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**Research,
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Sustainable Communities Institute

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The Sustainable Communities Institute (SCI) brings together specialists to develop new ideas, products and services that offer high-impact, sustainable solutions to some of society's biggest challenges.

SCI aims to be a leader in the development of new thought and novel approaches to solving the big challenges of air pollution, climate change, escalating urban housing costs and moving away from a carbon-based economy.

Our aim is to:

- act as a centre for generating groundbreaking thought by dialogue with a broad range of public, private and third sector leaders and other universities to create a powerful voice to influence Government policy and practice
- work with start-ups and SMEs to develop new energy and carbon-saving products and services by using LSBU's specialist knowledge, facilities and equipment
- collaborate with larger organisations to build innovative demonstration projects that push the boundaries of the latest global technologies

The Sustainability Debates

A sustainable society is one that allows everyone to live well within our environmental limits. It is flexible, resilient, efficient and able to adapt to change. It focuses on two broad areas, the development of new, low-carbon infrastructures and the adaption of the existing infrastructure in order to create sustainable, productive communities.

The Sustainability Debates, founded and hosted by LSBU, aim to facilitate discussion around the barriers currently limiting society's ability to drive sustainable development and the ways in which industry can overcome those barriers through improvement of:

- policy
- responsibility
- education
- knowledge and skills
- approach, attitudes and action

By raising the issues and encouraging their open discussion we hope to encourage change, develop awareness and drive the sustainability agenda forward.

The series attracts high-profile speakers with diverse backgrounds and expertise and it is free and open to students, professionals, business leaders and clients.

The 2016 series focused on the building industry. The Built Environment Exchange 2016 is a debate series jointly developed by LSBU, Chartered Institution of Building Services Engineers (CIBSE) and All-Party Parliamentary Sustainable Built Environment Group (APSBEG), focused on the development of the sustainable built environment.

Summaries and outcomes of the debates so far:

Regulation versus self-regulation

The current Conservative Government is seeking to deregulate the building industry with a one-policy-in, three-out approach. With the sustainability challenge imperative for the building industry, LSBU, CIBSE and APSBEG, chaired by Paul King, MD of Landlease, debated whether regulation is needed to drive sustainability across the sector.

The discussion made it clear that regulation has its place in enforcing sustainable design and practice in industry; however, it can limit progress due to low benchmarks and the creation of unnecessary requirements.

The self-regulation team produced a compelling argument, almost swaying the audience in the final poll for a result of 52% for regulation and 48% for self-regulation.

Energy efficiency versus wellbeing

Efficient low-carbon buildings have been the focus of the sustainability agenda for some time – and progress in this area is vital in reducing the systematic effects of climate change.

Many professionals working in the building industry perceive sustainability as meaning energy efficiency. However, a more holistic interpretation of sustainability is gaining focus: one that considers wellbeing and the effective measurement of the workability or liveability of spaces and places.

- Should the industry aim for energy efficiency or holistic sustainability?
- How well do our definitions and approaches scale – do we need to better define criteria for a sustainable building as different from a sustainable built environment?

The debate aimed to address these questions and more. Professor Andy Ford, Acting Director of the Centre for Efficient and Renewable Energy in Buildings (CEREB) at LSBU, and Tom Taylor, Principal Consultant at BRE Global, argued the case for energy efficiency while Professor Derek Clements-Croome Sessional Lecturer at Reading University and Carine Guenand, Assistant Design Manager at Skanska, argued in favour of wellbeing. The debate was chaired by Jon Bootland, Director of The Sustainable Development Foundation.

The post-debate poll results revealed a reversal in opinion from the pre-debate poll – energy efficiency won with 60% of the vote to 40% for wellbeing. But the audience asked if we should be aiming to achieve both and the panel answered unanimously with 'yes'. An audience member noted that other countries such as Australia are ahead of the game in taking a holistic approach to energy efficiency and wellbeing in buildings. Resources, knowledge, evidence, skills and expertise are all required to help us implement this

holistic approach to a sustainable built environment. We know what we want to achieve, we now just need to work together to make it a reality.

Generalist versus specialist learning for a sustainable built environment

Sustainable development requires a systematic approach driven by collaboration. Projects in the built environment tend to bring together the specialists necessary to create multidisciplinary teams. At first sight, this collaboration of expertise complements the sustainable development agenda. However, the team often lacks a shared vision or understanding which can lead to a conflict in priorities, resulting in compromised sustainability performance. How then, do we best create graduates and professionals who have both the skills and knowledge to create and maintain a built environment that is environmentally, socially and economically sustainable?

