MANCHESTER 1824
The University of Manchester

Faculty of Biology, Medicine & Health

Environmental sustainability projects: a welcome addition to our portfolio of final year ('capstone') projects

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Dr. Ruth Grady – Senior Lecturer and Academic Lead for UG Final Year Projects
University of Manchester
School of Biological Sciences

Maggy Fostier

Ruth Grady

UoM Institute of Teaching and Learning conference
July 2025

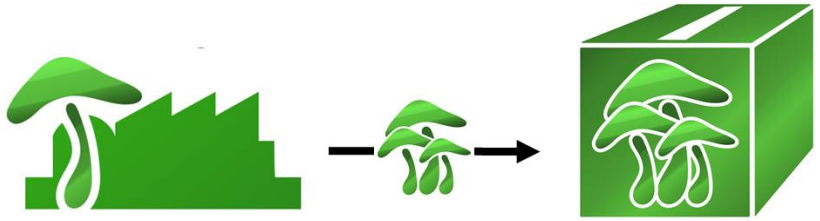
In the School of Biological Sciences, our current project portfolio can easily incorporate Environmental Sustainability topics

Science Communication (public)
Engaging UK public via social media on non bee pollinators in the UK

Science Communication: (education)
Engaging students in UoM and Malaysia with an e-learning package on sustainable palm oil

Enterprise:
Spin-off company based on mycelium technology

MycoTech



Fungal degradation of end of life plastics.

Sell mycelium as biomaterial for insulation, building material, packaging, and fashion.

Bioscience Stakeholder project:
Factors influencing rewilding eco-tourism in the UK?

But what about having student projects to advance our sustainable strategy?

