LEAF is a sector-wide framework containing a set of criteria aimed at improving the sustainability and efficiency of research and teaching laboratory spaces. Such spaces include typical wet laboratories, science teaching spaces, and IT research laboratories.

Teams taking part work to improve the environmental performance of their laboratory throughout the year. This is done by working through clear and easy to implement environmental actions in the LEAF spreadsheet, categorised into Bronze, Silver and, Gold.

Crucially, LEAF seeks to produce comparable data on efficiency and sustainability, through the use of in-tool calculators, thus allowing quantifiable baselines, targets, and measures to be developed. Calculators are completed by team members before and after participating.

**For those who haven’t yet commenced LEAF:**

Take a look at the LEAF criteria below, see what you can make a start with or what you may have already implemented in your lab as good practice.

**For those who have already signed up to LEAF:**

The criteria within the LEAF spreadsheet are listed below and are organised according to category. If as a lab you are only completing Bronze you can solely focus on these actions. If your lab is targeting Silver or Gold, they must also pass the criteria for the lower award level(s). If the criteria are not applicable to your lab (for example because you don’t have that type of kit) just make a note of this and the Environmental Sustainability Team will sign them off when we return to campus.

For each criteria there is:

* An overview of the criteria
* A target outcome which lists what the lab should be achieving or in the process of achieving.

Make a note of the actions you have completed either within this document or in the LEAF spreadsheet to help you when we are back on campus.

Good luck and we look forward to working with you again when the University re-opens.

The Environmental Sustainability Team

**Criteria**

***Waste***

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| # | Level | Criteria | Target Outcome |
| 1 | **Bronze** | The lab possesses required waste bins (possibly clinical, glass/sharps, hazardous etc.), as well as recycling/general waste bins with appropriate and clear signage.  | * Appropriate bins are present to easily recycle items particularly packaging.
* There is clear signage in place depicting which bins are for what purpose.
 |
| 17 | **Silver** | The lab has assessed its use of consumables and implemented realistic measures to reduce use. These efforts should target single-use plastics where feasible.  | * Usage of consumables has been assessed for feasible means to reduce.
* Change in practice has resulted in a reduction of single use plastic, which may be quantified in some manner.
 |
| 18 | **Silver** | There is a minimum contamination of recycling in clinical waste bins (no more than 10%), and lab members are aware of best practice. | * Correct disposal procedures are well communicated through documentation and training for all waste streams.
* Clear signage on bins, and audit confirms minimal mixing of waste streams is occurring.
 |
| 34 | **Gold** | The lab has implemented some form of reuse of materials, e.g. reuse of consumables. | * Users can demonstrate reuse practices, or at minimum can validate why such reuse is not feasible (e.g. referencing examples from the LEAF Consumables Guide). Ideally the impacts have been recorded, e.g. via LEAF calculators.
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***People***

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| # | Level | Criteria | Target Outcome |
| 2 | **Bronze** | The lab has an induction procedure in place for all new arrivals, explaining the sustainable practices to take. | * There are viewable induction materials containing sustainable practices, specifically closing fume cupboards, turning equipment off, chemical/ sample management, and waste practices.
 |
| 3 | **Bronze** | The lab has a system in place to clear or track materials left by departing staff.  | * There must be a system in place to ensure old materials do not go unmanaged e.g. through an exit-tracking document.
 |
| 4 | **Bronze** | Either the lab has a nominated person to drive sustainability forward or a group of people that meet to address sustainability within the lab. Sustainability has been added as a standing agenda item into regular meetings and/or relevant networks (e.g. Health & Safety) | • One or more people have the responsibility of leading on sustainability. This is communicated in some fashion to all lab members.• Sustainability have become integrated within regular meetings, and as such is not isolated from those who are not active in implementing LEAF |
| 5 | **Bronze** | The lab (or relevant group) has taken part in 1 team activity of sorts over the course of the year, or one is imminently planned.  | * The lab can evidence at least 1 activity within the past 12 months or have one imminently planned.
 |
| 19 | **Silver** | The lab has communicated with other groups/labs/departments about sustainable practices, and/or has taken part in a sustainability audit.  | * Communication, collaboration and knowledge exchange has led to either increased participation in sustainability activities/awards, or lab members have assisted auditing others for sustainable practices.
 |
| 35 | **Gold** | The lab has implemented at least one action to reduce travel.  | * Environmental implications of travel are considered and minimised where feasible, e.g. via teleconferencing.
* This criteria is not about commuting to the lab.
 |
| 48 | **Gold** | The lab has taken action to address the sustainability of corresponding office spaces. This may be through a programme, or by taking individual actions. | * Actions to improve the sustainability of office spaces have been considered and implemented. This includes actions regarding IT management, waste (such as food waste), and etc.
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***Purchasing***