The debate delved into the world of learning and questioned the best approaches to enable people across their careers to drive the sustainability agenda in the built environment. Chaired by Nigel Tonks, Buildings London Leader at Arup, the team arguing for a generalist approach including Paul Tymkow, Director of Learning and Knowledge, Hoare Lea and Robert Schmidt III, Senior Lecturer at Loughborough University, had the audience on its side with an overwhelming majority of 86%. The debate was interesting and questioned the traditional roles in the design team, and attitude and approach to collaboration. The final debate poll showed a swing of support from the audience to 54% for specialists team, constituting Satheesh Jacob, Head of Excellence for building services at Ramboll, and Alex MacLaren, Assistant Professor – Architectural Design at Heriot Watt University and 46% for generalists.

The heat is on

The Paris Climate Agreement, and its subsequent ratification, sets out some challenging targets for the UK. LSBU is working hard to find ways of minimising the impact of civilisation on the environment and contribute to decarbonising the economy.

New design practices mean the buildings we construct today have less of an impact on the environment, but around 90% of the buildings that will comprise London in 2050 are already built.

The majority of the existing building stock in the UK is extremely energy inefficient, especially in regards to heating, which makes up half the UK's energy use. The Climate Change Committee says the Paris targets are unachievable without a near complete decarbonisation from the heating sector. The UK currently has no answer to this challenge. A new way of tackling the problem is needed – and a consortium including LSBU experts might have a solution. A Balanced Energy Network (BEN) could have a big impact on reducing the UK's carbon emissions. It works on a simple principle – managing the use of available heat before consuming grid gas and electricity. BEN balances the delivery of heating, cooling, and electricity in a way that minimises costs and carbon emissions. The network is a complex system of innovative technologies working together to effectively manage heat loads across multiple buildings. Using water to transfer heat in winter and to cool in summer; The Balanced Energy Network can effectively take advantage of overheating different types of buildings and utilise the waste heat in other spaces or even store or recover heat from the London Aquifer.

“The idea of heat sharing in itself isn't especially new,” explains LSBU's Andy Ford, Professor at LSBU. “It's been done in The Netherlands, although their aquifers are easier to get to than ours, which are buried under some quite complex geology. What we are doing that is different is looking at scaling it up, so rather than a single well working to heat and cool a single building, we can develop and deliver a whole network of connected buildings

that share the same system. That's where the challenge lies, and that's where what we are doing could play a huge part in helping the UK meet its carbon targets in the future.” The pilot scheme, which will be one of the first of its kind, will connect LSBU buildings to the same heating system, giving the team the chance to see how it works in practice, refine their idea, and increase the scope of the project again. “LSBU is a great place to trial it,” says Andy. “Not only is the campus made up of different types of building that represent a microcosm of London, we're also within walking distance of Westminster. That way, the Prime Minister can walk down and see how it works for herself – she won't even need to add to her own carbon footprint to see how she could reduce the nation's.”

The BEN project coordinator is the Renewable Energy Company ICAX Ltd. LSBU are in a consortium of cross-sector partners including TFGI, Upside, Mixergy, Origen Power, and Cranfield University who have been awarded a £2.9 million grant by Innovate UK, the UK's innovation agency, towards this £4 million project to build BEN on the University's campus.

LSBU and renewable energy company ICAX are leading a consortium of cross sector partners that have been awarded a £2.9 million grant by Innovate UK, the UK's innovation agency, towards the £4 million project.

Stronger connections

We've all been there. Out of the office or away from home, with an urgent task needing our attention via our mobile. It might be signing off an important document for work, emailing the childminder, or arranging a meeting with friends via Facebook. Whatever it is, we can't do it – because our mobile or tablet's wireless connection is moving at a snail's pace.

LSBU and Hughes Electronics Ltd are developing a solution to that, thanks to new research making use of LSBU's state-of-the-art anechoic chamber, a unique noise-free environment. If all goes to plan, slow wireless connectivity could soon be a thing of the past.

The research has shed fresh light on the effects of passive intermodulation (PIM), and helped the design of the world's first system aimed at reducing signal loss and interference for mobile devices. PIM is the name for the distortions that happen when two or more signals pass through cables and connectors, resulting in interference to wireless communications – interference that leads to loss of signal, buffering and generally poorer performance.

