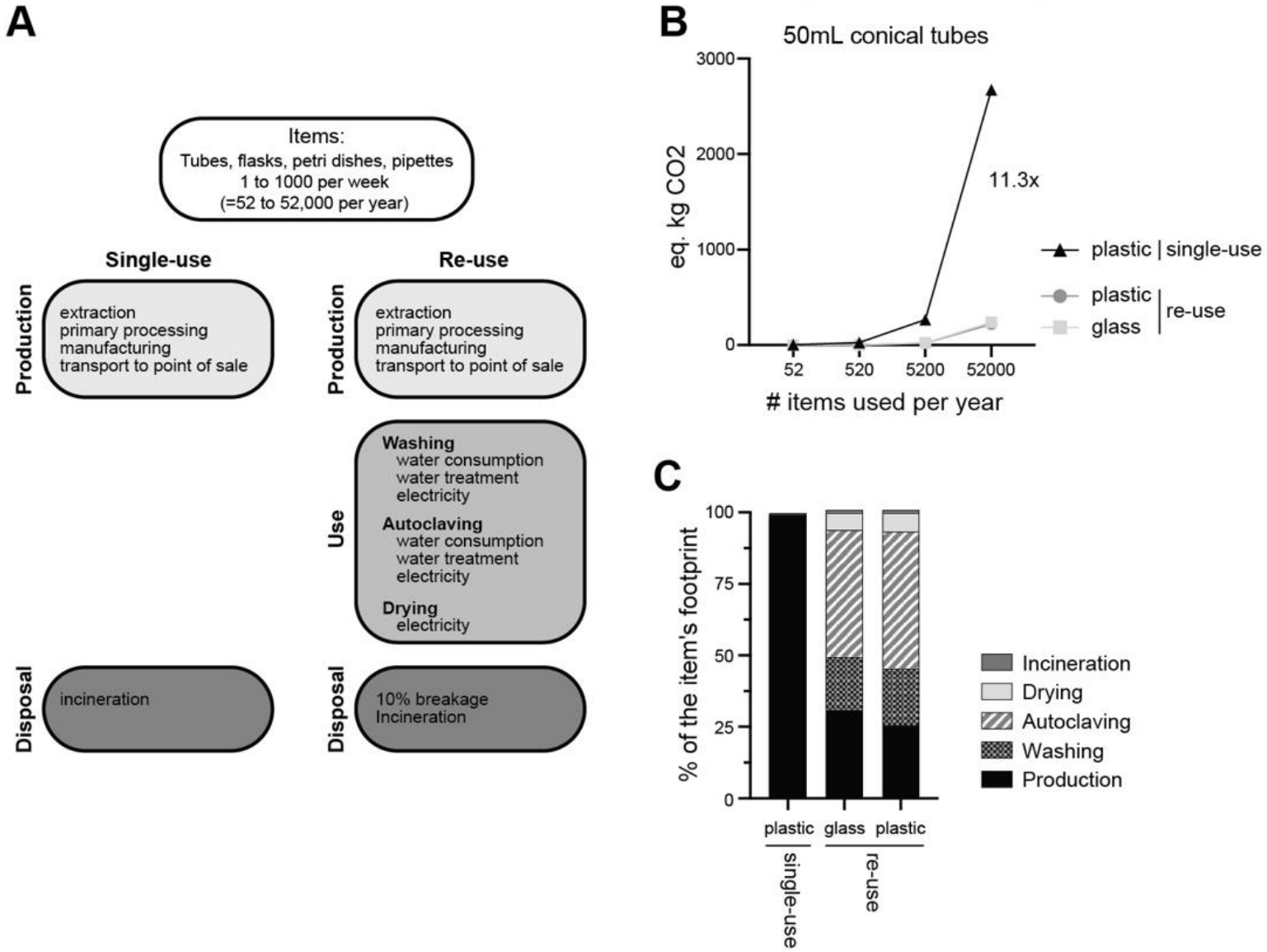
Figure 1 Farley & Nicolet

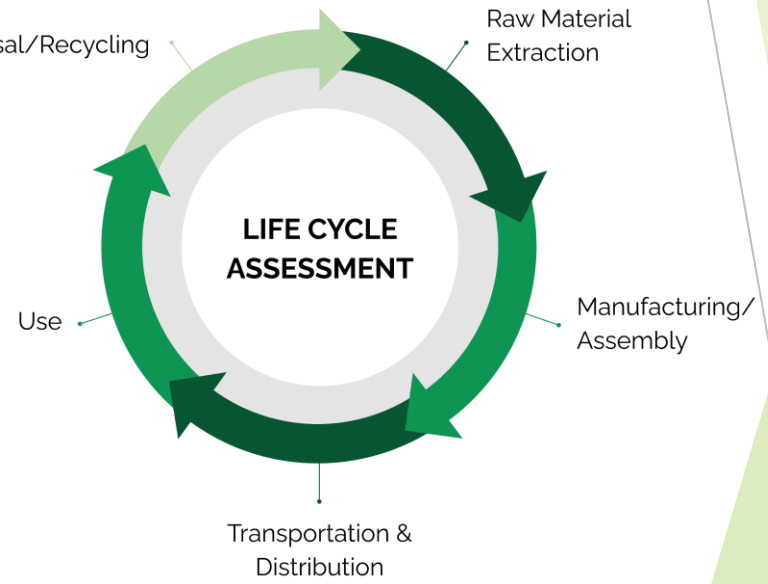


https://www.biorxiv.org/content/10.1101/2022.01.14.476337v1

LCAs for understanding science impacts

- Currently we have decent data on:
  - Travel (sometimes)
  - Energy (gas and electricity)
  - Spend (sometimes)
  - IT

- We are now doing LCAs on:
  - Consumables (plastics)
  - Chemicals
  - Freezers
  - TBC – Further equipment types



More Research is Needed!

- What are the CO2 emissions of scientific pathways?
- Where are the real balance points between sterile and reusable? Contaminated and not?
- Storage temperatures
- LCAs of so many products and processes still unknown

Funding Environments

Funding opportunity

Environmental sustainability in life sciences and medical practice

Opportunity status:	Open
Funders:	Medical Research Council (MRC)
Funding type:	Grant
Total fund:	£1,000,000
Maximum award:	£100,000
Publication date:	15 December 2021
Opening date:	3 January 2022
Closing date:	1 March 2022 16:00 UK time

