THE UNIVERSITY of EDINBURGH

Sustainable Laboratories Steering Group (SLSG)

Tuesday 12th May 2020, 2pm

via Microsoft Teams

AGENDA

1	**Minute** To *approve* the minute of the previous meeting on 21 January 2020 and *raise* any matters arising	**A**
2	**Covid-19 Impact and Implications for Labs** To *receive* an update from the Director of SRS	**Verbal**
3	**Update on Lab Awards** To *receive* a verbal update from the SRS Projects Coordinator	**Verbal**
4	**Sustainable Labs Programme Plan Update** To *note* and *discuss* a report from the SRS Projects Coordinator	**B**
5	**2020-2025 Plan** To *discuss* and *endorse* a paper from the SRS Projects Coordinator	**C**
6	**Chemical Substitutions** To *note* and *discuss* a paper from the SRS Projects Coordinator	**D**
7	**Freezer Fund Update** To *receive* a report from the SRS Projects Coordinator	**E**
8	**Non-recyclable Plastics: Review of Steps Taken by the NHS & Pharma Companies** To *note* and *discuss* a paper from the SRS Projects Coordinator & Waste and Recycling Manager	**F**
9	**Technician Commitment update** To *receive* an update from Laboratory Technician Val Gordon	**Verbal**
10	**Any Other Business** To *consider* any other matters from Group members including: • Social Responsibility and Sustainability Report 2018-19	**Verbal**

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If you require this agenda or any of the papers in an alternative format

UNIVERSITY OF EDINBURGH **A**

MINUTE OF A MEETING *of the Sustainable Laboratories Steering Group held in the Balcony Room, Old Moray House on Tuesday 21 January 2020.*

Members: Dave Gorman, (Convener), Director of Social Responsibility and Sustainability
Andrew Arnott, SRS Projects Coordinator
Rachael Barton, SRS Projects Coordinator
David Brown, Technical Services Manager, School of Chemistry
Michelle Brown, Deputy Director of Social Responsibility and Sustainability
Glen Cousquer, Joint Unions Green Rep
Dean Drobot, Head of Energy and Utilities Management
Joanne Dunne, Early Stage Researcher
Grant Ferguson, Director of Estates Operations
Kate Fitzpatrick, Waste & Recycling Manager
Val Gordon Technical Officer, Institute for Education, Teaching & Leadership
David Gray, Head of the School of Biological Sciences
Sharon Hannah, Bioquarter Campus Operations Manager
Yuner Huang, Early Stage Researcher
Angela Ingram, Service Manager, IGMM
David Jack, Energy & Utilities Operations Manager
Andy Kordiak, Laboratory & Medical Equipment & Consumables Team Manager
Julia Laidlaw, Estate Development Manager
Chris Litwiniuk, Engagement Manager
Guy Lloyd-Jones, Forbes Chair of Organic Chemistry
Robert MacGregor, Energy Engineer, Utilities Management
Stewart McKay, Technical Services Manager, IGMM
Brian McTier, Easter Bush Campus Facilities and Services Manager
Lee Murphy, Genetics Core Manager
Claudia Schaffner, Technical Services Manager, School of Biological Sciences
Candice Schmid, Occupational Hygiene and Projects Manager
Matthew Sharp, BVS Deputy Director - Business

Apologies: Dave Gorman; Dean Drobot; Joanne Dunne; Grant Ferguson; David Gray; Yuner Huang; David Jack; Julia Laidlaw; Brian McTeir; Claudia Schaffner; Matthew Sharp

1 Minute **A**

In the absence of the Convener, the Deputy Director of SRS welcomed attendees to the sixteenth meeting of the Group.

The minute of the meeting held on 23 September 2019 was approved as a correct record.

Matters Arising

Action – AA to follow up with Evan Morgan to check if he was still the right contact for the LILLEE project.

2 Sustainable Labs Programme Plan Update **B**

The SRS Projects Coordinator updated the Group on progress. Members were pleased to see so many activities at Green status.

Efforts to identify substitution opportunities for hazardous chemicals had met with limited success. The volumes used in teaching labs had already reduced, and opportunities for further efficiencies were not evident. SLSG agreed to drop this line item for now in order to focus resource on more impactful work.

Action – AA to take a paper on chemical substitutions to the next meeting on 12 May.

Action – AA to provide RAG updates on outcomes as well as activities in future.

3 2020-2025 Draft Plan **C**

SLSG noted this draft programme plan for 2020-2025, based on workshop sessions held in autumn 2019. Four objectives and six key targets were proposed, designed to pull activities together.

The first objective was to see good practice behaviours adopted across all labs. This would be measured via three targets: 100% of buildings with labs having at least one Lab Awards team; 100% of building with labs having a Sustainability Coordinator working in or regularly with labs; and expanding knowledge of good practice outwith key contacts and Sustainability Champions (as measured in biannual SRS staff and student surveys).

Members discussed whether Sustainability Champion and lab Sustainability Coordinator roles were taken into account and allocated time as part of the Annual Review process. This was very mixed, depending on the individual line manager. SLSG noted that the Principal had recommended becoming a Sustainability Champion during recent Town Hall meetings. Health & Safety had found HR unreceptive to acknowledging these types of roles.

Action – CS to send GC a link to the HR paper.

The second objective was investment in lab sustainability projects. This would be assessed via one target: lab sustainability projects saving 500tCO_2e annually, implemented by 2025. This was a stretch target, but should be achievable (depending on funding), particularly factoring in carbon savings from fume cupboard refurbishments. Ventilation was the largest energy consumer in most labs. There were huge potential savings across campus if UoE could drop to six to eight air changes per hour. After fume cupboards, the next major area to tackle would be long term storage freezer farms, which would require significant systemic change.

Action – AK to feed back further information on the dry heat autoclave and large volume steriliser tender.

The third objective was to increase reuse of materials and equipment across UoE labs. There were no associated targets, though there were reuse targets outwith labs. Members discussed recognising a Warpit Champion at the Sustainability Awards, and logging uptake numbers of the new reuse/resale policy.

Action – AA & AK to have a follow up discussion on how best to capture data for a potential target.

The final objective was to eliminate avoidable lab plastic waste by increasing options and awareness, measured via two targets: working with waste contractors to develop recycling/reuse streams for 10 new categories of lab plastic items by 2025; and 100% of labs following best practice in relation to reducing lab plastic waste.

Recommendations that were just tasks for the SRS Department would be carried over into SRS work streams, but would not be included in the Plan for this SLSG audience.

Members endorsed the proposed targets.

Action – All members to read through the actions and send their comments to AA.

Action – All members to feed in any notes or actions in their area for inclusion in the new Plan.

Action – All members to review proposed timescales and confirm if they were appropriate.

Members were asked to feed back within one month. Attendees could share the Plan within their teams, provided they emphasised that it was in draft form.

4 Lab Procurement - Equipment Re-use/Re-sale Process **D**

Members noted the finalised paper, approved by University Executive in September 2019. The Convenor thanked all members who worked on the process. The FAQ and equipment relocation flowchart were included for noting. While some additional guidance from Health & Safety was still outstanding, these considerations would not change the process.

UoE had been selling on unwanted equipment for quite some time, with an approach generally based on financial value, and including a CT scanner and laser vibrometer. The current process had not set a lower threshold, as this would depend on the resource needed. Various options for lower value kit had been considered, including a 'shop window' facility. Help to find a buyer was not currently offered, as those in possession of the equipment tended to have the best networks for resale. Feedback had already been received on the wording and what should be included, and a full scale review of the process was scheduled at the three year point.

5 Consultant Report on Equipment in Swann Building **E**

The Group noted this report from Andy Evans of Green Light Laboratories, an independent consultant specialising in lab equipment sustainability. The report had been commissioned to identify items of laboratory equipment suitable for replacement. The audit, carried out last summer, covered all benchtop lab equipment, ULTs and fume cupboards in the Swann Building. It identified seven ULT freezers in need of replacement. Fume cupboard alterations would be incorporated into Estates' wider work plans. Members recognised that a snapshot audit did not always get the best idea of actual usage. If benchtop autoclaves were being used for media bottle sterilisation, moving to microwave autoclave media bottle sterilisers would be recommended. Recommended for replacement with high efficiency models when they came to end of life were: -20 freezers, fridges, drying ovens, incubators, heater blocks, water baths and microbiological safety cabinets. Members noted that as Swann had an on-call system for alarms, there was less concern around replacing old freezer kit.

Action – AA to circulate a stand-alone copy of the report.

Action – AA to review user behaviour change recommendations to check if they were already integrated into Lab Awards criteria.

6 Freezer Fund Performance Summary **F**

SLSG noted this paper updating members on the financial and carbon performance of the ring-fenced sub-fund of UoE's Sustainable Campus Fund (SCF). The Freezer Fund had been running for three years, offering a maximum grant of £1,500 towards purchase

of new energy saving models. A lower amount was offered towards replacing -20s. The fund in general was not supportive of fleet expansion, but would offer an 'eco top-up'. £34K had been awarded to date, generating a total electricity cost saving of £10K and annual CO_2 savings of 32.6 tonnes. These figures were on the basis of the grant, not the total cost of the ULT.

As a good proportion of the 23 applications received to date were from repeat customers, members advised trying to promote the fund more widely. It was proposed that the Freezer Fund go further, by recommending a machine or range of machines. Procurement and SRS could arrange a ULT tender, provided there would be reasonable demand over the next four years. (As it would be below the £50K threshold, this could be via the three quote route). This would put a framework in place that could serve as a 'shop window'.

Action – AA & AK to take forward the freezer proposal.

Action – AK to look into framework options and report back.