The research discovered that the metal bases used in most telecoms towers and underground across the UK are particularly susceptible to this interference. The good news is that the WaveWay™ connector that has been invented as a result of the research can stop it happening.

The WaveWay is a connector that delivers stronger and more consistent signals, giving people more data, faster, with less buffering and better performance. Even more impressive is that it can be retrofitted to existing cables and it's compatible with 5G technology, giving it some valuable future-proofing.

It's a device that could only really have been developed in a facility such as LSBU's anechoic chamber, a specially designed space that cuts out all noise from outside the room and absorbs

all noise within it – so there is no interference. They are often described as “the quietest places on earth” and Billy Hughes, MD of Hughes Electronics Ltd, believes it was the perfect location for the research.

“It was vital that we tested the connector somewhere free from other interference, so we could get clean results,” he says. “It means we've developed a connector that has the potential to revolutionise the way data connections are made.”

The system is currently nearing the end of tests in Ireland, and will be available for the national market shortly after that. In fact, by the time you read this, it could be being rolled out around the country – so if you find your wireless connection is much better next time you're out and about, you'll know one of the reasons why.

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The circle of life

For centuries – since the Industrial Revolution, in fact – design and manufacturing have been based on the same concept. We make things, use them, and then get rid of them. However, as resources become increasingly scarce and the damage we are doing to the planet is clearer than ever, that needs to change – and LSBU is playing its part in making that happen.

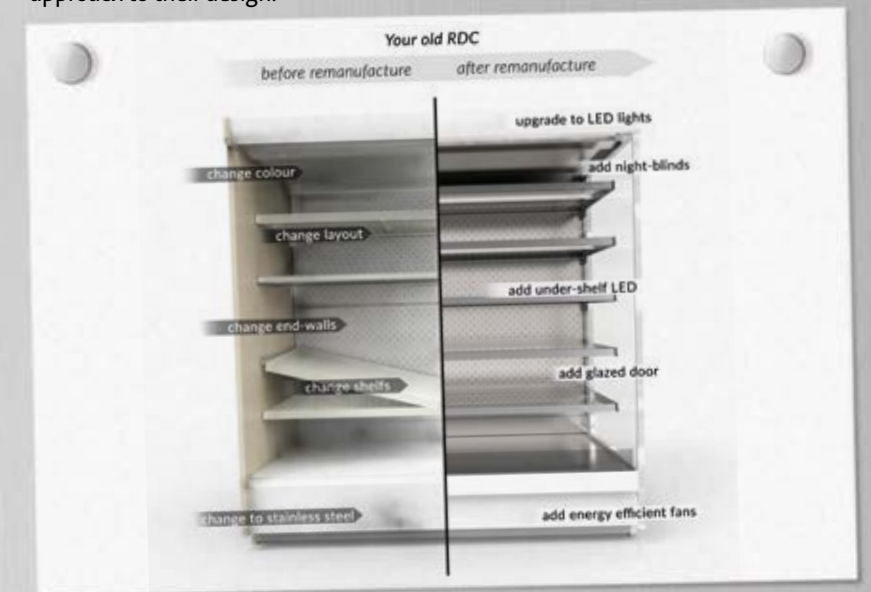
LSBU's Dr Deborah Andrews has long believed that the circular economy – where items are re-engineered, remanufactured or refurbished to extend their lifespan – is the future. However, it is only recently that people have started to listen.

“There are two sides to the problem,” says Deborah. “The technical side – how do we do this, how do we design things so that individual parts can be repaired or replaced – is actually reasonably straightforward. The more complicated side is in amending the behaviour of consumers and businesses so that they are considering sustainability when they buy new products – that’s where the challenge really lies, something we identified with an initial feasibility study with The Bond Group to help them improve their re-engineering capacity.”

It’s a challenge that Deborah herself is helping to tackle. Deborah and LSBU have been working alongside The Bond Group, a business that manufactures new refrigeration cabinets as well as re-engineering existing cabinets to extend their life – often making them better than new. This involves things such as replacing and upgrading components over time and using renewable elements instead of non-recyclable ones.

