Sustainable Science

Martin Farley - Sustainable Labs Manager (UCL)

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

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

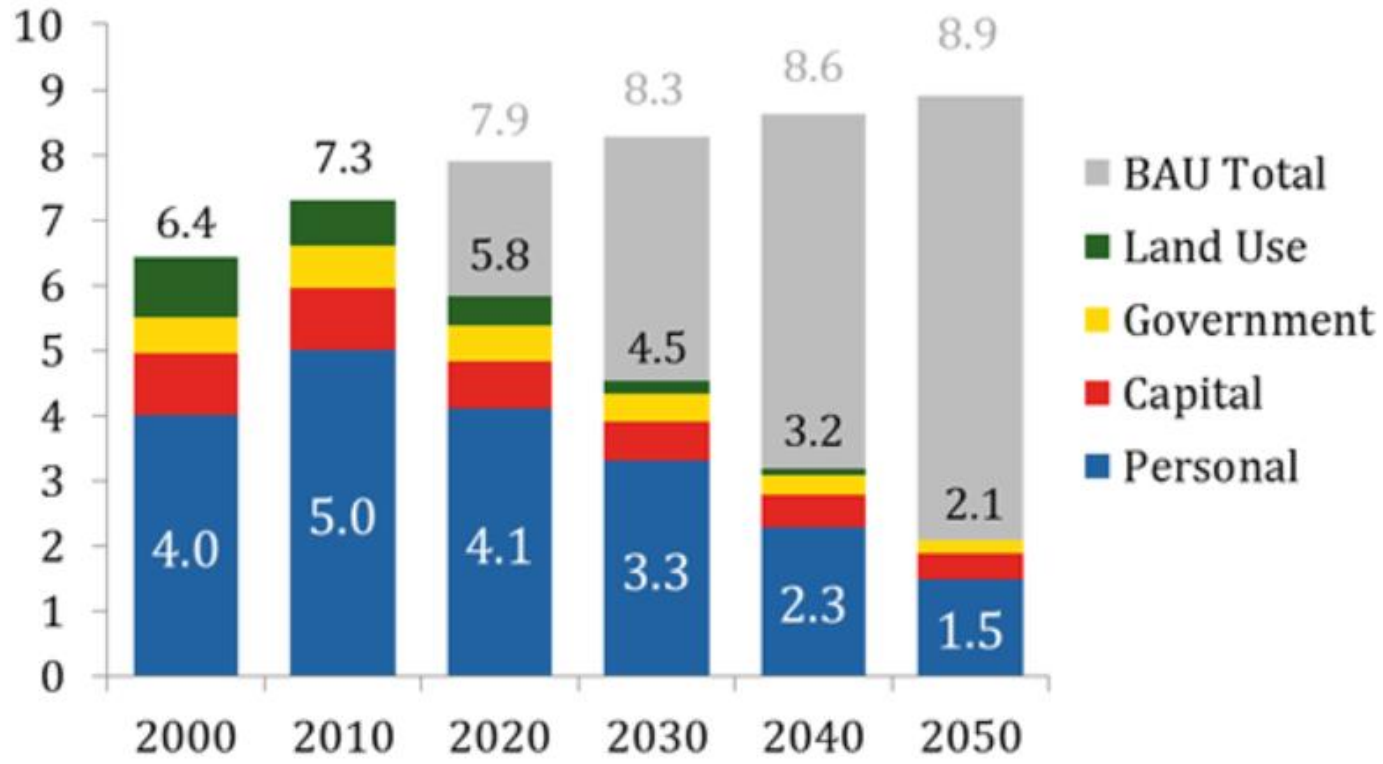
NERC SCIENCE OF THE ENVIRONMENT

2040 – UKRI net zero

2030 – UCL net zero

EAUC Lists Targets

2° C Target - Personal Carbon Budget (t CO_2e)



Note: Emissions totals for 2020-2050 are based on a pathways for limiting likely temperature increase by 2100 to 2°C above pre-industrial levels. 'Personal' includes the sum of emissions of the consumption categories: housing, travel, food, products and services. BAU is the 'business as usual' forecast for total emissions. The analysis assumes global population of 6.1 (2000), 6.9 (2010), 7.5 (2020), 8.3 (2030), 8.8 (2040), 8.9 (2050) billion people.

Source: Authors own calculations, IEA, UN

Shrink That Footprint

Quiz

3) A typical new ULT freezer will consume as much energy in a year as:
(UCL has 500+)

a. An average UK household

b. An average US person

c. An average UK person

d. Charging 50 phones all the time (for a year)

Quiz

4) What piece of standard lab equipment consumes the most energy?

a. Fume cupboards
b. Centrifuges
c. Ovens
d. Biological safety cabinets

Quiz

9) What % of research conducted gets published? Or shared widely? Or is accessible? Or is reproducible?

Sustainable Labs Today

Sustainable / Green Labs

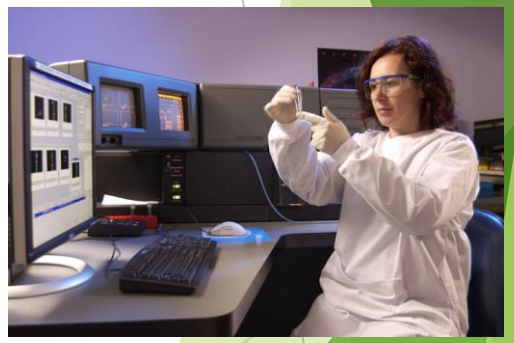
Green Chemistry

Built Environment

- BREEAM, Passive house labs?
- SKA Labs
- Ventilation Rates
- Net-zero construction

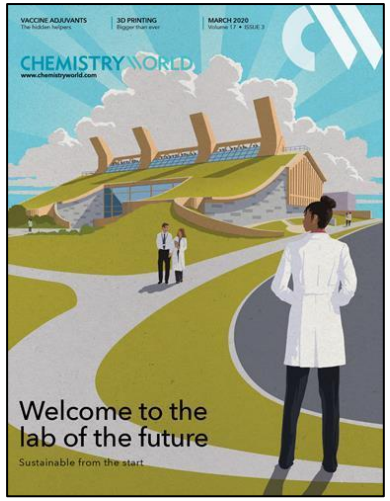
Equipment & Consumables

- Sustainable Tenders
- Manufacturers Impact
- NEED Life-cycle carbon assessments



