**Green Lab Programme Initiation Guide** Setting up a Sustainable Labs Programme

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# Introduction

Laboratories are resource intensive in terms of both energy and materials. In light of the climate emergency, institutions across the world have been developing sustainability lab programmes to reduce the significant carbon emissions associated with their environments and activities.

UCL is consistently ranked in the top 10 QS World University Rankings and is a global leader in research on sustainability. With over 50% of UCL’s energy consumed by laboratories and a 2030 net-zero carbon target for the institution, our labs are a major focus for resource and energy reduction. We have developed LEAF (Laboratory Efficiency Assessment Framework) to enact change and deliver improvements. Currently 80 institutions use this programme across the world, click on this link to [find out more here.](https://www.ucl.ac.uk/sustainable/make-your-lab-sustainable-leaf)

This guide outlines how UCL is improving sustainability in laboratories. It is designed to inspire and support sustainability teams, researchers, and technical staff at other institutions. Information provided on our programme may be applied and adapted to support your institution to further improve lab sustainability.

The guide is divided into four sections which are key to improving lab sustainability:

1. Engagement – LEAF Certification
2. Buildings, Refurbishment, and Waste
3. Training and Education
4. Circular Economy, Procurement and Purchasing

# **1. Engagement & LEAF Certification**

Engagement programmes may be run in a variety of ways. To facilitate sustainable laboratory operations and to support staff engagement, UCL has developed LEAF (Laboratory Efficiency Assessment Framework). It is a user-friendly online tool, aimed at improving the sustainability of lab spaces. The framework guides users through a structured pathway, using a set of criteria to help users to maximise the impact on their lab. LEAF allows users and institutions to quantify the impacts of their actions, providing estimated financial and carbon savings achieved. At UCL over 100 teams, ranging from single laboratories to whole institutes, are using LEAF.

The following eight steps are based on experience gained at UCL using LEAF to support sustainable lab operations and engagement. The process may be applied and adapted to any nascent sustainable lab programmes. To learn more about LEAF, click [here](https://www.ucl.ac.uk/sustainable/staff/labs/leaf), or contact [LEAF@ucl.ac.uk](mailto:LEAF@ucl.ac.uk).

## 1.1 Form ‘Sustainable/Green lab’ Groups

Collective efforts increase the probability of success and provide continuity. Creating sustainable lab groups enhances engagement, networking, and sharing of best practices. Groups act as a point of contact for stakeholders, new staff, and other departments or institutions. Groups can consist of multiple labs, each participating in LEAF. They can also be determined by departmental or building limits – determine what makes the most sense for your setting.

At UCL, implementing LEAF has helped develop our community. Groups of LEAF teams (individual labs) have formed their own “green lab groups”, or institutes have agreed to achieve certain targets regarding uptake.

When initiating sustainable lab groups, you should:

* Start with motivated individuals who have a drive to improve sustainability.
* Tap into existing groups, for example technical manager groups, or PhD/post-doc forums.
* Map out groups which cover your institution according to what makes sense (location, department, or type of research/teaching).
* Value all contributions and explore opportunities to support the work of others.

# 1.2 Set Targets – LEAF Criteria

Targets help to track progress and identify key areas to enable improved sustainability. Targets for UCL’s faculties include LEAF uptake across our labs, sustainable travel improvements, and reduced overall carbon emissions.

LEAF provides targets for our individual groups and institutes. The LEAF criteria are divided into Bronze, Silver, and Gold, award categories to provide a development pathway (examples here in the [Introduction to LEAF Infographic](https://www.ucl.ac.uk/sustainable/leaf/resources-and-materials)). Wider targets can be set based on LEAF uptake, or can focus on specific areas of impact, e.g., setting targets for fume cupboard sashes to be closed institutionally.

# 1.3 Stakeholder Engagement

Engagement programmes can require some administration and management, which should be considered. At UCL, LEAF is managed from within Sustainable UCL, but some institutions manage their efforts from technical services, energy managers, interns, or through academic staff. Managing such programmes can provide career development for existing staff. To read job descriptions of Sustainable Lab professionals around the UK, check out the [LEAN-Network site](https://www.lean-science.org/job-descriptions).

Sustainable lab efforts often cross over with other areas and priorities. Identifying and engaging with stakeholders will broaden support for activities and ensure any changes are fully embedded. There are clear benefits to establishing communication early in the process. Examples of some key stakeholders are;

1. Health and Safety
2. Researchers and research administration
3. Procurement
4. Utilities and Engineering
5. Facility/Technical Managers
6. Capital Projects teams
7. Communication teams

In some cases, sustainability has been introduced as a standing item on meeting agendas of existing groups which involve lab representatives and stakeholders, ensuring long-term engagement.