The message is getting through. LSBU now has a PhD student, Zaneta Muranko, who is working closely with the senior management team at Bond to understand and challenge the behaviour of procurement teams at supermarkets, who are responsible for purchasing huge numbers of refrigeration cabinets each year – and who often choose cheaper cabinets that can’t be refurbished or repaired. It is cheaper in the short term but Zaneta’s work is aimed at showing that they would be better off in the long run if they considered a circular approach to their design.

Deborah is not naive about the challenges ahead. “The whole industry is set up to manufacture things that aren’t part of a circular economy,” she says. “Something needs to happen to encourage more businesses to consider their behaviour – whether that is grants, or a rise in raw materials that means it makes more sense to invest in the circular economy remains to be seen – but at LSBU, we’re certainly doing our part to make it a reality.”



Inner space

The average person will spend around 90,000 hours of their life at work. That's a considerable amount of time to spend in any environment, so it's only natural that people will want as many of those 90,000 hours to be spent somewhere that has a positive effect on health, rather than a negative one. Similarly, it will come as no surprise to discover that students learn better in the right kind of physical environment.

That's why LSBU and CETEC are teaming up to try to bring Australian standards of indoor environmental quality (IEQ) to the heart of London – improving the IEQ of the office and education space at LSBU along the way.

This partnership will see CETEC monitor LSBU's learning spaces and offices using the NABERS Indoor Environment assessment tool – a pilot scheme that is the first of its kind in the UK.

The system, which is commonplace in Australia, rates six different indoor environment parameter, including thermal comfort, indoor air quality, acoustics, lighting, office layout and maintenance of the HVAC system.

These are assessed via a combination of physical measurements taken using specialist equipment and a questionnaire given to those who use the space. The results are then measured against the NABERS benchmarks and a star rating is awarded for office spaces that indicates the building's relative performance.

It's a system that many believe to be far in advance of any other rating system for indoor environmental ratings. LSBU is in a great position to develop this new and emerging area of healthy spaces due to our strong expertise in health and social care and built environment, especially building services.

The aim? It's hoped that the project will act as a catalyst to develop further research into healthy spaces, supported by staff from across the University, as well as giving CETEC the traction in the UK to monitor more indoor spaces – hopefully resulting in happier, more productive offices all over the country.



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Knowledge is power

These are testing times for local authorities. Budgets have been slashed in the austerity measures introduced after the banking crisis, and the post-Brexit future has yet to take any clear shape. Making every penny count – and ensuring it will have value as a long-term investment – is at the heart of all council decision-making for obvious reasons.

Big data could make the difference between spending wisely and reaping the rewards, or making poor planning decisions that will hamstring a council for years, if not generations, to come.

One council determined to ensure all its decisions are based on the best possible information is Lambeth Council. The council's plan was simple: to use data analysis to inform the development of the first Co-operative Local Investment Plan (CLIP) for the wards of Stockwell, Vassall and Larkhall (known as the Stockwell CLIP).

The solution, provided by LSBU, was anything but simple.

The team set about extracting information from a variety of sources held by the council using specially designed bits of code that brought together a huge amount of data into a single database. The information included demographic and business intelligence, investments made and planned by the council, and existing assets (including physical and organisational assets).

The resulting database and dashboard, all designed by the team at LSBU, meant that Lambeth Council was able to break down each ward

and access a staggering range of data to help plan where to invest – for example, identifying areas with higher densities of traffic fatalities to decide where to invest in traffic calming – as well as tracking the impact that existing traffic calming measures have had in other wards to decide what the most effective approach would be.

It was a Herculean undertaking, but one that Lambeth Council now finds invaluable. The council can now view data through the different dashboards as required, and all the information is in a single fact table in an MS SQL Server. The code that

LSBU wrote to help consolidate the information can also be reused to gather more data in the future if required.

The future, of course, remains uncertain. Life would be very boring indeed if anyone could predict what it holds with 100% accuracy. But for Lambeth Council, the work that it undertook with LSBU means the future is less of a mystery for it than it used to be – and the people of Lambeth can look forward to investments that will make as much difference to tomorrow as they do to today.

Can bugs fight world hunger?

By 2050 earth will be home to nine billion people. The planet's resources are stretched to breaking point today. Add another three billion on top of the existing population and the future begins to look less than utopian.

Among the resources most stretched will be food. There will be fewer fish in the ocean as a result of decades of overfishing. On top of that, water will be scarce due to higher demand and the effects of climate change, which in turn has an enormous impact on food production. We don't just drink the stuff, we also use massive quantities of water to produce food and raise livestock. We won't be able to sustain current farming practices.