7 Non-recyclable Plastics

This issue was moving up the agenda, with increasing numbers of staff and students wanting to know more about plastic waste and reuse. While UoE was working with its contractors and suppliers, there was no definitive list as yet of what could and could not be recycled. The University could not take on this recycling itself – there needed to be a market for it. Coordinated efforts across the sector would be required to consolidate supply and generate enough demand. Changeworks were not currently on the framework as they were not equipped to handle the quantity of waste produced. Terracycle had proved useful for certain waste streams. It was recommended that UoE find out what the NHS was doing, as they were expected to be leading on this issue, with developments then trickling down. In the meantime, UoE could look at what it was buying in order to try to produce less plastic waste, and consider making additional staffing resource available for wash up. A section could be added to the SRS website advising that the issue was being looked at and outlining the intricacies involved.

Members noted that there were potential procurement levers. Within the Life Sciences tender currently out for renewal, some of the suppliers had responded very positively to the University's sustainability agenda (with plastics as a focus item). Engagement with clinical waste contractors would be key. A lot of these companies were SMEs, and already on APUC frameworks, so were open to engaging on the issue. Different suppliers offered different sustainability options (such as take back schemes).

Action – AA to share output from the My Green Lab audit with the Group.

Action – KF to follow up with BIFFA on microplastics and feed back to the Group.

Action – All members to send any further comments to AA.

Action – AA & KF to review steps taken by the NHS and pharma companies and bring a paper to the next meeting on 12 May.

Action – JR to make this a standing item.

8 Technician Commitment update

Members recognised that a lot had been happening since the last meeting, with highlights including an apprenticeship celebration event at QMRI on 12 December, with Moira Whyte acting as the University's Technician Commitment Champion. Bringing in new technicians was vital to sustainability of skills. On 17 February UoE's Employer

Champion award would be presented at University Court. Members of SLSG had been invited to speak at the Edinburgh Managers event and would discuss the Technician Commitment. Full details were available on the technicians website.

9 Any Other Business

Life Sciences Tender
The Life Sciences framework was up for renewal, with 33 offers in (down 20 compared to the previous framework). The process would allow suppliers to join a dynamic purchasing system over the four years of the arrangement. It was not just a one shot opportunity, and suppliers were able to continue trying until they were successful. The Laboratory & Medical Equipment & Consumables Team Manager was reviewing the sustainability and community benefits side, which had met with a range of responses. Strong CB offers would be highlighted and taken forward.

Selling Equipment
An MRI machine at the Western General was being removed this weekend, following a three quote process. The saving would be recorded.

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B

Sustainable Labs Steering Group

12th May 2020

SLSG Programme Plan update (February 2020 – May 2020)

Description of paper

This document is intended to give an update on progress against the objectives of the 2017-20 Sustainable Laboratories Steering Group Programme, which was drawn up to provide a structured approach to improving sustainability within laboratories at the University of Edinburgh over that time period, with a view to achieving wider University goals such as the Zero by 2040 target within the Climate Strategy. A Gantt Chart using a traffic-light colouring system (Red/Amber/Green) has been used to communicate quickly and clearly the progress which has been or is being made. In general this is taken to mean: green = on track, amber = delayed or problematic, red = objective is in danger of not being met, and grey = action scheduled for future work. Further details on the progress against each individual action is included within a table. This document will be updated prior to each meeting of the Sustainable Laboratories Steering Group.

The purpose of this report is to report against progress in relation to activities with further thought on monitoring of outputs and outcomes to be considered. The outcome objectives of the 3 year plan are noted below.

The RAG grades and other comments within this paper give a provisional assessment of the likely outcomes. However, there is greater uncertainty than usual in this regard due to the impact of the novel coronavirus Covid19. This will be revised when the duration of lockdown and the financial impact on the University becomes clearer.

This is the final report to the SLSG of progress against the 2016-2020 plan, as there are no further SLSG meetings planned until September 2020, after the end of the current plan. As such, an overall RAG grade is given to the outcome objectives as well as the individual project lines.

Action requested

SLSG is asked to note the progress described in this paper and provide any advice or guidance for further improvement.

Background and context

At the October 2017 meeting of the SLSG this 2017-2020 programme plan was presented and approved. This report notes the progress against this 3-year plan.

Outcome objectives:

Objective		Comments	RAG
1	10% reduction in energy consumption.	Overall, it is unknown if this objective has been achieved. Labs across the University have made good use of the Sustainable Campus Fund to reduce operational energy consumption. Data for energy consumption trends 2016-2020 is not yet available at the University-wide scale, let alone for 'lab buildings'. The vast majority of projects/activities related to this objective are graded green, so it is possible that energy consumption has reduced. However, there are many factors which may mean that energy consumption in University of Edinburgh labs has increased, not least the increase in floor area and the increase in activity/intensity of use of labs.	
2	Lab equipment reuse and sharing increased.	Overall it is considered that this objective has been achieved. Lab items are more frequently available on the University's equipment reuse and sharing website now than in 2016.	
3	Reduced consumption of materials, especially hazardous materials.	Overall it is considered that this objective has not been achieved, but that there is not substantial unnecessary waste. For further information please read the paper on Hazardous Chemicals presented later at this meeting.	
4	Enable culture of sustainable working through provision of support and training for lab technicians.	Overall this objective is considered to have been achieved. Since 2016 the University of Edinburgh has signed up to the Technician Commitment, has become recognised as an Employer Champion by the Science Council, and now has an active and engaged Technician Steering Committee operating centrally, as well as localised TechNet groups. More	

		information can be found on the website: https://www.ed.ac.uk/technicians	
5	Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	Overall, this objective is considered to have been achieved, (see caveats below) Progress was slow and adoption of the new standards is only just beginning in a small number of projects.	
6	100% of labs covered by Edinburgh Sustainability Awards teams.	Overall, this objective has not been achieved. Good progress has been made in attracting new teams to the awards, but we currently have a lab awards team in 54% of lab buildings. Some of these awards teams may not cover the whole building.	
7	By 2020 every building with labs will have an energy coordinator who is lab-based.	Overall, this objective has not been achieved. Good progress has been made in recruiting Energy Coordinators, and, since September 2019, Sustainability Champions, but only 70% of lab buildings have a Sustainability Champion. Based on self-reporting as whether they are lab-based or not, only 32% of buildings have a lab-based Sustainability Champion.	

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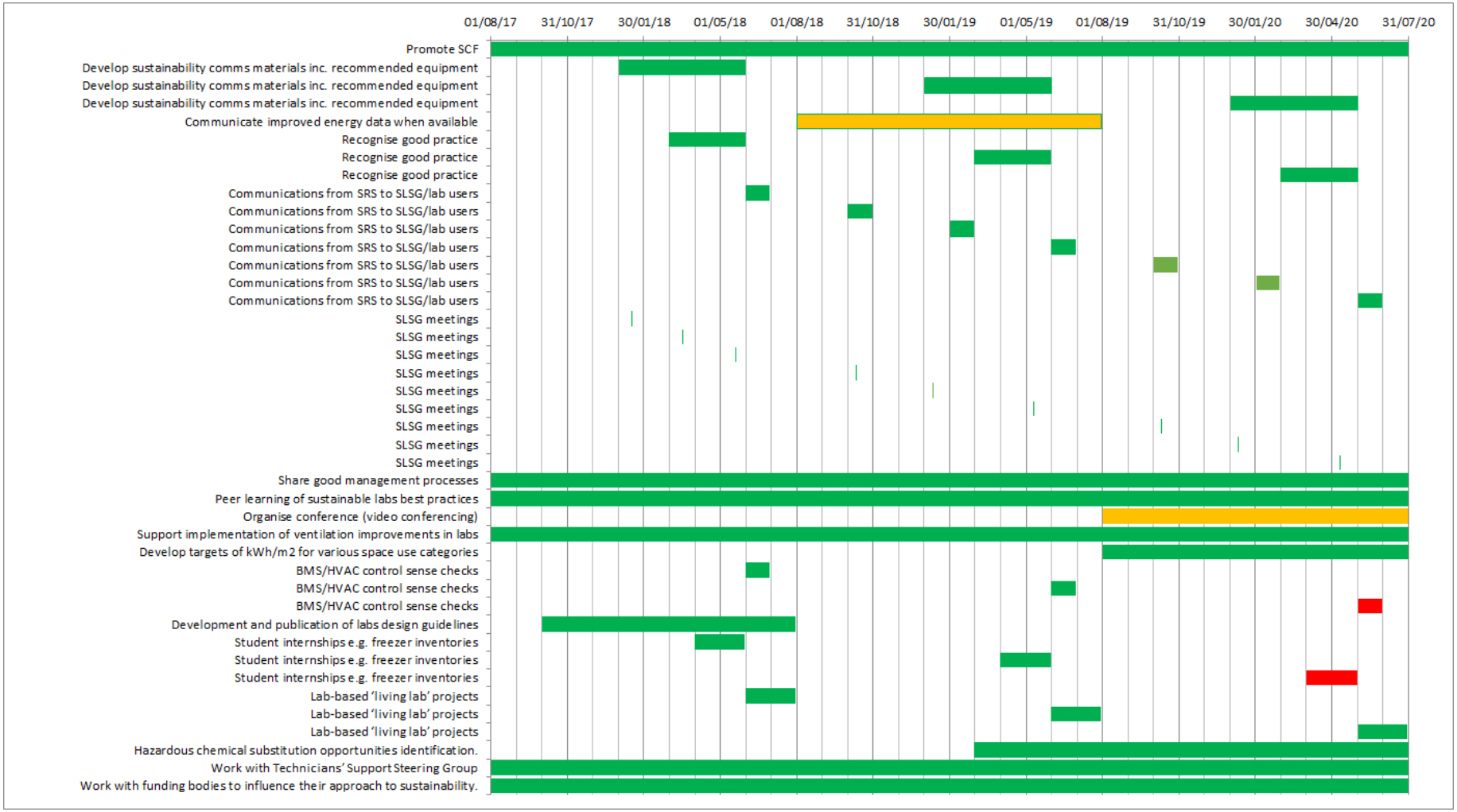
RAG Progress Reporting



