The Living Laboratory for Sustainability

Annual Report 2015-16

THE CAMBRIDGE *green* CHALLENGE
· *LIVING* LABORATORY ·

Contents

Overview

The Living Laboratory for Sustainability provides opportunities for students to help improve environmental sustainability across the University estate, through projects, internships and research. Funded by Santander, the project aims to enhance students' educational and practical experience, contribute to teaching and research, foster collaboration across the University and contribute to the University's efforts on environmental sustainability.

Activities

Academic projects | **Voluntary projects** | **Internships** | **Award scheme**

Practical assistance	• Provision of data and information • Linking up with relevant contacts
Collaboration	• 'Go-to place' for information on environmental activities across the University • 'Connecting the dots' between different initiatives
Communication	• Highlights stories of success • Increases awareness of the Environment and Energy section
Engagement	• Provides opportunities for students to get involved • Helps engage people who are not already involved in environmental action

Outcomes

Effects on University operations

- Enhanced links between academics and Estate Management
- Use of research to apply on the Estate
- Allows for work to be done that might not otherwise be focused upon

Environmental impacts

- Cuts resource use and reduces the University's environmental footprint
- Demonstrates that the University is acting in a sustainable way on multiple scales

Culture change across the University

- Embeds sustainability into the fabric of the University
- Fosters greater innovation
- Allows new approaches to be trialled

Teaching and research

- Contributes to the impact agenda of academic research
- Provides local and relevant examples and case studies to enhance learning
- Allows operational and administrative areas of the University to contribute to the core aims of teaching and research

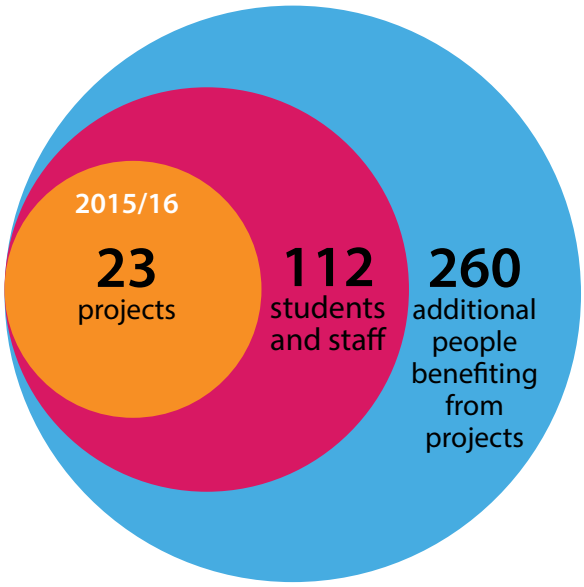
Student experience

- Students learn professional skills
- Improves students' employability
- Provides meaningful opportunities for students to contribute to improving the University's environmental sustainability

Over its first three years between October 2012 and September 2015, 43 projects were undertaken, involving 120 students and staff directly responsible for the projects, and reaching a further 300 people who benefited from the projects. Some of the outcomes of these projects were detailed in **last year's report** on pages 8-10.

In 2015/16, the level and rate of activity continues to grow – 23 projects have been undertaken, involving 112 students and supporting staff, and reaching a further 260 people (through attendance at events, involvement in activities initiated through Living Lab projects).

These projects are briefly described over the following pages under the four activity areas of the Living Lab.



Academic projects

Academic projects refer to any student project carried out as part of their course, degree or research, such as undergraduate dissertations, Masters' projects or PhD research, aiming to provide insights for improving the sustainability of the University. Below are some of the projects carried out in 2015/16.

Charlotte Airey

Third year undergraduate Architect student, from New Zealand.

Project: Charlotte carried out research on building adaptations at Cavendish II, home to the Department of Physics. This study investigated the advantages and disadvantages of design requirements in the Cavendish II in relation to adaptability and user requirements, and the longevity of the building. The report recommends adopting a long-term management strategy for building adaptation.

Results: The findings of this project have been sent to the design team and the user group for consideration as part of the development of Cavendish III. Charlotte's interviews with staff at the Cavendish have led to a more detailed recording all of the decisions being made for Cavendish III. This is so that when the next building has to be built they can go back to what has happened previously for informing what happens in another 30 years. On a personal level, Charlotte said the project resulted in her better understanding of qualitative analysis and interview techniques, as well as management of buildings used for scientific research.