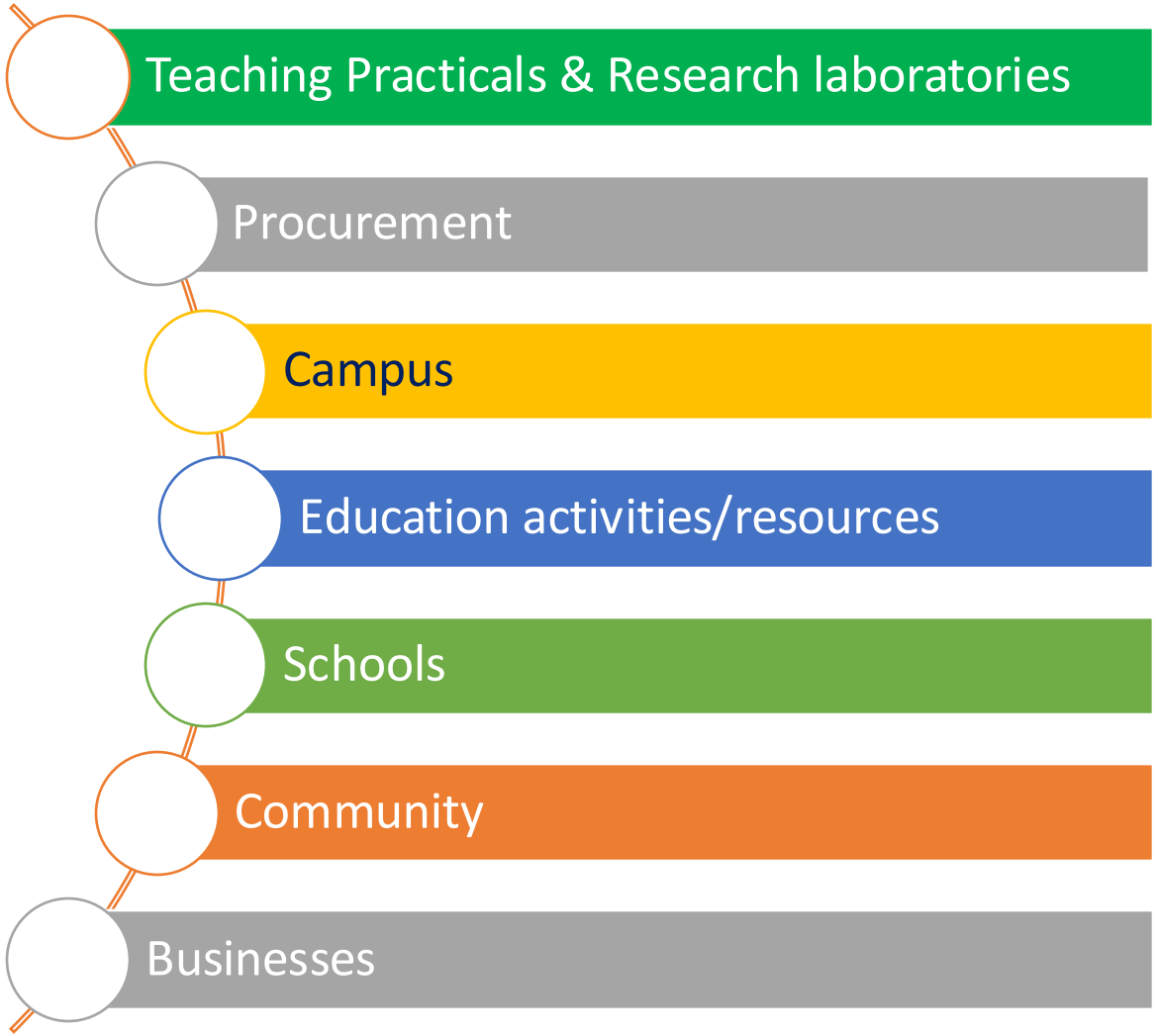
Green our operations and campus

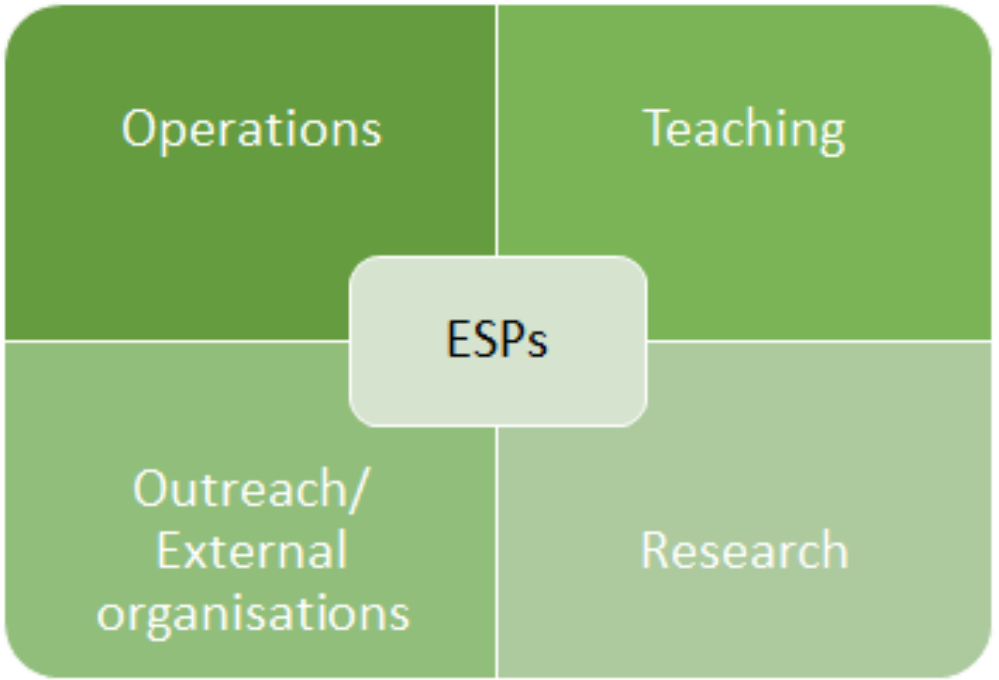
Engage campus users with our urban biodiversity

Create a more sustainable world by

- Educating and up-skilling our staff and students
- Educating and assisting those within our reach of influence

New: Environmental Sustainability Projects (ESP) are action-centered for any setting





21-22: pilot with 3 students, 22-23: 15 students, 23-24: 17 students, 24-25: 13 students

Themes so far:

- Greening labs
- Learning tools and fostering engagement
- Valuing nature (incl green prescription)

ESPs can involve a range of tasks

- **Audit/needs analysis** (questionnaire, observation, discussion, research)
- **Desk research** into the problem or existing solutions
- **Primary research** via emails, focus groups etc.
  - Define problem, explore solutions/path/barriers, monitor progress or estimate impact
  - Gather data or opinions from users, stakeholders, companies…
- **Intervention:** design or implement a campaign, event, information/education pack, operation procedure
- **Test a strategy** to improve sustainability (operation or lab)
- **Evaluate impact**: environment, cost, practicalities, acceptance, health benefit, compliance …
- **Evidenced recommendations** to improve sustainability, an intervention or for next st