Last updated: 13 January 2022

Timeline

3 January 2022 00:00
Opening date for outline applications

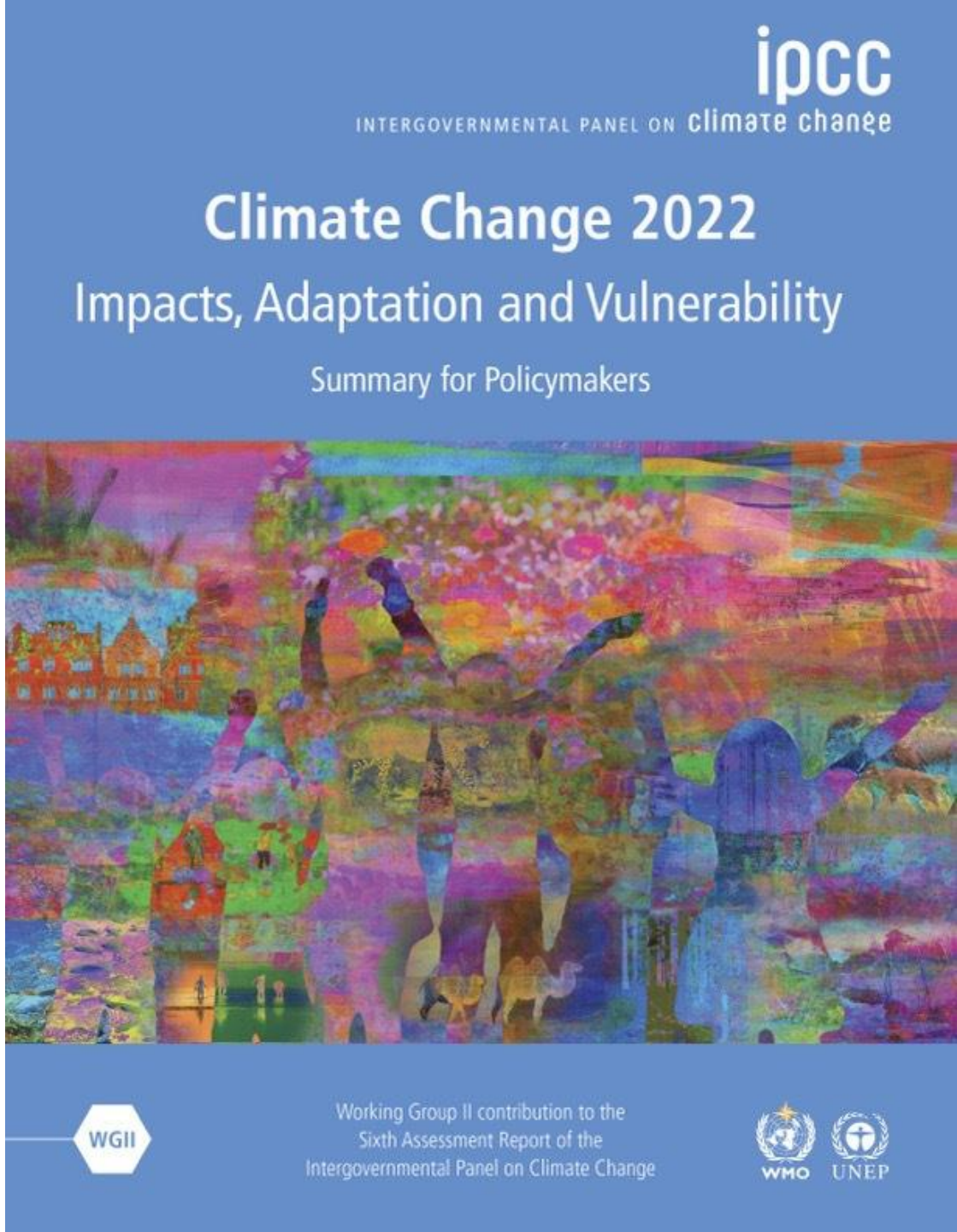
End of January (to be confirmed)
Webinar about the call

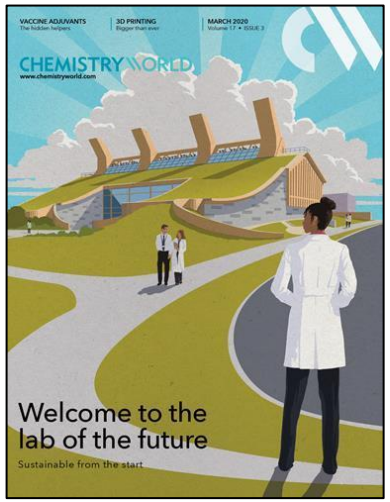
1 March 2022 16:00
Closing date for outline applications

13 May 2022 (to be confirmed)

BUT

- We need action now…..
- We know reuse is better typically, and reduction is obviously better





Environment: Labs should cut plastic waste too

Mauricio A. Urbina, Andrew J. R. Watts & Erin E. Reardon

University of California - multi-institutional sustainable laboratory policy:
www.ucop.edu/sustainability/policy-areas/sustainable-operations/index.html

Networks

- SELs is a network for sustainable science networks across Europe

- SELs aims to:
  - Provide networking events
  - Provide training
  - Develop resources
  - Unify approaches

SELs

Sustainable European Laboratories

There’s a reason we all follow H&S, but don’t all implement sustainable practices…