Communications and Engagement

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Promote use of the Sustainable Campus Fund	1. 10% reduction in energy consumption 3. Reduced consumption of materials, especially hazardous materials	• Robert MacGregor • Energy Office • Estates Small Works Team	• Emails sent promoting the fund • Verbal communications with colleagues, including via Sustainability Awards teams • 33% of funded SCF projects are lab projects	
Develop further sustainability communications materials for use by non-SRS staff including persuasive body of evidence to influence academics and lab users, as well as lists of recommended items of lab equipment (based on verified sustainability credentials)	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.	• Lab Users	• Research (living labs) into effective communication methods (e.g. energy monitoring) will feed into this • Presented a webinar on lab sustainability for 26 live attendees, and published the recording on our website for those who could not attend (around 40 signed up). • Shared a list of take-back schemes identified by Oxford University • Presented on lab sustainability at Edinburgh Manager launch event	
Work with lab users/building managers to make use of improved energy data (when available) – e.g.	1. 10% reduction in energy consumption	• Energy Office • Lab Users	• Improved metering data has not yet been made available, and is considered to be delayed • Where short term localised energy monitoring projects have been undertaken (e.g. HRB, IGMM and Roger Land) the energy data has	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
communicating the data, setting targets			been a useful communication and engagement tool • The energy monitoring project based in Ashworth commenced its baseline phase in early October 2019 and an engagement activity schedule was agreed with the lab manager. Engagement was due to begin in Feb 2020 but lack of initial interest in participation from lab users resulted in this being delayed. Another workshop date was being sought when the uncertainty around the COVID-19 pandemic and subsequent shutdown put these discussions on hold. Arranging engagement activities will be resumed on the reopening of the Ashworth building. • During the COVID-19 shutdown the project will now be gathering data on the energy consumption of the lab during a period where equipment should be shut down.	
Recognition of good practice via awards and/or other communications.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams	• Lab Users	• Nine teams actively took part in the Lab Awards in 2019-2020, with seven teams taking a break year and remaining accredited from last year • This includes five taking part in the Awards for the first time • 27 Buildings have lab awards teams (although not all teams cover a whole building) equating to around 54% of lab buildings participating or partially participating in the lab awards • The LEAF pilot will be running for a second year, with the SCRM Tissue Culture Awards team currently signed up to participate. Due to the	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
			COVID-19 shutdown, participation in LEAF is on hold, with the intention to resume when University buildings reopen.	
Regular communications between SRS and SLSG/lab users (e.g. newsletter or emails)			• Established communications via Technicians' Group • Regular communications via contacts lists, e.g. lab and/or building managers • All SLSG are encouraged to sign up to SRS newsletter for departmental news and events • Further sustainability committee has been established on a campus-wide basis at Little France • The publication of lab plastics guidance has generated new contacts and new activity, with some exciting pilot studies underway. • Communicated about a lab equipment repair company, and about a take-back scheme for Tespa lab benches	
SLSG meetings (strategic direction, project support and progress reporting)		• SLSG members	• Suitable scheduling of meetings is taking place • Attendance is good	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Share good management processes – e.g. equipment sharing	2. Lab equipment reuse and sharing increased	• Lab Users • SRS Comms • Waste Dept • Procurement Dept.	• Guidance on ventilation and cold storage good practice has been disseminated • Equipment reuse and resale process has now been approved and will be launched shortly • Promotion of equipment sharing is included within communications to Awards teams • Lab plastics and consumables guidance is being developed in collaboration with other UK HEIs and will be available before summer 2020.	
Peer learning of sustainable labs best practices (via awards, workshops, campus meetings) – including recruitment of awards teams and energy coordinators.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.	• Lab Users	• Award Audits were carried out in November 2019. Peer auditing allowed teams to share experience and learnings with other labs. • Some awards teams are recruiting additional teams • 76% of lab buildings have Sustainability Champion, based on recent analysis, however it is currently unknown if these Sustainability Champions are lab based **Energy Coordinators were replaced with Sustainability Champions in September 2019**	
Encourage and support organisation of a prestigious conference over video conferencing, potentially with		• Lab Users • Academics • Funders	• Proposed to Peter James for an S-Lab conference (no response yet) • Held a lab sustainability webinar with an international attendance on 23rd April – 26 attendees, positive feedback.	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
support from The Wellcome Trust				

Utilities, Waste and Carbon

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Support implementation of ventilation improvements in labs	1. 10% reduction in energy consumption.	• Health and Safety • Energy Office • Estates small works team	• Fume cupboards in 2 labs in Joseph Black Building have been converted to VAV with motion sensor controls for the sash, in the first phase of improvements • Post installation communications materials have been developed to provide guidance on correct fume hood use following the fume hood retrofit in the Joseph Black Building • Many practical projects are in development/implementation phases (e.g. Demand Based Ventilation, fume cupboard upgrades, ensuring efficient new fume cupboards in new labs, chemical store upgrades) • Estates have a long list of projects which they intend to undertake, spending c.£2.5m annually. This includes some ventilation work, including on Swann Building, Joseph Black Building and Christina Miller Building.	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Develop targets of kWh/m2 for various space use categories	5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Estates Development • Estates Operations • Contractors (Cundalls and Henry Gun-Why)	• The ESME tool (used as a checklist for design teams in Estates Development and minor works projects) incorporates the following statement: • "Total CO2 emissions target should be less than 15kgCO2/m²/yr. for regulated energy (EPC rating A) in new build and 22kgCO2/m²/yr. in refurbishments. We expect that the equivalent of 20kgCO2/m²/yr. and 27kgCO2/m²/yr. respectively will be achieved without renewables." • This is under review and may become more ambitious	
BMS/HVAC control sense checks programme extended to further lab spaces (incorporating checks of biohazard category activities)	1. 10% reduction in energy consumption.	• Energy Office (controls) • Lab Users	• Scheduled review during summer 2020 may not be appropriate as buildings will be in a lock-down mode due to COVID19.	
Engage with lab users on development and publication of labs design guidelines	5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Lab Users	• The new design standard, ESME, is being phased into building projects, including those which are currently in early RIBA stages.	

Living Labs projects

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Recruitment and implementation of student (paid) interns for freezer inventories and/or other laborious semi-skilled work.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials.	• Lab Users	• Due to COVID19 there probably will not be access to labs for a student intern in summer 2020	
Support lab-based 'living lab' sustainability projects (DNA, lighting, freezers)	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials.	• Lab Users • Estates	• Long-term cold storage project (-60, -70 and -80) is ongoing (expected publication 2020) • Energy efficient equipment replacements (SCF) are being monitored for actual energy performance • A lab in Roslin is trialling multiple actions to reduce lab plastic waste	
Hazardous chemical substitution opportunities identification.	3. Reduced consumption of materials, especially hazardous materials.	• Lab Users	• Cancelled. • Preliminary meetings and conversations have been held with key individuals in Chemistry teaching, Chemistry research, and Chemistry health and safety. Materials and web links regarding possible avenues for investigation have been shared.	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
			• A re-assessment of this project concludes that Chemistry is following an appropriate appraisal process for its use of hazardous materials, and as such the potential benefits from spending time on this project may be low. It is thus recommended to drop this project now in favour of spending time on other projects which have a more pressing need/opportunities for greater impacts.	

Technical Staff

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Work with Technicians' Support Steering Group to improve CPD, career development and community cohesion of technical staff.	4. Enable culture of sustainable working through provision of support and training for lab technicians.	• Technical Staff • Technical Managers • IAD • HR • Academics	• The Technician Steering Committee remains active, and is producing a weekly newsletter for technicians during lock-down • The Webinar mentioned previously was advertised to and attended by many technicians.	

Funders

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Work with funding bodies to influence their approach to sustainability.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 4. Enable culture of sustainable working through provision of support and training for lab technicians. 5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Lab Users	• SRS department personnel are involved in discussions with Wellcome Trust on a bilateral and multilateral (via the UK-wide Lab Efficiency Action Network) basis • Wellcome Trust now has a requirement about offsetting business travel emissions (they include guidance) • Director or SRS is on a steering committee developing the UKRI approach to sustainability	

Resource implications
No resource implications are related to reporting on progress against this plan. Implementation of the plan will have wider resource implications, which have been detailed elsewhere.

Risk Management
No risks associated with reporting on progress against this plan. No items on the plan are currently at risk of failure (red graded).

Equality & Diversity
No foreseen impacts.

Next steps/implications
A further progress report will be provided at the next SLSG meeting by the SRS Project Coordinator – Labs (or appropriate substitute). During that time further actions will be taken towards the outcome objectives of the plan.

Consultation
This document has been reviewed by:
Director – SRS
Head of Programmes – SRS
Engagement Manager – SRS

Further information
Author and Presenter
Andrew Arnott
SRS Projects Coordinator - Labs
Department for Social Responsibility and Sustainability
April 2020

Freedom of Information
This is an open paper.

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C

Sustainable Labs Steering Group

12th May 2020

SLSG Programme Plan proposal August 2020 – July 2025

Description of paper
This document is intended to show the final draft of the programme plan for 2020-2025. The final draft of the plan is based on workshops held at previous SLSG meetings in September and November 2019, and feedback from subsequent consultations with SLSG members.

Action requested
SLSG is asked to endorse the objectives, targets and actions described in this paper and to approve the final draft of the 2020-2025 programme plan.

Background and context
The existing SLSG programme plan runs to the end of July 2020. The SLSG were asked whether they believed there was value in continuing, and the response was that there is value in further SLSG activities continuing. This plan describes the proposed objectives, targets and actions.

