

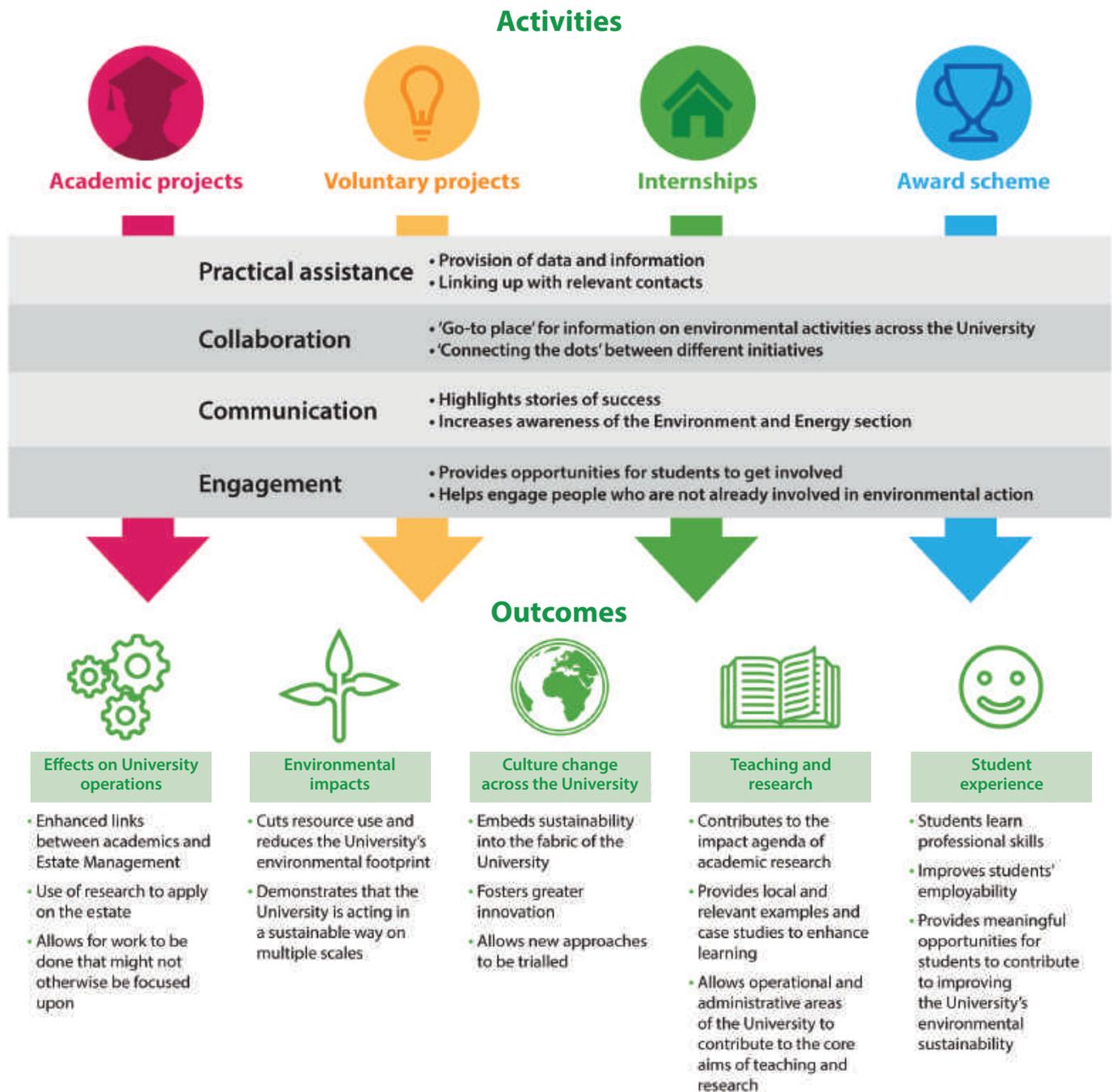
The Living Laboratory for Sustainability

Annual Report 2018–19



Overview

The Living Laboratory brings together students, academics and staff to test new ideas, apply research to practice, and develop new solutions for enhancing sustainability within the University. Students bring enthusiasm and ideas, academics bring world-renowned expertise and research, and staff bring practical advice and assistance, leading to more innovative interventions and effective results.