University operations, Culture change, Student experience

Ele Brown

Fourth year undergraduate Engineering student, team leader for the student formula racing team.

Project: Ele investigated the impact that early decision making has had on the North West Cambridge (NWC) development's heat generation strategy and carbon emissions implications. This project recommended that the gas Combined Heat and Power (CHP) system which is part of the development should be replaced with a heat pump system at the earliest possible opportunity.

Results: These recommendations have been passed to the NWC development team and to the new contractors who are looking at next phase of the energy strategy. Ele achieved a first class mark for this project.

University operations, Teaching and research

Ramaraj Sundraraj

Fourth year undergraduate Engineering student, Scrabble enthusiast.

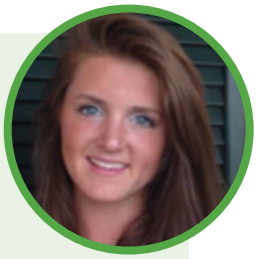
Project: Analysis of U-values (the effectiveness of materials as insulators), ventilation schemes and underfloor heating in an unoccupied classroom in the University of Cambridge Primary School.

Results: The report is being used by architects who designed the primary school as they are developing a proposal for energy monitoring and usage at the school.

University operations

Georgia Stewart (with Riya Patel and Gail Sucharitakul)

Second year undergraduate Natural Scientist students focused on Biology.



Project: They tested the use of three different 'nudges' (presentation of choices, altering people's behaviour without forbidding options or significantly changing things) in College formal hall booking systems. They sought to measure whether the use of these nudges increased the likelihood of a student booking a vegetarian meal. They concluded that the nudges they tested were not effective, and that stronger choice interventions are likely to be necessary to reduce meat consumption.

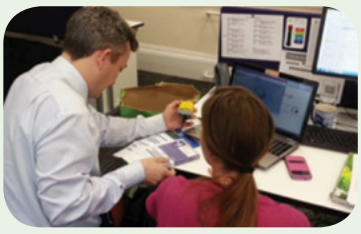
Results: These findings are feeding into a longer term PhD project investigating interventions to reduce the impact of food in diets, hopefully using the University's cafes and college dining halls as some of the case studies.

Culture change, Student experience

Nevena Nikolic

Fourth year undergraduate Engineering student, from Serbia.

Project: This project involved an investigation of the differences between a naturally ventilated (the Institute for Manufacturing) and mechanically ventilated (the Department of Materials Science and Metallurgy) building, focusing on air quality and thermal comfort of each building.



Results: This project concluded that naturally ventilated buildings may be a better solution than mechanically ventilated ones. This report will be sent to the relevant buildings managers to see if there are better ways of using the current ventilation systems in these buildings.

University operations

Focus on education

Tercia Jansen van Vuuren an MPhil student in Engineering for Sustainable Development, investigated the attitudes and perceptions of individuals across the project team to sustainability, using a construction site in Cambridge as a case study. Tercia learnt a lot about social sciences and qualitative research as she came from a technical background so this was all new. She is now working for a sustainability consultant in London where *"I will be able to put what I have learnt in the course of the year here in Cambridge into practice."*

Student experience

Focus on education

Kate Belford measured the temperature of students' rooms alongside a survey on thermal comfort and opinions on heating. Kate articulated how *"the project has made me see how small changes we can make in our own lives can have a difference"* and it was the first time she had used statistics to apply to a real life context.

Culture change, Student experience

Focus on education

Pritesh Hiralal ran a course on design and simulation of photovoltaics on building rooves, using University buildings as case studies, for the third year running.

"We're very happy because the students are a lot more excited and they have learned a skill that's actually applicable to the real world. Different companies designing solar installations would use the same software that the students are using at the moment to design installations here".

Teaching and research

Outcomes in 2015/16 from academic projects in previous years

The literature review (compiled by **Dana Boyer** in 2013/14 as part of her dissertation) on how vegetation can act as a tool to address psychological and social wellbeing has been used for proving the benefit of having plants indoors, informing the addition of plants within the new Greenwich House offices in the University.