6R to manage plastics sustainably

How the ESPs are run:

First Semester (wk 1-10)

- 8 min recorded PPT on a specific bioscience topic linked to the ESP title/area
- Submitted for feedback
- Live Q&A for 15 min to supervisor and moderator
- 'Understanding the Biosciences' mark awarded (15% of project mark)

Second semester (wk 1-10)

- Project work carried out (~ 8 weeks)
- Data analysed and presented as a 17-page report including reflection
- Report marked and moderated (75 % of project mark)
- Project performance mark returned by supervisor (10 % of unit mark)

Training	1. Introduction to sustainability	5. F2F campaigning actions on campus
	2. Circular economy	6. Environmental sustainability in the lab: LEAF and 6R 6. Online resources for the others.
	3. Psychological models of behavioural change	7. Measuring impact (C literacy, LCA, other)
	4. Campaigning, engaging and influencing	8. Conducting a project professionally, survey designs and data analysis

Examples

Our ESPs are already making a difference

LEGACY: Dissemination

- Blogs for the FBMH ES Good Newsletter (e.g. blog1, blog2, blog3),
- Presentations for the FBMH ES showcase
- Via 3 research publications

LEGACY: Helping the Faculty/UoM to be more sustainable

Helping us green the campus

- Eco-Campaign material and engagement
- Building blocks for new courses
- Labcoat reuse policy
- Green tips slides for the labs
- Material for green NHS
- Greening our labs

Biography of an ESP student for a career in Sustainability: blog

Helping us build a greener campus

Building a more biodiverse/blue campus

Jacob Spensley

Have you noticed nature on campus? blog:

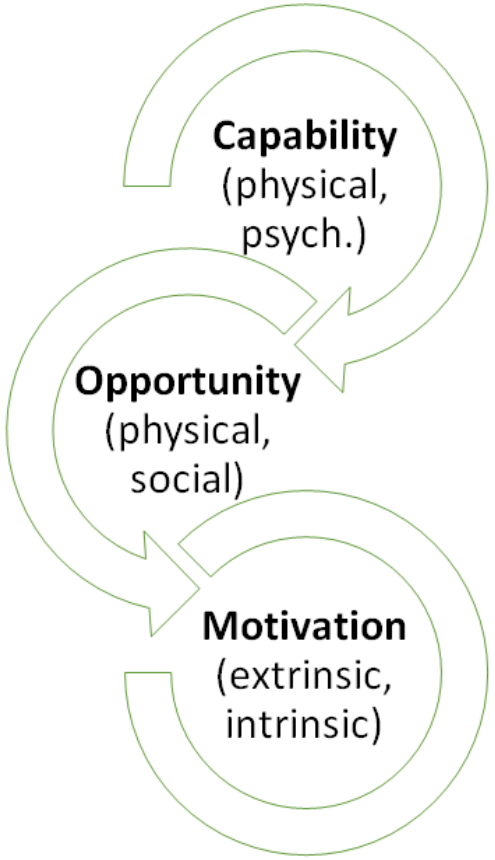
Freddy Crisp (middle)

Building a nature positive campus: blog

Audit current practices	Contextualise UoM audits, plan and strategy
Engage users	Campaign/blog to explain the value of biodiversity and ponds on campus
Key stake-holders' opinions	Interview UoM nature experts on best way forward and barriers + lessons learnt Survey students to determine knowledge and opinions

Promoting plant-based milk and diet

COM-B model for behaviour change



BLOG

Nathan Hudson (left)
Athena [Chi Lam] (center)

Outputs

10 blogs , 2 publications and one manuscript submitted

Impact of reducing single use plastics for a technique

FEATURE | MARCH 06 2025

Sustainable SDS-PAGE and Western blotting: cutting plastic, not corners *Biochem (Lond)* (2025) 47 (1): 3–8.

