

# Laboratory plastics

## Summary report: single-use plastic in University laboratories

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Summary report of research project for single-use plastic in University laboratories.

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## Introduction

The University of Edinburgh is a leading research-intensive university, with more than 80% of our research activity considered world leading or internationally excellent. Laboratories are an integral part of the continued excellence of the University’s research, but they can also be a large source of plastic waste. It has been estimated that laboratory research generated approximately 5.5 million tonnes of plastic waste in 2014, equal to 83% of the plastic recycled worldwide in 2012 (Urbina et al., 2014).

The purpose of this project was to identify the most effective and impactful actions to improve the sustainability of plastic use and disposal in University of Edinburgh laboratories, particularly focused on the potential to reduce single-use plastics. This included researching best practice within and outside of the



University, establishing a better understanding of current plastic recycling practices within the University, and creating an action plan for future work in this area.

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## Findings

Laboratory research generates a significant amount of plastic waste, and much of that is single-use. There is only one estimate, listed above, that is commonly cited regarding the contribution of laboratories to global plastic waste. The exact amount of plastic waste generated by laboratories worldwide is unknown, and there are few estimates available for the amount of plastic waste that a single lab might produce.

### Best practice research

A few universities who are currently working on the issue of plastic waste are University College London, Kings College London, University of York, and University of Manchester. Martin Farley, of KCL and UCL, has generated [a general advice poster](#) for reducing single-use plastic in labs, which has been adapted for use in the University of Edinburgh. Many of these recommendations overlap with the top recommendations from this project, listed below. The Basic and Clinical Neuroscience Team at KCL has also [implemented a recycling scheme](#) to increase recycling of lab plastics, particularly from cell culture. They confirmed recyclable plastic types with their local council, created and circulated clear guidance, and supplied bins for the new waste streams to increase recycling. Another scheme to increase lab plastics recycling was implemented at the [University of York](#). Researchers identified common plastic types and suppliers, reduced the number of suppliers and plastic types where possible, set up a decontamination station and colour-coded recycling system, and arranged for their chemical waste removal company to accept these decontaminated plastics for recycling. Lastly, the University of Manchester is also working on this subject following their recent commitment to 'eradicate avoidable single-use plastics' by 2022. They have focused largely on teaching labs, asking them to reuse gloves, weigh boats, tubes, cuvettes, to replace necessary single-use items with biodegradable alternatives, and to use multi-media teaching aids where possible to avoid unnecessary waste. A full list of UoM initiatives is in the 'Guidance list (ongoing)' document available here:

**K:\SRS\Sustainable Labs\Lab plastics**

Apart from these universities, some of which have published their initiatives and others who have not, there is limited information available for reducing single-use plastic in laboratories. Much of the available guidance is published from less credible websites and blogs, rather than peer reviewed publications, and most of it is specific to certain lab types (e.g. examples of how to reduce plastic in cell culture). While these forms of guidance can be helpful in certain context, there are limited case studies to use as guidance for action at the University level. This shortage of information is likely due to a combination of the field being relatively new and lack of platforms through which to share best practice. The UK wide Lab Efficiency Action Network (LEAN) is one such platform, but only limited information of reducing plastics has been shared thus far.

### Lab plastics survey

To determine current practices and desired support for reducing plastic in University laboratories, we conducted a survey in May and June, 2019. The survey contained a mix of fixed- and open-answer questions and received 225 responses. The majority of responses were from research labs (as opposed to teaching labs), and most were from the Colleges of Science and Engineering or Medicine and Veterinary Medicine. Some of the main findings from the survey are below:

- 75.5% of respondents are currently recycling some types of plastic from their labs
- Largest barrier to recycling, or increases in current recycling, is a misunderstanding that the University 'doesn't allow' any lab plastics to be recycled



- Further barriers are that the contractor doesn't accept certain plastic types, lack of bins, effort, uncertainty about recycling, and contamination concerns
- Survey respondents listed many forms of desired support from the University, the most common of which were requests for clearer instructions on recycling in labs, centralised guidance for plastic-reducing initiatives, more accessible bins, and a decontamination method to increase recycling

Further information on the types of items recycled, most common plastic items used in labs, current plastic-reduction initiatives, and desired support is available here: [K:\SRS\Sustainable Labs\Lab plastics\Lab plastics survey](#)

## Guidance

We have compiled guidance on reducing lab plastics from the university case studies, online resources, and lab plastics survey. The following recommendations are in a simplified format, with much more detail available on the full 'Guidance list (condensed)' available at: [K:\SRS\Sustainable Labs\Lab plastics](#)

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### Recommendation (in no particular order)

Substitute single-use plastic for glass.

Substitute single-use plastic for other reusable materials, or reuse current single-use items.

Substitute single-use plastic for biodegradable.

Reduce packaging plastics.

Increase laboratory plastic recycling.