Discussion

Summary of objectives and targets:

1. Good practice behaviours adopted across all labs
    a. TARGET 1: 100% of buildings with labs have at least one Lab Awards team by 2023
    b. TARGET 2: 100% of buildings with labs have a Sustainability Champion who works in or regularly with labs by 2023
    c. TARGET 3: Expand knowledge of good practice outwith key contacts and Sustainability Champions (as measured in biannual SRS staff and student surveys) by 2025
2. Funding is made available and used to support lab sustainability
    a. TARGET 4: Lab sustainability projects saving 500t CO2e annually implemented by 2023 (including ventilation/HVAC improvements in lab buildings)
3. Increase reuse of materials and equipment across University labs
4. Eliminate avoidable lab plastic waste through increasing options and increasing awareness
    a. TARGET 5: Develop new recycling/reuse streams for 10 lab plastic items by 2025
    b. TARGET 6: 100% of labs follow the best practices in relation to reducing lab plastic waste that are practicable in their lab by 2025

OBJECTIVE 1: Good practice behaviours are adopted across all labs

TARGET 1: 100% of buildings with labs have at least one Lab Awards team by 2023

Action	Responsible	Timescale
Schools mandate that all labs achieve at least Bronze in sustainability awards.	SRS and School management	December 2021
Lab-based PG students get credits for working on a lab sustainability awards team (as part of their skills training outside of the curriculum)	SRS and School management	December 2022
Develop an e-learning course specifically focussed on sustainable labs (as a spin-off from Be Sustainable)	SRS	July 2021
Review the Awards processes making the awards more appealing / less burdensome for participants.	SRS	February 2022

TARGET 2: 100% of buildings with labs have a Sustainability Coordinator who works in or regularly with labs by 2023

Action	Responsible	Timescale
Increase number of contacts/labs undertaking pilots to demonstrate that good practices are compatible with science Case studies to include details to contact the participants. Including information on costs, staff time, buy-in from management and practicalities	SRS Lab users	1 case study published each year (ideally on different topics).
Colleges mandate that each school with labs has an appointed/nominated Sustainability Leader who heads up a committee of Sustainability Champions and coordinates	SRS and College management	First Schools declare their decision by July 2021 50% of Schools declared by July 2022

sustainability actions across their School.		100% of Schools declared by December 2022
Sustainability Champions encouraged to work with neighbouring labs, helping to spread good practice and information	Lab Users, SRS	August 2021

TARGET 3: Expand knowledge of good practice outwith key contacts and Sustainability Champions (as measured in biannual SRS staff and student surveys) by 2025

Action	Responsible	Timescale
Publicise that the Sustainability Awards criteria is available to all lab users to inform good practice.	SRS	November 2020
Link communications about lab sustainability to academic research e.g. Horsfall Labs' work on complete life cycle analysis / Bio Technology and Circular Economy ('theme' within CSE) / Chemistry's work on global mineral scarcity/capacity	SRS with input from key academics and lab users	July 2022
Restrict procurement options/heavily promote better options	SRS and Procurement with input from lab users	July 2022
Undertake more face to face lab audits/advice visits to give targeted and personalised advice	SRS	3 new labs visited each year, with follow up advice and support provided where appropriate.
Identify the top 5 initiatives that labs are working on and develop into posters and other communications to prompt spread of good practice.	SRS	December 2021

OBJECTIVE 2: Cost effective lab sustainability improvement projects are identified, funded and implemented

TARGET 4: New lab sustainability projects implemented between August 2020 and July 2023 save 500t CO2e annually (including ventilation/HVAC improvements in lab buildings)

Action	Responsible	Timescale
Assess labs to optimise ventilation rates and controls, including night set-back	SRS, Estates, Lab users, H&S	Ongoing
Lab users are trained in ventilation risk assessment	H&S, Estates, Lab users	Ongoing
Pilot projects funded for novel approaches such as LILEE	SRS, Lab users, Estates	2 more pilots by 2023
Identify replicable actions which are cost effective, impactful and broadly relevant across labs.	SRS, Lab users, Estates	By February 2022
Roll out replicable actions identified (e.g. drying ovens)	SRS, Lab users, Estates	By July 2022
Work on ensuring the Sustainable Campus Fund is available until 2025	SRS, Estates	2025

OBJECTIVE 3: Increase reuse of lab materials and equipment

Action	Responsible	Timescale
Identify any gaps in the departments/Schools which use Warpit, and target these to increase participation	SRS	July 2021
Raise awareness of Warpit and promote external sale/donation with Lab managers/Stores/those with purchasing responsibilities	Procurement	July 2021
Provide greater clarity on what is and is not allowed on Warpit (e.g. plasticware and consumables can be included), processes and guidelines	SRS	December 2020
Provide more case studies of successful usage of WARPit, including savings.	SRS	March 2022

Adopt a policy requiring people to show evidence of trying to source from Warpit or 2nd hand before purchasing new equipment/resources.	Procurement	July 2022
Increase visibility of information about Warpit e.g. the main page of the Procurement website, clearly on SRS and Waste websites, and as a reminder box on SciQuest.	SRS, Waste and Procurement	July 2021

OBJECTIVE 4: Eliminate avoidable lab plastic waste

TARGET 5: Develop new recycling/reuse streams for 10 lab plastic items by 2025

Action	Responsible	Timescale
Attend a workshop bringing suppliers and waste contractors together to share challenges on both sides, and to prompt development of new lab plastics waste streams.	Procurement Waste SRS NHS EAUC ZWS	November 2021
Identify the most commonly used lab plastic items and confirm which plastic types they are.	SRS	July 2021

TARGET 6: 100% of labs follow the best practices in relation to reducing lab plastic waste that are practicable in their lab by 2025.

Action	Responsible	Timescale
Develop case studies on swapping to use re-usable instead of single-use lab items.	SRS	July 2021
Communicate to provide clarity on what can (and cannot) be recycled in a lab setting	SRS Waste Lab users	December 2021
If new recycling streams/recyclable items become available promote these options to lab users.	SRS Procurement Waste Lab users	July 2024

Work with labs to undertake trials/pilots to phase out non-recyclable / reusable plastics, and help designing experiments to reduce waste.	SRS Waste Lab users	2 labs undertake trials by July 2023
Share the findings of the trials/pilots	SRS	December 2023
Encourage labs to rethink the location of bins and consider allowing recycling bins in labs to facilitate ease of segregation	SRS Waste Lab users	July 2023

Resource implications
Implementation of the plan will have wider resource implications, for example draw-down on the Sustainable Campus Fund, but this has already been allocated.

Risk Management
The extend of the impact of the Covid19 crisis on timings and resource availability is currently estimated but unknown. Revenue reductions across the University and restrictions on working practices for lab users may have the effect of 'cooling' engagement with sustainability initiatives, making it harder to achieve some of the coverage and/or timescales described above. There is a risk that those identified as being responsible for some actions in 2020/2021 will not have capacity to support them. To mitigate this risk, timescales for likely affected actions have been amended to a later timeframe, but these timescales may need to be revisited at a later date.

Risks exist if lab ventilation is adjusted inappropriately, or if waste is segregated inappropriately, but for both of these actions advice will be sought from Health and Safety and Waste respectively and these areas will receive particular and careful consideration before any actions are implemented.

Additional risk exists if this plan were not produced, or not implemented, as lab sustainability forms a key aspect of achieving many of the University of Edinburgh's sustainability targets, including the target of Zero Carbon by 2040. Without this plan it is doubtful whether appropriate scale or direction of action would be taken in relation to lab sustainability.

Equality & Diversity
No foreseen impacts.

Next steps/implications
Following approval of this final draft by SLSG members, SRS will prepare to begin implementing the plan in August 2020, working alongside the key partners who share responsibility for actions in their area of expertise.

Consultation
This document has been reviewed by:

Dave Gorman, Director – SRS
Michelle Brown, Deputy Director and Head of Programmes – SRS
Chris Litwiniuk, Sustainability Innovation and Engagement Manager – SRS
Kate Fitzpatrick, Waste Manager – Estates
Julia Laidlaw, Senior Estate Development Manager – Estates
Brian McTeir, Easter Bush Facilities and Estates Liaison Manager – CMVM
Prof. David Gray, Head of School – SBS
Matthew Sharp, Operations Manager/Deputy Director – BVS
Stewart McKay, Facility Manager – IGMM
Lee Murphy, Genetics Core Manager – Wellcome Trust CRF

Further information

Authors and Presenters
Andrew Arnott and Rachael Barton SRS Projects Coordinators
Department for Social Responsibility and Sustainability
May 2020

Freedom of Information

This is an open paper.

THE UNIVERSITY of EDINBURGH

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Sustainable Labs Steering Group

12th May 2020

Hazardous Chemicals Substitution/Reduction Investigation

Description of paper
This paper describes the findings of an investigation into opportunities for hazardous chemical substitution or reduction. This paper is for information and discussion.

Action requested
SLSG is asked to note the contents of the paper and provide comment.

Recommendation
It is recommended that no further action be taken on the topic at the current time, as the sustainability benefits are not expected to warrant the time required.

Background and context
The 2016-2020 SLSG Implementation Plan included a project to investigate opportunities for substitution of higher hazard materials with lower risk alternatives, and to identify opportunities to reduce the volume of hazardous materials used.

The expectation was that sustainability benefits could be realised by reducing the use of highly hazardous materials, including:

- High hazard materials could have correspondingly high embedded carbon emissions from the extractive and manufacturing processes used in their production.
- They could also have negative health and social impacts on the communities around/involved in the extraction and manufacturing processes.
- In addition the waste produced in University of Edinburgh laboratories would be classified as ‘hazardous’ and consequently would require energy intensive processing during disposal.
- Finally, the health, safety and wellbeing of University of Edinburgh laboratory users working with highly hazardous materials would be at (a controlled) risk during handling/use of these materials.

It was assumed that the main use of highly hazardous materials was likely in the School of Chemistry, and so the initial investigation focused on that School. It is acknowledged that other schools do make use of highly hazardous materials (e.g. ionising radiation in medical equipment, carcinogenic use of Ethidium Bromide in some bio/medical processes, strong acids in geosciences).

It was determined that working with teaching labs would enable any single recommendation to have a larger impact than working with research labs, as experiments in teaching labs are replicated tens or even hundreds of times.