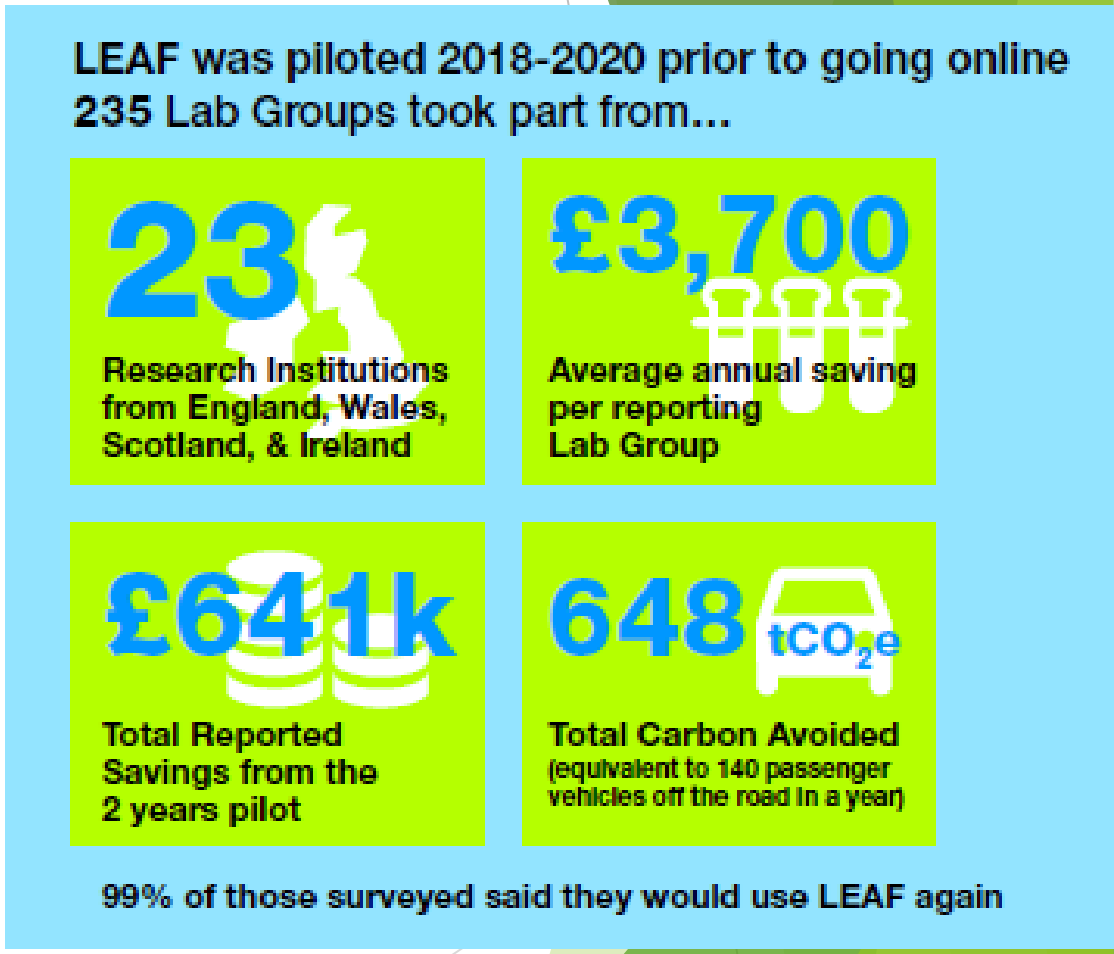
If there was a standard, what might it look like?
How do we know if a lab is “green”?

LEAF: Laboratory Efficiency Assessment Framework

- Standard in Sustainable Laboratory Operations
- Criteria in areas like ventilation, equipment, people, facilities/space, procurement & waste, samples & chemicals, and research quality
- Bronze, Silver, Gold categories of criteria
- User-led initiative
- Crucially allows you to estimate impact in CO2 and money saved, with inbuilt calculators

LEAF 2018-2020 Pilot Results

- 225+ submissions from 23 Institutions (England, Scotland, Ireland, Wales)
- £3,700 – Average saving per lab / annum
- 2.9 tCO2e – Average CO2 reduction per lab / annum
- Equivalent of 132 cars taken off the road (620 tonnes of CO2 equivalent)
- 52% had used a system before, though 74% said it was driving new good practice and not a validation of the existing
- 99% said they would participate again



LEAF
HELPING TO MAKE SCIENCE SUSTAINABLE

LEAF is an easy to use programme to help you integrate sustainability practices into your lab; supporting you to do your science in a climate friendly way.