Calista Ow; Isobel Taylor-Hearn; Lydia Wunderley; Susan Taylor; Martin Pool; Maggy Fostier

https://doi.org/10.1042/bio_2025_106

Audit

Collating various practices

Energy considered when designing new experimental system

Adaptation at the Extremes of Life: Experimental Evolution with the Extremophile Archaeon Sulfolobus acidocaldarius

Al-Baqsami, Z., Palmer, R., Darwent, G., Mcbain, A., Knight, C. & Gifford, D., 14 Jun 2024, In: Journal of visualized experiments : JoVE. 208

10.3791/66271

User survey

Testing (experiment or operation)

Impact of reusing plastics in fly lab and reviewing biosafety protocol for waste stream (possible 75% reduction of C footprint)

Toward more sustainable research: reducing the environmental impact when working with *Drosophila*

Milo Challiner,[1,†] Saroj Saurya,[2,†] Sanjai Patel,[1] Jordan W. Raff,[2] Maggy Fostier,[1,*] Andreas Prokop [1,*]

https://doi.org/10.1093/genetics/iyaf114

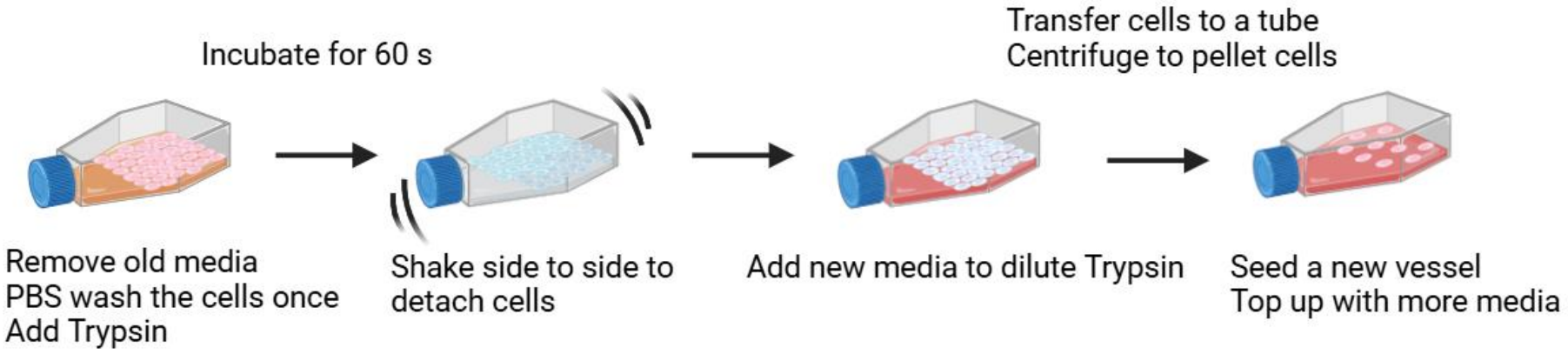
Impact calculation of various solutions

Ornella Trombetta
(23-24)

Student project = **How to green cell passaging?**

Cell passaging is the basic and most routine SOP in cell culture to **maintain cell lines**, therefore it is the **best place to start looking at green SOP**

Presented at the FBMS ES showcase in June 2024



Aim: Develop and test greener protocols for cell passaging, using the cell lines in BSL1 and BSL2, checking the impact on cell growth

- **By reducing plastic use**
- **By reducing FBS use**

LEAF AND 6R: MAKING SCIENCE SUSTAINABLE

Review
Reduce
Reuse
Refill
Replace
Recycle

Green your cell culture

Waste

Choose better consumables

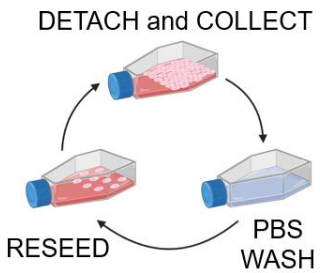
Switch to Pasteur or small volume serological pipets (1-2 mL) for Trypsin and Cryogenic fluid instead of 5 mL serological pipets.

Have an aspirator? Use dishes instead of flasks with the same surface area.

Protocols

Choose better practices

Strongly adherent cell lines don't need a centrifuge step and weak cell lines can use gentle **TrypLE**. Skip the centrifuge tube!



Reusing culture dishes and flasks (left) in consecutive passages of one cell line up does not pose risk of contamination, and saves money. Detach your cells properly, wash with PBS 2x, and seed the cells back in!

Similarly, you can place serological and Pasteur **pipets** in their original packaging and **reuse** them for the same reagent in the **same working session**. Then discard them!

Ethics

FBS is not the best

FBS manufacturers have shown **inconsistencies** with ethical standards, availability, contamination, and adulteration of batches. It is time to start thinking of a future without FBS.