Lab Operations

- Chemicals, equipment use, etc.
- How staff interact with their facility

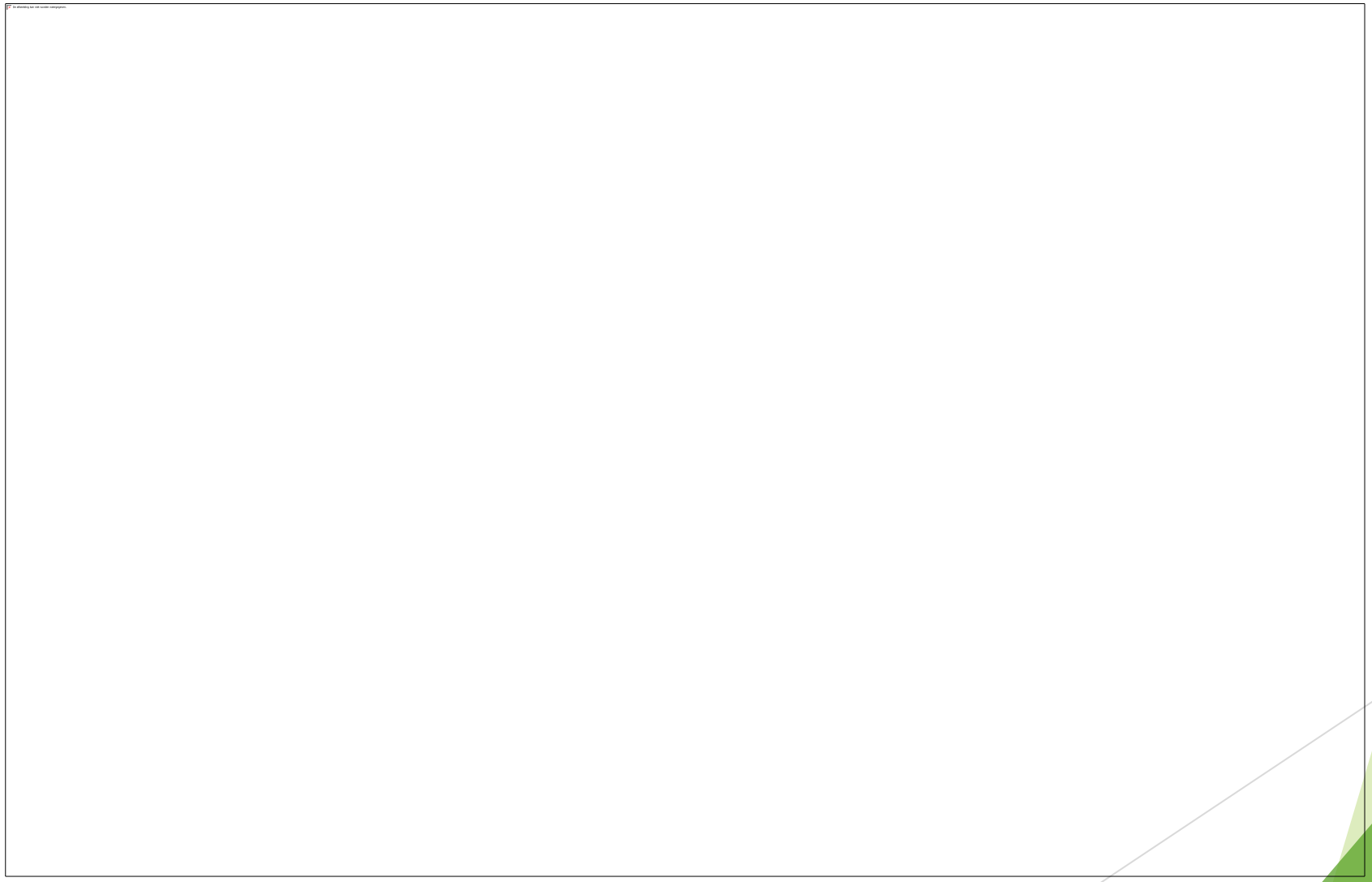


Environment: Labs should cut plastic waste too

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

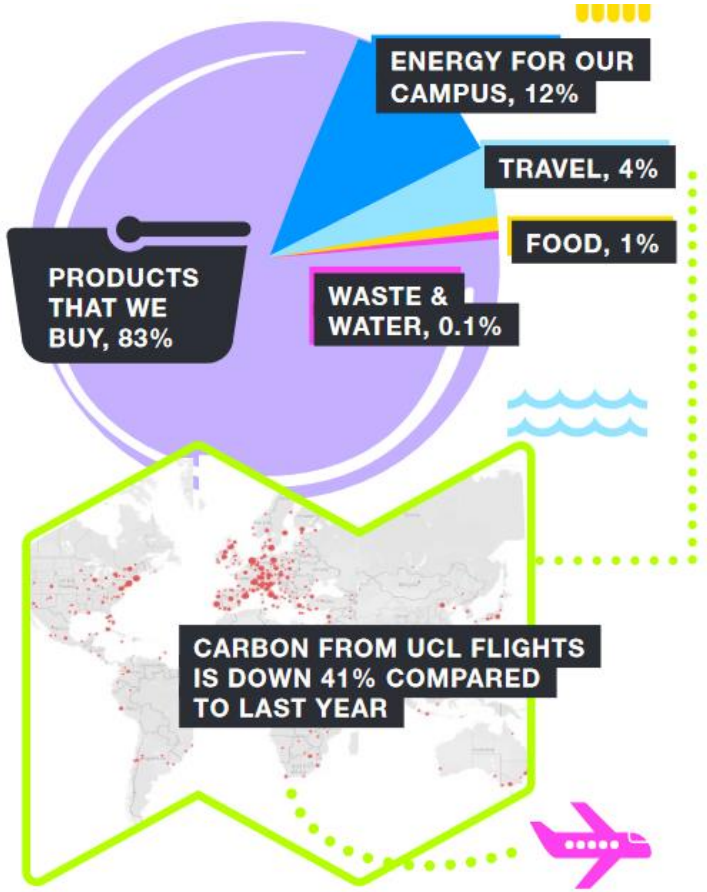
University of California - multi-institutional sustainable laboratory policy:
www.ucop.edu/sustainability/policy-areas/sustainable-operations/index.html