Consider implementing a further recycling scheme:

- Non-contaminated gloves
- Collection points for packaging take-back schemes from suppliers
- Create a decontamination station for recyclable plastics

Plan experiments to reduce single-use.

Where possible, share common items to reduce ordering.

Reduce plastic used for labelling.

If reliant on bottled ultra-pure water, consider replacing with an in house system

When plastic is unavoidable, use recycled sources rather than virgin plastic.

Utilise bottle top dispensers to reduce tips, pipettes, and other intermediary containers

Clean and re-use plastics in teaching labs where sterile procedure is not as high priority.

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## Recommendations

This initial project has researched the subject of laboratory plastics and generated guidance for the University's next steps, outlined in the 'Action Plan' below.

### Action plan

Below are the main points of the action plan, in order of priority. The complete action plan can be found at: **K:\SRS\Sustainable Labs\Lab plastics**

Priority	Action, risk, resource needed
1.	<p><b>Action:</b> Determine the type of plastic used in common lab consumables and identify which laboratory plastics can currently be recycled in University systems (e.g. what can be accepted by the University's general waste contractor).</p> <p><b>Risk:</b> Raising the issue with the contractor might lead to more strict regulations than currently in place, such as a blanket ban on lab items (unlikely)</p> <p><b>Resource:</b> SRS Engagement Team time, approximately 1 day of work</p>
2.	<p><b>Action:</b> Work with Waste Department to create instructions on what can be recycled and how. Focus on collaboration and buy-in from lab managers, related to point 11.</p> <p><b>Risk:</b> N/A</p> <p><b>Resource:</b> SRS Engagement Team time (approximately 3 days of work), SRS Communications Team time (approximately 1-3 days depending on desired materials), Waste Department time. Timeline would be dependent on information needed from lab contacts.</p>
3.	<p><b>Action:</b> Create central resource/guidance for plastic-reducing strategies.</p> <p><b>Risk:</b> Potential to be seen as promoting certain companies who accept back packaging.</p> <p><b>Resource:</b> SRS Engagement Team time, approximately 2 days of work.</p>
4.	<p><b>Action:</b> Circulate guidance via multiple platforms.</p> <p><b>Risk:</b> N/A</p> <p><b>Resource:</b> SRS Engagement Team time (approximately 1 day of work), SRS Communications Team time (approximately 1-3 days of work, depending on desired products). If printing instructions, more time and budget would be needed to print and circulate.</p>
5.	<p><b>Action:</b> Consider developing a platform for sharing research, case studies, best practice, etc.</p> <p><b>Risk:</b> If establishing a new platform, risk of missing things because multiple platforms in use. If using LEAN, risk the platform not being suitable to these needs.</p> <p><b>Resource:</b> Dependent on platform desired.</p>
6.	<p><b>Action:</b> Consider necessity of identifying the scale of the problem, begin to assess.</p> <p><b>Risk:</b> N/A</p> <p><b>Resource:</b> SRS Engagement Team time, approximately 5 days of work. Timeline would be dependent on outside sources of information.</p>
7.	<p><b>Action:</b> Consider adding lab plastics item to sustainability awards</p> <p><b>Risk:</b> N/A</p> <p><b>Resource:</b> SRS Engagement Team time (approximately 1 day)</p>
8.	<p><b>Action:</b> Focus on teaching labs for 'easier' changes where sterile procedure is not as necessary (following University of Manchester examples).</p> <p><b>Risk:</b> Teaching labs offer 'low-hanging fruit' with easier changes, but most impactful changes can likely be made in research labs.</p> <p><b>Resource:</b> SRS Engagement Team time, teaching lab coordinator time.</p>
9.	<p><b>Action:</b> Implement or coordinate a decontamination scheme/service/method to increase recycling of single-use plastics</p>

**Risk:** People will misunderstand, use incorrectly, and put waste contractors in danger (unlikely, lab workers know the safety of their products).

**Resource:** SRS Engagement Team time, time from 'case study' labs, potential funding needed to offset new scheme

10. **Action:** Facilitate study to determine most environmental choices for common items. Incorporate this into guidance

**Risk:** Possibility that findings are too complicated to lend easily to improved guidance (such as if the instructions depend on autoclave type, plastic type, type of use, etc.)

**Resource:** SRS Engagement Team time

11. **Action:** Facilitate buy-in and encourage action at lab and building level

**Risk:** Shifting responsibility without follow-up on what actions are actually being taken

**Resource:** SRS Engagement Team time

12. **Action:** Work with Waste Department to improve recycling bins available to laboratories

**Risk:** Any increase in types of bins could lead to further confusion and therefore contamination

**Resource:** SRS Engagement Team time, Waste Department time, potential funding for improving bins

13. **Action:** Work with Waste Department and University waste contractor to expand accepted types of waste

**Risk:** Relying on a temporary solution (expanding recycling rather than reducing waste)

**Resource:** SRS Engagement Team time, Waste Department time, potential funding for increasing accepted types of waste

14. **Action:** Implement cleaning support to facilitate uptake in glass and reusable use