"LEAF enables scientists to reduce waste, save money, and reduce the carbon emissions of our research"

Saroj Saurya
Postdoctoral Laboratory Manager,
University of Oxford

By taking part in the programme, laboratories will reduce their carbon emissions and create an environment that supports research quality.
To learn more, visit **www.ucl.ac.uk/sustainable/staff/leaf** or contact us at **LEAF@ucl.ac.uk**

You can see a few example actions below

CATEGORY	Bronze	Silver	Gold
Waste	Provide recycling bins in the lab	Single-use plastic waste has been reduced (guidance provided)	Recycling rates have been increased, or overall waste produced has been decreased
People	Samples owned by departing staff are cleared or tracked	The lab has engaged other labs on LEAF and sustainability	One action to reduce travel has been implemented
Sample & Chemical Management	Labels are legible, and there's a common labeling system in place	Procedures are in place in case cold storage equipment breaks down	At least 80% of all samples and/or chemicals are clearly catalogued
Equipment	Equipment is turned off when not in use	There is a system in place for communal equipment booking	Excess equipment is repaired, sold, and/or donated
Ventilation	There is a clear reporting system for building issues	Fume cupboard sashes are kept closed when not in use	Solvent vapours are condensed and disposed and not released into the atmosphere

LEAF Update

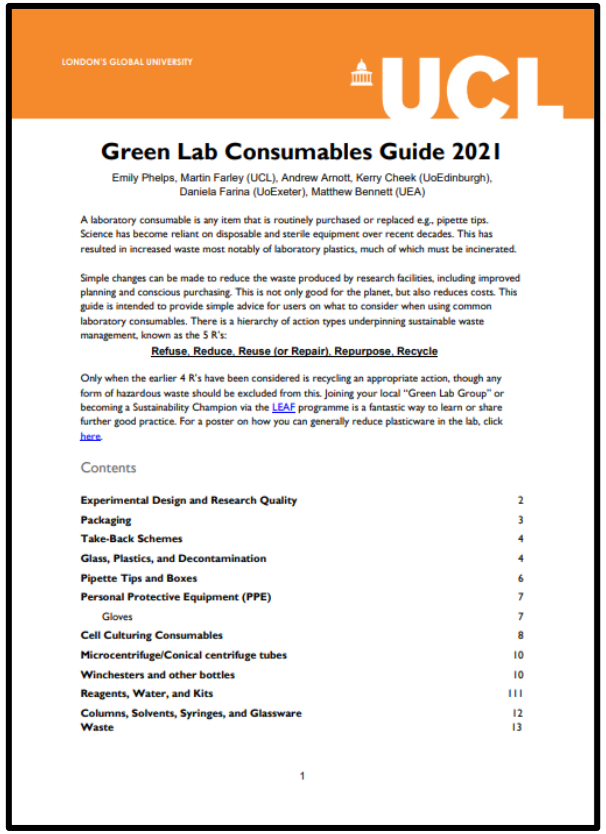
- Been online for 2 years
- 92 Institutions signed up since going live in Feb 2021 from 15 countries. Over 3,300 users from 2,100 labs
- Stated target for MRC facilities to achieve Gold by 2025
- World's largest Green Lab Programme
- Both Exeter and Bristol have reached 100% uptake in their labs, the only institutions in the world to accomplish this

National Technician Development Centre for Higher Education

UK Research and Innovation

Medical Research Council

Resources



LONDON'S GLOBAL UNIVERSITY

UCL

Green Lab Consumables Guide 2021

Emily Phelps, Martin Farley (UCL), Andrew Arnott, Kerry Cheek (UoEdinburgh), Daniela Farina (UoExeter), Matthew Bennett (UEA)