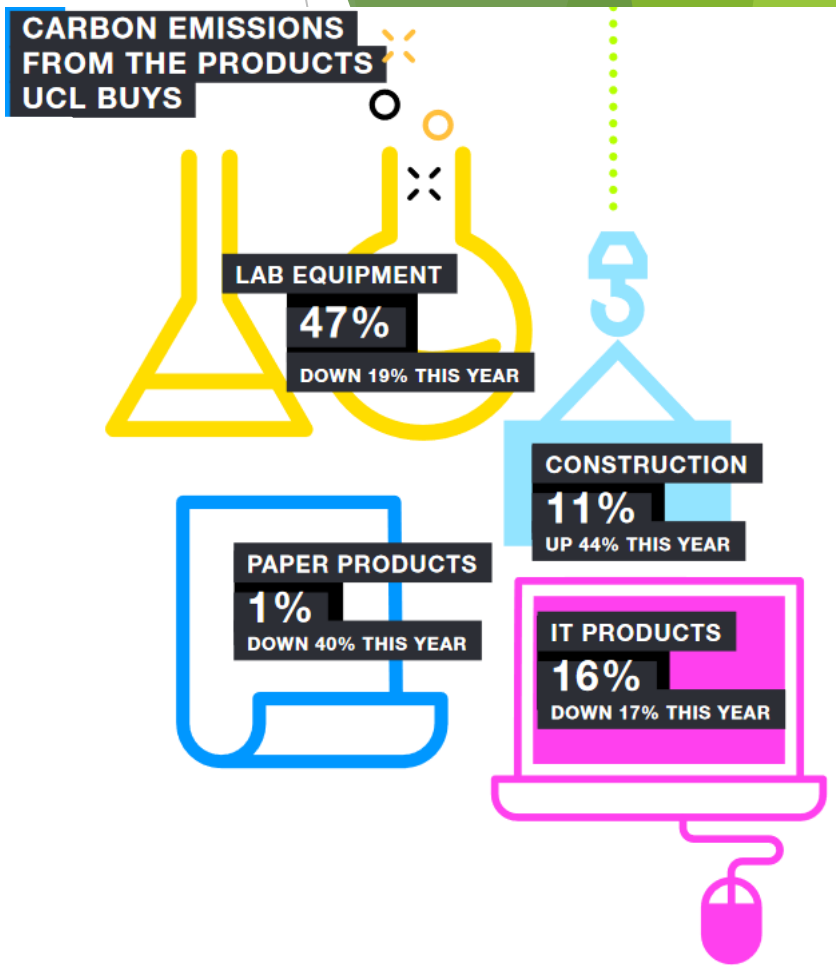
Scopes of Carbon and the future



Impacts of Science - Life Cycle Analysis

- Would not promote the replacement of functional models for efficient versions… Why? Because of Embodied Carbon
- Much data on impacts of science skip this crucial aspect
- Lot's 'green' initiatives are unsubstantiated, and driven by marketing





2019-20 UCL Sustainability Report

Sustainability in Animal Housing

- Waste Segregation
- ACH
- Humidification
- Material usage
- Gowns & Garb
- Equipment usage – Can you drive better use?