Explore

Reduce FBS consumption

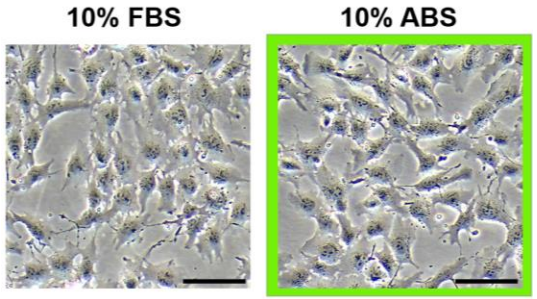
Reducing FBS from 10% to **5%** may be a viable option for your cell line. This was tested with HEK293 and RPE1. Why not give it a try?

Explore alternatives to FBS

Other bovine sera such as Adult bovine sera (ABS) have shown comparable performance to FBS. Why not try it for ¼ the price of FBS?

Explore

RPE1 cells cultured in FBS or ABS (right). Scale bar, 100 µm.



Watchout for literature validating other cost-effective alternatives such as **GroPro** human platelet lysate solution and **Chemically Defined Lipid Concentrate**!

New policy for labcoats management

Y1: Review environmental impact of our labcoat provision and explore better options.

Robert Musgrave
(22-23) - BSc Biology

Y2: Develop and pilot SOP for labcoat collection and laundry

Khoon Hwee Lee
(23-24). BSc Biotech

- Audit
- Collating various practices
- User survey
- Testing (operation)
- Campaign
- Impact calculation of old vs new solution

Annual savings via reusing 1800 labcoats, instead of buying new ones

£20,000	10 tons CO2 eq	5.5 millions L of clean and dirty water
166 kg pesticides	Less land degradation	

Type of ESP projects so far

Greening the labs

- assessing more sustainable laboratory products (less toxic or better environmental footprint),
- reducing energy consumption in labs (cold storage/incubation equipment),
- reducing plastics/consumables in labs and practicals
- Developing a calculator for estimating impact of actions in the lab
- improving the sustainability of student lab coats provision,
- increasing recycling compliance in labs and developing local rehoming network

Learning tools and engagement

- Forging a path for a greenwashing and eco-influencing short module/guide
- Exchanging on the impacts of climate change and eco-actions *in my country*.
- Establishing campaigns/events to engage students and staff with sustainability, recycling and 6R on campus or in schools, plant-based food options

Valuing nature

- Forging a path towards more biodiverse green or blue spaces on campus
- Exploring ways to engage students with biodiversity of campus.
- Exploring ways to increase the use of our green spaces for field studies or teaching and learning.
- Developing a guide for green prescription for practitioner and for users on campus

These projects equip students with knowledge and skills to address environmental issues; some projects help solving problems or making decisions and some help engaging students and staff.

Reflection and future plans

Benefits for us:

Internal impact: ESPs support

- the sustainability strategy of Faculty, University, NHS: i.e. projects to improve the sustainability of our campus and those within our reach.
- embedding sustainability in curriculum which is a requirement for Biology and healthcare courses
- disseminating the sustainability agenda to students and staff as we communicate outcomes → hopefully inspire
- establishing blueprint strategies which volunteers or staff can follow later.

External impact:

- Equips students for 21st century workplace – long term impact.
- Some training sessions can reused for other courses
  - Greener lab for masters, PhDs,
  - Greener NHS: supports clinic and quality improvement clinical placements.

Fits with other initiatives for authentic projects

Aspiring to 1 in 5 projects on ES

Academic driven

In the UK, every year, ~500,000 students complete an undergraduate degree and final year projects.

If 1 in 5 of these projects focused on climate and biodiversity (actions, adaptations, mitigations), there could be a significant impact.