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| # | Level | Criteria | Target Outcome |
| 6 | **Bronze** | Energy and materials consumption have been considered during the purchase of new materials. Ideally users should request life-cycle assessments (LCAs), though should be prepared for vendors to not have these available. | • Examples of when and how energy/water consumption, consumables, and durability have been considered in any recent purchases. • In the absence of any purchases, users must display an understanding of how to purchase sustainably for when such a time arises.• A basic understanding of what a lifecycle assessment is and why it is important to request when purchasing materials should be displayed. |
| 20 | **Silver** | The lab is aware and makes use of schemes offered by suppliers/manufacturers which increase reuse, recycling, and waste reduction. This includes but is not limited to tip box recycling and the return of polystyrene boxes and Winchesters to suppliers.  | * Relevant schemes (tip-boxes, Winchester bottles, package returns) have been considered and implemented wherever feasible.
 |
| 36 | **Gold** | LEDs have been considered for research applications and purchased where feasible.  | * Feasible options for LED lights in research applications have been identified and implemented.
* This excludes room lighting and should focus on LED applications for research, e.g. microscopy.
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***Equipment***

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| # | Level | Criteria | Target Outcome |
| 7 | **Bronze** | Heat sources on cold storage equipment are not blocked, and any filters are cleaned regularly.  | * There are no items blocking the expulsion of hot air, excluding under-bench units.
* Any freezer filters are cleaned regularly, or there is a plan to clean within 3 months.
 |
| 8 | **Bronze** | Cold storage, ovens, or incubators operate only when as full as possible. | * There are no ovens, cold storage, incubators, or similar equipment operating when empty, unless for a specific purpose.
 |
| 9 | **Bronze** | There is a system in place to ensure equipment and lighting are turned off when they are not needed.  | * Users can validate they understand the system in place, potentially via visual communications.
 |
| 21 | **Silver** | Freezers, fridges, and LN2 dewars are maintained or there is a plan in place going forward to achieve this. This includes defrosting, removing unwanted samples, checking seals, and cleaning filters on ULT freezers.  | * Cold storage equipment is well maintained; with no more than 10% of units having either excessive frost, blocked filters, or bad seals.
 |
| 22 | **Silver** | Washers, autoclaves, and any equipment which permits batching, are only run when full. The lab considers appropriate sizing when buying such equipment. | * There is an organised approach to batching ensuring units are only run at full or near capacity e.g. dishwashers aren’t empty when operated.
* For any units purchased in the past 12 months assessments have determined the appropriate size of units in line with batching procedures.
 |
| 23 | **Silver** | There is a system in place permitting the booking and sharing of communal equipment.  | * Items of communal equipment are shared via a booking system which is communicated to users.
 |
| 24 | **Silver** | Where feasible, freezers and fridges have temperatures raised and drying cabinets/ovens have had temperatures lowered. | * Temperature regulating equipment has been assessed and changes in temperature have been implemented wherever feasible.
* Freezers should not be colder than -20°C unless necessary, and ULT freezers should not be colder than -80°C, but ideally set at -75°C/-70°C.
* ULT freezers at -80°C are acceptable where research methods take priority.
 |
| 37 | **Gold** | There is a process in place for excess equipment and materials in the lab to be shared, repaired locally, or sold.  | * Excess equipment and materials are identified and made available for reuse by others through clearly defined procedures.
* There are means to fix broken equipment.
 |
| 38 | **Gold** | Where water is used for cooling it is recirculated. | * Tap to drain / single pass through cooling water is not used where this regularly leads to large volumes of water wastage.
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***IT***