For more details on Living Lab projects please see the website:
www.environment.admin.cam.ac.uk/living-lab

2018/2019 Highlights

127 students involved,
including through
Engage for Change,
 and **34** staff
directly involved

"It's really a programme that keeps on giving, mostly in terms of intangible things like attitude and mindset and how you approach relationships with others – all things that you don't really get trained in specifically in a usual job but that are invaluable skills to cultivate as a working professional"

Izzy, Engage for Change Participant

7 (out of 9)     
areas of the University's
Environmental Sustainability Vision,
Policy and Strategy supported  

"Altogether, I've had a fantastic Summer working in Environment and Energy and would thoroughly recommend it to any students looking for experience in the field of environmental sustainability!"

Robyn Topper, transport intern

12  academic
projects
completed

6
internships
completed



45 
voluntary projects
supported,
including through
Engage for Change

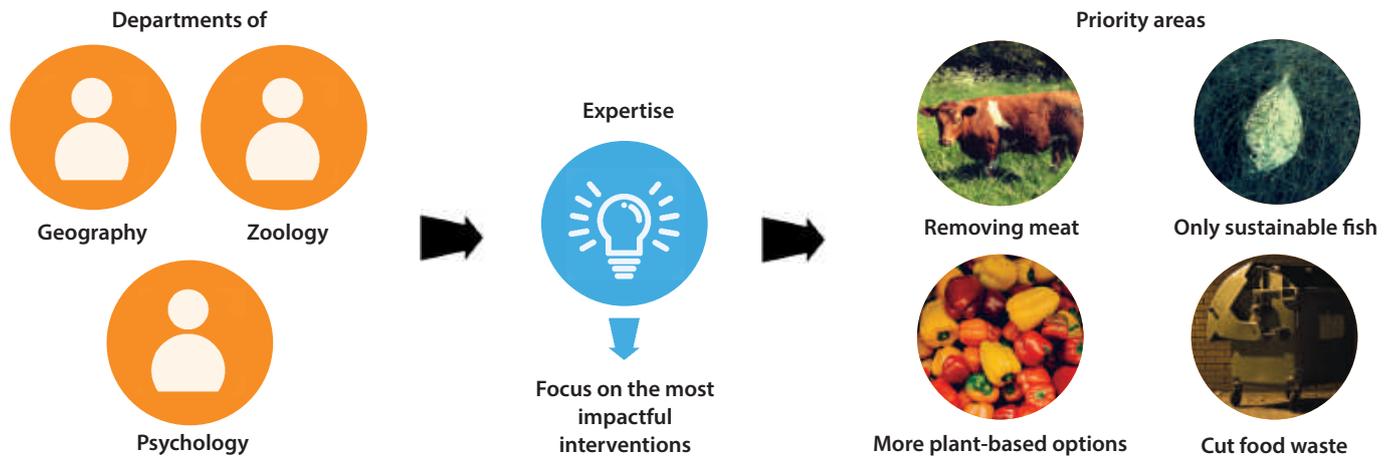
10
events
and
416
participants

Sustainable food

This year saw a review of the University’s Sustainable Food Policy (SFP). The Living Lab worked with academics and the University Catering Service (UCS) to measure the impact of the policy over the last two years and supported the initiation of several new academic projects on catering.

Seek academic input

Academics from four University departments were asked to review the SFP and make recommendations for improvements. These recommendations included measuring the impact of the policy using cutting-edge research, and making the switch from *reducing* ruminant meat to *removing* ruminant meat.



Link research and practice

Green warm glow

Lili Jia, a research fellow in the Institute for Manufacturing, has been working with UCS to develop an app aiming to reduce the use of single-use cups using the concept of “green warm glow” (people’s positive feelings about minimising their environmental impact).

Carbon labelling

Paul Lohmann, a PhD student in the Land Economy department has been working with UCS on a project to develop carbon footprint labelling for food in UCS cafés to get people thinking about the environmental impact of their food.

Collaborate and engage

#nobeef

The Living Lab worked with filmmaker Matthew Shribman as part of his #nobeef initiative. We provided a case study from UCS to show that dramatic reductions in ruminant meat can be successfully implemented in commercial operations.



Sustainable Food Marketing Assistant



Following on from measuring the impact of the Sustainable Food Policy UCS has gone on to develop a sustainable marketing strategy which is being implemented by a new Sustainable Food Marketing Assistant, Sophie Satchell.