See blog for more info

The Living Labs

Partners driven

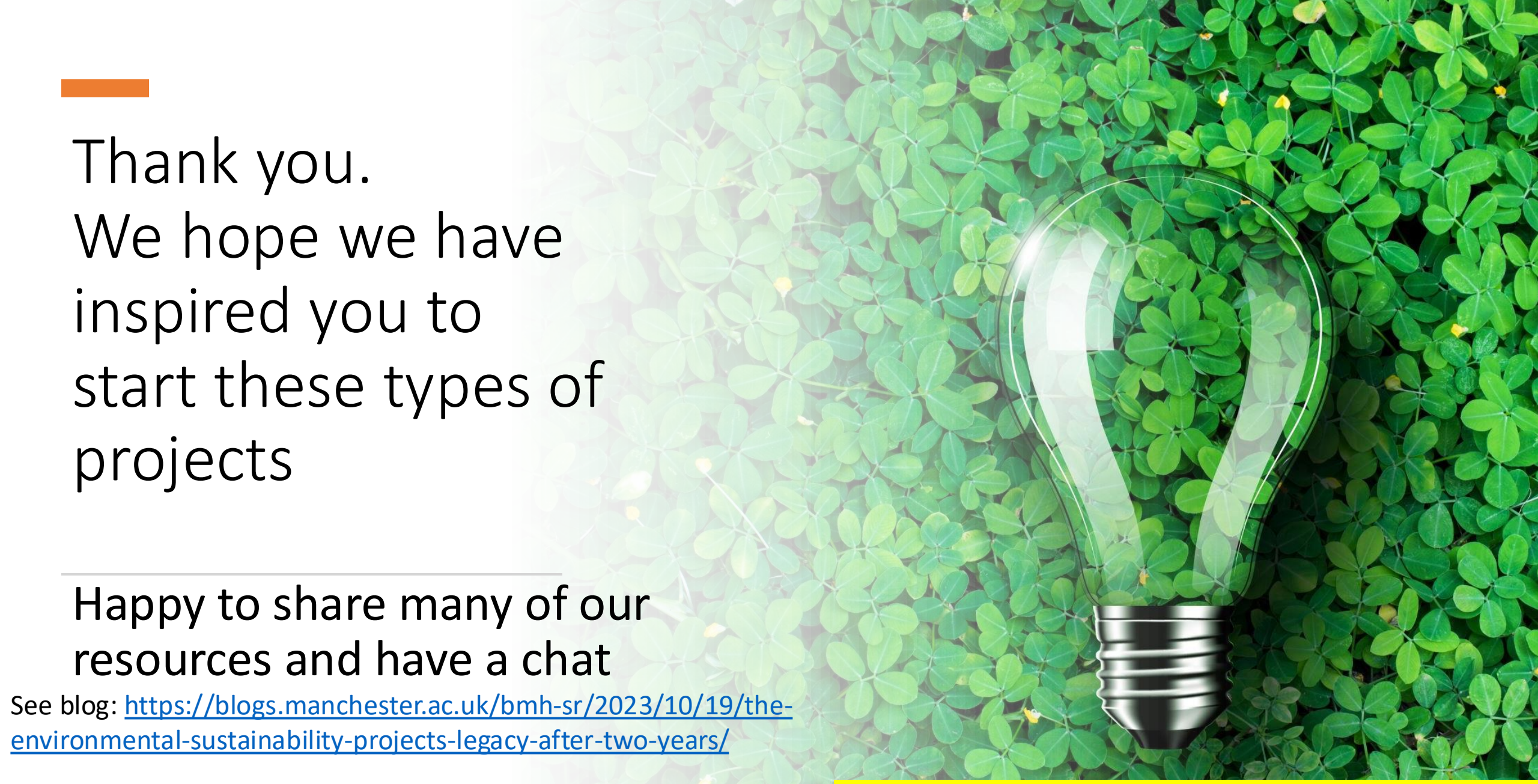
The University Living Lab helps to develop student research projects in partnership with external organisations, to help them meet their sustainability goals in line with the United Nation's Sustainable Development Goals (SDGs).

Challenges encountered for supervising ESP

- Recruiting supervisors to try something new
  - Support and staff training
- Development of student training is ongoing: responding to new project ideas
  - Students must be ready to embrace uncertainty/proactive
- Determining impact in the projects can be difficult
  - Using literature from different disciplines
- Supervisors are not experts in sustainability
  - Developing interdisciplinary contacts

- However ….. projects can be built on and improved each year

Thank you.
We hope we have inspired you to start these types of projects



Happy to share many of our resources and have a chat

See blog: https://blogs.manchester.ac.uk/bmh-sr/2023/10/19/the-environmental-sustainability-projects-legacy-after-two-years/

See FBMH ES Good Newsletters for more actions: https://blogs.manchester.ac.uk/bmh-sr/

The 6R guides to manage plastic sustainably at home and on campus, or in the labs

Student testimony

“I developed field research skills which I had never done before, as well as communication and project management skills”

“Overall, sustainability is becoming more important in or outside of the lab and in every sector, so understanding more about how to improve this is very useful for the future”