In early 2019 a desk-based literature review was undertaken and interviews were conducted with colleagues in the School of Chemistry, as well as communications with colleagues in the Department of Health and Safety.

Discussion

Desk based research

Initial desk-based research indicated that one of the more likely areas for success would be the replacement of hazardous solvents with low hazard solvents.

Chemistry's approach to, and barriers to reducing hazardous materials (from interviews with teaching and research staff)

1. Teaching practicals are meant to work. It would in theory be possible to run a practical where the course organisers didn't know whether it would work or not, but there would likely be negative feedback from the students.
2. Changing an experiment in teaching can often be very time consuming (even just working out if an alternative is possible) while trying to still achieve the learning outcomes
3. School of Chemistry researchers routinely try to make activities less hazardous – for Health & Safety improvements but also because it aids commercialisation of novel techniques.
4. Synthetic chemistry researchers may use high hazard materials in the early stages of a research project because they are trying to get something to work which has never been made to work before, so they need to use the most powerful inputs. They aim to avoid hazardous materials, but very often that's not possible.
    a. Once a researcher has proven the technique can work, they then refine it in the 'development phase', including reducing hazard level
5. Some Chemistry academics are working on substitutions of cheap/low hazard/common metals to replace expensive/hazardous/rare-earth metals
    a. Steve Thomas
    b. Michael Cowley
    c. Jenny Gardiner
6. Successful replacements already in place at University of Edinburgh School of Chemistry:
    a. Completely replaced an organo-metallic chemistry practical to avoid use of Mercury
    b. 3rd year lab replaced a compound as it was being made by the technicians and needed cyanide to make it
    c. School of Chemistry won't use pyrophoric (catches fire in contact with air) material in teaching labs.
7. There is a very important learning benefit for students (whether they are going on to PhD or into industry) from introducing the students to handling hazardous materials.

a. However this should not prevent a substitution campaign as even after a substantial substitution campaign there will probably still be sufficient techniques where substitution is not an option to maintain this learning outcome.

Main hazardous materials used in Chemistry Teaching

Discussion with health and safety advisers and teaching academics in the School of Chemistry provided some initial information on the main hazardous chemicals in the teaching labs:

- Strong acids (acute safety risk)
  - Sulphuric
  - Nitric
  - Hydrochloric
- Strong bases (acute safety risk)
  - Sodium hydroxide
  - Ammonia
  - Potassium hydroxide
- Solvents in general present a chronic (not acute) health risk
  - DCM – Dichloromethane (solvent) https://en.wikipedia.org/wiki/Dichloromethane
  - Acetone is used for washing up, and thus goes down the drain in relatively small quantities. It is volatile so is unlikely to persist in the environment for very long, so environmental impact is thought to be low. SEPA do not licence, monitor or otherwise control discharges from Chemistry.
    - The course lecturer would prefer to use Industrial Methylated Spirit

Research findings

Possible alternatives were identified via desk-based literature review:

- Strong acids[1]
  - Alumina support
    - fluorided silica-alumina catalysts, offer an alternative to using more hazardous catalysts in a number of chemical processes
    - Envirocat catalysts, provided by Contract Chemicals Ltd, are more environmentally friendly catalysts that have been used to replace hazardous substances in a variety of reactions.

[1] http://ehs.mit.edu/greenchem/

        - Lanthanide triflates, such as ytterbium triflate, and scandium triflates are water soluble catalysts that can be used to replace Lewis acid catalysts in many reactions.
        - Microwave irradiation has been increasingly used by both academia and industry to reduce reaction times from days to minutes. Reactions performed in a microwave batch reactor, for instance, can be constantly monitored, and temperature and pressure can be manually controlled, often leading to more complete reactions and higher product yields.
        - Montmorillonite clay catalysts, which are composed of octahedral and tetrahedral sheets of gibbsite and silicate, offer a safer and, in some cases, more effective alternative to using more hazardous acids in catalysing a number of chemical reactions
        - Solid acid catalysts can be used in the place of a number of hazardous strong acids traditionally used in chemical reactions.
        - Sulphated zirconia is a solid acid catalyst that can be used in a number of reactions to avoid the use of strong acids such as hydrofluoric acid and other strong Lewis acids.
- Strong Bases
    - Different forms of alumina support, such as fluorided silica-alumina catalysts, offer an alternative to using more hazardous catalysts in a number of chemical processes.
    - Envirocat catalysts, provided by Contract Chemicals Ltd, are more environmentally friendly catalysts that have been used to replace hazardous substances in a variety of reactions.
    - Microwave irradiation has been increasingly used by both academia and industry to reduce reaction times from days to minutes. Reactions performed in a microwave batch reactor, for instance, can be constantly monitored, and temperature and pressure can be manually controlled, often leading to more complete reactions and higher product yields.
    - Montmorillonite clay catalysts, which are composed of octahedral and tetrahedral sheets of gibbsite and silicate, offer a safer and, in some cases, more effective alternative to using more hazardous acids in catalysing a number of chemical reactions.
    - The use of hazardous chemicals can often be avoided without the addition of a reaction solvent in solventless or solvent-free reactions. Although a reactant may act as a solvent to still allow for a liquid reaction, other reactions can occur simply by crushing two solids together in the dry phase.
- Solvents:
    - Dichloromethane[2]
        - Benzotrifluoride (for alumina support)

[2] http://ehs.mit.edu/greenchem/

        - For catalytic systems
            - D-Limonene
            - Dibasic esters
            - Diethoxymethane
            - Ethanol
            - Ionic liquids
            - Lactate esters
            - Methyl soyate
            - Methyl tert-butyl ether
        - For microwave irradiation
            - N-methyl pyrrolidone
        - Polycarbonate synthesis without phosgene or theylene chloride
        - Solventless or solvent-free reactions
            - Supercritical CO2
            - Supercritical fluids
        - TEMPO systems
            - Vertec Gold
            - Water
    - ‘generic hazardous solvent’
        - See appendix 1

Conclusions

Teaching labs

Following the discussion with the teaching labs it was concluded that the use of high hazard materials was already quite thoroughly critiqued and that the approach taken to designing the practicals for the course was already cognisant of the need to avoid or reduce high hazard material use.

The above list of substitution options illustrates that there is rarely a direct replacement option where chemical x can replace chemical y. Instead chemicals a, b and c can all replace chemical y in different circumstances. Not all uses of a hazardous material are replicable with substitutions.

It has not been explored in detail here, but it is possible that some substitutions would have knock-on sustainability implications, for example increasing the energy inputs required to achieve the reaction.

Research labs

Contacts in research labs were identified in order to discuss hazardous chemical use in that setting. The hypothesis was that the research labs would, from time to time, use high hazard materials – higher hazard than would be acceptable in the teaching labs. This was found to be true, however the use of these materials would also likely

be less regular and less predictable, so implementation of any substitution plan or programme would be difficult as (unlike the teaching labs) the activity in the research labs would be constantly changing. Thus any recommendations to refine a technique may only be impactful for a short while, before the use of that technique was no longer needed. Many more different techniques and different materials would need to be analysed for substitution/reduction options than in a teaching lab. Risk assessments undertaken under standard operating procedures for these labs will already identify high hazard materials and ask the user to explain why that is the best available option.

Overall
In conclusion the School of Chemistry's practices are aligned with what we would recommend. They use hazardous materials sparingly and are cognisant (and act upon) of the need to minimise use of high hazard materials.

Resource implications

1. No initial resource implications from purely raising awareness of the desk-based findings.
2. There is a time-benefit from reducing SRS input into this process, on the understanding that Chemistry will continue to risk-assess and critique their processes to reduce hazard levels and volumes wherever possible.
3. If further study projects are undertaken either by University of Edinburgh staff or students there would be an accompanying cost for their time – this cost may be already factored in to departmental spend (e.g. as it has been within SRS over the course of this initial investigation) or it could be additional (e.g. a student summer project)

Risk Management
By definition the replacement of high hazard substances with lower hazard solvents should reduce risks, except under the following circumstances:

- Where additional energy (especially if in the form of heat) has to be added to the reaction in order to achieve the same functionality as was previously obtained using high hazard materials
- Where new experimental design has unintended and unexpected results (to alleviate this risk a thorough risk assessment should be undertaken by an appropriately knowledgeable and skilled individual prior to any change in practical experiments).

Equality & Diversity
There may be circumstances currently where vulnerable students or members of staff (for example pregnant women) are excluded (or self-exclude) from certain practicals or experimental practices on account of the hazardous materials involved. If this is the case, the reduction of hazard level should see an improvement in participation equality and diversity.

Next steps/implications

1. Further reading could produce more recommendations for substitutions, but this is a time consuming process with no guarantee of sustainability benefits. It is felt that the case-by-case approach of risk assessments at the School of Chemistry will deliver similar levels of substitutions and control of hazardous chemicals.
2. There is scope for a possible project for a Principal's Teaching Award Scheme funded summer student to identify specific substitutions and/or generate new practicals:
    a. E.g. 6 weeks for a Chemistry student between 3rd and 4th year.
3. Discuss implementation of some or all of the existing list of possible substitutions with course leaders in Chemistry
    a. Peter Kirsop
    b. Murray Low
    c. Carol Morrison
    d. Michael Seery (Director of teaching)
    e. Steve Thomas
    f. Michael Cowley
    g. Jenny Gardiner
4. One idea might be to get students to think about re-designing experiments/techniques in 4th/5th year. But this would run the risk of it taking a lot longer for the student to get to the end point of the learning outcome (learning and analysing the technique) when compared to the standard practical/lesson.

Consultation

School of Chemistry:
Dr Peter Kirsop, Senior Teaching Fellow
Isobel Easdale, Health and Safety Manager (School of Chemistry)
Prof. Jason Love, Professor of Molecular Inorganic Chemistry

SRS:
Chris Litwiniuk, Engagement Manager, SRS
Michelle Brown, Deputy Director and Head of Programmes, SRS
Dave Gorman, Director, SRS

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Further information

Author and Presenter
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Department for Social Responsibility and Sustainability
January 2020

Freedom of Information

This is an open paper.