Outcome

Teaching and research

Projects carried out by three undergraduate Engineering students (**Bryn Pickering, Viktor Byström** and **Si Min Lee**) in 2013-14 have been synthesised into an academic paper. This paper was presented at the World Symposium on Sustainable Development at Universities (WS-SD-U-2016), held at the Massachusetts Institute of Technology (MIT) in September 2016, and has since been published in the Handbook of Theory and Practice of Sustainable Development in Higher Education Volume 1, **available here**.

Outcome

Teaching and research

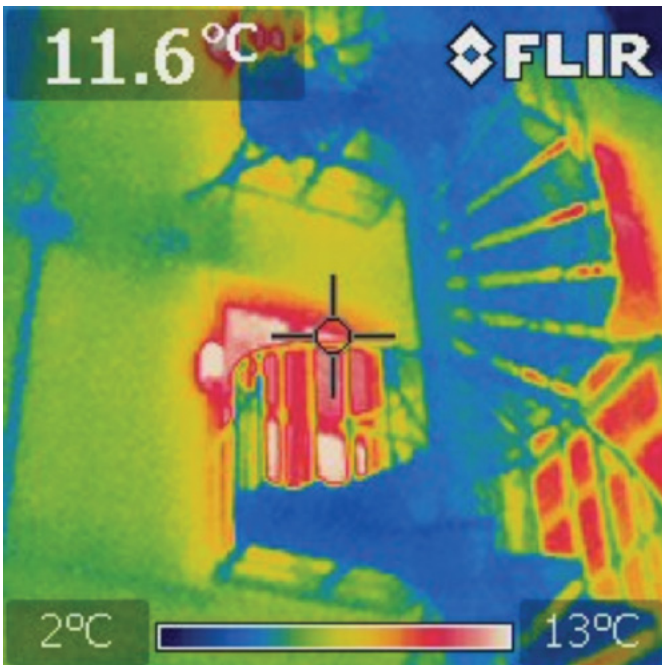
The Living Lab has provided support to an Engineering and Physical Sciences Research Council (EPSRC) research project, called the **Energy Efficient Cities Initiative**, led by **Ruchi Choudhary** (Reader in Architectural Engineering). The project aims to help reduce the uncertainty in modelling the energy management of non-domestic buildings. Support has been provided through data provision and use of University buildings for modelling. Six academic papers have been published to date that make use of a range of University buildings.

Outcome

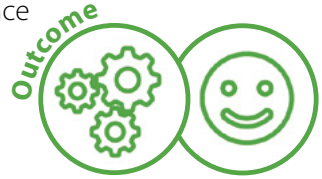
Teaching and research

Voluntary projects

Thermal imaging survey



A team of five students from the Cambridge University Environmental Consultancy Society (CUECS) undertook a **thermal imaging survey** at the Department of Plant Sciences, supported by the Department's Energy Coordinator, the Living Lab and local organisation Cambridge Carbon Footprint (who provided training on the use of thermal imaging cameras). Following identification of the areas in most urgent need of attention, **recommendations were made for follow up actions**. Although no work has yet been undertaken, the report has focused attention on the need for these improvements and the hope is that rolling replacements of the worst windows, as identified by the survey, will recommence next year.



University operations, Student experience

'Bin busting' waste audit

A team of ten students, together with Environment and Energy section staff and Dr Edmund Tanner (Department of Plant Sciences), conducted a **'bin busting' waste audit** of nine University departments in December 2015. This involved sorting, categorising and analysing the content of general waste bins. The project followed up a longitudinal study that has been running since the 1990s, and the results have informed follow up actions for improving recycling rates. Overall, 42% of the material in the general waste bins could have been recycled. There were great disparities between departments in terms of the rates and nature of recyclable waste. This project recommended that food waste be disposed of separately and sent for anaerobic digestion, that focus is placed on increasing the proportion of plastic being recycled, and that departments are encouraged to have prominent and well-labelled recycling bins. All of these recommendations have since been implemented across the University estate.

University operations, Environmental impacts, Culture change, Student experience

Focus on employability

After being involved in the 'bin busting' waste audit, **Cecily Church** joined the Geography Green Impact team and supported their communications around what could and should be recycled. Her involvement in the Living Lab helped her attain one of the summer internships with the Environment and Energy section in summer 2016. Since then, she has joined the team as the Carbon Management Assistant for a year's graduate placement!