Colleges Sustainable Food Policy

The success of the first version of the University’s SFP has led to the approval of the first SFP for Colleges by the Catering Managers Committee: www.environment.admin.cam.ac.uk/sustainable-food-colleges#

Benefits and outcomes

Sustainable Food Journey



Teaching and research

The review of the Sustainable Food Policy led to a project that assessed the impact that the policy has had so far. A recent Zoology graduate, Anya Doherty, carried out the data collection and analysis elements of this project.

The carbon and land use footprints for two comparable periods, before and after the policy was implemented, were calculated. These were based on the carbon conversion factors produced by Poore and Nemecek in their 2018 paper (Poore and Nemecek, 2018). Anya found a large reduction in carbon emissions between the two periods (see figures below). The large reduction in emissions were reported in a document developed by the Living Lab called the Sustainable Food Journey which was widely reported in the national press.



The review of the SFP also led to a number of changes in the policy, for example, switching from reducing to removing ruminant meat and an increased focus on reducing dairy.

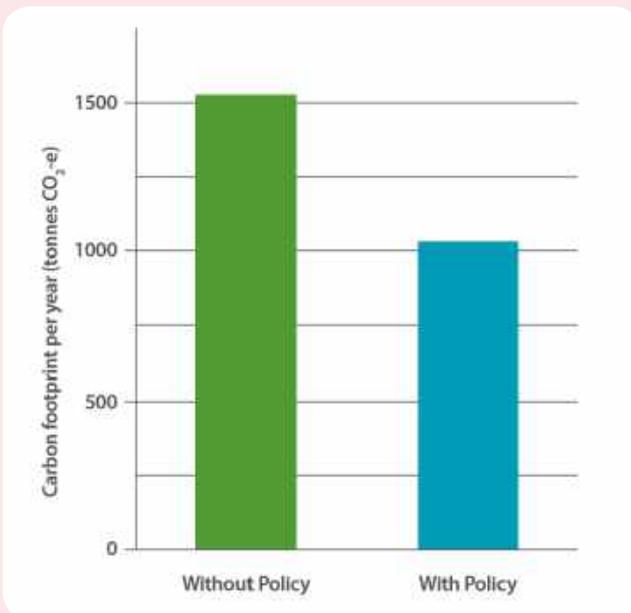


Figure 1. Projections of carbon footprint per year shown in tonnes comparing with and without the policy implementation.

	March-May 2015	March-May 2018	% Reduction
Overall Carbon Footprint of Food (tonnes)	287	257	10.5%
Overall Land Use of food (m per year)	434,102	414,107	5%
Kg CO ₂ per kg food purchased	4.78	3.22	33%
Land Use per kg food purchased	7.22	5.18	28%
Total food purchased (kgs)	60107	79863	

Figure 2. Overall carbon footprint and land use of food, proportional carbon footprint and land use per kg of food purchased and the total amount of food purchased during two time intervals before and after policy implementation.

Poore, J. and Nemecek, T. (2018) Reducing food's environmental impacts through products and consumers. *Science* 360 (6392). pp. 987–992.

University of Cambridge water bottles



Environmental impact

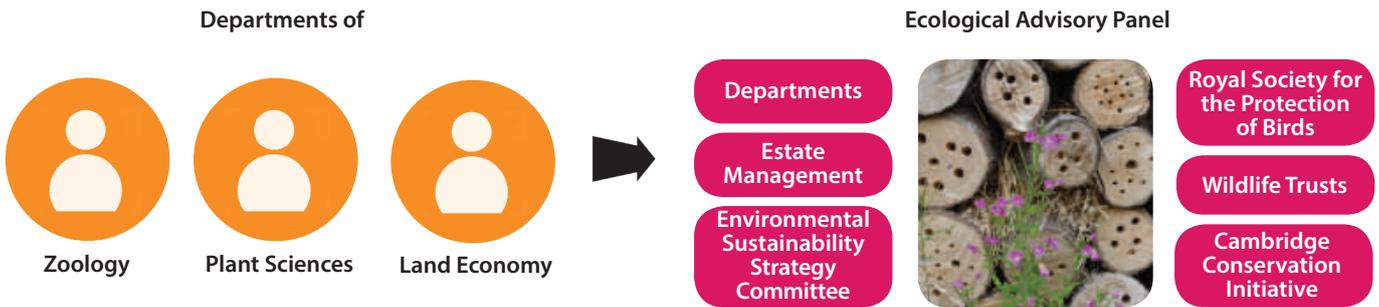
Francesca O'Hanlon, a PhD student from the Department of Engineering designed a new water bottle which went on sale in UCS cafés this year. The water bottles are made from bamboo and are sold at cost by UCS.