Suppliers & Manufacturers

Managing Director – Alan Rance
https://www.midaspattern.co.uk/green-initiative

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

Contributed equally to this work with: Martin Farley, Benoit P. Nicolet

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

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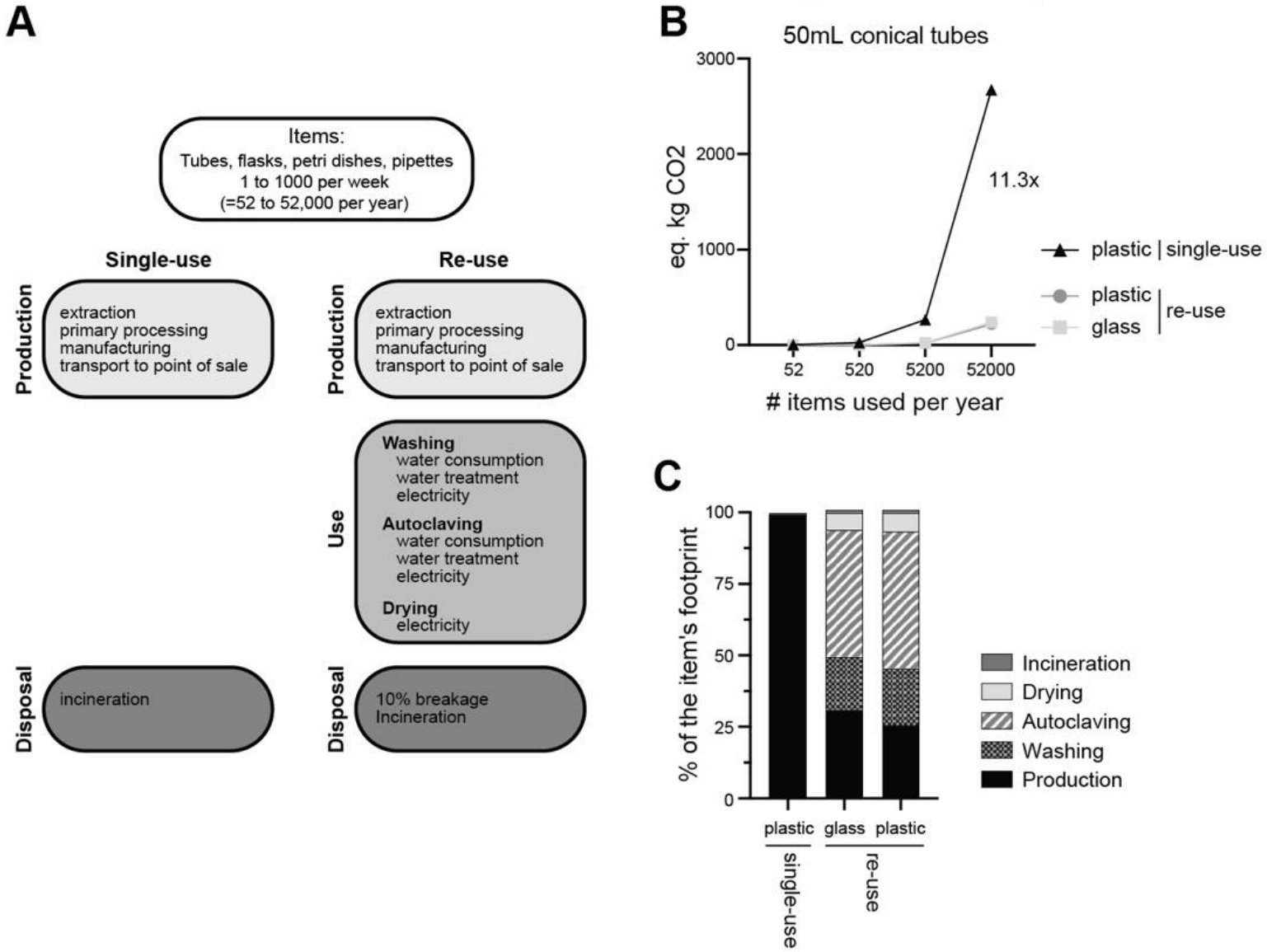
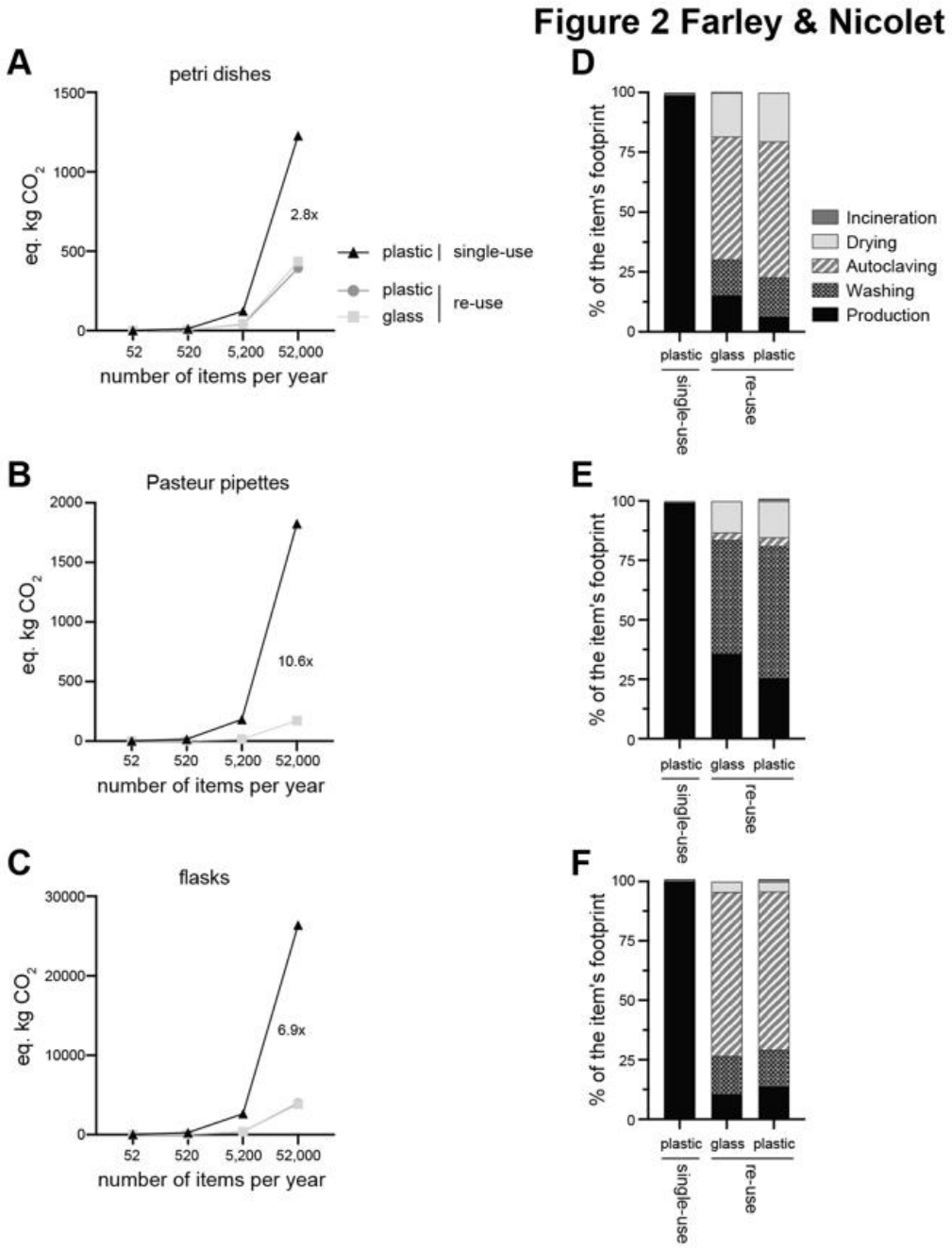
Figure 1 Farley & Nicolet