Outcome

Student experience

Voluntary project › Internship › Grad placement

College sustainability projects

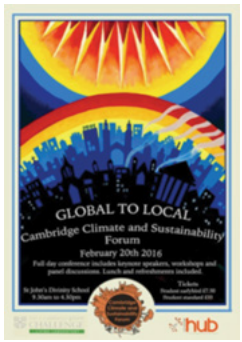
An opportunity emerged for the Living Lab to support college sustainability projects. Lucy Cavendish College set out three differing **energy conservation projects** for teams of students to tackle, providing the opportunity for students to gain practical experience, and enabling the college to assess its energy use for making further reductions. The resulting project saw Hadi Modarres, Mudassar Ahmed and Ioannis Anagnostopoulos analyse the change in heating policy on energy use. They found that gas consumption reduced by 6% and also identified the need for additional and better quality data to improve future analysis.

Outcome

Culture change, Student experience

Cambridge Climate and Sustainability Forum

The Living Lab supported the 2016 Cambridge Climate and Sustainability Forum. The event brought together around 90 attendees in February 2016, aiming to raise awareness of pressing environmental issues around the world among students, and what is being done to address them. It provided a platform for discussion and debate of critical issues and trends evolving around the topics of climate change and sustainability with leading professionals working in these areas. Feedback from attendees was very positive (92% said they would recommend the conference to a friend), and they expressed commitment to make further changes to their lifestyle or to seek to influence further change within the University.



Outcome

Culture change, Student experience

"A very rewarding experience where I gained insights into the energy policy as well as employed and polished my analytical skills to return something back to my University and society at large."

Mudassar Ahmed, student on the project

"It is really useful to us and has helped us to have some confidence in the changes to the heating policy which we made. We recognise the problems that the students encountered in getting some of the data and are hoping to address these in due course."

Lesley Thompson, Bursar, Lucy Cavendish College

Internships

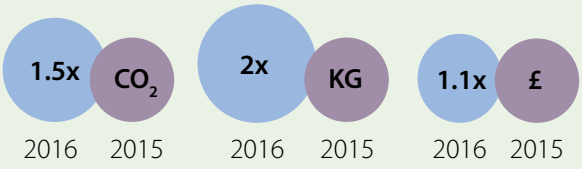
Laura Farrell

Subject: Sustainability Science major at Australian National University in Canberra, Australia.

Motivations: I applied to the IARU Sustainability Fellowship in order to gain greater skills in developing and implementing sustainability projects that encourage people to make changes in their lives to achieve our sustainability goals.

Worked on: Investigating the impacts of reducing ruminant meat consumption across University Catering Service outlets (part of the University's Sustainable Food Policy).

Results: The evidence Laura brought together demonstrates the positive impacts of implementing the Sustainable Food Policy in financial and environmental terms. Partly thanks to this work, the Sustainable Food Policy was approved in October 2016 and is now being implemented in all University Catering Service cafes and outlets.



This diagram demonstrates the impacts of reducing ruminant meat consumption on spend and CO_2 emissions. In 2016, even though the quantities of meat purchased doubled (because of more catering outlets and more customers), the proportion of ruminant meat decreased from 23% to 10% of total meat purchased. Because of this, costs increased by only 10% (rather than doubling) and the emissions increased by only 50% (instead of doubling).

Gergely Horvath

Subject: Land Economy

Motivations: I wanted to be part of an action team that works on real life issues. While sustainability has always been an area of interest to me, the scope of my previous activity was too broad to see any practical solution. With this project I had a chance to change that.

Worked on: Resources for cycle parking guidance for the University, to form part of the University Travel Plan. This project considered regulatory requirements and best practice from other institutions as well as from across the University estate.

On a scale from 1-10, how much more knowledgeable about environmental issues do you feel?

★★★★★★★★★★

Average score 9 out of 10

Robert Cashman

Subject: Theology

Motivations: I have an interest in supporting students to make change within the University, as well as in environmental sustainability issues. I saw this project as a way to combine these interests and develop ways of supporting students to improve the University's environmental performance, as well as supporting staff to encourage the students they work with to take action.