Biodiversity and ecosystems

The Living Lab is supporting the University's commitments on biodiversity and ecosystems through the Ecological Advisory Panel (EAP). In collaboration with the EAP, the Living Lab has produced a finalised biodiversity baseline and supported the ongoing development of the University's first Biodiversity Action Plan. The Living Lab has also supported a number of student projects and engagement activities.

Seek academic input



Link research and practice

Colonisation of new woodland from adjacent ancient woodland in Madingley, Cambridge

Zoology students, Mareinn Collins, Isobel Ollard and Alice Tilley, studied differences in abundance and species richness between Madingley wood and the recently replanted 800 wood. This can help us make future decisions about wood replanting for biodiversity.

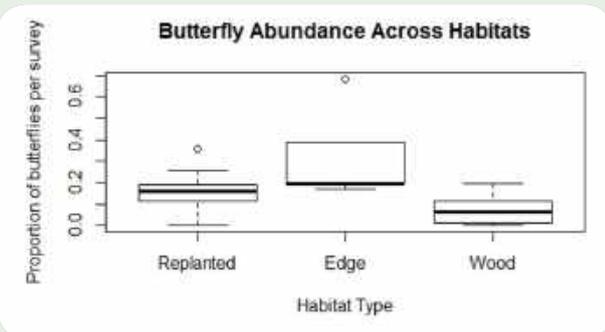


Figure 3. Distribution of butterflies across habitats. There was a significantly higher abundance in the 'edge' (between ancient woodland and replanted), than either of the other habitats (ANOVA and Tukey-HSD, $P < 0.05$). The difference in abundance between replanted and ancient woodland approached significance ($P = 0.052$).

Members of the Departments of Zoology and Plant Sciences provided advice on bee hives and mowing regimes.

Ash dieback disease in the 800 wood

Alistair Wilson from the Department of Plant Sciences studied genetic resistance to ash dieback in the 800 wood. He found no evidence that there is evidence for resistance to ash dieback. This result has subsequently been used in forestry management decisions about the 800 wood.

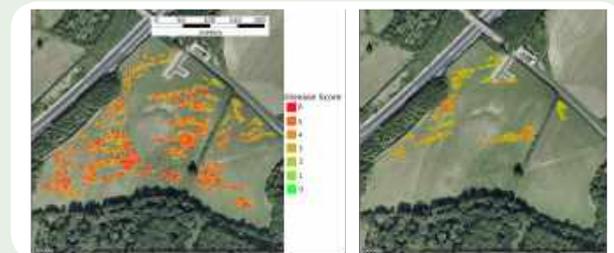


Figure 4. Map showing the locations of ash trees sampled in the 800 Wood in summer 2018, with associated disease score (see key) compared to previous data collected 2017/18 winter.

Biodiversity Baseline

The University's first Biodiversity Baseline Report was finalised this year. This covers our current state of biodiversity knowledge across the whole University estate.

Collaborate and engage

Gardeners' meeting

This year saw an inaugural gardeners meeting for wildlife. 32 gardeners from both the University and Colleges attended the meeting. This included a tour of the bee borders at the Cambridge University Botanic Garden along with talks from the Cambridge Natural History Society and the Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust.



Biodiversity engagement internship

Cécile Thiaucourt's project set out the ground work for a new biodiversity engagement competition scheme. The scheme aims to engage as many staff and students in biodiversity as possible, within our resources, and will create a supportive community for further work on biodiversity across the University.

"I can't stress enough how I enjoyed the internship with you."
 Cécile Thiaucourt

Social Innovation Programme project

A group of students, recruited by Cambridge Hub, identified a number of small-scale actions that University departments could take to improve biodiversity on their sites. This report was distributed to departmental Green Impact teams, some of whom implemented the student's recommendations funded by Environment and Energy's micro-grant scheme.