## 1.4 Implementation *– Complete LEAF*

Providing clear, consistent guidance on actions which can be implemented by lab teams is the key to delivering sustainability improvements. Implementation can take time. Setting feasible timeframes to enable planning helps to ensure targets can be met alongside the labs core activities. The majority of institutions run LEAF on an annual basis, for continuous improvement.

LEAF provides guidance and examples of best practice alongside a set of predetermined criteria which improve the sustainability of lab operations. Teams indicate how they have met the criteria or why this is not possible. Effective approaches or conversely, barriers to improvements are identified across the implementation. Solutions can be shared with other areas or teams where they may be applicable, whilst widespread barriers can prompt a broader approach to seek a solution.

# 1.5 Audit and Assessment *- LEAF Assessment*

An audit process validates actions taken to improve the sustainability of lab operations, and can allow an exchange of knowledge leading to long-term benefits.

LEAF is designed so that institutions are self-reliant, with submissions verified by staff within their own organisation through audits. This provides rigor of validation, whilst enabling opportunities for networking, sharing of best practice, and development opportunities.

All LEAF labs are subject to an audit before an award can be issued. Audits should balance the rigour of validation, with the availability of those implementing the actions, and shouldn’t last more than hour. The audit process provides an opportunity to learn, celebrate achievements and identify issues the team may have experienced. Audit functions are built into the LEAF online tool to optimise the process and minimise administration.

UCL have created a number of resources to support LEAF audits, embedded within the tool. UCL labs are audited by our LEAF manager, as well as through peer-audits, where our lab groups can audit each other. This provides a development opportunity for the auditors.

# 1.6 Estimate impact *- LEAF Calculators*

Increasing the sustainability of laboratories will result in significant financial savings and reduced carbon emissions. Reporting data on the outcomes of improvements publicly and to senior management is key to maintaining engagement and support, particularly during the early stages of a sustainable labs programme.

LEAF provides calculators to estimate the impact of their actions. Financial and carbon savings are reported for areas including ventilation, cold storage and waste. Total savings at various scales from the team level to the full institution are obtained from a report dashboard in the online tool.

# 1.7 Communicate and Recognise Outcomes *– LEAF Certification*

Progress, improvements and continued best practice must be acknowledged. This is key for maintaining engagement and supporting the efforts of lab personnel and all those contributing to sustainable lab operations. Awards provide a good opportunity to raise awareness, recognise contributions, inspire others and gain further support for lab sustainability.

At UCL, LEAF Awards are celebrated at an annual awards event. This is a great opportunity to invite extended groups to recognise the achievements of colleagues in lab sustainability and highlight the benefits of their work to the institution. LEAF teams are issued with a LEAF certificate and award logos. Social media and publicly accessible articles or case studies are also useful for celebrating and sharing progress made by LEAF teams. Some UCL case studies are available [here](https://www.ucl.ac.uk/sustainable/case-studies?collection=drupal-professional-services-case-studies&meta_UclOrgUnit=%22Sustainability%22&f.Subjects%7CUclSubject=Laboratory+Efficiency+Assessment+Framework+%28LEAF%29&f.Subjects%7CUclSubject=labs&le_DateFilter=20210929).

# 1.8 Review, Repeat, Provide Continuity & Resources *- LEAF Resources*

Evaluating progress, identifying widespread barriers, and sharing examples of solutions or resources at an institution level is essential for continuity and maintaining engagement.

Single competitions, challenges, or efforts can yield positive outcomes, but continuity is key to any successful programme. At UCL LEAF provides a mechanism for continuous improvement, with annual award certifications. LEAF awards provide a progression structure for teams and recognition for maintaining best practice. At an institutional level, feedback from teams and auditors is combined to efficiently identify where support or resources would be beneficial. Examples of such resources created for our UCL teams can be found [here](https://www.ucl.ac.uk/sustainable/staff/labs/resources-and-materials).

# **2. Buildings, Refurbishment, and Waste**

**Buildings & Refurbishment**: Infrastructure must be carefully considered in the design of new or refurbished laboratories. Whilst the energy intensity of labs is impacted by scientific equipment in lab spaces, infrastructural components often pose the greatest energy burden. For example, ventilation alone typically amounts to 60% of the overall energy consumption of lab spaces. LEAF addresses how users interact with lab infrastructure such as fume cupboards. It is important to ensure new lab spaces are designed with sustainability in mind. This allows optimisation through smart controls and educating users on the impacts of their interaction with lab infrastructure.

Like most institutions, UCL carries out a large number of lab fit-out projects, focusing on refurbishing rather than new builds. Environmental assessments are carried out appropriate to the size and scope of the work: BREEAM for major new builds and refurbishments; Ska for larger fit-out work; and an adapted ‘Mini-Ska’ for smaller projects. All of these tools include dedicated criteria aimed at the sustainable construction and operation of labs.