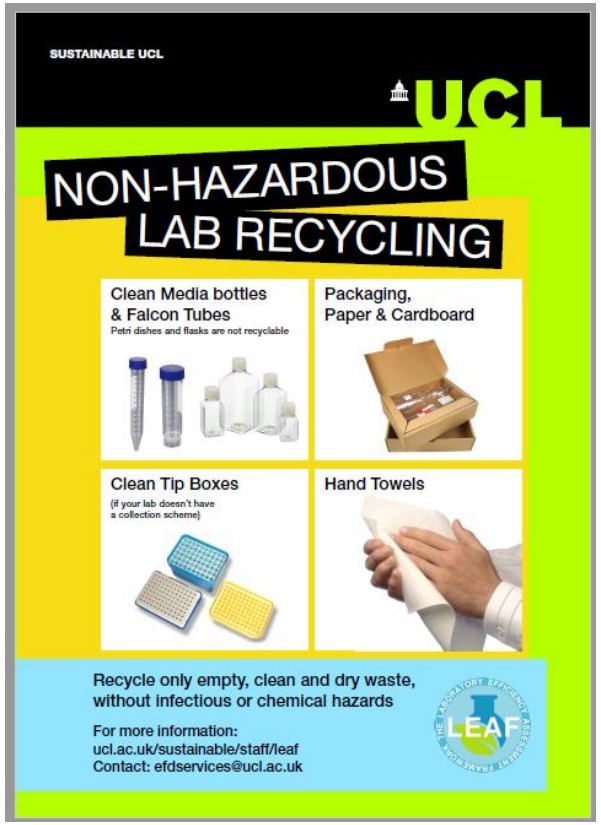
A laboratory consumable is any item that is routinely purchased or replaced e.g., pipette tips. Science has become reliant on disposable and sterile equipment over recent decades. This has resulted in increased waste most notably of laboratory plastics, much of which must be incinerated.

Simple changes can be made to reduce the waste produced by research facilities, including improved planning and conscious purchasing. This is not only good for the planet, but also reduces costs. This guide is intended to provide simple advice for users on what to consider when using common laboratory consumables. There is a hierarchy of action types underpinning sustainable waste management, known as the 5 R's:

Refuse, Reduce, Reuse (or Repair), Repurpose, Recycle

Only when the earlier 4 R's have been considered is recycling an appropriate action, though any form of hazardous waste should be excluded from this. Joining your local "Green Lab Group" or becoming a Sustainability Champion via the LEAF programme is a fantastic way to learn or share further good practice. For a poster on how you can generally reduce plasticware in the lab, click here.

Contents



SUSTAINABLE UCL

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NON-HAZARDOUS LAB RECYCLING

Clean Media bottles & Falcon Tubes

Petri dishes and flasks are not recyclable

Packaging, Paper & Cardboard

Clean Tip Boxes

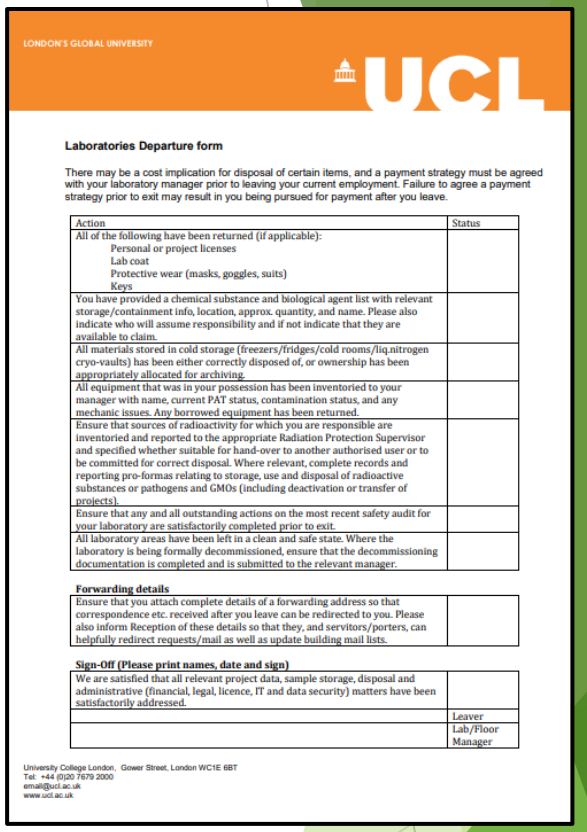
(if your lab doesn't have a collection scheme)

Hand Towels

Recycle only empty, clean and dry waste, without infectious or chemical hazards

For more information:
ucl.ac.uk/sustainable/staff/leaf
Contact: efdservices@ucl.ac.uk

LEAF



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Laboratories Departure form

There may be a cost implication for disposal of certain items, and a payment strategy must be agreed with your laboratory manager prior to leaving your current employment. Failure to agree a payment strategy prior to exit may result in you being pursued for payment after you leave.