Benefits and outcomes

Greenwich House biodiversity project

The Greenwich House biodiversity trial had its first tangible success with one of the bat boxes installed as part of the trial being occupied by a bat. In addition, the planting of a wildflower meadow with advice from Cambridge University Botanic Garden has not only seen an anecdotal increase in invertebrate species on site, but also an improvement in staff well-being with 68% of staff reporting improved well-being in a recent survey.



Carbon and Energy Management

Link research and practice

Two students, Hari Chandrasakan and Petr Dolezal, from the Department of Engineering undertook a six week Undergraduate Research Opportunity Project (UROP) analysing the University's electricity and heat data. Their project aimed to gather and document all the metered data across campus within a single repository as time series data and went on to test and implement machine learning techniques to cluster, analyse and learn from the data. The final element of their project looked to link the time series data with the emerging university map to allow data to be visualised and analysed spatially. The project produced a number of visualisation outputs. The key outcome from the project was highlighting a number of clear directions for further research.

Rebecca Ward and Bryn Pickering from the Department of Engineering, both of whom worked

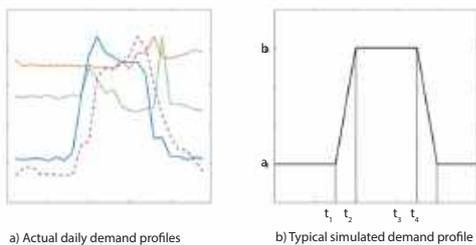


Figure 5. Plug load profiles a) monitored demand and b) typical profile assumed for simulation (O'Brien, Abdelaïm, and Gunay 2018).

in Living Lab Champion Ruchi Choudhary's research group, have submitted several research papers for publication based on University building management data. These papers have largely focussed on principle components analyses of energy demand within buildings.

Ward, RM. and Choudhary, R. and Heo, Y. and Aston, JAD. (2019) A data-centric bottom-up model for generation of stochastic internal load profiles based on space-use type. *Journal of Building Performance Simulation*, 12. pp. 620-636. ISSN 1940-1493

Waste management

Seek academic input

Mitigating the impact of laboratory expanded polystyrene (EPS) waste

Engineering student, Mick Grierson, investigated the effect of lab EPS on the environment in terms of greenhouse gas emissions. He found that on the Downing Site, one-time recycling could mitigate 1600kg/month of CO₂ and one-time reuse could mitigate 1400 kg/month of CO₂. As a result of Mick's report, Estate Management are planning to install a new polystyrene compaction machine on the New Museums Site.

The 'bin busting' study

The study has now been running for 15 years assessing recycling rate accuracy. It involves pulling the University's waste apart bit-by-bit and recording the contents. The University's waste contractor, Mick George Ltd, helped source six randomly-chosen bins from around the University's estate. A group of a dozen intrepid students and staff occupied a car park for one afternoon, donning safety suits and masks and sorting through waste from each of the bins, weighing the waste and recording it.



Travel

Link research and practice

Travel Internship

Robyn Topper's internship mapped University staff commutes by using Geographical Information Systems to analyse staff postcode data. She identified the most popular routes used to travel to work and went on to break this down by site to focus on site-specific characteristics of staff journeys. She then used travel survey data to estimate the spatial modal split between a variety of transport to work methods such as car use, cycling and bus travel. The maps produced from this work could go on to inform future decision making about, for example, improvements to cycle networks.



In 2018, one of our former Living Lab interns, Matt Ewen, carried out work to improve our data on the University's emissions from flights. This work made improvements to our approach, and highlighted areas where further improvements are needed to allow us to calculate these emissions accurately in future, which we are now seeking to implement.



Water management

Link research and practice

Felicia Chang's project looked at improving water conservation in laboratories across the University. Her project improved our understanding of how water is used in labs and made recommendations on how progress on water management can be accelerated. For example, by:

1. Improving engagement in high water use departments.
2. Improving infrastructure with more extensive metering and by collating existing information on water management systems across the University.
3. Replacing equipment like water condensers, rotary evaporators and autoclaves with more water efficient equivalents.
4. More accurate specification of water purification and provision systems at the planning stage.