If we want food security we need to rethink our entire approach, by looking for alternative food sources and making food production more efficient.

Insects are shaping up to be a really good option, both nutritionally and environmentally. According to the Food and Agriculture Organization of the United Nations (FAO)¹, more than two billion people across the globe (30% of the world's population) already supplement their diets with insects, and with good reason. Crickets are nutritional powerhouses. They can be eaten whole but also ground down into a flour that contains:

- all nine essential amino acids
- more iron than spinach
- more calcium than milk

Cricket flour is also high in protein, fat, fibre, vitamins and minerals, and low in saturated fat, and it requires much less water to produce than other sources of protein such as chicken or beef. This makes insects a particularly interesting nutritional supplement for people in developing countries, especially children.

The commercial appeal of insect-based food products is on the rise in developed countries, especially in the UK, with a number of companies now selling insect-based products. LSBU was approached by one of them, which was looking for expert help to expand its product range. It was paired up with Devon Petrie, an LSBU graduate in Baking Technology Management, to carry out the testing and development.

It was an exciting challenge for Devon. "This was a new type of flour that neither me nor my mentors had seen or used before. We had to investigate the molecular structure before we could start developing any products.

"There was a lot of testing and retesting. If I was not in the lab processing and analysing samples, I was in the bakery trying to see if

the products would have the same properties as a loaf of bread."

Devon found that a cricket flour mix doesn't have the same molecular make-up as normal bread mixture. "It seemed to act the same as additional bran and therefore the molecular structure alters." This meant that additional gluten had to be added to the dough to form the bread products. "Once we had analysed the flour, the product development was a straightforward process and allowed us to create products for the market."

In the end, Devon created a flour mix that is in the process of being commercialised by the company, which was delighted with the results and is in early talks with the University about a second collaboration to develop more insect-based foods.

Devon has now become an expert in the area and he is using his new knowledge of insect-based products to study for a PhD focusing on insect-based products. He is also hoping to be able to one day use the experience gained at LSBU to help eradicate hunger in his homeland, Zimbabwe.



¹ *Edible insects: future prospects for food and feed security*

A. van Huis, J. Van Itterbeek, H. Klunder, E. Mertens, A. Halloran, G. Muir and P. Vantomme
FAO Forestry Paper No. 171. 2013. FAO, Rom

Big fan of heating

LSBU, London Underground and Islington Council are working together on a project called MICAH (Metropolitan Integrated Cooling and Heating) to use waste heat generated from the London Underground ventilation system to support the local community by heating nearby homes and businesses via Islington's existing district heating network.

LSBU and London Underground have been working together to solve heating and cooling issues for 15 years. Cooling the tube is a growing focus for London Underground. It involves the extraction of hot air from the tube system that is usually vented out at street level and is wasted.

The MICAH study is investigating the technical process and efficiency of using heat extracted from the tube system during the cooling process to support Islington's district heating network. The project also seeks to identify the environmental, social and financial value of doing so.

Like all the best ideas, the principle is simple. Heat will be taken from air in the underground system, at around 20°C to 30°C. It will be passed through

an air source pump which will transfer the heat into water, at a temperature of around 80°C. That water can then be pumped to homes and businesses via the network, heating their radiators and hot water systems.

London Underground is a precious untapped resource, and produces a huge amount of wasted heat and energy as a side effect of transporting Londoners around the capital. It's estimated that each year enough heat escapes from the underground to heat 16,000 flats – that's a huge carbon saving if the energy can be repurposed instead of wasted.

Islington Council is seen as pioneering in this field thanks to the Bunhill Energy Centre and heat network. At present, heat created while

generating electricity is used to provide heat for more than 850 homes, a swimming pool and a leisure centre.

If proved feasible, MICAH could provide the chance to heat a further 1,500 homes as well as a school and a nursery, while saving millions of pounds in heating budgets each year. It will also make the London Underground network more environmentally friendly.

MICAH is still in the early stages, and is some way off from being a solution to London's heating and energy requirements – but the work being put in now has the potential to change how we heat our homes and protect the environment for generations to come.

London South Bank University has been transforming lives, businesses and communities for more than 125 years

When it first opened, the aims of the University were to improve the employment opportunities for the people of south London and to support the community by providing access to relevant applied knowledge.

The core of our mission remains unchanged today.



Our Borough Road building in 1892 and today.

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