Worked on: Research of best practice in student engagement and induction at the University of Cambridge and elsewhere. Produced resources to support student inductions in Colleges and Departments, prepared Living Lab communications for the coming year, wrote content for websites, and prepared guidance for the Environment and Energy Coordinator network.

Results: Induction materials were provided to all departments and carried out by Environment and Energy section staff in six departments, resulting in greater awareness and activity (e.g. larger student teams part of Green Impact, more involvement in Living Lab projects).

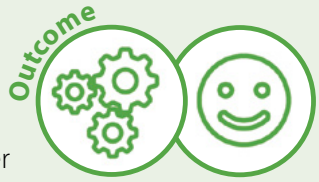
Student experience

Cecily Church

Subject: Geography

Motivations: I have always been really interested in environmental issues, because of the scale of the challenge and the potential for exciting and innovative solutions. I became really interested in the University's waste when I volunteered for the Living Lab's 'Bin Busting' waste sort in December 2015. Waste is a great area to tackle because it relies on the actions of individuals, so everyone really does have the power to make a difference. Scaled up across the entire University, there is a huge amount of potential for dramatically improving sustainability, with minimal effort from individuals.

Worked on: Investigated best practice across University departments and researched the conditions that enabled high levels of recycling and low levels of waste production. Using this information, worked with staff to facilitate increases in recycling rates and reductions in waste production within departments, and communicated guidance with a wider audience across the University.



University operations, Student experience

100% of 2016's summer interns would recommend an internship with the Environment and Energy section to a friend or colleague.

On a scale from 1-10, how much more prepared for work/life after university do you feel?

Average score 9 out of 10

From previous years' internships, the following further outcomes have been identified.

The **videoconferencing** case study by **Frederick Lowther Harris** in 2014 was used by the videoconferencing team to inform their strategy for the future of the videoconferencing service within the University: *"I will be using these very heavily as I take the videoconferencing service forwards…and agree its inclusion and shape in the forthcoming service catalogue, and its place in the future. Thank you SO MUCH."* – Sue Rogers. Since then, we have learnt that take-up of the pilot service they put in place has continued steadily with 2000 total meeting hours (averaging 5.5 hours/day) on the main host system over the academic year.

Outcome

University operations

Ishbel Cullen's research and recommendations from summer 2014 around **Post-Occupancy Evaluation (POE)** are being used as a basis for the new approach to POE within Estate Management.

Outcome

University operations

The **freezer replacement programme** informed by **four previous internships** (see p8-9 in annual report 2014/15) is resulting in tangible energy reductions. Each Ultra Low Temperature (ULT) freezer consumes roughly twice the daily consumption of an average household, so this roll out across the University will have significant impacts. For example, in the Department of Plant Sciences 50% less energy is used relative to other older freezers, saving over 4,600kWh of electricity and £650 over the course of a year. Across the University, 10 replacements have happened so far, with 24 more in the pipeline to date.

Outcome

Environmental impact

Focus on employability

Harrison Bowers was selected for an internship in summer 2013 and then continued work in a voluntary capacity to undertake **freezer audits**. He said it was *"such a great thing to be able to talk about to potential employers"* and that *"it was one of the best ways I got the experience to lead, plan and deliver something all by myself"*. This was the point that *"I knew for sure I love doing this and made a decision to go into sustainability full-time"*. Upon graduating, he joined AECOM, a design, consulting, construction, and management services company, working on energy use assessments. He has since got a job at CBRE, a real estate consultancy which helps landlords and companies to report on carbon emissions.

Outcome

Student experience

Focus on employability

Tom Norris carried out an internship in summer 2013 and then focused his undergraduate dissertation on the same topic, energy reporting and monitoring in buildings. He received the prize for best architectural dissertation in 2014. He now works for Accenture as a digital technologies consultant. He said: *"my work with the living lab made it apparent that I can make real change within organisations if I'm prepared to rock the boat."* His ambitions in his current role continue: *"There are some big changes happening at my current company too and I'm hoping to be at the forefront of them." "The work I did definitely contributed towards my future career opening my horizons outside of just architecture into wider spheres… It definitely made me more employable outside of the architectural industry".*

Outcome

Student experience

Award scheme

Global University Climate Forum 2015

We advertised the opportunity to attend IARU's Global University Climate Forum 2015 in Paris, which took place at the same time as the United Nations' COP21 climate change talks.