**Risk:** Assess if/when action is taken

**Resource:** Assess if/when action is taken

15. **Action:** Implement centralised services (other than washing) to reduce single-use plastics

**Risk:** Assess if/when action is taken

**Resource:** Assess if/when action is taken

16. **Action:** Identify and offer funding for replacement of single-use items with reusable alternatives (once the most 'environmental' alternatives have been identified)

**Risk:** Assess if/when action is taken

**Resource:** Assess if/when action is taken

17. **Action:** Establish incentives, policies, rules and/or other pressure top-down to encourage recycling and reuse

**Risk:** Assess if/when action is taken

**Resource:** Assess if/when action is taken

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## Review of project success

All of the items listed as 'success criteria' for this project have been achieved. However, some of the deliverables remain in progress or were not started. This is largely due to the unanticipated response rate to the lab plastics survey. The large number of responses, particularly free text, took more time to analyse than initially accounted for. The stated deliverables for this project are listed below, and more information is available in the project brief located in: **K:\SRS\Sustainable Labs\Lab plastics**

### Success criteria

- **Establish an understanding of most sustainable practice** regarding consumption, use, and disposal of common plastics in laboratory settings.
- **Recommend clear actions** which can be taken to improve sustainability of plastic use in labs.
- **Engage with key stakeholders on this subject** including SRS Communications, Waste Department, and UoE laboratory contacts.

### Deliverables achieved

- Research best practice in this field, including any areas of good practice within the University of Edinburgh, and identify the most successful campaigns/initiatives/etc.
- Research communications for reducing lab plastics and identify the most successful campaigns/initiatives/etc.
- Generate initial recommendations based on above research. Collaborate with key UoE laboratory sustainability contacts to better understand the feasibility of these recommendations.
- Provide guidelines, data, or other necessary information which can be translated to various communication formats (email, posters, potentially identify other impactful communication methods)
- Identify any 'low hanging fruit' and easy changes that can be made, as well as larger changes that might be more difficult but have a greater impact.
- Based on an understanding of where opportunities lie, generate an action plan which will serve as groundwork for future initiatives and/or a pilot study
- Conduct a survey to better understand current recycling practices within the University of Edinburgh research and teaching laboratories (note: this was not in the original project brief but was a key deliverable added later in the project)

### Deliverables in progress

- Research best choices (incorporating lifecycle environmental impact, safety, and sterile procedure) for common laboratory items and create general guidelines
- Identify key differences (and similarities) of plastic use in different lab types which can impact effectiveness of interventions
- If time allows, begin work on implementing the action plan for future work in this area
- If time allows, begin to tailor guidelines of communications based on findings

### Deliverables not started

- Work with Communications team and other relevant stakeholders (Waste Department, etc.) to ensure effective communication of new information

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## References and resources

### References

Kings College London. 2019. Recycling Laboratory Plastics. *Case Studies*. Available at: <<https://www.kcl.ac.uk/aboutkings/strategy/sustainability/get-involved/staff/sustainability-champions/lab-champions/case-studies/recycling-laboratory-plastics>>.

Lab plastics recycling poster: [https://www.ed.ac.uk/files/atoms/files/labs\\_plastics\\_poster\\_uae\\_0.pdf](https://www.ed.ac.uk/files/atoms/files/labs_plastics_poster_uae_0.pdf)

University of Manchester. 2019. University signs up to help Manchester go zero carbon and plastic free. *News*. Available from: <<https://www.manchester.ac.uk/discover/news/university-signs-up-to-help-manchester-go-zero-carbon-and-plastic-free/>>.

University of York. 2019. One Planet Week: Waste plastic from science labs would fill over 100 bathtubs a year, say researchers. *News*. Available at: <<https://www.york.ac.uk/news-and-events/news/2019/research/one-planet-week-waste-plastic-from-labs/>>.

Urbina, M.A., Watts, A.J.R., and Reardon, E.E. 2014. Labs should cut plastic waste too. *Nature*. 528, p. 479. Available at: <<https://www.nature.com/articles/528479c>>.

### Resources

- BLOG: <https://edinburghcrf.wordpress.com/2017/09/14/improving-recycling-in-the-laboratory-challenges-to-be-overcome/>
- Glove recycling: <https://www.ed.ac.uk/about/sustainability/what-we-do/circular-economy/case-studies/glove-recycling>
- EACR blog: <http://magazine.eacr.org/a-few-key-ways-to-reduce-plastic-waste-in-the-lab/>
- University of Westminster guidance: [http://2018.igem.org/wiki/images/a/aa/T--Westminster\\_UK--chemJen.pdf](http://2018.igem.org/wiki/images/a/aa/T--Westminster_UK--chemJen.pdf)
- Article on reducing plastic waste: <https://www.the-scientist.com/careers/life-scientists-cut-down-on-plastic-waste-64547>

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