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| # | Level | Criteria | Target Outcome |
| 10 | **Bronze** | Computer monitor brightness settings and computer time-to-sleep have both been minimised.  | * Monitors have minimised brightness settings visible, and there are no screens on when not in use (e.g. on longer than 15 min).
 |
| 25 | **Silver** | There is a system in place to ensure critical data is backed up, which also ensures large files are not excessively stored and cleared where feasible. | * Systems or plans are in place to ensure all critical data is retained and backed-up. Non-critical data is not backed up unnecessarily. E.g. through the cloud, or there is a system in place to push research staff to drive reduced storage of large files (e.g. clear-out days, or assessing how many copies are necessary
 |
| 39 | **Gold** | Computing code has been optimised, and the number of storage clusters has been optimised to the tasks or schedule of tasks.  | * Optimisations have led to faster, more energy efficient operation.
* Storage clusters use minimum server space.
* These criteria only apply to labs with significant data storage.
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***Sample and Chemical Management***

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| # | Level | Criteria | Target Outcome |
| 11 | **Bronze** | All samples and chemical containers have legible labels, or there is a system in place to ensure that going forward all samples will be consistently labelled.  | * Request a spot check of one or more storage units to ensure a labelling system is in place.
 |
| 12 | **Bronze** | The lab has a system in place for sharing chemicals between users within the lab group.  | * Chemicals are shared where feasible, and waste of usable chemicals is minimised.
* A shared shelf of chemicals is sufficient, if it is actively in use and maintained in some organised fashion.
 |
| 26 | **Silver** | Procedures for equipment breakdown are in place and well communicated to minimize losses. This may include but is not limited to freezer alarms, back-up storage spaces identified, call-out procedures, etc.  | * Equipment breakdown will not result in the loss of valuable items due to monitoring alarms and contingency planning.
* Users are aware of the procedures to follow in the event of a breakdown.
 |
| 27 | **Silver** | The 12 Principles of Green Chemistry have been considered for current lab members, and communicated to the new members.  | * Discussion, resources and/or training which support the 12 Principles of Green Chemistry have led to opportunities for more green alternatives to harmful chemicals.
* Labs which don’t do chemistry, should show an awareness of why they are unable to replace harmful chemicals in use with less harmful alternatives.
 |
| 40 | **Gold** | There is a system in place to promote the use of existing data, and/or existing samples from biobanks, as opposed to always generating novel data or sourcing new samples.  | * The lab uses shared external sources for existing samples, chemicals, materials and/or data where possible and facilitates sharing through making its resources available to other external organisations. Consider public data/sample resources where feasible.
 |
| 41 | **Gold** | At least 80% of samples and chemicals are being actively used, or being stored and are easily identifiable. No more than 20% should be uncatalogued. | •There is evidence of organization or a catalogue of chemicals. Alphabetical organization on a shelf in a communal space is sufficient. •The lab user can give detail about the management of chemicals and samples including how frequently unused or out of date items are disposed of.•Spot check a few chemicals to ensure that they are no older than 5 years old. Enquire about older chemicals with the user. Award the criteria if there is sufficient explanation. |
| 47 | **Gold** | No solvents are being evaporated into the atmosphere. Solvent selection has been considered for 'greenness'. Solvent recapture/recycling has been assessed for feasibility. | •Any vapor from solvent evaporation is captured and not released into the atmosphere.•Where feasible, captured solvents have been condensed, possibly purified, and made available again for use.•The lab has reviewed the Chem21 Green Solvent guide, and substituted any solvents accordingly. |