Appendix 1: Options for substitution of hazardous chemicals, identified during desk-based literature review:

Solvents:

- Ethyl Lactate[3]
    - Commonly used in paints and coatings industry
    - Also used as a cleaner in the polyurethane industry
    - Replaces NMP, toluene, acetone and xylene.
- Supercritical CO2[4]
    - Good solvent
    - Also useful for heterocyclizations
- Polyethylene Glycols (PEGs)[5]
    - Wide range of molecular weights
    - Can also act as a catalyst
- Glycerol[6]
    - Potential for heterocyclic chemistry, especially combined with microwave irradiation.
    - Aza-Michael reactions[7]
    - Transfer hydrogenations[8]
    - Reductions of carbonyls[9]
- Gluconic acid aqueous solution[10]
    - Potential for heterocyclic chemistry, especially combined with microwave irradiation.
- The methyl ester of sunflower oil[11]
    - Used to extract astaxanthin from shrimp processing waste
    - Replacing hexane:isopropanol mix
- Water[12]
    - Diels-Alder reaction
    - Lacisen-rearrangements
    - Aldol reactions
    - Allylation reactions
    - Oxidation of alkenes
    - Aminohydroxylations
    - Cycloadditions
    - Clyclopropanations
    - Dihydroxylations
    - Epoxidations

[3] http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
[4] https://www.sciencedirect.com/science/article/pii/B9780128000700000050
[5] https://www.sciencedirect.com/science/article/pii/B9780128000700000050
[6] https://www.sciencedirect.com/science/article/pii/B9780128000700000050
[7] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[8] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[9] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[10] https://www.sciencedirect.com/science/article/pii/B9780128000700000050
[11] https://www.sciencedirect.com/science/article/pii/B9780444634283501132
[12] https://pubs.acs.org/doi/full/10.1021/cr010122p

    - Hydrogenations of alkenes
    - Claisen Rearrangement reactions[13]
- 2-methyl-tetrahydrofuarn (from bagasse)[14]
    - Organometallic reactions,
    - Extractions
    - PTC reactions
- DEM (from EtOH and formaldehyde)
- 1,3 Propane diol[15]
    - Prepared biologically from glycerol
    - Used for polymers
    - Can be a substitute for methyl cellosolve
- 1,2 Propane diol[16]
    - Used to form drug substances into drug products
    - Available in food grade
- DW-Therm, a mix of triethoxyalkylsilanes[17] with high BP (240degC)
    - thermal cyclization
- Perchloroethylene (PCE)
    - Problems from chronic exposure mainly
    - But PCE is non flammable
    - Alternatives for dry cleaning
        - Hydrocarbons
        - Volatile Methyl Siloxanes
        - Substituted Aliphatic glycol ethers
        - Liquid CO2
    - Risk: the alternatives are little studied, so may be harmful but it's not expected.
- Dichloromethane[18]
    - Benzotrifluoride (for alumina support)
    - For catalytic systems
        - D-Limonene
        - Dibasic esters
        - Diethoxymethane
        - Ethanol
        - Ionic liquids
        - Lactate esters
        - Methyl soyate
        - Methyl tert-butyl ether
    - For microwave irradiation
        - N-methyl pyrrolidone
    - Polycarbonate synthesis without phosgene or theylene chloride
    - Solventless or solvent-free reactions
        - Supercritical CO2

[13] https://pubs.acs.org/doi/pdf/10.1021/cr00022a004
[14] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[15] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[16] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[17] https://www.sciencedirect.com/science/article/pii/B9780123865373000058#s0035
[18] http://ehs.mit.edu/greenchem/

        - Supercritical fluids
    - TEMPO systems
        - Vertec Gold
        - Water
- 'generic hazardous solvent'
    - For Alumina Support
        - Aqueous surfactants
    - For catalytic systems
        - Cetyltrimethylammonium chloride
    - Computer programmes
        - D-limonene
        - Diacetone alcohol (DAA)
        - Dibasic Esters
        - Dimethyldodecylamine oxide
        - Ethanol
    - Flow Chemistry
        - Fluorous solvents
        - Gas-expanded liquids
    - Indium
        - Ionic liquids
        - Lactate esters
        - Methyl soyate
    - Microwave Irradiation
        - N-methyl pyrrolidone
    - Pervaporation
        - Poly(ethylene glycol)
    - Polymer Immodilised Solvents
        - Propylene Carbonate
        - Sodium dodecyl sulphate
    - Solventless or solvent free reactions
        - Supercritical CO2
        - Supercritical fluids
    - Supported liquid membranes
        - Tetrabutylammonium bromide
        - Vertec Gold
        - Water

Table 8. Drop-in solvents for synthesis.

Solvent	Problem	Replacement	Reference
Diethyl ether	Flammable, flash point = −40°C	Methyl *tert*-butyl ether	(*107*)
Benzene	Carcinogenic	Toluene	(*108*)
Carbon tetrachloride	Carcinogenic, ozone depleting	Cyclohexane	(*108*)
Chloroform	Explosive hazard with azides	Dimethoxy ethane	(*109*)
Dichloromethane	Suspected carcinogen, volatile	Benzotrifluoride	(*110*)

    - [19]

[19] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)

- Ionic Liquids. Seddon (112) showed that 1-ethyl-3-methyl imidazolium chloridealuminum (III) chlorides are ionic liquids at temperatures as low as -90°C. These non-volatile ionic liquids can solvate a wide range of organic reactions including oligomerisations, polymerizations, alkylations, and acylations (113).[20]
- A particularly effective solvent is n-octyl tetrahydrofurfuryl ether, which has been shown to be a satisfactory replacement for THF in a series of reactions in the synthesis of the human immunodeficiency virus (HIV) protease inhibitor Crixivan. A number of solvent switches and off-line recovery operations can potentially be avoided using this approach.[21]

- Phase transfer catalysis takes advantage of the solvating properties of biphasic systems. Reagents are solvated in the organic and aqueous phases and a phase transfer catalyst is used to bring them to react in the organic phase, as illustrated in Figure 5 (114). Aqueous alkali hydroxides can be used to replace flammable bases of sodium metal, sodium hydride, sodamide, and other alkoxides, whereas expensive anhydrous or aprotic organic solvents such as dimethylsulfoxide, dimethylformamide, and hexamethylphosphoramide can be replaced with dichloromethane, chloroform, hexane, and benzene. The reaction temperature is lowered while the reaction rate improves because the increased reactivity of anions in the nonpolar solvent. Reactions performed with phase transfer catalysts have been reviewed in several books (114-116), as have asymmetric phase transfer reactions (117).[22]

- Monflier showed that solvent-free telomeriztion of butadiene with water to form octadienols could be carried out effectively in the presence of a nonionic surfactant; the conventional process is performed in the solvent sulfolane (123).[23]

- For water-soluble reagents, catalytic reactions such as hydrogenations and hydroformylations may be carried out homogeneously in the aqueous phase with water-soluble ligands such as triphenylphosphinotrisulfonate (120).[24]

- Barbier-Grignard-type reactions in water (126) between allyl halides and carbonyl compounds can be mediated by metals of tin, zinc, or indium. Usually the generation of the organometallic reagent takes place in anhydrous organic solvents, but using softer metals allows this reaction to take place in water.[25]

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[20] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)
[21] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)
[22] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)
[23] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)
[24] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)
[25] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)

- The Shaw group has also shown that brominations are performed readily in water instead of in carbon tetrachloride (128).[26]
- more at this link: https://www.who.int/ifcs/documents/standingcommittee/substitution/solvents/en/

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https://www.bizngo.org/info/webinar-ken-gesier-chemicals-without-harm3142016

https://www.uml.edu/Research/Lowell-Center/Chemicals-Materials-Products/Alternatives-Assessment/Publications.aspx

https://www.turi.org/Our_Work/Research/Alternatives_Assessment/Examples

http://www.theic2.org/

https://www.who.int/ifcs/documents/standingcommittee/substitution/en/

https://www.who.int/ifcs/documents/standingcommittee/substitution/solvents/en/

https://www.who.int/ifcs/documents/standingcommittee/substitution/sulfuric/en/

https://www.who.int/ifcs/documents/standingcommittee/substitution/acids/en/

- Strong acids[27]
  - Alumina support
    - fluorided silica-alumina catalysts, offer an alternative to using more hazardous catalysts in a number of chemical processes
    - Envirocat catalysts, provided by Contract Chemicals Ltd, are more environmentally friendly catalysts that have been used to replace hazardous substances in a variety of reactions.
    - Lanthanide triflates, such as ytterbium triflate, and scandium triflates are water soluble catalysts that can be used to replace Lewis acid catalysts in many reactions.
    - Microwave irradiation has been increasingly used by both academia and industry to reduce reaction times from days to minutes. Reactions

