Making Science Sustainable

Martin Farley - Sustainable Research Manager (UCL)
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

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**2050 - UK net zero**

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**2040 - NHS net zero**

The NHS is the world’s first national health system to commit to net zero

FOR A GREENER NHS

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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

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**2040 - UKRI net zero**

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**2030 - UCL net zero**

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**EAUC Lists Targets**

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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?
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

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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

Environmental sustainability in life sciences and medical practice

**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

**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
Networks

SELs is a network for sustainable science networks across Europe

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

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

- [https://www.ucl.ac.uk/sustainable/staff/labs/resources-and-materials](https://www.ucl.ac.uk/sustainable/staff/labs/resources-and-materials)
MRC announces membership of laboratory efficiency framework

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

2 December 2021
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

Please allow us 6 months for these to be fully integrated
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

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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