Action	Status
All of the following have been returned (if applicable): Personal or project licenses Lab coat Protective wear (masks, goggles, suits) Keys	
You have provided a chemical substance and biological agent list with relevant storage/containment info, location, approx. quantity, and name. Please also indicate who will assume responsibility and if not indicate that they are available to claim.	
All materials stored in cold storage (freezers/fridges/cold rooms/liq.nitrogen cryo-vaults) has been either correctly disposed of, or ownership has been appropriately allocated for archiving.	
All equipment that was in your possession has been inventoried to your manager with name, current PAT status, contamination status, and any mechanic issues. Any borrowed equipment has been returned.	
Ensure that sources of radioactivity for which you are responsible are inventoried and reported to the appropriate Radiation Protection Supervisor and specified whether suitable for hand-over to another authorised user or to be committed for correct disposal. Where relevant, complete records and reporting pro-formas relating to storage, use and disposal of radioactive substances or pathogens and GMOs (including deactivation or transfer of projects).	
Ensure that any and all outstanding actions on the most recent safety audit for your laboratory are satisfactorily completed prior to exit.	
All laboratory areas have been left in a clean and safe state. Where the laboratory is being formally decommissioned, ensure that the decommissioning documentation is completed and is submitted to the relevant manager.	

Forwarding details

Ensure that you attach complete details of a forwarding address so that correspondence etc. received after you leave can be redirected to you. Please also inform Reception of these details so that they, and servitors/porters, can helpfully redirect requests/mail as well as update building mail lists.	

Sign-Off (Please print names, date and sign)

We are satisfied that all relevant project data, sample storage, disposal and administrative (financial, legal, licence, IT and data security) matters have been satisfactorily addressed.	
	Leaver
	Lab/Floor Manager

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- https://www.ucl.ac.uk/sustainable/staff/labs/resources-and-materials

MRC announces membership of laboratory efficiency framework

Subscribe to UKRI emails

Sign up for news, views, events and funding alerts.

Email address

Subscribe

2 December 2021

Membership of Laboratory Efficiency Assessment Framework (LEAF) offers a new approach to improving the environmental sustainability of lab work for MRC.

What will LEAF look like?

- Currently developing LEAF for new specialist spaces, including:
  - Commercial laboratories (piloting with Unilever)
  - Clinical/Diagnostic laboratories (piloting Viapath, NHS)
  - Animal Facilities
  - Workshop / Engineering
  - Computing / dry laboratories

<u>Please allow us 6 months for these to be fully integrated</u>

Like LEAF, but for Emergency room spaces

Green ED

Funders have started….

- MRC seeks implementation of LEAF
- Wellcome seeks low-carbon travel
- Green Charter, MRC, NERC, are all asking individuals what action they're taking

Funders could….

- Fund enabling research – We don’t know how to do net-zero science…. Yet
- Incentivize underspend in grants
- Require standards like LEAF
- Avoid offsetting prior to mitigation
- Engage funding recipients what they are doing regarding sustainability
- Provide guidance on what common equipment should be purchased with such funds
- Fund technical staff to support operations
- Set Net-Zero targets (e.g. UKRI)

Thank you!

@GreenLabGuy
@LEAFinLabs

m.farley@ucl.ac.uk

THANK YOU
-Sustainable UCL
-UoExeter Technical Services
-Matthew Bennett, UCL
-UCL ISD, Aaron Kashab, Vindya Dassanayake
-Joanna Marshall-Cook, UCL
-UoBristol Sustainability
-UK Reproducibility Network
-NTDC
-UKRI, MRC, NERC
-Everyone using LEAF!

-Nicola Dotti, all at Science Europe