***Research Quality***

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| # | Level | Criteria | Target Outcome |
| 13 | **Bronze** | Common protocols and methods are centrally shared and available to all lab members.  | * Where lab members are doing the same experiments/ processes, methods are standardised to improve comparability and consistency of results.
* Lab members can evidence a folder, paper or digital, in which common protocols are shared.
* Lab members varying protocols for scientific reasons is permitted.
 |
| 14 | **Bronze** | The lab has had its pipettes calibrated in the past year, or has them scheduled to be done. In absence of pipettes, the lab has considered calibrating any materials commonly utilised for measurement.  | * Ensure there is at minimum a plan in place to calibrate if not done in past 12 months.
* In absence of pipettes, ask if there are other similar items like scales.
 |
| 28 | **Silver** | The lab is aware of any relevant local core facilities or equivalents. Either there is a valid rationale for not utilizing such a facility, or the lab makes regular use of them.  | * Local core facilities (e.g. mass spectroscopy) are fully utilized wherever relevant and feasible, and their availability is communicated.
* Request users to display an understanding of available core facility resources (potentially external).
 |
| 29 | **Silver** | The lab has a forum for sharing and discussing negative results.  | * Lab members have a means to regularly communicate negative results, at minimum with other lab members. Simply having regular lab meetings is not sufficient, lab members must feel encouraged to share negative results in some fashion.
 |
| 41 | **Gold** | The lab has adopted a laboratory management software, or have reviewed the options and provided a reason why this isn't appropriate.  | * Laboratory Information Management Systems (LIMS) are in use where appropriate, or as a minimum users have considered LIMs for sample or chemical management.
 |
| 42 | **Gold** | Sterilisation and cleanliness methods have been reviewed for efficiencies and effectiveness. Including but not limited to autoclave methods, UV sterilisation necessity, and cleaning rotas.  | * Over-treatment of outgoing waste and excessive sterility may represent wastage. As such the lab has reviewed its means of sterilisation/ cleanliness for opportunities to reduce autoclaving, UV sterilization, or etc.
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***Teaching Criteria***

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| # | Level | Criteria | Target Outcome |
| 28 | **Silver** | An awareness of resource use and associated environmental impacts is incorporated into practical laboratory learning and teaching.  | * There are viewable lesson plans that integrate best sustainable practices, such as instructions on which waste streams to use.
* Sustainability is a key aspect of the induction for students.
 |
| 41 | **Gold** | Environmental impacts are considered in the design or revision of experimental procedures for taught laboratory courses.  | * Evidence that teaching experiments have been either revised or designed to include sustainable practices.
* Examples may include using smaller tubes, using smaller sample sizes, or using reagents that are less toxic.
* This criteria is an extension of the previous teaching criteria, in that sustainability is not only integrated in the lesson content but experimental design has been affected.
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***Ventilation***

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| # | Level | Criteria | Target Outcome |
| 15 | **Bronze** | Any issues that estates must address have been reported. This includes ventilation, room pressure, water leaks, heating & cooling, and etc. | * There are no observable issues with heating, cooling, or ventilation which have not been reported to estates to address.
* Ensure users know where to go when needing to report any such faults.
 |
| 16 | **Bronze** | Fume cupboards and safety cabinets possess signage encouraging good practice. | * There is signage in place encouraging users to lower fume cupboard sashes and turn safety cabinets off when not in use.
 |
| 30 | **Silver** | Fume cupboards and Local Exhaust Ventilation equipment is not used for extended storage, and nothing impedes internal airflow. | * Items in fume cupboards and LEV equipment are kept to a minimum resulting in improved safety and reduced energy consumption.
 |
| 31 | **Silver** | Users have been made aware and have improved sash lowering of fume cupboards, and/or turn safety cabinets off when finished (at least 80% of the time).  | * Clear signage is present.
* Training and/or guidance on the benefits of sash lowering and turning off safety cabinets is provided to users.
 |
| 44 | **Gold** | The lab has engaged and implemented actions via estates on lowering: fume cupboard flow rates, air change rates, and/or removing unnecessary extracts from safety cabinets to become recirculating.  | * Extract and ventilation are optimised ensuring safety whilst maximising energy efficiency, or at minimum users have actively engaged with estates on such opportunities beyond a single email.
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***Water***

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| # | Level | Criteria | Target Outcome |
| 32 | **Silver** | Sustainable water use is communicated to all lab users. This includes specifying what levels of water purity are necessary for various applications and ways to avoid taps running (e.g. soaking glassware).  | * Lab users can demonstrate an understanding of the differences between water types.
* Best practice is included in the induction for new lab members.
* Any repeated issues with incorrect usage have been flagged at meetings.
 |
| 45 | **Gold** | Guidance on appropriate usage of drains and effluent waste is communicated to all lab users, during inductions and beyond.  | * Users can give examples of where guidance for effluent waste is displayed. This could include but is not limited to, in the induction, posters, given at lab meetings, signage at sinks.
 |

**Finally**

Consider whether there are there any practices that have come about as a result of the current pandemic, which the lab may continue once over. E.g. are there ways to minimise travel or keep some items off moving forward? Make a note of these in the open initiative tab of the LEAF spreadsheet.

Criteria updated from LEAF Website on: 2nd of February, 2023.