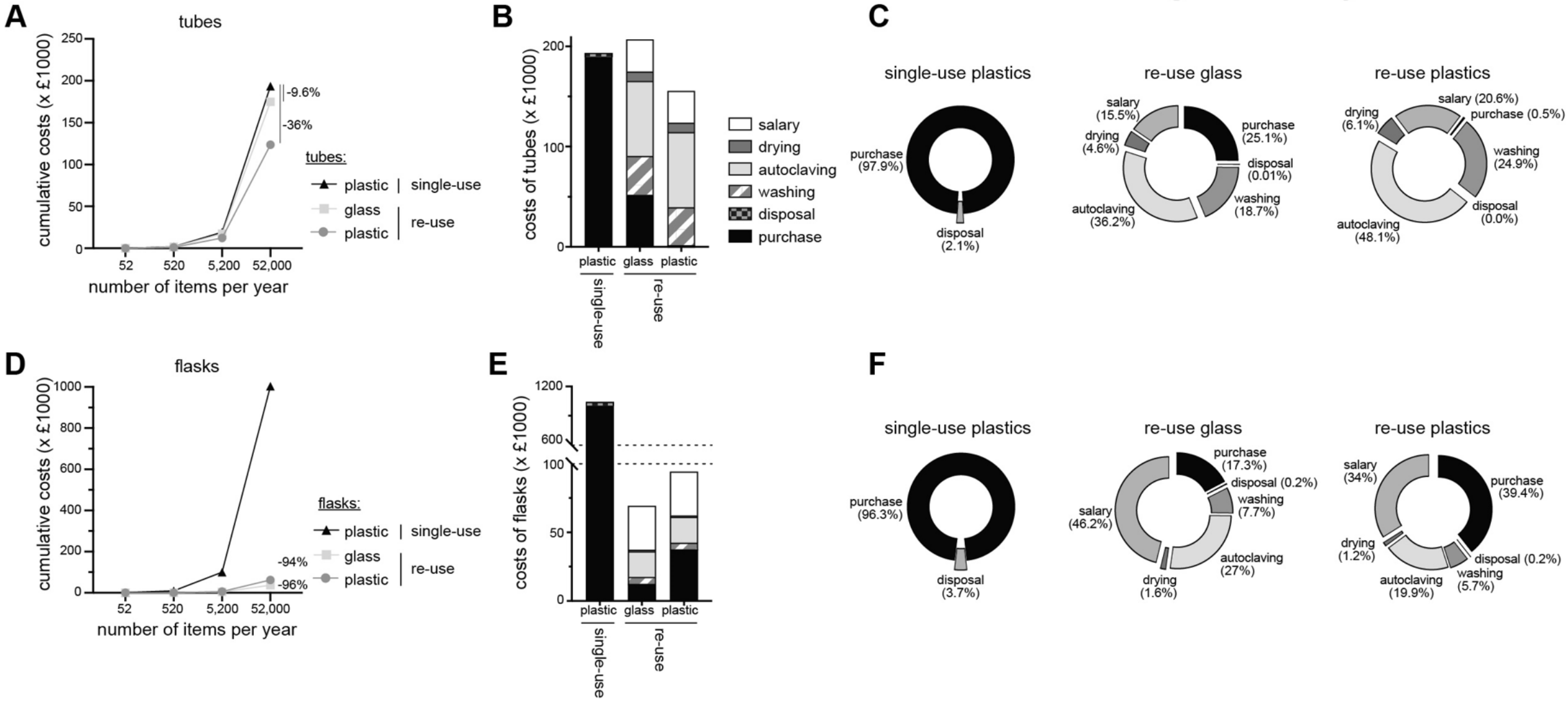


https://www.biorxiv.org/content/10.1101/2022.01.14.476337v1



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

Figure 3 Farley & Nicolet



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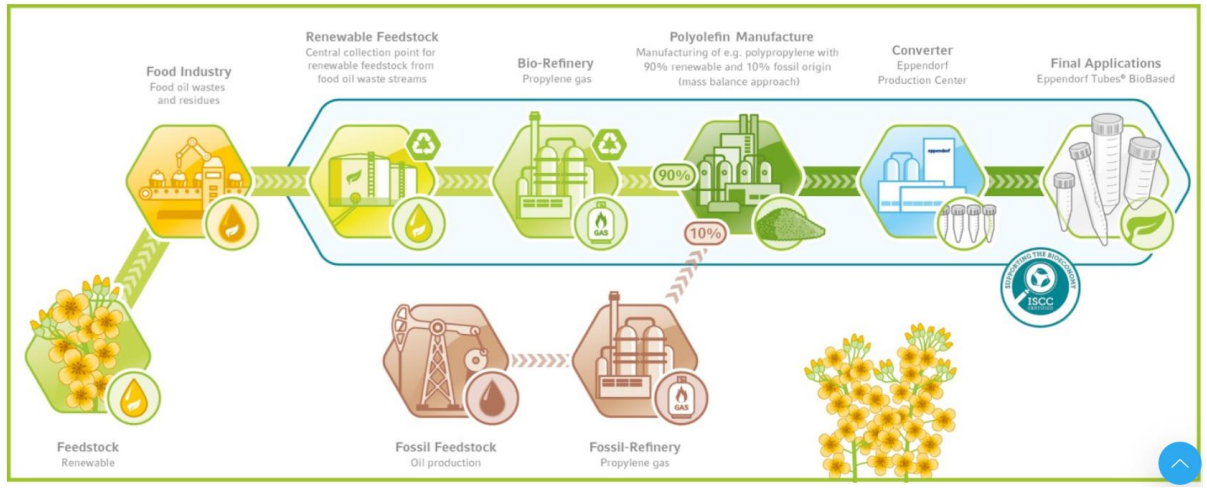
Biobased Tubes



Full length article

Environmental life cycle assessment of polypropylene made from used cooking oil

Christian Moretti [a], Martin Junginger [a], Li Shen [a]

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https://doi.org/10.1016/j.resconrec.2020.104750

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"A life cycle analysis compared the conventional way to produce polypropylene made of crude oil and the process with used cooking oil as raw material and showed that the second process has a 62% lower impact on climate change [12]."