Four student teams from Cambridge were selected to participate, following their submission of proposals for improving campus-based sustainability initiatives at the University. They joined around 90 other students from 30 different universities around the world to present their project ideas. The proposals from Cambridge included:

- The One World Challenge, where students are encouraged to form teams and compete to take more sustainable everyday actions over a period of three weeks.
- A financial mechanism to aid positive investment, supporting the University's work around improving investment responsibility.
- Communications in the form of a blog around positive investment initiatives to enhance transparency around colleges' investment portfolios.
- Reduction of electronic waste by setting up a system for students to more easily share, exchange and pass on items.

The first three of these have since been taken forwards within the University of Cambridge context, with the One World Challenge taking place in March 2016; and Positive Investment Cambridge are involved in ongoing efforts to support the University in its endeavours around investment responsibility.

Other activities

Community of Practice for the UK Higher Education Sector

The University of Cambridge's Living Laboratory for Sustainability is seen as a pioneer amongst UK universities. Our Living Lab coordinator Emily convenes the new Environmental Association of Universities and Colleges (EAUC) **Community of Practice on Living Labs**, initiated after her conference talk for EAUC in May 2016. This community of practice is a platform for members to share and learn from each others' experience. EAUC have also established a **Living Lab research project**, which we are actively contributing towards. This has involved webinar contributions, telephone interviews and provision of examples on specific practices. The output is intended to be a guide for universities wishing to set up or scale up their own Living Lab.

Celebration event

In June 2016, we held the first **Living Lab celebration event,** bringing together those involved in the Living Lab over the last year, from staff and students across the University; highlights can be found in the video below.

https://youtu.be/JBYn5cjzXWI

Feedback following the event tells us that it met its aims of fostering collaborations, showcasing some of the great work carried out during the year, and creating a sense of community…

"It was refreshing to see so many young people at the dawn of their careers with such enthusiasm, embracing and benefiting from the power of networking and linkages."

"Enjoyed the celebration event – thanks for organising, and great to hear about a variety of projects from different people!"

"Thought the event was really useful. I probably spoke to about 15 different people, at least 7 of them new and was part of the group who stayed past the end to chat about our links and how we could help each other further…. There was a really good mix of people there from different interest backgrounds etc which was nice."

"I saw so many people swapping email addresses and having really in-depth conversations!"

"It's these kinds of gatherings that make me actually think we can change the world for the better!"

"It was so interesting to hear all the different things going on."

"Thank you for such a fantastic, inspirational, fun and delicious event: I can't imagine how it could have been improved. I met so many fantastic people, and I am not sure if the asparagus soup, carrot fritter or blue cheese pancake was my favourite!"

Communications opportunities

Every month over the last year we have provided an update for the University's sustainability newsletter **Greenlines** called the 'Living Lab lowdown'. This has enabled ongoing progress updates to be shared and increased the profile of the Living Lab's activities and projects it supports.

10 TALKS »»»» 360 PEOPLE

Throughout the year, ten talks took place to share opportunities, projects, insights and experiences from the Living Lab, both internal to the University and outside to share with others, reaching an estimated 360 people.

Future plans – aspirations for 2016/17

More projects

More people involved

More data provision

More relationships across departments

More links with other Living Labs across UK and internationally

Focus on innovation

The Cambridge Carbon Challenge

A new competition, in collaboration with the University's Energy and Carbon Reduction Project, to invite proposals from students and staff for reducing building energy use and associated carbon emissions across the University estate. Its aims are to harness expertise, improve environmental performance and increase the University's capacity to reduce carbon. Our hope is to foster innovation and new collaborations along the way.

Acknowledgements

A huge thank you to Santander for funding the Living Lab and enabling its growth and increasing momentum year on year. Thank you to Professor Peter Guthrie and Dr Ruchi Choudhary for their enthusiastic support, ideas, suggestions, and encouragement. Final thanks to everyone involved with the Living Lab – the students who participate, the staff who support, and everyone who provides assistance along the way.