All building work at UCL is subject to our [Sustainable Building Standard](https://www.ucl.ac.uk/estates/policies/2020/jul/ucl-sustainable-building-standard) which provides additional detail on environmental assessments, and specific sustainability requirements. Crucially, projects are managed via a stage-gate process which requires engagement with Sustainable UCL. This ensures sustainability is considered throughout project implementation stages.

To access our Mini-Ska template, click [here.](https://www.ucl.ac.uk/estates/policies/2020/dec/mini-ska-template) Check the tabs at the bottom for “Labs”.

**Waste Management**: As outlined in the Bronze criteria of LEAF, many labs can safely have non-hazardous or clinical waste streams. This avoids unnecessary incineration of waste, and saves money as recycling streams are 5-10 times cheaper. To facilitate this, UCL has undergone several key steps:

* **Engage your Labs**: Check what common items may qualify for recycling with lab users.
* **Engage you Waste Provider**: Ask your waste provider if the common items (like packaging) may be recycled, and which plastic types (typically numbered 1-7) are accepted.
* **Procure appropriate Bins**: Ensure the budgeting and allocation of bins has been considered.
* **Engage Cleaning Services**: Ensure any new bins have been agreed with cleaning services.
* **Update Training and Signage**: It may be easier to target a few items in the signage, as opposed to complicated flow charts.
* **Engage your Labs again**:Once all is in place, engage the labs to notify them of any changes.
* **Monitor Impacts**: Such efforts will reduce carbon emissions and can save money – communicate these impacts.

Institutions should consider also consider disposal of old lab equipment. Local companies may accept or even repair old equipment, reducing embodied carbon emissions. To promote repair, UCL has hosted repair workshops for repair of small lab equipment.

# **3. Training & Education**

As institutions of education, it is crucial to integrate sustainable science practices into educational and training materials. At UCL, we currently do this in two ways:

1. Engage Educators: Educators have direct influence on tomorrow’s scientists, technicians, and research facilitators. We work with UCL’s educators to integrate sustainable science materials into their teaching content.
2. Sustainable Science Course: Sustainable UCL run an educational course for staff and students run at least three times per year. It is a 2-hour course reviewing why sustainability is relevant in science and providing expert technical guidance. It supports new and existing LEAF participants and the wider scientific community.

# **4. Circular economy, Procurement & Purchasing**

Procuring sustainably can be a challenging area for laboratories. However, the likely greatest source of carbon emissions for science is embodied in items purchased, and so procurement is a vital area to address. Unlike domestic equipment like refrigerators, performance standards and comparative data for lab equipment is difficult to obtain, especially for highly specialist equipment. Data provided by manufacturers may have varied testing protocols and conditions making comparisons problematic. Consumable single-use plastic items are commonly used in significant volumes. Crucially, we lack life-cycle assessments (LCAs) for materials entering a lab, presenting a challenge to making informed purchasing decisions. Purchasers should always request LCAs, and be sceptical of any ‘green’ credentials if not validated by a 3rd party, or not displayed in kg of CO2e or in kWh.

At UCL, we currently have two approaches to promote sustainable procurement and purchasing;

1. **Specification & Standardisation (top-down)**

UCL’s laboratories will purchase thousands of pieces of equipment and many more consumables and chemicals. UCL has begun standardising equipment and consumables to achieve the following benefits through tender processes;

* Economic efficiency
  + Standardisation of equipment, accessories and maintenance services
  + Reduced administration for selection and purchasing of units
  + Improved sustainability performance by requiring environmental specifications
  + Ensuring ethical manufacturers

Group tenders can increase purchasing power, which can lead to improved prices for more sustainable equipment and influence manufacturers to focus on sustainability performance. Equally, sharing tender specifications can have a comparable impact of cooperatively driving efficiency targets on manufacturers. All tenders should request LCAs and validation of equipment performance metrics.

1. **Technical Guidance & Engagement (bottom-up)**

UCL’s lab users will always be making the final purchasing decisions. As well as making users aware of procurement contracts, it is our responsibility to provide them with easily accessible information on how to make sustainable purchasing decisions. We have produced two guides, the ‘Sustainable lab consumables guide and ‘Sustainable lab equipment guide’ which are updated annually and available on the [LEAF resources page here](https://www.ucl.ac.uk/sustainable/leaf/resources-and-materials).

**Get in touch**

We hope you find this guide useful and wish you the best with starting your programme. To learn more, visit [www.ucl.ac.uk/sustainable/make-your-lab-sustainable-leaf](http://www.ucl.ac.uk/sustainable/make-your-lab-sustainable-leaf)