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

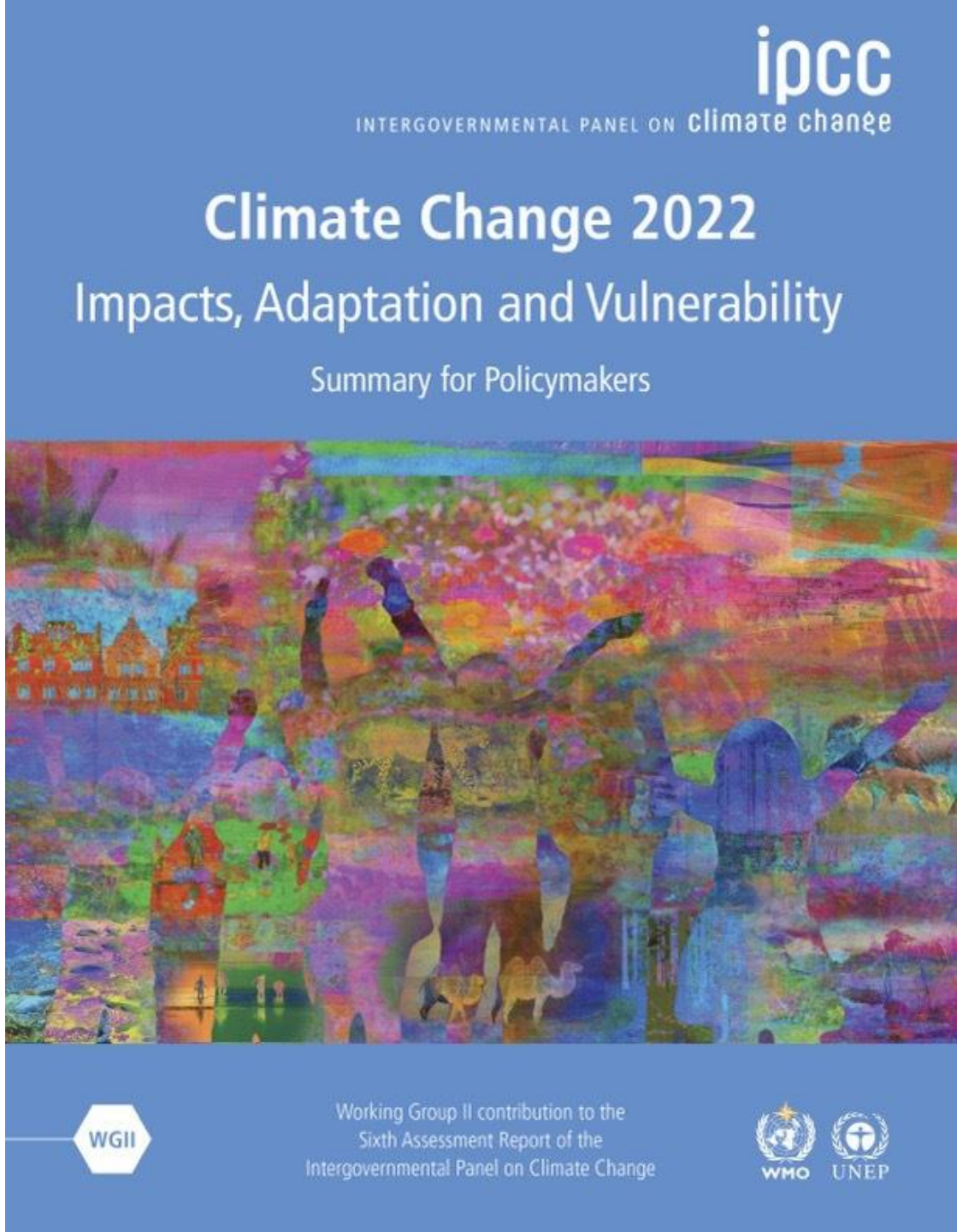
End of January (to be confirmed)
Webinar about the call

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



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

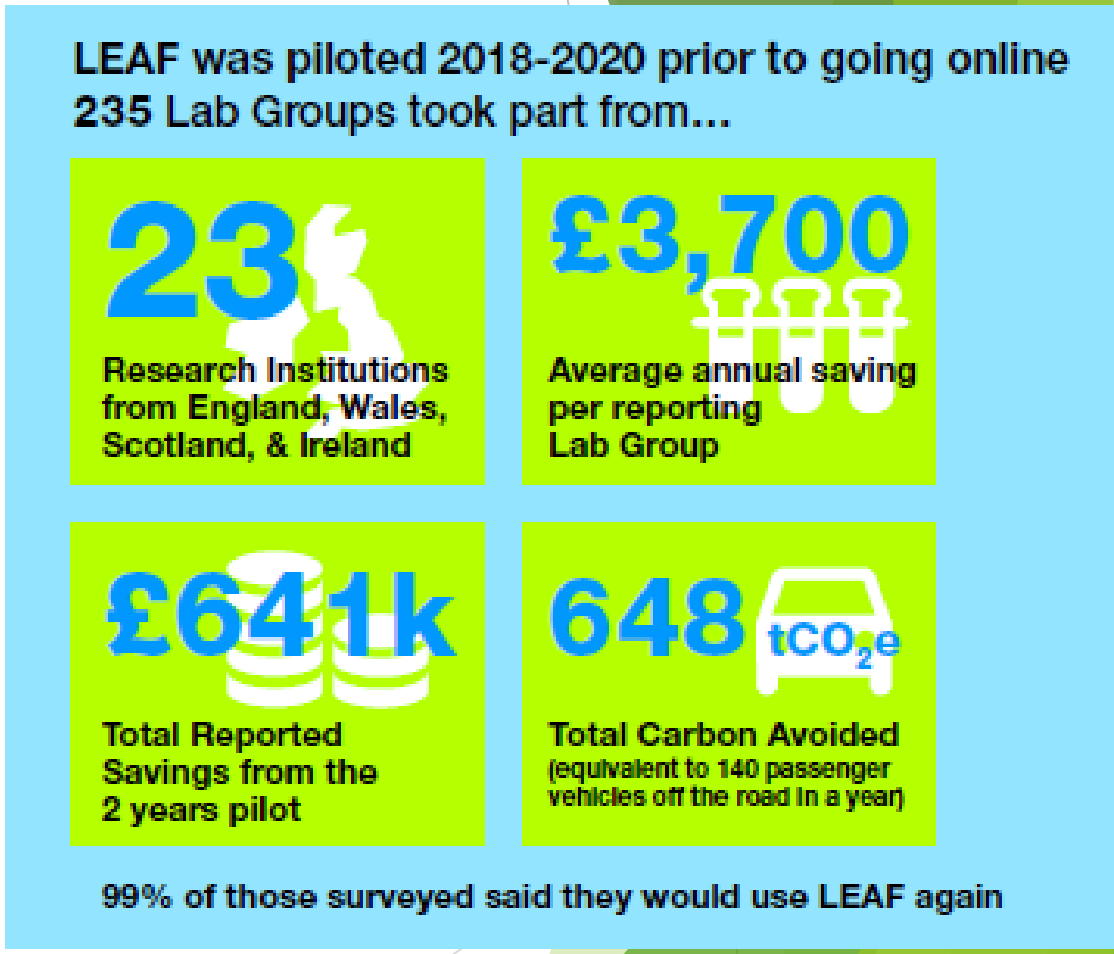
If there was a standard, what might it look like?
How do we know if a lab is “green”?