Education for Sustainability

Link research and practice

Catrin Darsley's internship project aimed to identify how students are learning about sustainability in the existing undergraduate curriculum. Her project built on a previous set of curriculum audits, firstly by collecting a contact list of key stakeholders for education for sustainability from across the University, and then reviewing the results of the earlier audits through interviews. This data fed into a series of graphical representations, including a comparison across schools and an overall map of results. Architecture was the highest scoring tripos overall, followed by Economics, Geography and Manufacturing Engineering. Interestingly at school level, the school with the highest level of content was the School of Humanities and Social Sciences followed by the School of Physical Sciences.



Collaborate and engage

Engage for Change is a training programme, designed with and run through Cambridge Hub, where students build their engagement and advocacy skills. Students use these skills to design and trial sustainability interventions within their College or department. A pivotal part of the programme was creating a community to support peer learning. Within this community students worked together to identify what was working well and what could be improved in their projects. Through the programme students learned that each successful project was not just one action, but a series of actions and opportunities to learn and make improvements. Engage for Change has created a community of young environmental leaders who are knowledgeable in creating change, resilient and resourceful in project implementation and who support each other in making those changes.

This year Engage for Change ran every term, with 43 projects taking place. The projects were extremely varied and ranged from modelling predicting food waste trends through to lobbying Colleges to provide free mooncups for female students.



Michaelmas 2018 cohort

Benefits and outcomes



Student experience

"Engage for Change made me realize that I can truly make a difference in my community and influenced me to get more involved in trying to address the issues in the society around me. Furthermore, it gave me the necessary skills to address these issues when engaging with those around me."

Verner, PhD student, Engage for Change participant

Partnership and engagement

Cambridge Science Festival

At this year's Cambridge Science Festival the Living Lab ran a public engagement workshop on biodiversity. Members of the public were encouraged to think about how they interact with biodiversity in urban environments in their day to day lives through the medium of drawing.

Climate Forum

The Living Lab supported the annual student climate forum, attended by 150 students in February 2019. At this event the Living Lab also ran a lunchtime workshop encouraging forum participants to think about climate change solutions for every-day life.



Careers workshops

This was an exceptionally busy year for the careers workshop that the Living Lab facilitates in collaboration with the careers service and the Cambridge Institute for Sustainability Leadership.

The Michaelmas workshop was the first to be oversubscribed and had 45 attendees. The Lent workshop was also extremely well attended and received very positive feedback with 95% of attendees rating it as good or excellent.

"Hearing other people's perspectives was very inspiring as well as having structured time for introspection."

Student quote

Green Officer support

The Living Lab supported termly discussion groups and pre-term webinars for Green Officers to provide an opportunity for them to share knowledge and to help develop a supportive sense of community for these officers.

"I remember how useful the termly meetings with E&E were when I was the Green Officer"

Chloe Newbold

Spotlight on Energy

This month of activities focussed on energy usage and energy research around the University. The Living Lab arranged a lunchtime seminar for staff and students with three speakers who carry out different types of energy research. Rebecca Ward from the Department of Engineering, Cristina Peñasco from the Department of Politics and International Studies and Arfa Karani from the Department of Physics.



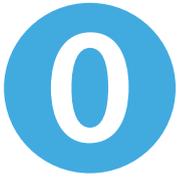
Work to Change the World Careers event

The Living Lab attended the Work to Change the World Careers event to advertise the internship programme and discussed sustainability careers with an additional 25 students.

Course inductions

The Living Lab gave a number of sustainability inductions across the Departments of Engineering and Zoology to introduce them to our work.

Future plans 2019/20



Cambridge Zero

The next year should be an exciting year for the Living Lab as the University launches its flagship initiative to solve climate change.



Carbon Challenge competition

This year's Carbon Challenge competition, in collaboration with Cambridge Zero, will be looking at how decarbonisation can be gameified. The focus will be on innovation and mentoring to get the best out of the teams that sign up.



Education and Research for Sustainability

The Living Lab will continue to develop its work on changing culture around sustainability in education and research.



Aviation

Last year Matt Ewen's internship looked at calculating our emissions from flights. The Living Lab will seek to develop this work this year working with researchers from the Psychology Department to investigate the potential for interventions to change behaviour.



Food

The Living Lab will continue to support the University's efforts to reduce its food related emissions. Upcoming work includes a vegan Michelin starred dinner for College fellows with talks from eminent academics and work to engage with the remaining University departments that run their own catering operations.

Acknowledgements

Thanks to all the students, staff and academics who have donated their energy and insights to the Living Lab in the past year. These are some of them...