[26] Sherman et al., "Solvent replacement for green processing" Environ Health Perspective 106(Suppl 1) :253-271 (1998)
[27] http://ehs.mit.edu/greenchem/

performed in a microwave batch reactor, for instance, can be constantly monitored, and temperature and pressure can be manually controlled, often leading to more complete reactions and higher product yields.
        - Montmorillonite clay catalysts, which are composed of octahedral and tetrahedral sheets of gibbsite and silicate, offer a safer and, in some cases, more effective alternative to using more hazardous acids in catalysing a number of chemical reactions
        - Solid acid catalysts can be used in the place of a number of hazardous strong acids traditionally used in chemical reactions.
        - Sulphated zirconia is a solid acid catalyst that can be used in a number of reactions to avoid the use of strong acids such as hydrofluoric acid and other strong Lewis acids.
- Strong Bases
    - Different forms of alumina support, such as fluorided silica-alumina catalysts, offer an alternative to using more hazardous catalysts in a number of chemical processes.
    - Envirocat catalysts, provided by Contract Chemicals Ltd, are more environmentally friendly catalysts that have been used to replace hazardous substances in a variety of reactions.
    - Microwave irradiation has been increasingly used by both academia and industry to reduce reaction times from days to minutes. Reactions performed in a microwave batch reactor, for instance, can be constantly monitored, and temperature and pressure can be manually controlled, often leading to more complete reactions and higher product yields.
    - Montmorillonite clay catalysts, which are composed of octahedral and tetrahedral sheets of gibbsite and silicate, offer a safer and, in some cases, more effective alternative to using more hazardous acids in catalysing a number of chemical reactions.
    - The use of hazardous chemicals can often be avoided without the addition of a reaction solvent in solventless or solvent-free reactions. Although a reactant may act as a solvent to still allow for a liquid reaction, other reactions can occur simply by crushing two solids together in the dry phase.
- Phenol (for biomedical research)[28]
    - Several companies now offer DNA extraction kits which can be used in the place of traditional DNA extraction methods to avoid the use of more hazardous substances and the generation of unnecessary wastes.
    - Traditional DNA extraction procedures can avoid the use of dangerous and hazardous chemicals by performing DNA extraction with polycarbonate filters.
    - Traditional DNA extraction procedures can be replaced by alternative processes such as DNA extraction with polyethylene glycol and simple salts.
    - Polyethylene glycol (PEG) is a water soluble solid that can be used as a recyclable solvent medium in the place of volatile organic compounds.
        - Pros
            - Non-volatile
            - Inexpensive
            - Low toxicity (approved for food industry)
        - Cons

[28] http://ehs.mit.edu/greenchem/

- Viscous liquid at room temperature for PEG of molecular weights 300 and 600
- Waxy solid for PEG 900, 1000, and 1500 which may become liquid under pressurized conditions (40°C at 90 bar)
- Terminal hydroxyl groups may be esterified or etherified
- PEG may be coextracted when using supercritical carbon dioxide, although PEG1500 is significantly less likely to be coextracted than the others

Appendix 2 – Notes on research lab substitutions

Discussion with Professor Jason Love, Chemistry (inorganic)

12th March 2019

Main area of interest: metal recycling and metal recovery from ores. Working on waste electronics.

He says the Dept of Chemistry is always trying to make things less hazardous – for H&S but also from the point of view that if you have developed a new technique/process and you want to commercialise it you will struggle to get industry to be interested in it if involves lots of hazardous materials.

That being said, there is a v important learning benefit (whether going on to PhD or industry) to introducing the students to handling hazardous materials – but there will probably be sufficient techniques where substitution is not an option that we are not in danger of ever getting to a point where Chemistry students don't handle haz mats.

He also said that, in the research side of things, you are trying to get something to work which has never been made to work before, so you use whatever you need to when you start. Aiming to avoid haz mats, but very often that's not possible. Once you have proven the technique can work, you then look about refining it, including reducing hazard level (Jason refers to this as the 'development phase').

Changing an experiment in teaching can often be very time consuming (even just working out if an alternative is possible) while trying to still achieve the same learning outcome.

Successful replacements:

- Completely replaced an organo-metallic chemistry practical to avoid use of Mercury
- 3rd year lab replaced a compound as it was being made by the technicians and needed cyanide to make it

One idea might be to get later-year students to think about re-designing experiments/techniques in 4th/5th year. But this would run the risk of it taking a lot longer for the student to get to the end point of the learning outcome (learning and analysing the technique) when compared to the standard practical/lesson.

Wouldn't use pyrophoric (catches fire in air) material in teaching labs.

Volume reduction instead of substitution?

- Could be opportunities. Speak to lab organisers:
    - Peter Kirsop
    - Murray Low(e)
    - Carol Morrison

    - Michael Seery (Director of teaching – specifically focuses on teaching and has a very good level of knowledge about redesigning courses)
- Possible project for a PTAS funded (UoE fund) summer student:
    - E.g. 6 weeks for a student who is at the gap between 3rd and 4th year.
    - Possibly too late to apply for this year
        - Do we (SRS) have cash for this?

Some Chemistry academics are working on substitutions of cheap/low haz/common metals to replace expensive/haz/rare-earth metals

- Steve Thomas
- Michael Cowley
- Jenny Gardiner

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Sustainable Laboratories Steering Group

12th May 2020

Performance of the Freezer Fund

Description of paper
This paper describes the financial and carbon performance of the Freezer Fund, a ring-fenced section of the University of Edinburgh's Sustainable Campus Fund

Action requested
SLSG is asked to note the performance.

Recommendation
It is recommended that the fund continue, as it performs well and provides a useful and impactful incentive to lab users to remove old inefficient freezers and replace them with energy saving equivalents. As well as an energy benefit, there is often a science benefit too, with more consistent and reliable temperatures and better racking/organisation making samples quicker and easier to find.

Background and context
The freezer fund was set up as a ring-fenced section of the Sustainable Campus Fund shortly after the fund was established in 2016.

Discussion (this section can be adapted as appropriate)
Using the Project Tracker spreadsheet the following analysis was produced using figures up to end of April 2020:

1. Total spend £40,298 (from SCF grants, not including the amounts spent by the recipients - we haven't been tracking this. For example we give a maximum grant of £1,500 per ULT freezer but we don't track if that freezer cost £6k or £9k)
2. Total annual electricity cost savings £12,490
3. Simple payback 3.8 years
4. Average NPV is £3,116
5. Average IRR is 30%
6. Average ROI is 299%
7. Total annual CO2e savings 37.6tonnes
8. Average £/tonne CO2e saving is £86
9. 27 applications have been received (mostly for a single ULT, two for a pair of ULTs, one for a single -20 freezer). Two applications (one for a pair of freezers) were an 'eco top up' for someone purchasing additional freezers, which obviously we try to discourage unless absolutely necessary.
10. More than half of all applications (18) have come from only 4 applicants (with 9, 4, 3 and 2 applications each)

Resource implications
The grants given (maximum £1,500) are relatively small, compared to the cost of the ULT (c.£6-9k). There has been a steady but not excessive increase in use of the fund over the past year or so. The usage of the fund is deemed to be within the capacity of the SCF to support.

Risk Management
Discontinuation of the freezer fund could risk reducing the number of new contacts SRS makes through this fund, as well as disincentivising engagement in wider SRS activities from existing contacts.

Equality & Diversity
No Equality and Diversity implications have been identified relating to this fund.

Next steps/implications
It is recommended the fund continue to be reviewed and 'topped up' as and when the ring-fenced funds are exhausted.

Consultation
The Deputy Director and Head of SRS Programmes has been consulted.

Further information
Author and Presenter
Andrew Arnott
Project Coordinator - Labs
Engagement Team
Department for SRS
05/05/20

Freedom of Information
This is an open paper.

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Sustainable Laboratories Steering Group

12th May 2020

Lab Plastic practices in NHS, Pharmaceutical Companies and H.E.

Description of paper

This paper describes the results of investigations into lab plastic waste reduction practices elsewhere by the Waste Manager, and the SRS Projects Coordinator for labs. The SLSG is asked to note the contents of this paper and provide advice and comment.

Action requested

The SLSG is asked to note the contents of this paper and provide advice and comment.

Volunteer labs are sought to take part in pilot studies to identify locally applicable opportunities for decontamination and reuse of lab plastics.

Recommendation

This investigation should continue, as far as is possible, during the COVID19 lockdown, acknowledging that this may limit progress. Once restrictions on movement and gatherings are lifted to a sufficient degree it is recommended that a large workshop meeting of Scottish producers of lab plastic waste (Universities, colleges, NHS, private sector, lab users, procurement, waste/sustainability staff) with lab plastic waste contractors should be explored – perhaps with an umbrella organisation like Environmental Association of Universities and Colleges, Zero Waste Scotland or Chartered Institute of Waste Management leading on this.

University of Edinburgh should also collaborate as far as possible with any ‘roadshow’ events run by NHS Lothian and Biffa.

Background and context

The University of Edinburgh’s Waste Strategy aims to eliminate ‘avoidable’ plastic waste by 2030. Investigations are required to ascertain which plastic wastes are feasibly avoidable in the laboratory environment currently. University of Edinburgh will also work to influence the sector to expand the amount of lab plastic waste which is avoidable (i.e. can be recycled or re-used).

SRCL “Stericycle” are the contractor for our clinical waste, while Biffa are the contractor for our recycling streams. Both are stakeholders in this project, as we are investigating the feasibility of moving items from clinical waste streams to recycling streams.

Stericycle currently provide the following services

1. Incineration in a combined heat and power plant for all waste types

2. Creation of Solid Recovered Fuel from orange bags (sterilised infectious waste which does not have contamination from chemicals, pharmaceutical or medical wastes). This Solid Recovered Fuel can then be used to generate energy from waste in appropriate plants.
3. They can also provide reusable sharps bins (currently sharps bins are incinerated) - this is currently not available to University of Edinburgh as we don't produce sufficient quantities of sharps waste.

Budget 2018 announced that the UK government will introduce a new tax on produced or imported plastic packaging. Subject to consultation, this will apply to all plastic packaging that doesn't include at least 30% recycled content[1]. As this is a tax on packaging there is no reason to expect that it won't apply to products being delivered to labs. Alongside the announcement of the tax was an announcement of a £20m fund to increase and improve plastic recycling in the UK. Though this is more likely to focus on domestic or catering plastics initially it indicates a direction of travel which may impact on lab products in future.

Discussion

It should be noted that progress has substantially slowed on this large and complicated topic during the COVID19 lockdown. As both waste contractors and NHS staff are key workers in this crisis, we have chosen to reduce our communications with them to allow them to deprioritise their work on this project and focus on the increased pressures related to the virus. In addition, the SRS Projects Coordinator for labs has had to reduce working hours in order to undertake childcare.