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

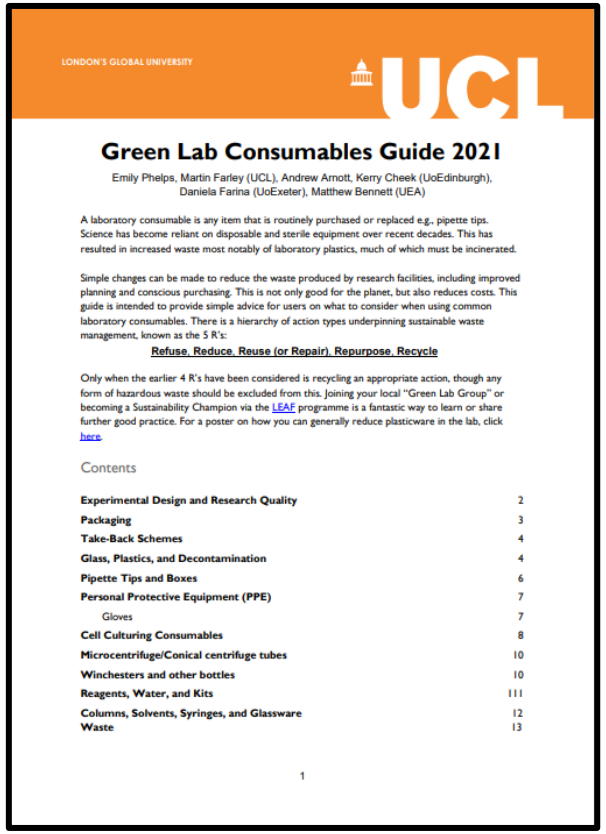
- Been online for 2 years
- 91 Institutions signed up since going live in Feb 2021 from 15 countries. 3,000 users from 2,000 labs
- Stated target for MRC facilities to achieve Gold by 2025
- World's largest Green Lab Programme
- Both Exeter and Bristol have reached 100% uptake in their labs, the only 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)

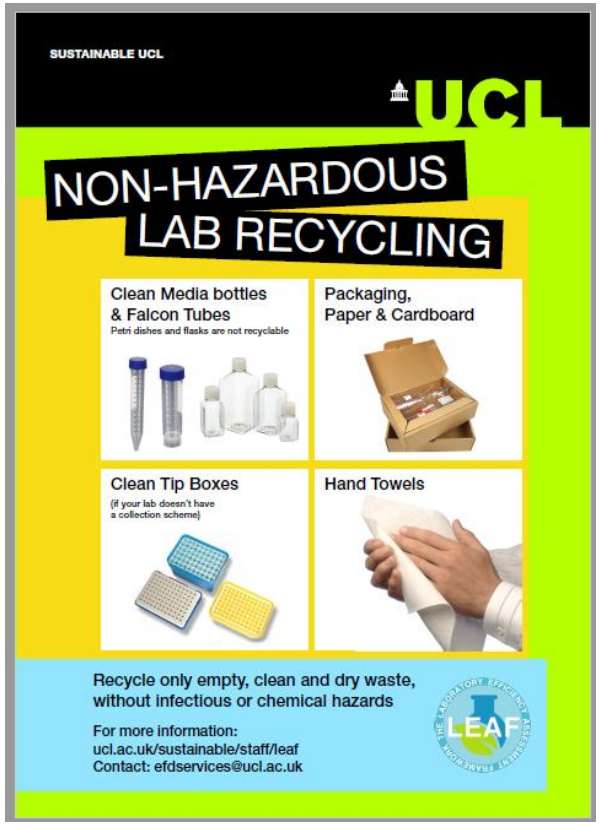
A laboratory consumable is any item that is routinely purchased or replaced e.g., pipette tips. Science has become reliant on disposable and sterile equipment over recent decades. This has resulted in increased waste most notably of laboratory plastics, much of which must be incinerated.

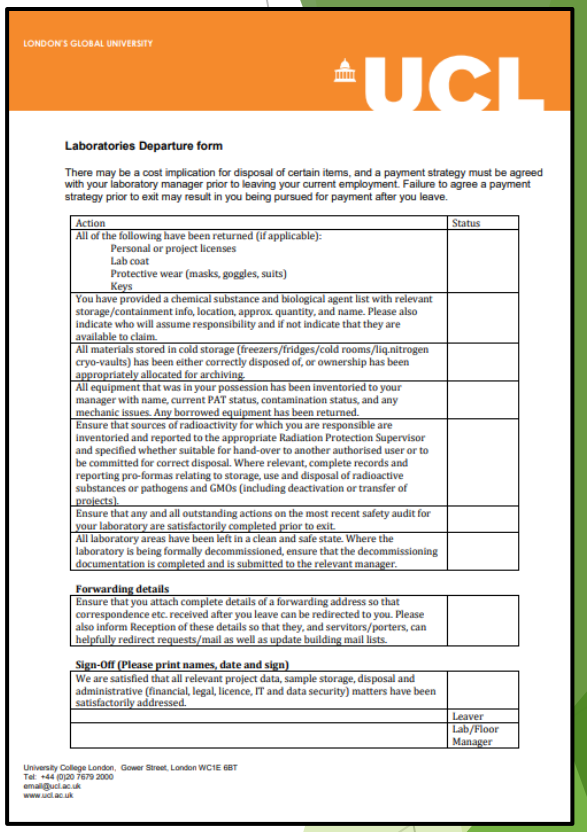
Simple changes can be made to reduce the waste produced by research facilities, including improved planning and conscious purchasing. This is not only good for the planet, but also reduces costs. This guide is intended to provide simple advice for users on what to consider when using common laboratory 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





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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.	

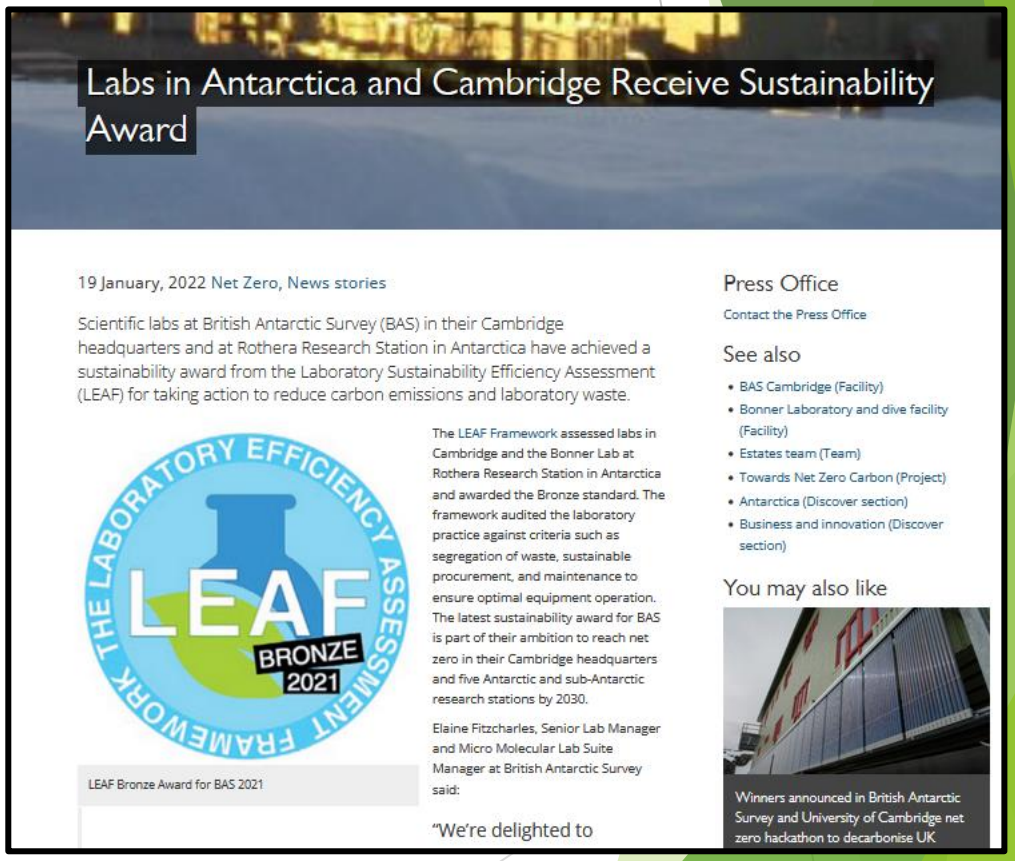
Sign-Off (Please print names, date and sign)

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

University College London, Gower Street, London WC1E 6BT
Tel: +44 (0)20 7679 2000
email@ucl.ac.uk
www.ucl.ac.uk

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

Grassroots goes pretty far!



Labs in Antarctica and Cambridge Receive Sustainability Award

19 January, 2022 Net Zero, News stories

Scientific labs at British Antarctic Survey (BAS) in their Cambridge headquarters and at Rothera Research Station in Antarctica have achieved a sustainability award from the Laboratory Sustainability Efficiency Assessment (LEAF) for taking action to reduce carbon emissions and laboratory waste.

LEAF Bronze Award for BAS 2021

The LEAF Framework assessed labs in Cambridge and the Bonner Lab at Rothera Research Station in Antarctica and awarded the Bronze standard. The framework audited the laboratory practice against criteria such as segregation of waste, sustainable procurement, and maintenance to ensure optimal equipment operation. The latest sustainability award for BAS is part of their ambition to reach net zero in their Cambridge headquarters and five Antarctic and sub-Antarctic research stations by 2030.

Elaine Fitzcharles, Senior Lab Manager and Micro Molecular Lab Suite Manager at British Antarctic Survey said:

"We're delighted to

Press Office

Contact the Press Office

See also

- BAS Cambridge (Facility)
- Bonner Laboratory and dive facility (Facility)
- Estates team (Team)
- Towards Net Zero Carbon (Project)
- Antarctica (Discover section)
- Business and innovation (Discover section)

You may also like

Winners announced in British Antarctic Survey and University of Cambridge net zero hackathon to decarbonise UK

MRC announces membership of laboratory efficiency framework

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2 December 2021

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

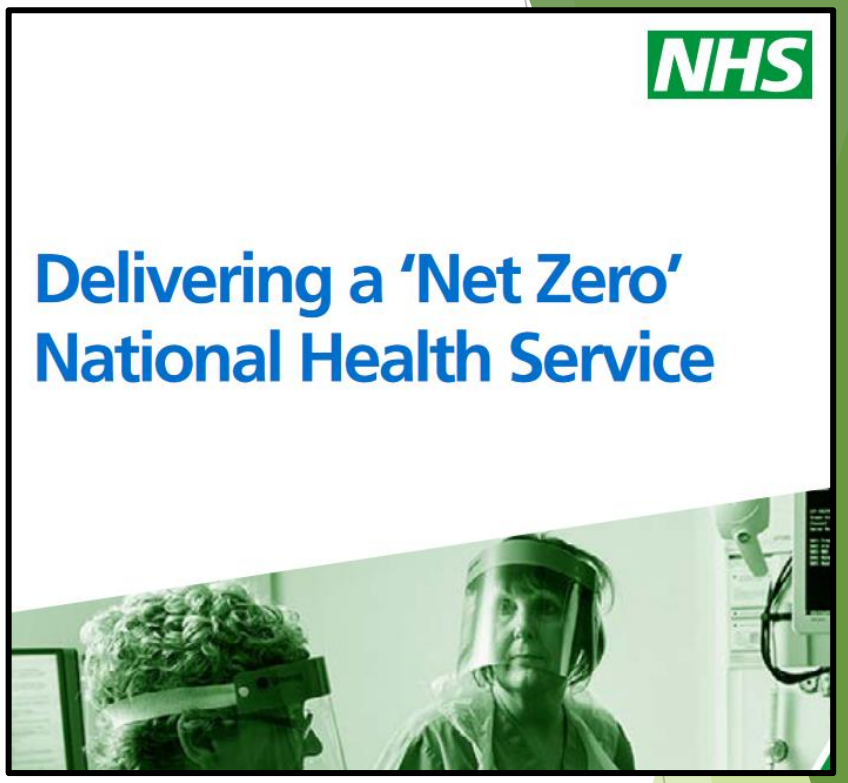
University of Exeter Technical Services
@UoETechServices

100% of our eligible spaces have received Bronze @LEAFinLabs accreditation or higher - a HUGE achievement in 12 months. This shows the dedication of academics, students, and especially technical staff to #sustainable #research.

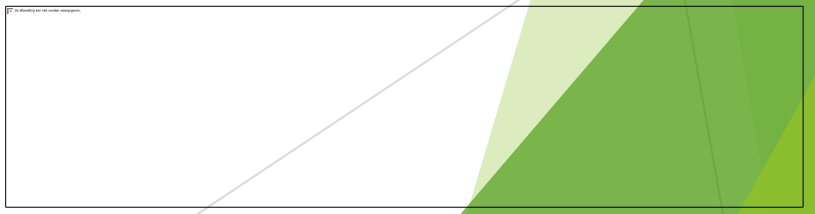
What will LEAF look like?

- 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



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!