Progress which has been made thus far:

<u>NHS</u>

An initial meeting with the Head of Soft Facilities Management (including waste management) for NHS Lothian was held in January. This introductory meeting was used to learn good practices from NHS, and to ascertain the level of enthusiasm NHS Lothian may have for cooperating with University of Edinburgh on a joint project to develop practices in collaboration with our waste contractors to reduce lab plastic waste. NHS Lothian did not at that time have any good practices to share with us. The feedback from NHS Lothian was positive regarding collaboration, with our contact noting that staff in NHS are keen to reduce plastics as awareness and concern for this issue growing rapidly (as has been seen at University of Edinburgh and elsewhere in the wider public). Some further local contacts were offered, including the Site Services Manager in the Western General Hospital site who is already undertaking a waste analysis to identify further opportunities to divert waste streams into recycling.

[1] https://www.gov.uk/government/publications/single-use-plastics-budget-2018-brief

NHS Lothian were planning (prior to the COVID19 crisis) to run joint roadshow events with Biffa around their main sites in order to engage with the local staff, and take questions and answer expected requests for greater recycling facilities. This could also involve a walk-around where Biffa could look at the various waste streams in bins and recommend any diversions which could be made immediately.

It's important to note that, from the advice of our contact, NHS Lothian would never recommend an item be sent for recycling if it had ever been contaminated – even if it had been autoclaved or otherwise decontaminated. This position is currently in line with University of Edinburgh, but it's possible that in future University of Edinburgh, in collaboration with our waste contractors and lab users, may develop a more nuanced approach where some items are deemed to be recyclable after decontamination processes have been completed on site (such as autoclaving). Under this circumstance NHS and University of Edinburgh waste processes would not be aligned, which may cause some confusion on joint sites.

In terms of the barriers to increasing recycling, it was noted during our discussion that many lab plastics can technically be recycled (assuming they are clean, uncontaminated items), but the restriction is due to market forces. Currently it's not sufficiently profitable for our waste contractors to offer recycling for all plastics which are technically recyclable. Collaborating with neighbouring producers of lab plastic waste, especially the NHS, may enable us to make those services financially feasible through economies of scale, and/or optional additional waste services contracts which we pay an additional fee for.

Another way we can make recycling plastics more financially feasible is if we, as a University, purchase large amounts of recycled plastics, in order to increase the demand side of the supply:demand equation. One downside of this could be that items made from recycled plastics may be more difficult to recycle at the end of life, as the plastic quality degrades over subsequent cycles of recycling treatments.

Pharmaceuticals

Astrazeneca[2] changed the packaging for the packs they sent out for clinical trials. The old packs had 15kg of packaging waste, the new packs have reusable thermally insulating materials which the recipient sends back. They have a 98% returns rate. They are also taking action to reduce single use items in their catering and offices.

Pfizer[3] are likewise taking action to reduce single use items in their catering and offices.

[2] https://www.astrazeneca.com/sustainability/environmental-protection/waste-management.html
[3] https://www.pfizer.co.uk/environment-health-and-safety

GSK[4] have a target of zero waste to landfill by 2050, with interim target at 2020 of 50% reduction in haz and non-haz waste – it's not clear what actions they are taking in labs to achieve this.

Roche[5] take a number of actions on sustainability but mention very little about lab plastics.

Johnson and Johnson[6] are a founding member of the Healthcare Plastics Recycling Council "working with partners to promote and enable viable, safe and cost-effective recycling solutions to dramatically reduce the volume of plastics that hospitals send to the landfill." A quick look through their website[7] shows they are piloting trials of recycling plastics in hospital environments (currently seems to be USA based) – this could be a useful resource in future. Several case studies exist of local success stories – whether these are scaleable/transferrable to University of Edinburgh would require further investigation and analysis.

J&J also have a subsidiary company called Sterilmed[8] who reprocess single-use medical devices for re-use. This could be a useful site for purchasing items for University of Edinburgh.

Finally, J&J signed the New Plastics Economy Global Commitment in 2018, with targets for 2020 and 2025 "pledging to use more recycled materials in packaging; reduce reliance on the single-use model; and ensure that 100% of plastic packaging be reusable, recyclable or compostable by 2025."

Sanofi appear not to be doing anything in this area.

Merk[9] are replacing polystyrene packaging for non-thermal items with moulded recycled paper pulp. They are also providing solvents in a plastic bag within a cardboard box, which uses less plastic and less material than plastic bottles. Returnable stainless steel containers are also used instead of glass for bulk chromatography solvent packaging. Finally, they currently offer a biopharmaceutical produce take-back, sterilisation and recycling programme in the USA, which may be expanded to Europe.

Novartis have an aim to be 'plastic neutral' by 2030[10]

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[4] http://www.wfaa.eu/cms/wp-content/uploads/2017/06/1.Scott-Oram_2017_05_23_WFAA_GSK.pdf

[5] https://www.roche.com/sustainability/environment/recycling_and_waste_management.htm

[6] https://www.jnj.com/global-environmental-health/world-without-waste

[7] https://www.hprc.org/

[8] https://www.jnjmedicaldevices.com/en-US/service/reprocessing

[9] https://www.merckgroup.com/en/cr-report/2018/products/sustainable-products/packaging-and-recycling.html

[10] https://www.novartis.com/our-company/corporate-responsibility/environmental-sustainability/waste

Notes from other UK HE institutions

University of Bristol are recycling unsoiled autoclaved plastics from Cat 2 labs on a risk-assessed, lab-by-lab basis.

University of Birmingham are shredding plastic bottles, granulating and extruding it for use in 3D printers as a filament. The ARLI group (Alternative Resources for Low Impact) are also shredding plastic for use as insulation. The input plastic has to be PP, LDPE, PET (low melting point).

In addition, University of Birmingham are using 2B Scientific's service which takes back ice packs (from any manufacturer, not just their own brand) to reduce ice pack waste. Initial demand was too great, so the service was temporarily stopped, but has now restarted capping donations at 4 x 20kg boxes per month.

University of Birmingham also mentioned that Reagent Genie might provide a take-back scheme (ELISA genie, and Assay genie).

In England Fisher/VWR take back 2litre plastic bottles for re-use or recycling. The SRS Projects Coordinator for labs has not had time to ascertain if this is available at University of Edinburgh or not.

A lab in University of York[11] has been well publicised as having developed an in-house decontamination station where they soak items in a disinfectant overnight and then recycle the plastic.

Within University of Edinburgh a lab at the Roslin Institute is taking similar actions to decontaminate plastics for internal re-use (cascading down a hierarchy of sterility needs) and is running a pilot.

Resource implications

Everything discussed is still at very early stages, but the following resource implications are theoretically possible in future:

1. Increased cost of purchasing plastic items (for labs or non-labs) if we move in large scale to recycled items
2. Possible human resource requirement from Procurement relating to prioritising/encouraging procurement of items which our waste contractors have confirmed are recyclable.
3. Increased cost of waste services if we opt to pay a premium cost to make the recycling of more lab plastics financially feasible for our waste contractors
4. One-off costs (likely small, if at all) of hosting roadshows with NHS and Biffa
5. Staff time of the Waste Manager, and the SRS Projects Coordinator for labs (this is already costed-in to budgets, but of course time spent on this project is time not spent on other projects) in coordination of this project, and communications with waste contractors, lab users and lab plastics suppliers.

[11] https://environmentjournal.online/articles/how-scientists-are-recycling-tonnes-of-plastic-waste-from-labs/

6. Re-use of items internally has the potential to reduce demand for purchase of new lab plastic items, saving money
7. Some possible outcomes from this project may justify the need for more technical staff resource within laboratories in order to facilitate medium to large scale decontamination stations.
    a. This may also be a catalyst to develop centralised wash-up/decontamination/other common services across a broader area of the University of Edinburgh.

Risk Management

1. If decontamination process creation is not approached cautiously, and with sufficient interaction with Health and Safety, there could be a risk of items not being properly decontaminated prior to being handled by either University of Edinburgh or waste management contractor staff.
    a. To eliminate this risk all suggested actions will have to be approved by Health and Safety first, along with approval from the School or College.
    b. No over-arching University-wide process will be described, but rather each participating lab will be asked to develop locally appropriate processes in collaboration with local and/or corporate Health and Safety, local facilities management, and corporate waste management.
2. If not managed appropriately decontamination processes could be more environmentally damaging than the disposal of single-use items
    a. To manage this risk the normal sustainability advice of ensuring dishwashers and autoclaves are full prior to being used would be reiterated to those involved in decontamination, along with any other locally appropriate advice.
3. The re-use of improperly decontaminated plastic items could alter results of scientific studies
    a. Any site adopting re-use procedures will be asked to undertake trials and pilots to ensure their procedures are sufficiently sterile for their own needs. They will be advised that if in doubt, use a new item.
4. New recycled plastic items (if adopted) may be of a poorer quality of plastic than is required for some lab uses.
    a. Lab users will be asked to assess the items, ask manufacturers for information, and/or undertake their own trial to ensure the item is sufficient for their purposes.
    b. Lab users will be advised that if they are in doubt they should use a new virgin plastic item

Equality & Diversity

No equality and diversity impacts are anticipated from this project.

Next steps/implications

1. Continue desk based investigation into good practice elsewhere
2. Communicate remotely (if time allows) with NHS to further investigate their actions to date, and future plans, and identify opportunities for collaboration

3. Once COVID19 restrictions allow, attend a workshop for all stakeholders (including lab users) to identify opportunities to move items from clinical waste streams to plastic recycling waste streams in future.
4. Once COVID19 restrictions allow, work locally with lab users, H&S, and facilities management to develop local decontamination processes to allow re-use.

Consultation
This paper has been reviewed by:

Kate Fitzpatrick - Estates – Waste Manager
Dave Gorman – SRS – Director
Michelle Brown – SRS – Deputy Director
Chris Litwiniuk – SRS – Engagement Manager

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Freedom of Information
This paper is an open paper.